VIII INTERNATIONAL CONFERENCE ON OPERATIONS RESEARCH

La Habana 25-29th-2008.

Organized by:

Universidad de La Habana

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Contents

INVITED LECTURES

PLENARY LECTURES

CHARLES BOUVEYRON (FRANCE): Lagrangian Methods for equilibrium problems: an overview on high-dimensional data classification with model based techniques.
HELMUT GFRERER (AUSTRIA): On a combined penalty and barrier approach for a class of infinite dimensional optimization problems.
ALFREDO IUSEM (BRAZIL): Proximal point and Augmented Lagrangean Methods for equilibrium problems.
HANS KEIDING (DENMARK): The probability of factor price equalization.
PIERRE-LOUIS LIONS (FRANCE): Analysis, models and simulations.
WERNER ROEMISCH (GERMANY): Scenario reduction in stochastic programming.
GERARDO RUBINO (FRANCE): Transient analysis of markovian queues.
GEORGES ZACCOUR (CANADA): Optimal pricing and advertising policies for an entertainment event.

MAIN LECTURES

O. Abramov (Vladisvostok),, R. Caballero (Malaga), H. Cancela (Montevideo), B. Cornet(Paris-Kansas), M. Cottrell (Paris), F. Cucker (Hong Kong), R. Enkhbat (Ulan Bator), M. Florenzano (Paris), E. A. Galperin (Montreal-Toronto), M, J. García-Ligero (Granada), M. J. Geiger, Martin (Stuttgart), A. Griewank (Berlin), J. Guddat (Berlin), C. Hervés (Vigo), V. Kalashnikov(Mexico), A. M. Lara-Porras (Granada), A. F Pashenko (Moscow), Ll. M. Pla (Lleida), P. Román (Melilla), M. M. Rueda (Granada), M. I. Todorov (Puebla), P. Valdés (Habana).

TUTORIALS

XAVIER GUYON (France): Estadística espacial.

MINI COURSES

Luis Caffarelli(USA) Problems involving anomalous diffusion I.
Luis Caffarelli (USA)Problems involving anomalous diffusion II.
Laurent Desvillettes (France): Population dynamics via infinite dimensional reaction-diffusion.
Hisao Fujita Yashima (Italy): Ecuaciones estocásticas de la dinámica de poblaciones con la difusión en un territorio.
Pierre-Louis Lions (France): On mean field games.

GENERAL TIMETABLE

Monday

9:00-12:00	Registration	Felipe Poey Building Facultad de Matemática y Computación Universidad de la Habana San Lazaro y L, Vedado
15:00-16:30	Opening Address	Aula magna
19:00-22:00	Welcome party	Hotel Vedado

	Salón 250	Laboratorio 1	Laboratorio 2	Salón UNESCO
9:30-10:30	Tutorial			PD1
10:30-11:30	Tutorial			PD1
11:30-12:30	Lunch	Lunch	Lunch	Lunch
12:30-13:30	Tutorial	EP1	EP2	PD1
13:30-14:30	Tutorial	EP3	EP4	PD1

Tuesday

8:30-9:00: Welcome activity, Hemiciclo del Capitolio.

9:00-10:00 Opening Lecture Introducer: J. Guddat	Rubino, Gerardo, France	TRANSIENT ANALYSIS OF MARKOVIAN QUEUES
14:00-15:00 Plenary Lecture Introducer: S. Allende	Iusem, Alfredo Brazil	PROXIMAL POINT AND AUGMENTED LAGRANGIAN METHODS FOR EQUILIBRIUM PROBLEMS

Time	Room 1	Room 2	Room 3	Room 4
9:00-10:00				PDE1
10:00-10:20	Coffebreak	Coffebreak	Coffebreak	Coffebreak
10:20-12:40	AL1	PE&RT	TS&IO1	PDE1
12:40-14:00	Lunch	Lunch	Lunch	Lunch
14:00-15:00				PDE2
15:00-15:10	Coffebreak	Coffebreak	Coffebreak	Coffebreak
15:10-17:30	MME	SM&A1	O1	PDE2

Wednesday

9:00-10:00 Opening Lecture Introducer: M. Cottrell	Bouveyron, Charles France	AN OVERVIEW ON HIGH-DIMENSIONAL DATA CLASSIFICATION WITH MODEL-BASED TECHNIQUES
14:00-15:00 Plenary Lecture Introducer: B. Cornet	Zaccour, George Canada	CANADA OPTIMAL PRICING AND ADVERTISING POLICIES FOR AN ENTERTAINMENT EVENT

Time	Room 1	Room 2	Room 3	Room 4
9:00-10:00				PDE3
10:00-10:20	Coffebreak	Coffebreak	Coffebreak	Coffebreak
10:20-12:40	HDD	GR&RT1	OR1	PDE3
12:40-14:00	Lunch	Lunch	Lunch	Lunch
14:00-15:00				PDE4
15:00-15:10	Coffebreak	Coffebreak	Coffebreak	Coffebreak
15:10-17:30	MEC	OR2	O2	PDE4

Thursday

9:00-10:00 Opening Lecture Introducer: A. Griewank	Gferer, Helmut Austria	ON A COMBINED PENALTY AND BARRIER APPROACH FOR A CLASS OF INFINITE DIMENSIONAL OPTIMIZATION PROBLEMS
14:00-15:00 Plenary Lecture Introducer: M. Florenzano	Keiding, Hans Denmark	THE PROBABILITY OF FACTOR PRICE EQUALIZATION

Time	Room 1	Room 2	Room 3	Room 4	Hall
9:00-10:00				PDE5	
10:00-10:20	Coffebreak	Coffebreak	Coffebreak	Coffebreak	
10:20-12:40	NA&RP1	O4	TS&IO2	PDE5	
12:40-14:00	Lunch	Lunch	Lunch	Lunch	
14:00-15:00				PDE	
15:00-15:10	Coffebreak	Coffebreak	Coffebreak	Coffebreak	
15:10-17:30	SM&A2	AL2	NA&RP2	PDE6	POSTER SESSION NA&RP3

Friday

9:00-10:00 Opening Lecture Introducer: C. Bouza	Roemisch, Walter Germany	SCENARIO REDUCTION IN STOCHASTIC PROGAMMING
14:00-15:00 Plenary Lecture Introducer: S. Mischler	Lyons, Pierre-Louis France	ANALYSIS, MODELS AND SIMULATION

Time	Room 1	Room 2	Room 3	Room 4	Hall
9:00-10:00				PDE7	
10:00-10:20	Coffebreak	Coffebreak	Coffebreak	Coffebreak	Coffebreak
10:20-11:20	OR5	SM&A4	ECHU	PDE7	
11:20-11:50	OR6	SM&A4	ECHU	PDE7	POSTER SESSION
11:50-12:40	OR6	O4	ECHU	PDE7	POSTER SESSION

SESIONS

Monday

(To be held at the University Campus: San Lázaro y L, Vedado)
Tutorial: Salón 250, Varona Building.
Introducer: C. Bouza
09:30-11:30 Guyon, Xavier: ESTADÍSTICA ESPACIAL I.
12:30-14:30 Guyon, Xavier: ESTADÍSTICA ESPACIAL II.

Session EP1: Room 1, 3^{rd} floor, Poey Building

Chair: Freyre, P.

Time	Author	Contribution
13:30-14:30	Espinosa, M.	Musical genre recognition and cluster analysis
	Melis, Y.	Ant colony optimization for $\mathbb{R}^n$ functions
13:30-14:30	Díaz, C.	Automatic linear model selection for a least squares data fitting problem with continuously differentiable piecewise defined models.
13:30-14:30	Fernández, A.	A polynomial time algorithm for the context free satisfiability problem
13:30-14:30	Chávez, M.C.	Use of Bayesian networks obtained by particle swarm optimization for high blood pressure diagnosis
13:30-14:30	Abdel-Azizm E.	Political games and use of linear complementarity process in its solution

Session EP2: Room 2, 2^{nd} floor, Poey Building

Chair: Otero, J.M

Time	Authors	Contribution
12:30-13:30	Griep, C.C.	Scientific cooperation in Latinamerica
12:30-13:30	González, Z.	Parameter estimation of diffusion processes using EDAs
12:30-13:30	De Arazoza, H.	Modeling dengue fever: an overview and some working ideas
12:30-13:30	Abdel-aziz, E.	Integer linear programming objective - constraint zooming theory
	Osman, H.	Applications of integer linear programming in architecture

Session EP3: Room 1, 3^{rd} floor, Poey Building

Chair: Díaz, N.

Time	Authors	Contribution
12:30-13:30	Pino, C.	Aplicación de los sistemas de simulación al proceso de abastecimiento de combustible a los aviones de pequeño y gran tamaño en la empresa Sonangol distribuidora-aeroinstalación de Luanda
12:30-13:30	Medrano, B.	Heurísticas para el job shop scheduling
12:30-13:30	Martínez, H.	Aplicación de la modelación matemática en el funcionamiento hidrogeol gico de las aguas subterráneas
	Pérez, M.	Nuevo método de trabajo con los regresores en las series cronológicas de lluvia
	Delgado, Y.	Classification by means of ant colony and parameters configuration

Session EP4: Room 2, 2^{nd} floor, Poey Building

Chair: Baguer, M.L.

Time	Author	Contribution
13:30-14:30	Bandala, M.	Reducción del espacio de búsqueda para problemas de calendarización aplicando un algoritmo genético multiobjetivo
	Baguer, M.L. Kakes, A.	Heurísticas de reordenamiento en matrices con estructura particular
	González, R.	Grasp con búsqueda de vecindad variable aplicada al problema de asignación cuadrática para instancias de gran escala
	Hernández, H.	Problema de cubrimiento de conjuntos

Session EP4: Salon UNESCO

Chair: Estebán, M

Time	Speaker	Contribution
9:30-11:30	Caffarelli, L.	Problems involving anomalous diffusion I (mini-course)
12:30-13:00	Ackermann, N.	An invariant set generated by the domain topology for parabolic semiflows with small diffusion
13:00-13:30	Cabré, X.	Saddle-shaped solutions of bistable diffusion equations

Tuesday

Opening Lecture

Introducer: J. Guddat

9:00-10:00 Rubino, Gerardo: TRANSIENT ANALYSIS OF MARKOVIAN QUEUES

Session O1: Room 1

Chair: Cucker, F.

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: Bouza G.	Cucker, F.	Coverage processes on spheres and condition numbers for linear programming
11:00-11:20	Rapcsák, T.	Sectional curvatures in nonlinear optimization
11:20-11:40	Fulöp, J. Hungary	Global optimization techniques for some optimization problems on Stiefel manifolds
11:40-12:00	Gárciga, R.	New condition characterizing solutions of variational inequality problems
12:00-12:20	Bouza, G.	On the role of MPCC-LICQ when solving bilevel programs by the Fritz-John relaxation

Session PE&RT: Room 2

Chair: Kalashnikov, Vy.

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: Alvarez, A.	Kalashnikov, Vy.	Human migration model applied to Laguna region in Mexico
11:00-11:20	Ozdemir, D.	Retailer coordination under backordered and lost sales
11:20-11:40	Muñiz, L.	Nonparametric estimation of covariance functions: an approach based on covariance function expansions and regression methods for second order moments under quadratic loss
11:40-12:00	Alvarez, A.	Asymptotic properties of the estimators of the coefficients of a jump diffusion model
12:00-12:20	Milanés, A.	Numerical and simulation methods for the approximation of the probability of ruin with heavy tailed claims

TS&IO1

Chair: Román, P.

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: Lara, A.M.	García, M.J.	Interactive materials for the resolution of a linear programming problem using the simplex method
11:00-11:20	Lara, A.M.	New methodologies in statistics: a different way of studying SPSS
11:20-11:40	Abad, F.	Obtaining of mortality tables in the classroom
11:40-12:00	Arcos, A.	Use of free software for mathematical and statistical training in pharmacy's studies
12:00-12:20	Montero, M.Á.	Education statistics of the autonomous city of Melilla

Session PDE2: Room 4

Chair: Zuazua, E.

Time	Speaker	Contribution
09:00-09:30	Martínez, I.	Propagation and creation of L^1 and L^∞ estimates for the Boltzmann equation for variable hard potentials
09:30-10:00	Wolanski, N.	A free boundary problem for the $p(x)$-Laplacian
10:00-10:30	Coffebreak	
10:30-12:00	Desvillettes, L.	Population dynamics via infinite-dimensional reaction-diffusion (mini-course)

Plenary Lecture

Introducer: S. Allende

14:00-15:00 Iusem, Alfredo: PROXIMAL POINT AND AUGMENTED LAGRANGIAN METHODS FOR EQUILIBRIUM PROBLEMS

AL1: Room 1.

Chair: Griewank, A.

Time	Speaker	Contribution
15:10-15:50 Main Talk Introducer Kalashnikova, N.	Griewank, A.	Adjoint Broyden a la GMRES
15:50-16:10	Kalashnykova, N.	Numerical solution of complementarity problems with perturbation algorithms
16:10-16:30	Papa, E.P.	Classical and logarithmic-quadratic proximal methods for quasiconvex functions
16:30-16:50	Xavier, A. E.	A novel soft clustering algorithm via the hyperbolic smoothing approach
16:50-17:10	Lage, A.	Solution to the Edward Anderson model in Husimi graphs
17:10-17:30	Bank, B.*	Real polynomial equation solving and applications

Session SM&A1: Room 2

Chair: Rueda, M.M.

Time	Speaker	Contribution
15:10-15:50 Main Talk Introducer: Salas, R.J.	Rueda, M.M.	Estimating linear parameters from survey data using nonparametric regression
15:50-16:10	Škrabić, B.	Information identity in parameter estimation assuming nonconstant variance
16:10-16:30	Salas, R.J.	Identification of correlations between some of the metaheuristics used to solve the quadratic assignment problem by multivariate statistical techniques
16:30-16:50	Clemençon, S.	Estimation in a stochastic SIR model with contact tracing
16:50-17:10	Zetlaoui, M.	Statistical inference for markovian forestry models
17:10-17:30	De Bragança, B.	Meld as a predictor of long term mortality in liver t ransplantation list- a survival tree analysis

Session MME: Room 3.

Chair: Galperin, E. A

Time	Speaker	Contribution
15:10-15:50 Main Talk Introducer: Posedel, P	Galperin, E.A	Consistency and non-causal models for long term planning via uniform small sample random number generation
15:50-16:10	Posedel, P	Mathematical model and decision support system for determining the marginal reserve requirement as a monetary policy instrument
16:10-16:30	Arnerić, J.	Multivariate risk-return decision making within dynamic estimation
16:30-16:50	Assis de S., A.	The effects of the information flow on the stock market volatility: an empirical test
16:50-17:10	Jurun, E.	Independence testing of variables with nominal measure-customs component in croatian brand

Session PDE3: Room 4

Chair: Murat, F.

Time	Speaker	Contribution
14:00-14:30	Padilla, P.	Genetic regulatory networks: a PDE approach
14:30-15:00	Salort, D.	Trace theorem on infinite tree, application to human lung
15:00-15:20	Coffebreak	
15:20-15:50	Dolbeault, J.	The two-dimensional Keller-Segel model after blow-up
15:50-17:30	Fujita, H	Stochastic equations in population dynamics with diffusion (mini-course)

Wednesday

Plenary Lecture

Introducer: Cottrell, M.

9:00-10:00 Charles Bouveyron: AN OVERVIEW ON HIGH-DIMENSIONAL DATA CLASSIFICATION WITH MODEL-BASED TECHNIQUES

SESSION HDD: ROOM 1

Chair: Cottrell, M.

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: Bouveyron, C.	Cottrell, M.	Dynamical equilibrium, trajectories study in an economical system. The case of the labor market
11:00-11:20	Gaubert, P.	Combining Markov switching models and the detection of change-points with the SOM algorithm to explain a temporal process
11:20-11:40	Girard, S.	Regularization methods for sliced inverse regression
11:40-12:00	Pradier, P.	Applications of decision theory in economics: Massé after Pascal, Laplace and Bachelier (right before Pontryagin)
12:00-12:20	Verleysen, M.	Feature selection with low-dimensional mutual information

Session GT&RT1: Room 2

Chair: Hervés, C.

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: De Meyer, B.	Hervés, C.	Large economies and two-player games
11:00-11:20	Bich, P.	Nash equilibrium existence in discontinuous games without quasi-concavity: a new approach
11:20-11:40	Tomala, T.	Correlation and authentication in repeated games with network monitoring
11:40-12:00	Abdou, J.	Stability index of interactive form
12:00-12:20	De Meyer, B.	Price dynamics on a stock market with asymmetric information

OR1: Room 3

Chair: Plá, Ll.

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: Neralic, L.	Plá, Ll.	Modern intensive livestock production: the case of the Spanish pig sector planning
11:00-11:20	Bahovec, V.	Forecasting the direction of changes in Croatia's industrial production with Ici and Crolei
11:20-11:40	Dorneles, J.	A nonlinear programming approach for scheduling problems in ports
11:40-12:00	Gryspolakis, J.	A multicriteria approach for measuring airport visitors' perception
12:00-12:20	Jula, P.	Mathematical programming based scheduling of parallel batch processing machines under multi resource constraints

Session PDE2: Room 4

Chair: DESVILLETTES, L.

Time	Speaker	Contribution
09:00-09:30	Valiño, B.	Obtaining shock solutions via Maslov's theory and Colombeaus algebra for conservation laws with analytical coefficients
09:30-10:00	Mouhot, C.	Hypocoercivity for kinetic models with a confining potential
10:30-12:00	Caffarelli, L.	Problems involving anomalous diffusion II (mini-course)

Plenary Lecture

Introducer: B. Cornet

14:00-15:00 George Zaccour: OPTIMAL PRICING AND ADVERTISING POLICIES FOR AN ENTERTAINMENT EVENT

MEC 2: Room 1

Chair: Cornet, B.

Time	Speaker	Contribution
15:10-15:50 Main Talk Introducer: Mastinsek, M.	Cornet, B.	Existence of financial equilibria in a multi-period Stochastic economy
15:50-16:10	Kalashnikov, Vy.	Conjectural variations equilibrium: applications to mixed duopoly
16:10-16:30	Mastinsek, M.	On the option delta in discrete time
16:30-16:50	Rozga, A.	Dependence between volatility persistence, kurtosis and degrees of freedom
16:50-17:10	Blanco, B.	The application of the fuzzy sets to the evaluation of the operation risks
17:10-17:30	Espín, R.	Toward a rationality of decision based on the Language: theoretical links and experimental of the compensatory fuzzy logic, the expected utility theory and prospects

OR2:Room 2

Chair: Geiger, M.

Time	Speaker	Contribution
15:10-15:50 Main Talk Introducer: Hunjet, D.	Geiger, M.	Interactive approaches to multi-criteria optimization and decision support - principles, methods, and applications
15:50-16:10	Hunjet, D.	An application of data envelopment analysis in industrial efficiency assessment
16:10-16:30	Marasović, B.	Comparison of optimal portfolios selected by multicriterial model using absolute and relative criteria values
16:30-16:50	Pivac, S.	Traders-investors decision strategy by rolling estimates
16:50-17:10	Tomić, N.	An application of alternative risk measure in estimation of the efficient frontiers for transitional European capital markets
17:10-17:30	Aljinovic, Z.	Difference estimation between old - well established and European new - fast growing capital markets

Session O2: Room 3

Chair: Todorov, M.

Time	Speaker	Contribution
15:10-15:50 Main Talk Introducer: Enkhbat, R.	Todorov, M.	Stability and ill-posedness in continuous linear optimization
15:50-16:30 Main Talk Introducer Todorov, M.	Enkhbat, R.	On the maximum and minimum radius problems over a polyhedral set
16:30-17:10 Main Talk Introducer Todorov, M.	Guddat, J.	A modified standard embedding for using in nonlinear global optimization

TS&IO 2: Room 4

Chair: Lara, A.M.

Time	Speaker	Contribution
15:10-15:50 Main Talk Introducer: Roman, P.	Lara, A.M.	Statistics by means of ICT, e-folders and real data
15:50-16:10	Fuentes, A.	Descriptive analysis of time series
16:10-16:30	Román, P.	New trends for teaching probability using CDPYE
16:30-16:50	Lara, A.M.	Statistics using a message in code and some literary texts
16:50-17:10	Bouza, C.	Estimating the difference of means with imputation of the missing observation

Thursday

Plenary Lecture

Introducer: Nowack, D.

9:00-10:00 Gferer Helmut: ON A COMBINED PENALTY AND BARRIER APPROACH FOR A CLASS OF INFINITE DIMENSIONAL OPTIMIZATION PROBLEMS

NA&RP1: Room 1

Chair: Abramov, O.

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: León, A.	Abramov, O.	Computer aided system for optimal parametric synthesis
11:00-11:20	Benitez, G.	A new stabilized finite element method for two second order PDEs: the Galerkin projected residual method
11:20-11:40	Bozóki, S.	A generalization of the eigenvector method for incomplete pairwise comparison matrices
11:40-12:00	León, A.	Random sequential adsorption algorithm to generate geometries of composite materials
12:00-12:20	Vampa, V.	The construction of beam and plate finite elements using wavelet basis functions

O3: Room 2

Chair: Cancela, H.

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: Velásquez, J.	Cancela, H.	Counting knight's tours through the randomized Warnsdorff rule
11:00-11:20	Böse, J. W.	Sensitive analysis of external influences on container handling cost
11:20-11:40	Velásquez, J.	Optex mathematical modeling system
11:40-12:00	Piza, E.	Circular chains of Chinese dice
12:00-12:20	Daduna, J.	Germany Resource scheduling in garbage collection

GR&RT2: Room 3

Chair: Florenzano, M.

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: Osorio, M.A.	Florenzano, M.	Public goods provision: general versus Lindahl equilibrium
11:00-11:20	Ferreira, F.	Patent licensing in a Cournot duopoly from high cost firm to low cost firm
11:20-11:40	Osorio, M.A.	Portfolio optimization based on the conditional value at risk (CVAR) of simulated scenarios
11:40-12:00	Ferreira, F.	Endogenous leader-follower relations when demand is uncertain
12:00-12:20	Huaccho, L.	Supplier-customer entropic-related complexity for customised products before vs. after core process redesign

Session PDE6: Room 4

Chair: Cabré, X.

Time	Speaker	Contribution
09:00-09:30	Leiva, H.	Interior controllability of thermoelastic plate equation
09:30-10:00	Zuazua, E.	Flow control in the presence of shocks
10:30-11:00	Ponce, G.	On uniqueness properties of solutions to the classical dispersive equations
11:00-11:30	De Teresa, L.	About insensitizing controls for the heat equation
11:30-12:00	Soler, J.	Dispersive properties and stability of solutions for relativistic and non-relativistic models in astrophysics: application to black matter halos

Plenary Lecture

Introducer: M. Florenzano
14:00-15:00 Keiding, H. THE PROBABILITY OF FACTOR PRICE EQUALIZATION

SM&A3

Chair:Valdés, P.

Time	Speaker	Contribution
15:10-15:50 Main Talk Introducer: de Bragança, B.	Valdés, P.	Neural mass model based EEG-FMRI fusion
15:50-16:10	De Arazoza, H.	Modeling HIV-AIDS in Cuba: analysis of non linear models
16:10-16:30	De Bragança, B.	Combining unsupervised and supervised neural networks analysis in gamma ray burst patterns classification
16:30-16:50	Lippe, W.	Analyzing multi-source medical data by neural networks
16:50-17:10	Viada, C.	Adaptive designs for ongoing phase II or phase III cancer clinical trials in Cuba
17:10-17:30	Joya, G.	Modelling of a greenhouse system by means of parameter estimation with Hopfield neural network

AL2: Room2

Chair: Otero, J.M.

Time	Speaker	Contribution
15:10-15:40	Beausoleil, R.	Optimizador de rutas para el transporte de carga homogénea
15:40-16:00	Trejos, J.	Modelación del crecimiento en el servicio de televisión por cable
16:00-16:20	Villalobos, M.	Modelación y convergencia del algoritmo del sistema inmune artificiales multiobjectivo
16:30-16:50	Freyre, P.	Algoritmo para la generación aleatoria de matrices booleanas inversibles
16:50-17:10	Palencia, G.	Aplicación del algoritmo de Alizadeh en la solución de problemas de programación cuadrática convexa discreta
17:10-17:30	Murillo, A.	Representación de objetos y sus conglomerados

NA&RP2: Room 3

Chair:Pashchenko, F.

Time	Speaker	Contribution
15:10-15:50 Main Talk Introducer: Purevdorj, M.	Pashchenko, A. F.	Statistical linearization and identification of nonlinear systems
15:50-16:10	Pashchenko, F.F.	Problems of modelling of stochastic systems and consistent methods of identification
16:10-16:30	Purevdorj, M.	Minimum time path and law
16:30-16:50		
16:50-17:10		
17:10-17:30		

PDE4: Room 4

Chair: Fujita, H.

Time	Speaker	Contribution
14:00-14:30	Jabin, P.E.	Mean field limit of interacting particles with singular potentials
14:30-15:00	Murat, F.	Existence and a priori estimate for elliptic problems with subquadratic gradient dependent terms
15:30-1600	Galeano, R.	Small data existence for the Boltzamnn equations in L^1
16:00-17:30	Abreu, R.	Generalized Moisil-Théodoresco systems and Cauchy integral decompositions

Session Poster 1: Hall

Chair: **********

Time	Authors	Contribution
15:10-17:30	Ortiz, M.	Procedure for the management of inventories in commercial and service companies, by using models of optimization
	García, E.	A didactic experience about probability by means casino
	Montero, M.A.	New tendencies and the learning in statistic
	Guarata, N.	Uncertainty evaluation models using interval arithmetic
	Lara, A.M.	An application of COX' s proportional hazard model to patients with AIDS in Spain
	Camero, Y.C.	Mathematical model for the feeding of the bovine live stock
	Laffita, A.	Determinación de los atributos claves del servicio SPA "Aguas de Oro" del hotel Paradisus Río de Oro Resort & SPA
	Mazcorro, G.	Applying fuzzy techniques to corrupt-collusion analysis
	Vila, E.	Problem structuring and decision taking in Venezuela

Friday

Plenary Lecture

Introducer: A. Griewank

9:00-10:00 Werner Roemisch: SCENARIO REDUCTION IN STOCHASTIC PROGRAMMING

OR 5: Room 1

Chair:Rodríguez, M.V.

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: León A.	Caballero, R.	Analysis, via multiobjective programming, of the impact of the reduction of the weekly working hours on the employment rate
11:00-11:20	León. A.	Timber harvest scheduling in Cuba using a multiobjective approach

OR 6: Room 1

Chair: Gómez, T.

Time	Speaker	Contribution
11:20-11:40	Pedreira, L.	Towards traffic light control through an hybrid methos of solution
11:40-12:00	Guerrero, F.	Indicadores sintéticos para destinos de turismo rural: el caso andaluz
12:00-12:20	Rodríguez, M.V.	Carteras socialmente responsables seleccionadas con referencia a benchmarks y metodología difusa
12:20-12:40	Plá, Ll.	La optimización del cultivo de variedades de caña de azúcar

SM&A4: Room 2

Chair:

Time	Speaker	Contribution
10:20-10:40	Herrera, C.	Distintos contrastes de cointegración en econometría. Aplicaciones
10:40-11:00	Sistachs, V.	Utilización del algoritmo del Gibbs Sampler en modelos de regresión
11:00-11:20	Covarrubias, D.	Un estudio de clases de estimadores basados en una razón
11:20-11:40	Juvier, J.C.	Resolución de grandes sistemas de ecuaciones con matrices sparses

O4: Room 2

Chair:

11:40-12:00	Neralic, L.	Data envelopment analysis in efficiency assessment of agricultural production
12:00-12:20	Lukač, Z.	Solving the production-transportation problem in the petroleum industry
12:20-12:40	Simões, R.S.	Reprogramming of orders of service of maintenance with prioritization of the delay time and equipment criticity using linear programming models

AL 3: Room 3

Chair:

Time	Speaker	Contribution
10:20-11:00 Main Talk Introducer: Helmes, K.	Wickstroem, B.A.	
11:00-11:20	Alina	
11:20-11:40	Schliebner, N.	Inequality, poverty and happiness in Germany

Session PDE7: Room 2

Chair: Ponce, G.

Time	Speaker	Contribution
09:00-09:30	Esteban, M.J.	Multipolar hardy-like inequalities
09:30-10:00	Vega, L.	On the stability of a singular vortex dynamic
10:30-11:00	Castellano, L.O.	Ecuación de Riccatti para la matriz de dispersión en medios no homogéneos
11:00-12:30	Lions , P.L.	On mean field games (mini-course)

Session Poster 2: Hall

Chair: **********

Time	Authors	Contribution
10:20-12:30	Roldán, R.	Espacio de funciones abstractas de p-variación acotada
	Roldán, R.	Un espacio de funciones de tipo James
	Roldán, R.	Un teorema de representación para el algebra de las funciones de p-variación acotada
	Fernández, A.	Un algoritmo para la detección de casos excepcionales basado en el modelo de conjuntos aproximados de precisión variable (VPRS)
	Torres, M.	Desarrollo de un sistema de gestión de inventario. Ejemplo de aplicación en una entidad comercializadora
	Dávila, M.	Estimación de parámetros en difusiones con saltos a partir de observaciones discretas usando funciones estimantes

Plenary Lecture

Introducer: Mischler, S.

14:00-15:00 Pierre-Louis Lions: ANALYSIS, MODELS AND SIMULATIONS

PLENARY LECTURES

AN OVERVIEW ON HIGH-DIMENSIONAL DATA CLASSIFICATION WITH MODEL-BASED TECHNIQUES

Charles Bouveyron
SAMOS, Université Paris 1 (Panthéon-Sorbonne) Centre Pierre Mendès France 90 rue de Tolbiac, 75634 PARIS Cedex 13 France.

Many scientific domains need to analyze data which are increasingly complex as, for instance, in medical research, financial analysis and computer vision. Classifying such data is a challenging problem since the performance of classification methods suffers from the "curse of dimensionality" first introduced by Bellman in 1957. In a first part, this overview introduces and illustrates this phenomenon in the context of classification with model-based techniques. Particularly, it shows that the "curse of dimensionality" does not have only bad consequences in classification problems. In a second part, this overview presents the different methods proposed by researchers in the last years to deal with this problem and to prepare the future of high-dimensional data classification.

MATHEMATICAL MODELS FOR REVERSE LOGISTICS: AN ALGORITHM FOR A TWOLEVEL PROBLEM

Leonardo Ribeiro da Costa and Roberto Diéguez Galvão
COPPE/Federal University of Rio de Janeiro, Brazil.

Distribution planning in reverse logistics involves the physical transportation of a reusable item from the final user to a refurbishing facility. This is part of the reverse distribution process, analogous to physical distribution in conventional logistics. The reconditioning/recycling process involves refurbishing a used item and returning it to the cycle of usable products.
The management of reverse flows has received increasing attention in the last decades. Societys increasing concern with the environment has made the subject of recycling and re-uses a top priority. The effort in reducing wastage of natural resources promotes the idea of several cycles for a given material/product, as opposed to the one-way economy. This is not a new phenomenon; the re-use of paper, bottles and scrap metals has been around for a long time. In the latter case the re-use of these products has proved to be more economical than their disposal.
The main subject of reverse logistics is therefore the management of reverse flows. The context of reverse logistics may be better appreciated if we attempt to classify the circumstances under which re-use occurs, according to the following criteria: (i) Motifs for reuse; (ii) Types of recovered items; (iii) Forms of re-use; (iv) Agents involved. Each of these aspects has important implications on the type of the planning problem to be tackled and the formulation of adequate models to solve the corresponding problem. Motifs for re-use: The recovery of materials/products has received increasing attention in the industrialized countries due, among other reasons, the concern with the depletion of nonrenewable natural resources. Many countries have also enacted environmental legislation that penalizes wastage and increases the responsibility of enterprises to cover the complete life cycle of certain products (for example batteries and printer cartridges, whose complete life cycle includes the disposal of these items as a responsibility of their

manufacturers). On the other hand there exists economic motivation for recycling certain products. A typical example is the re-manufacturing of parts and components of machinery. Economic and ecological motivations are often linked. Ideally, these should be combined under the concept of a self-sustainable economy. Types of recovered items: The main categories to be considered are: containers (for example: pallets, bottles), reserve components (for example: components of machinery, TV tubes) and consumer goods (for example: copiers, refrigerators). These categories differ in relation to when and why the items are returned. Reserve components are returned due to failure or for preventive maintenance, within a large life cycle. Consumer goods are returned at the end of their life cycle. Another possibility is items returned at the expiration of leasing contracts. In this case the timing of their return is known a priori and the corresponding activities may be planned.
Forms of re-use/reconditioning: Many authors adapted a classification by Salomon & Thierry (1995). The forms of re-use differ in relation to the production activities that must be planned and may involve different levels of coordination. In the present paper reconditioning will have a wider meaning, indicating any type of re-use.
Agents: Agents possess specific functions such as, for example, collection, test and reuse/ reconditioning. An example of distinction among agents is re-use under the original manufacturer and re-use under third parties. Re-use under third parties may imply important restrictions on the possibility of integrating direct and reverse logistic activities.
The present work focuses on mathematical formulations that model the reverse distribution system. We study a linear-mixed integer programming model that considers the location of capacitated facilities in a two-level system: collection facilities in level 1 and refurbishing/remanufacturing facilities in level 2. We propose a genetic algorithm to solve the two-level problem. Tests are conducted using data generated according to a methodology available in the literature, with the heuristic solutions being compared with exact solutions obtained via a commercially available solver.

ON A COMBINED PENALTY AND BARRIER APPROACH FOR A CLASS OF INFINITE DIMENSIONAL OPTIMIZATION PROBLEMS

Helmut Gfrerer
Institute of Computational Mathematics Unversity Linz Austria.

We consider the problem of minimizing a quadratic functional subject to equality constraints and pointwise inequality constraints in function spaces. This problem class includes the case of PDE-constrained optimal control problems with pointwise inequality constraints both on the state and the control variables. Recent solution approaches are based on regularized semi-smooth Newton methods, which can be in fact interpreted as a penalty method, or interior point methods and are formulated either for the state constraint or the control constraint case. Our approach is based on a combination of the penalty and the interior point method resulting in a Newton-based path following method. Convergence is shown and some numerical experiments demonstrate the efficiency of the algorithm.

PROXIMAL POINT AND AUGMENTED LAGRANGIAN METHODS FOR EQUILIBRIUM PROBLEMS

Alfredo Iusem*, Mostafa Nasri* and Wilfredo Sosa**
*IMPA, Rio de Janeiro, Brazil, **IMCA, Peru.

We propose a proximal point method for equilibrium problems in Hilbert spaces, which extends the well known proximal point method for variational inequalities. We prove global weak convergence of the generated sequence to a solution of the problem, assuming existence of solutions and rather weak monotonicity properties of the bifunction f which defines the equilibrium problem. We also present a reformulation of equilibrium problems as variational inequalities ones, under the same assumptions on f. For the finite dimensional case, we propose an Augmented Lagrangian method for equilibrium problems, generalizing the similar method for convex optimization. In each step, the primal variables are updated

by solving an unconstrained equilibrium problem, and a closed formula is used for updating the dual variables. Convergence of the method results from the fact that it coincides with the proximal point method applied to the solution of an associated "Lagrangian" equilibrium problem.

THE PROBABILITY OF FACTOR PRICE EQUALIZATION

Bodil O. Hansen and Hans Keiding
Copenhagen Business School University of Copenhagen, Denmark.

The factor price equalization (FPE) theorem is one of main results of international trade theory. It states that under suitable assumptions, factors of production will obtain the same remuneration in countries trading only in final products. Subsequent authors have refined and reformulated it, and in particular Dixit and Norman (Theory of International Trade, Cambridge University Press, Cambridge (1980)) have introduced the so-called factor price equalization domain, the set of initial distribution of factors among countries such that international trade equilibria are identical to equilibria of an integrated world economy with no restriction on trade in factors. Following a geometric approach to FPE domains, Deardorff (The possibility of factor price equalization, revisited, Journal of International Economics 36(1994)) formulated the so-called lens condition for FPE, which point to the role of the factor proportions in the different sectors which span the FPE domain, subsequently refined by many contributions. One of the main advantages of this approach is that it lends itself easily to geometric reasoning. In the present paper we present one such geometric argument, expanding on the intuitive connection between extent of FPE domain and likelihood of FPE. For a given world endowment of factors, the relative volume of the FPE domain gives the probability of FPE when the all distributions of world endowments are equally likely. Since the volumes involved in this assessment do not have a simple shape we shall be content with providing lower bounds for the probability of FPE. The simple argument which has a direct geometric interpretation may be extended to cover situations where the technologies is also subject to random sampling. Here technologies are specified as support functions of the upper level set corresponding to one unit of output. For given probability distributions over the space of technologies as we obtain lower bounds for the probability of FPE.

ANALYSIS, MODELS AND SIMULATIONS

Pierre-Louis Lions
College De France, France.

In this talk, we shall first present several examples of numerical simulations of complex industrial systems. All these simulations rely upon some mathematical models involving Partial Differential Equations and we shall briefly explain the nature, the history and the role of such equations. Then, some examples showing the importance of the mathematical analysis (i.e. "understanding") of those models will be presented and we shall conclude indicating a few trends and perspectives.

SCENARIO REDUCTION IN STOCHASTIC PROGRAMMING

W. Roemisch, H. Heitsch, R. Henrion and C. Kuechler
Humboldt University, Germany.

A standard approach for solving applied stochastic programming problems consists in approximating the underlying probability distribution by a discrete one. This leads to large scale finite-dimensional optimization models, which are often linear or mixed-integer linear. If the underlying applied optimization problem is already huge as, for example in energy planning or revenue management, one might wish to reduce the number of scenarios of the discrete approximation. We review an approach to scenario reduction based on quantitative stability results for stochastic programs and show how the general idea

can be implemented for linear stochastic programs with recourse, chance constrained, mixed-integer two-stage and multi-stage stochastic programs. Recent work in these directions is presented and some numerical results are reported.

TRANSIENT ANALYSIS OF MARKOVIAN QUEUES

Gerardo Rubino
University of Rennes, France.

Queuing models are usually analyzed in steady state, because their main applications concern systems in equilibrium behavior (stationary models), especially in computer science and in telecommunications. But precisely these last areas (and not only them) need today more tools for understanding the transient part of the evolution of queues and networks of queues with time. Of course, transient analysis is much more difficult than studying models in equilibrium, and little is known in the area.
In this talk, I will focus on transient analysis of basic Markovian queues. Part of the talk will be done around the fundamental $M/M/1model$, that allows understanding the difficulties and the progress that has been done so far. After presenting the main results on the analysis of this system, including our own contributions made some time ago, we will describe a new combinatorial approach we have been developing with some colleagues in CalPoly, Pomona, California, based on a concept of duality proposed by Anderson in 1991, which allows obtaining analytical expressions of the transient distributions of these Markovian queues with less effort than with previously developed tools. We will also show how these results can be extended to other models such as closed queues and reset queues (also called queues with catastrophes).

OPTIMAL PRICING AND ADVERTISING POLICIES FOR AN ENTERTAINMENT EVENT

Steffen Jørgensen* Peter M. Kort** and Georges Zaccour***
*Department of Business and Economics, University of Southern Denmark, Odense, Denmark **Department of Econometrics and Operations Research, Tilburg University, Tilburg, The Netherlands, and Department of Economics, University of Antwerp, Antwerp, Belgium ***Chair in Game Theory & Management, GERAD, HEC Montréal, Canada.

The paper suggest an optimal control model to determine optimal pricing and advertising policies for a one-time entertainment event. There are two periods, an initial period of regular price sales and a terminal period of last-minute sales at a reduced price. The price in a period is constant over time. In the initial period, the organizers of the event advertise the event to potential attendees. In the last-minute sales there is no advertising. If tickets are sold out by the end of the 1.rst period, there will be no last-minute sales. We 2.nd that advertising should be decreased over time during the 1rst period. There are three different advertising scenarios: It may be optimal not to advertise at all, to advertise at a positive rate until the end of the 1.rst period, or to stop advertising at an earlier instant of time. In the last-minute sales, the organizers implement a feedback pricing policy such that the selected price depends on the number of tickets that have been sold in the regular sales period.

TUTORIALS

ESTADISTICA ESPACIAL

Xavier Guyon
SAMOS, Université Paris 1 (Panthéon-Sorbonne) Centre Pierre Mendès,France.

La estadística espacial estudia fenómenos aleatorios $X = \{X(s)\}$ indexado por un conjunto espacial S de $\mathbb{R}^2$ o de $\mathbb{R}^3$. Las aplicaciones son por ejemplo en epidemiología, econometrita y geografía, medioambiente, ciencias de la tierra, forestales, agronomía, análisis de imagen, etc.... El objetivo del tutorial es de presentar problemas, proponer modelos probabilísticas y luego proponer métodos estadísticos. Ejemplos ilustran esas técnicas. La estadística espacial se distingue esenciadamente de la estadística de las series de tiempo por utilizar modelos no-causales. Hay tres tipos de datos espaciales.

Datos geo-estadísticos: S es un conjunto continuo y la observación es real. Modelo al segundo orden o modelo intrínseco: covarianza y variograma. Modelos clásicos, regularidad de la superficie$s \to X(s)$. Estimaciones: nubes varográficas y isotropía, variograma empírico y estimación de un modelo paramétricos. Bootstrap paramétrico y validación. Regresión espacial; kringeage y mapas de predicción.

Datos sobre una red: S es discreto provisto de un grafo de vecindad, los estados son reales o no. Auto-correlación espacial, índice de Moran; prueba de independencia espacial y método de Monte Carlo (MC). Auto-regresión simultánea (SAR), AR condicional (CAR). Campo de Markov y campo de Gibbs: el teorema de Hammersley-Clifford. Auto-modelos de Besag. El muestreador de Gibbs. Estimaciones: verosimilitud, seudo-verosimilitud-condicional (SVC), codificación.

Datos puntuales, $x = \{x(1), x(2), \ldots, x(n)\}$ localizan las casos del fenómeno aleatorio : modelos de Proceso Puntual (PP) : PP de Poisson (homogéneo o no), de Cox, de Gibbs, de Markov. Simulación por Metrópolis. Herramientas estadísticos: momento de orden uno, dos, función K de Ripley, distancias a los vecinos mas cercanos, verosimilitud o SVC; estimaciones no-paramétricas y paramétricas; prueba de independencia espacial. Validación MC.

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MINI-COURSES

PROBLEMS INVOLVING ANOMALOUS DIFFUSION

Luis Caffarelli
University of Texas at Austin, USA.

Problems involving anomalous diffusions, in particular Levy processes, have attracted considerable attention lately, arising for instance in mathematical physics, fluid dynamics, material sciences and financial mathematics. We will describe some of our recent research in the area and possible future research Some of my work related to this lecture is available at www.arxiv.org/archive/math.

POPULATION DYNAMICS VIA INFINITE- DIMENSIONAL REACTION-DIFFUSION

Laurent Desvillettes, , S. Mischler, G. Raoul; C. Prevost, R. Ferriéres and A. Arnold
ENS CACHAN, CMLA, France.

We consider populations which are structured with respect to a trait which is continuous, and which can also be structured with respect to space. We write a PDE for the evolution of such populations which can take into account the effects of selection, competition, mutation and migration (by diffusion). This PDE is reminiscent of equations of reaction-diffusion in infinite dimension which are used in the modelling of space-dependent coagulation fragmentation. It can be written in the abstract form

$$\partial_t f(t,x,y) - \nu(y)\,\Delta_x f(t,x,y) = \int K(x,y,y')\,f(t,x,y')\,dy'$$

$$-f(t,x,y)\int L(x,y,y')\,f(t,x,y')\,dy'.$$

Here $f(t,x,y)$ is the number density of individuals which at time t and point x have a (real-valued) trait of value y, and ν, K and L are functions which describe the processes of diffusion, selection/mutation and competition. We study the mathematical properties of the solutions of this equation, with a special emphasis on the large time behavior. We also present the results of a few numerical simulations.

ECUACIONES ESTOCÁSTICAS DE LA DINÁMICA DE POBLACIONES CON LA DIFUSIÓN EN UN TERRITORIO

Hisao Fujita Yashima
Dipartimento di Matematica, Universitá di Torino, Italy

Contenido

- Existencia y unicidad de la solucin
- Existencia de una medida invariante (por la ecuacin estocástica) sin distinción de ninguna especie.

- Técnicas: estimación de la solución, teorema de Hasminskii, teorema de Krylov-Bogoliubov

ON MEAN FIELD GAMES

Pierre-Louis Lions
College De France, France.

This talk will be an introduction to the theory of Mean Field Games. We shall explain how they are derived from Nash equilibria letting the number of players going to infinity. Various examples will be presented showing that these new systems of equations contain many classical ones. And we shall discuss the mathematical structure of these models.

ABSTRACTS

OBTAINING OF MORTALITY TABLES IN THE CLASSROOM

F. Abad-Montes, M. Huete-Morales and M. Vargas-Jiménez
Department of Statistics and Operations Research. Faculty of Sciences. University of Granada, Granada, Spain.

Demographic Statistics is a new topic taught in the Degree of Statistics, among other studies, which focus basically to present some of the demographic topics more used in the professional practice. This paper presents a methodology for the construction of *Mortality Tables* (also called *Life Tables*) which have multiple applications in Medicine, Actuarial Science or Labour Sciences. Moreover this paper introduces the terminology of longitudinal (or cohort) tables in order to obtain the "Tables of the moment" which allow to analyze diverse aspects related to the aging of the population, insurance premiums, but also to calculate the number of *years of potential life lost (YPLL)* a important indicator for the analysis of the accident rates in labour activities, sectors or professions. Finally, we perform a program that allows, in the classroom, use real data under the previous hypotheses that have been set.

POLITICAL GAMES AND THE USE OF LINEAR COMPLEMENTARITY PROCESS IN ITS SOLUTION

Elsayed Abdel-Aziz*, J. Guddat** and Bin Elsabhan***
*Faculty of Engineering, Cairo University, Egypt, **Humboldt Universitt Berlin, Sektion Mathematik, Germany, ***Abdel Aziz King University, Saudia Arabia.

In this paper special convexity and disjunctive cutting planes for linear complementarity problems are investigated with respect to the following question: Under which conditions do the applied cutting planes become redundant if further cutting planes are introduced? This is an important aspect for the implementation of cutting plane methods because, with the introduced cutting planes, the size of the problems rapidly increases. Therefore, necessary and sufficient conditions for the redundancy of cutting planes will be given. This paper discusses the political games, and how we can deal them through mathematics using the zero-one integer programming. It also interprets how to convert the political game into a linear complementarity problem. It shows the process of converting the different strategies of the countries of negotiation into constraints and how to perform the objective function of the problem. Furthermore, the paper illustrates the use of linear complementarity to add new strategies in the form of new cut planes in case of the adaptation of the original ones.
Keywords: Policy, Political Games, quadratic programming, Integer Programming, Linear Complementarity, cutting planes.

INTEGER LINEAR PROGRAMMING OBJECTIVE - CONSTRAINT ZOOMING THEORY

Elsayed Abdel-Aziz and Hesham Osman
Faculty of Engineering, Cairo University, Egypt.

The objective of this paper is to introduce a new theory in Integer Linear Programming. The theory provides a new method called "Objective-Constraint Zooming" method which is discussed, proved, verified,

applied and illustrated through this paper. This new method finds the exact integer optimal solution for the Integer Linear Programming problem, using a new cut plane in a number of iterations less than any other method. This method depends on adding a new constraint (cut plane) relative to the objective function itself, or in other words parallel to it. That is, the left hand side of the inequality of this new constraint is exactly the objective function itself, while its right hand side is the greatest integer value of the optimal solution obtained from solving the relaxed continuous problem associated with the integer one. We can add more parallel constraints by reducing one from the right hand side figure each time. Then we zoom in the feasible space by sets of planes each of which is parallel to the linear constraints, in a similar fashion. That is adding constraints, each of which is one (or more) less than any of the linear constraints whose slack variable exists as a non-basic variable, or sometimes adding constraints each of which is one (or more) more than any of the non-negativity constraints whose main variable exists as a non-basic variable. In a mathematical form, we consider the integer linear programming problem.

$$\max\{Z = \sum_i c_i x_i,\ \sum_i a_{r,i} x_i = b_r,\ r = 1, 2, \ldots, m,\ x_i \geq 0,\ n > m;\ x_i \text{ integer}\}$$

Let Z_0 be the optimal solution of the continuous problem obtained by relaxing the integer restriction on the design variables. Let $Z_0 = Z_{n0} + Z_{f0}$; where $Z_{n0} = [Z_o]$ = the greatest integer value of Z_0. We introduce the new cut plane in the form of the following constraint: $\sum_i c_i x_i < Z_{n0}$ which leads to $-\sum_i d_j x_j + S = -Z_{f_0}$. Finally, we get the exact integer optimal solution in a very simple way and the least number of iterations by the simplex method. An illustrative comparison is given using different examples using the new method and the traditional methods. The result is that the new method achieves the exact integer solution in a number of iterations (Simplex tableaus) less than any one of the other traditional methods. Hence, this method reduces the effort, time and storage.

APPLICATIONS OF INTEGER LINEAR PROGRAMMING IN ARCHITECTURE

Elsayed Abdel-Aziz* and Hesham Osman**
*Faculty of Engineering, Cairo University, Egypt **Binsabaan - ABD ELAZEZ KING UNIVERSITY.

The objective of this paper is to introduce a link between Mathematics and architecture, and to show how mathematics can be applied to architecture, planning, and construction. This is illustrated by solving some problems in the architecture, planning, and construction fields using the Integer Linear Programming. Architecture and planning are the art and science of designing, planning, and constructing buildings in different sites, on different types of lands, and under a set of requirements according to the rules of architecture and planning achieving the required conditions and requirements. However, one of the most important aspects of any project can not be perfectly achieved through the rules of architecture and planning; namely the financial aspect. At this point mathematics takes its place to help architecture to achieve its goals, with the minimum costs and the maximum profitability. This is done by expressing any architectural or Planning problem in a linear programming model, with an objective of maximizing profit or minimizing costs. This technique is illustrated in this paper through three architectural, planning and construction integer models. Each of them concerns with one of the most important tasks in architecture, planning, and construction; that is how, where, and how many to build achieving the maximum profitability with the minimum cost, reaching a satisfactory level of beauty. The first model discuses the distribution of some dwelling units among four sites to achieve the maximum profit under some restrictions. Each of the four sites has its own advantages and disadvantages; such as price of land, price of utilities, areas available, people density permitted, soil suitability, site appealing, sale prices, and other factors. There are three types of housing (Single, own house, apartment) to be built in each of the four sites. The mathematical model is made and solved to introduce the number of each type of housing in each site. The second model discusses how to build a house with certain area requirements through the minimum possible house length. The architectural design is made and

the problem is to minimize the length of each of the house units but within a specified limits of area requirements and some structural restrictions.
The house is to be built using prefabricated units of a determined unit length; one meter say; hence each architectural unit must be of integer length, so an integer linear model is made and solved to introduce the minimum length of each unit of the house. The third model discusses how to form a concrete formwork using different permutations to achieve the minimum cost using the available construction items. A binary linear model is made and solved to introduce the minimum cost for such a formwork. Hence, we conclude how mathematics can be useful in many tasks of architecture, planning, and construction, and how the financial aspect, which is one of the most important goals of any project, can mainly be achieved through mathematical treatment of the architectural.

STABILITY INDEX OF INTERACTIVE FORMS

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An interactive form is an abstract model of interaction based on a description of power distribution among agents over alternatives. A solution known as the settlement set is defined at any preference profile. Necessary and sufficient conditions for stability, that is the existence of settlements, are established. A stability Index that plays a role similar to that of the Nakamura Number is defined. It measures, loosely speaking, the complexity of those configurations that prevent a settlement. To any strategic game form one can associate an interactive form in such a way that given an equilibrium concept (e.g. Nash or strong Nash) and a preference profile, settlements of the interactive form are precisely the equilibrium outcomes of the resulting game. As a consequence we have necessary and sufficient conditions for the solvability of game forms. The paper provides a localization of the index in case of unstability.
Keywords: Interactive Form, Stability Index, Nash equilibrium, Strong equilibrium, Solvability, Consistency, Simple game, Effectivity Function, Acyclicity, Nakamura Number.

COMPUTER AIDED SYSTEM FOR OPTIMAL PARAMETRIC SYNTHESIS

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A theoretical approach and applied techniques for designing analogous electronic devices and systems with due account of random variations in system parameters and reliability specifications are considered. The paper discusses the problem of choosing parameter nominals of electronic devices and systems for which the system survival probability or the performance assurance probability for the predetermined time period is maximized. Several algorithms for region of acceptability location, modeling and discrete optimization using parallel and distributed processing are discussed. For seeking a numerical solution of the parametric design problem a network computer-aided reliability-oriented design system is proposed.

GENERALIZED MOISIL-THÉODORESCO SYSTEM AND CAUCHY INTEGRAL DECOMPOSITIONS

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Let $\mathbb{R}_{0,m+1}^{(s)}$ be the space of s-vectors $(0 \leq s \leq m+1)$ in the Clifford algebra $\mathbb{R}_{0,m+1}$ constructed over the quadratic vector space $\mathbb{R}^{0,m+1}$ and let $r, p, q \in \mathbb{N}$ with $0 \leq r \leq m+1$, $0 \leq p \leq q$ and $r+2q \leq m+1$. Then a $\mathbb{R}_{0,m+1}^{(r,p,q)} = \sum_{j=p}^{q} \bigoplus \mathbb{R}_{0,m+1}^{(r+2j)}$-valued smooth function W defined in an open subset $\Omega \subset \mathbb{R}^{m+1}$ is said to

satisfy the generalized Moisil-Théodoresco system of type (r,p,q) if $\partial_x W = 0$ in Ω. Hereby ∂_x is the Dirac operator in $\mathbb{R}^{m+1}$. A structure theorem is proved for such functions, based on the construction of conjugate harmonic pairs. Furthermore, let Ω be bounded with boundary Γ, where Γ is an Ahlfors-David regular surface, and let W be a $\mathbb{R}_{0,m+1}^{(r,p,q)}$-valued Hölder continuous function on Γ. Then necessary and sufficient conditions are given under which W admits on Γ a Cauchy integral decomposition $W = W_+ + W_-$.

Keywords. Monogenic functions; Generalized Moisil-Théodoresco systems; Harmonic potentials, Cauchy integral decompositions.

AN INVARIANT SET GENERATED BY THE DOMAIN TOPOLOGY FOR PARABOLIC SEMIFLOWS WITH SMALL DIFFUSION

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We consider the singularly perturbed semilinear parabolic problem $u_t d^2 \Delta u + u = f(u)$ with homogeneous Neumann boundary conditions on a smoothly bounded domain $\Omega \subset \mathbb{R}^N$. Here f is superlinear at 0 and $\pm\infty$ and has subcritical growth. For small $d > 0$ we construct a compact connected invariant set X_d in the boundary of the domain of attraction of the asymptotically stable equilibrium 0. The main features of X_d are that it consists of positive functions that are pairwise non-comparable, and that its topology is at least as rich as the topology of ∂ in a certain sense. If the number of equilibria in X_d is finite this implies the existence of connecting orbits within X_d that are not a consequence of a well known result by Matano.

DIFFERENCE ESTIMATION BETWEEN OLD - WELL ESTABLISHED AND EUROPEAN NEW - FAST GROWING CAPITAL MARKETS

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This paper analyses are there differences or/and similarities between old and well established and European new and fast growing capital markets. Firstly, the paper gives the statistical analysis of relevant capital market indices by correlation coefficients, one-way analysis of variance and nonparametric Mann-Whitney U-test and Kruskal-Wallis test. Using modern portfolio theory the efficient frontiers are estimated for each market in analysis. Comparative analysis of results shows significant difference between two groups of markets and significant similarities inside each group. The study is made for American, English, French and German capital markets as developed markets and for Croatian, Slovenian and Czech capital markets as transition European markets. Pearson correlation indices coefficients show that there are huge and significant correlations between developed market indices, while in the group of undeveloped markets there are week correlations between indices. Similar conclusions can be derived according to non-parametric Spearman correlation coefficients of the indices change rates. One-way analysis of variance confirms that there are significant difference between trends on well established on one side and new transitional capital markets on other side, considering Levene statistic test of homogeneity of indices variances. Furthermore, Kruskal-Vallis test shows that there is no significant difference in trends of the indices change rates in the "developed" group as well as in the "undeveloped" group. Efficient frontiers show the wider range of returns and risk in the group of new and growing capital markets, while established markets offers lower values of return but with significantly lower level of risk.

ASYMPTOTIC PROPERTIES OF THE ESTIMATORS OF THE COEFFICIENTS OF A JUMP DIFFUSION MODEL

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In this work we study the asymptotic properties of some estimators of the coefficients of a jump diffusion model under discrete observations of a realization of the process. The studied estimators are those of maximum likelihood type and estimating functions based estimators constructed after a previous detection of the jumps of the process.

THE CONSTRUCTION OF BEAM AND PLATE FINITE ELEMENTS USING WAVELET BASIS FUNCTIONS

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In the last years, applying wavelets analysis has called the attention in a wide variety of practical problems, in particular for the numerical solutions of partial differential equations using different methods, as finite differences, semi-discrete techniques or the finite element method. In the construction of wavelet-based elements, instead of traditional polynomial interpolation, scaling and wavelet functions have been adopted to form the shape function to construct elements. The wavelet-finite element method can be viewed as a method in which the approximating function is defined using a multiresolution analysis, based on scaling or wavelet functions. By means of 'two scale relations' of the scaling functions, the scale adopted, can be changed freely, according to the requirements to improve analysis accuracy. In particular, in some mathematical models the solutions may have discontinuities, singularities, or high gradients, and it is necessary to approximate with functions having good properties or capacities to efficiently localize those non-regular zones. In some cases it is useful and convenient to use the Daubechies wavelet, due to their excellent properties of orthogonality and minimum compact support, providing guaranty of convergence and accuracy of the approximation in a wide variety of situations. However, for Daubechies wavelets lacking of the explicit function expression, the key problem to construct wavelet elements is to calculate connection coefficients. In this paper, the elemental displacement field represented by wavelet coefficients is transformed into edges and internal nodes via a constructed transformation matrix. Some numerical examples are studied to show the feasibility of the proposed method.

USE OF FREE SOFTWARE FOR MATHEMATICAL AND STATISTICAL TRAINING IN PHARMACY'S DEGREE COURSE

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During the last years, some changes have been taken place in university teaching due to two basic points of view:

- The ongoing incorporation of the ECTS (European Credit Transfer and Accumulation System) credit system that have produce a new system to organize university teaching in order to achieve the convergence of the so called European Space for Higher Education
- The introduction of information and communication technologies (ICT) in the classrooms.

The use of ICT during the course let the teachers to improve the activity of university teaching. These technologies can supply the students the ways to establish a more realistic training, a cheaper access to study materials and a more stable communication with the lecturer, The goal of this paper is to improve

the training system in the subject Mathematic and Statistic of Pharmacy degree. We have redesigned the practice program and we have made a web environment to develop the proposal exercises using three different softwares. An important problem that we have had to solve is the lack of "mathematical culture" in our students. We think that the designed software can let them to develop the subject contents in spite of this important difficulty. In our paper, we display this software and the way to work with it.

MULTIVARIATE RISK-RETURN DECISION MAKING WITHIN DYNAMIC ESTIMATION

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Risk management in this paper is focused on multivariate risk-return decision making assuming time-varying estimation. In comparison to the conventional approach, empirical research in risk management showed that the static "mean-variance" methodology is very restrictive with unrealistic assumptions. Hence, risk measure dynamic estimation is used in this paper. For the purpose of the risk controlling it is important to forecast the rate of return and its variance over the holding period and to estimate the risk associated with holding a particular asset. By risk control manager makes free supplementary capital for new investments. For any investor and/or trader on stock market it is very important to predict portfolio stocks weights, depending on his risk and/or return preference. Therefore financial econometrics is founded as the most useful tool for modeling conditional mean and conditional variance of nonstationary financial time series of high frequencies. Univariate modeling approach is not appropriate, even when portfolio returns are treated as one variable, because portfolio weights are time-varying. In the case of changing portfolio weights it is necessary to reestimate whole model. So, multivariate volatility modeling is more adequate. Using assumption of bivariate Student's t-distribution, in MGARCH(p,q) models, it becomes possible to forecast time-varying portfolio risk much more precisely. From MGARCH family models, only those which guarantee positive-definite time-varying covariance matrices will be used. The complete procedure of analysis is established using daily observations of Pliva and Podravka stocks, as the most frequently traded stocks from CROBEX index at Zagreb Stock Exchange.

THE EFFECTS OF THE INFORMATION FLOW ON THE STOCK MARKET VOLATILITY: AN EMPIRICAL TEST

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In the financial markets the float of the securities prices, and the float of the returns, are directly related with the information flow that arrive to the participants of these markets. The random of the information flow justifies the treatment of the returns series of the financial instruments as a stochastic process. The information arrival has been represented many times by trading volume, a variable that can be used as a proxy of the information flow. The business happens when new information arrives to the investors' knowledge and the greater the informational efficiency degree of the market is the faster the information arrives to the investors allowing a new business occurrence. The information arrival has been represented many times by business volume, a variable that can be used as a proxy of the information flow. However, it should be emphasized that the adjustment of the employment of these variables as proxies for the information flows depends on the efficiency level of the market. In markets where the degree of informational efficiency is small, the disclosures are limited to a reduced number of investors. These investors can then manipulate the market, by making speculative turnovers, or stimulate floats in the prices, or in the returns, of the financial instruments. This work investigates the effects of the trading volume on the return volatility of the selected international stock markets using the statistical models for financial volatility available in the finance literature.

HEURISTICAS DE REORDENAMIENTO EN MATRICES CON ESTRUCTURA PARTICULAR

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Se estudian en el trabajo diferentes heurísticas que permiten, reordenando las filas y/o columnas de un matriz, reducir el ancho de banda, facilitando entonces la solución de sistemas de ecuaciones con matriz del sistema la matriz reordenada. Entre los métodos estudiados están los conocidos como Algoritmo de Cuthill-McKee, Reverso Cuthill-McKee y otros contenidos en el paquete Sparkit (para trabajar matrices sparse). La idea general de estos métodos es ir construyendo, a partir del grafo de adyacencia asociado a la matriz cuyos elementos se quieren reordenar, un nuevo grafo a partir del cual se obtendrá una matriz de iguales dimensiones a la inicial, pero con sus elementos reordenados. Los métodos serán empleados a matrices diagonales por bloques y a matrices tridiagonales por bloques.

DATA ENVELOPMENT ANALYSIS AND DISCRIMINANT ANALYSIS IN EFFICIENCY ASSESSMENT OF AGRICULTURAL PRODUCTION

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Relative (technical) efficiency of the agricultural production of the social sector in some county districts of the Republic of Croatia in the period from 1980 until 1990 is studied in the paper using methodology of Data Envelopment Analysis (DEA) and Discriminant Analysis (DA). The production of wheat and the production of corn are outputs, the area of the land under cereals, the number of tractors, the quantity of used fertilizers, and the number of people employed in agriculture are inputs. Results obtained using DEA and DA on the available data set are presented.
Keywords: Agricultural production, data envelopment analysis, discriminant analysis, efficiency.

REDUCCIÓN DEL ESPACIO DE BÚSQUEDA PARA PROBLEMAS DE CALENDARIZACIÓN APLICANDO UN ALGORITMO GENÉTICO MULTIOBJETIVO

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Como se sabe en los problemas de calendarización la mayor dificultad es recorrer el espacio objetivo, y encontrar soluciones que optimicen ciertos criterios. Lo que se pretende con este trabajo es reducir el espacio de búsqueda, aplicando un algoritmo genético que toma como población inicial cromosomas generadas de manera conveniente, de tal forma que proporcione una mayor eficiencia en la convergencia del algoritmo. Se considera el problema de calendarización de trabajos con transferencia cero para el caso multiobjetivo (flowshop) optimizando makespan y flowtime promedio.

REAL POLYNOMIAL EQUATION SOLVING AND APPLICATIONS

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In a series of articles we developed an efficient, geometrically established procedure to solve multivariate polynomial equation systems over the reals for the case that the real manifold defined by the system is smooth.

In the talk the main features of our method will be sketched and its complexity compared with the one of the common algorithms from commutative algebra (using Gröbner bases).
Furthermore, we will show how one obtains in a natural way an extension of our procedure to tackle the non–smooth hypersurface case.
Some remarks on successful applications to practical problems (signal and image processing) will complete the talk.
Keywords: Real polynomial equation solving, arithmetic circuits, singularities, complexity, signal processing, wavelets

MELD AS A PREDICTOR OF LONG TERM MORTALITY IN LIVER TRANSPLANTATION LIST- A SURVIVAL TREE ANALYSIS

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Many authors describe MELD as an independent factor related to liver transplantation waiting list mortality and determine a threshold to assess prognosis and mortality in this set The MELD score was described as a short term mortality index used to predict three month mortality in patients who underwent transjugular intrahepatic portosystemic shunt (TIPS) insertion. It was subsequently employed to allocate liver grafts in liver transplantation list in the United States and several countries, since February 2002. Many countries employed subjective local criteria or UNOS based policy to allocate liver grafts according to severity of the patient.. In Brazil, liver transplantation waiting list was determined by a chronological system until june , 2006. ting. There are several factors related to predict liver transplantation waiting list deaths in the literature, as age, gender, blood type and disease etiology The liver transplantation waiting list time varies significantly among various centers but usually reflect a gap between the donor liver pool and the demand for transplant The usual method to describe survival is the Kaplan Meier analysis. describe an original statistical method to assess liver transplantation waiting list related mortality factors in a long term chronological based system. The aim of this study was to analyze the MELD score as a predictor of long term mortality using a survival tree analysis and to establish a MELD cut-off point that better predict the mortality.

OBTAINING SHOCK SOLUTIONS VIA MASLOV.S THEORY AND COLOMBEAUS ALGEBRA FOR CONSERVATION LAWS WITH ANALYTICAL COEFFICIENTS

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Physical phenomena such that fluid flows in electromagnetics fields can be modelled by equations of Burgers.s type. But these last ones are particular cases of more general conservation laws with analytical coefficients as following:

$$u_t(x,t) + f(u(x,t))u_x(x,t) = 0,\ x \in \mathbb{R}, t > 0, \quad (1)$$

where f is an analytical function. When $f(u) = u$, we recognize Burgers's equation for which existence and uniqueness results are well known. But even in this simple case, we note the appearance of shock type solutions (even in the case when the initial conditions be smooth). Indeed, the function u may be discontinuous then the term u_x has the appearance of a Dirac delta function. Thus, the use of the algebra

of generalized functions of Colombea [1984, 1985, 1992] seems to be necessary in order to make sense of product of distributions $u\dot{u}_x$.
In particular, if $f(u)$ does not depend on u but only on the variables x and t and if the initial condition is a generalized function, then the existence and uniqueness of a solution have been proved by M. Oberguggenberger in this algebra. In addition, a generalized solution has been built via numerical schemes of Godunov.
On the other hand, the results obtained by V.P.Maslov [1977] in the seventies, about the structure of singular solutions of hyperbolic non-linear equations, have been successful applied in order to obtain approximate singular solutions of many physical problems (see, for instance, P.Dobrokhotov [1999]. From the numerical point of view, one of the main possibilities of this theory is the reduction of the problem of finding solutions of partial differential equations to the search of an infinite chain of ordinary differential equations, the so called Hugoniot-Maslov's chain.
Two of the authors of this article have obtained the Hugoniot-Maslov's chain for the case of conservation laws with polynomial flow by previously obtaining a theoretical foundation of this chain in the context of Colombeau algebra of simplified generalized functions.
In this work we study the generalized Riemann problem associates to the equation (1), applying the algebraic properties of Colombeau simplified generalized functions. In particular, using properties of Heaviside and Dirac generalized functions, we transform (1) into a system of partial differential equations. Then, this system is investigated both in theoretical and numerical point of view, in some particular cases when f(u) is a polynomial. Numerical simulations give an idea of the solutions and show the possibilities of Maslov's theory from the numerical point of view.

OPTIMIZADOR DE RUTAS PARA EL TRANSPORTE DE CARGA HOMOGÉNEA

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El Optimizador de Rutas para Carga Homogénea es un método novedoso para la optimización de un tipo particular de problema de ruteo. Este problema es la transportación de carga homogénea (unicidad de la dimensión de la carga: masa, volumen), hacia diferentes localizaciones, de manera que se utilice un parque mínimo de transporte, para recorrer rutas de transportación con un costo mínimo de tiempo. Para la solución de este problema se desarrolló un algoritmo heurístico multiobjetivo, computarizado, al que se le incorporo un sistema de selección multi-objetivo par la toma de decisión.

NASH EQUILIBRIUM EXISTENCE IN DISCONTINUOUS GAMES WITHOUT QUASI-CONCAVITY: A NEW APPROACH

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We propose a new approach to relax the quasi-concavity assumption in the classical Nash equilibrium existence problem in Game Theory:

a) First, we define a measure of non-quasiconcavity of the utility functions.

b) Then, we exhibit a criterium, using this measures, that allows to yield the existence of an equilibrium.

Since in many games without quasi-concavity, there are generally discontinuity problems, our approach has to cover the case of discontinuous games. More precisely, our main theorem generalizes the main result of Reny (1999).
We will give some examples of non-quasiconcave games for which our main result can be applied.

THE APPLICATION OF THE FUZZY SETS TO THE EVALUATION OF THE OPERATION RISKS

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The enterprisers risk management is a process dedicated to identify the potential events that can affect the entity and to manage the risks to provide a reasonable security in the achievement of its objectives. It includes the evaluation of risks like one of its fundamental stages. This research pretends to design and to apply a procedure to evaluate the operational risks when the main source of information is the opinion of experts. The fuzzy sets theory is appropriated for the treatment of the uncertainty and the subjectivity. They offered the Fuzzy Delphi method that supports the procedure. The necessity to apply the fuzzy sets theory to the operational risks evaluation is given by two fundamental conditions: the insufficient information in the companies to evaluate a great part of these risks and the quick changes that take place in the companies and their environment. This last factor provokes the non execution of the supposition of normality that the traditional models of evaluation of risks demand, based on the theory of the probabilities, and it develops the necessity to use the experts' opinion. Its applicability to the evaluation of risks is sustained in the risk uncertainty, as well as in the subjectivity of the information. The results of their application in a managerial unit confirm the applicability of these methods.

PORTFOLIO OPTIMIZATION BASED ON THE CONDITIONAL VALUE AT RISK (CVAR) OF SIMULATED SCENARIOS

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The main objective of this research was to develop and implement an algorithm which will complement the methodologies used today for making decisions in investment portfolios based on the generation of scenarios and the minimization of VaR (Value at Risk) by means of linear programming, which verifies that it is more feasible to use the CVaR (Conditional value at risk) as an objective to optimize.
Specific targets of this research were the acquisition and management of financial information relevant to decision-making, which includes risks and correlations of the selected actions, the modeling of equity prices, and the achievement of the optimal portfolio.
To forecast the prices, we used Monte Carlo simulation and Cholesky matrix decomposition, to get returns correlated in the same way that they were in the past. These results are more similar to the reality, within the restrictions and difficulties of the stock fluctuation models. We also implemented an optimization algorithm developed by Uryasev and Rockafellar that yields an optimal portfolio investment based on the minimization of VaR.
Finally, we created an interface whose functionality allows the user to work in a simple and easy to understand framework. The main tasks are in different windows and the information is distributed in a practical way, step by step. The help window can be reached at any step, and its visual design, includes buttons, graphics, dialogue boxes, tables of results, menus and secondary windows, in order to offer a pleasant working environment to the user.

SENSITIVE ANALYSIS OF EXTERNAL INFLUENCES ON CONTAINER HANDLING COST

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During the last years, market conditions of international container traffic have been changed drastically. This applies also to seaport container terminals (SCT) expressing by rising logistics and economic requirements as well by an increase of competition between related facilities. Focussing expenses caused by

container handling activities at STCs, a multitude of factors influences the amount of arising terminal operations cost. Basically, there may be distinguished between internal and external factors. The former are changeable by terminal operators and comprise mainly the organization and control of equipment and labour. The latter or their characteristics respectively "are given" and can be influenced on-site to a certain degree only. Typical examples for such factors are the local application conditions (e.g. level of labour cost), specific attributes of container handling technologies (e.g. stacking height) as well as the size of SCTs. Supposing the organization and control of terminal processes on a common level, in the framework of this contribution the strength of external influences on operations cost will be investigated, assuming an industrial country with typical application conditions as facility location. For this purpose an Excel based model has been developed which allows an automated sensitive analysis of related influences. The external factors handling technology and terminal size form the basis for this investigation. A combination of various technology operations cases and terminal extents (small versus large) define a set of initial investigation scenarios. Using the Excel model further external factors (like energy cost) will be included by going stepwise through value intervals determined for each factor. Beside measurement of significance of external factors for terminal operations cost, the results of sensitive analysis also serve for identification of most beneficial handling technology applied to small/large SCTs under the conditions of defined industrial (model) country. As central indicators for the competitiveness of SCTs, the economic efficiency (usually indicated by cost per box) and the terminal capacity are considered for evaluation in this regard. Being aware of changing application conditions (e.g. rising energy prices), finally the robustness of favoured technology solutions are investigated assuming that one or more of included external factors changes their characteristics considerably.

UN ESTUDIO DE CLASES DE ESTIMADORES BASADOS EN UNA RAZÓN

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Una clase de estimadores es construida. Esta contiene familias importantes de estimadores de razón. Se caracteriza la pertenencia a ella a partir de un vector de parámetros. Este permite identificar como casos particulares a mas de una docena de estimadores de razón. El comportamiento de estos al utilizar muestro por conjuntos ordenados es establecido al fijar las ganancias en precisión de estos. Experimentos numéricos establecen cual es el comportamiento de ellos en cuatro aplicaciones y al generar poblaciones normales, exponenciales y uniformes.

ESTIMATING THE DIFFERENCE OF MEANS WITH IMPUTATION OF THE MISSING OBSERVATIONS

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We consider the use of a finite population model for estimating the difference of the means of two variables under a mechanism for missing observations. The information available on the two variables is used for imputing the corresponding missing data. The proposed estimator is characterized by means of the expected squared error. Data from an environmental study are used for illustrating the performance of the estimator.

ON THE ROLE OF MPCC-LICQ WHEN SOLVING BILEVEL PROGRAMS BY THE FRITZ-JOHN RELAXATION

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Bilevel programs (BL) form a special class of optimization problems. They appear in many models in economics, game theory and mathematical physics. We study the so-called KKT-approach for solving bilevel problems, where the lower level minimality condition is replaced by the KKT- or the FJ-condition. This leads to a special structured Mathematical Program with Complementarity Constraints. We analyze the feasible set of the FJ-approach from the viewpoint of stability and genericity and reveal the advantages and possible drawbacks of this approach for solving BL problems numerically.

A GENERALIZATION OF THE EIGENVECTOR METHOD FOR INCOMPLETE PAIRWISE COMPARISON MATRICES

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Pairwise comparison matrices are used in Multi Attribute Decision Making (MADM) for determining the weights of the attributes or the evaluation of an alternative with respect to an attribute. When the size of the matrix $(n \times n)$ is high, e.g., $n = 8, 9, 10$, filling in all the $n(n-1)/2$ elements may be time consuming.
It is shown in the talk that the Eigenvector Method (EM) can be extended in the case of missing elements. A necessary and sufficient condition is given regarding the existence and uniqueness of the EM solution. The proof is based on an eigenvalue optimization problem.

COMBINING MARKOV SWITCHING MODELS AND THE DETECTION OF CHANGE-POINTS WITH THE SOM ALGORITHM TO EXPLAIN A TEMPORAL PROCESS

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In the analysis of a temporal process, Kohonen maps may be used together with time-series (TS) algorithms. Previous research aimed at combining Kohonen algorithms and Markov switching models in order to suggest a periodization of the international bimetallism in the 19th century (Boyer-Xambeu, Deleplace, Gaubert, Gillard and Olteanu, 2006). In a posterior paper the location of the major breakings occurring during the period of international bimetallism has been presented with a historical study linking them to special events, which operated as exogenous shocks on that system. The indicator of integration used was the spread between the highest and the lowest among the London, Paris, and Hamburg gold-silver prices.
As a consequence, it seems appropriate in a further study to locate the breakings of another indicator of integration: the spread between a representative "national" gold-silver price and an arbitrated international gold-silver price taking into account the foreign exchange rates.
At the same time it would be interesting to go further with the Markov switching model, trying more complete specifications. The algorithm used to detect change-points bring some help to find more accurate specifications. At the same time it gives a better understanding of the time process and some rationale to choose the sub-periods when grouping the classes produced by the SOM algorithm.

ANALYSIS, VIA MULTIOBJECTIVE PROGRAMMING, OF THE IMPACT OF THE REDUCTION OF THE WEEKLY WORKING HOURS ON THE EMPLOYMENT RATE

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In this paper, a model is designed in order to analyze the impact that a reduction in the number of weekly working hours can have on the unemployment level in a certain Economy. Nevertheless, maximizing the employment rate is not the only aim: an attempt is made to minimize simultaneously the costs variation for the firms in this new labor relations legal frame, and the incomes variation of the Administration in this new situation is also minimized, so that the burden of this policy is shared by all the agents involved in it. At the same time, the achievement of these objectives is constrained by two aspects. On the one hand, the production level must not decrease and, on the other hand, the global salaries must be kept at the same levels as before. This situation with multiple, clearly conflicting, objectives has led us to the application of multiobjective programming techniques, with the aim of obtaining a representative sample of the different employment levels that could be generated in the short term, which lay in the efficient frontier, and to evaluate the potential conflicts existing among them.

REACTION-DIFFUSION ELLIPTIC EQUATIONS AND MINIMAL SURFACES

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We will present recent developments on solutions of reaction-diffusion elliptic equations that are related to some classical results in the theory of minimal surfaces. The connection between reaction-diffusion (or semilinear) elliptic equations and minimal surfaces theory originates in semilinear models of phase transitions. As the reaction term becomes stronger, interfaces tend to minimize their area. A precise variational justification of this is given by the Modica-Mortola Γ-convergence result. Concerning the regularity of minimal cones in low space dimensions, we will discuss semilinear analogues, particularly recent results by Capella and the author on radial solutions of reaction-diffusion equations. In low space dimensions, they lead to the boundedness or regularity of radial stable solutions in a ball, and to the instability of bounded radial solutions in the whole space. A second classical result is the flatness of minimal graphs in low dimensions. Its semilinear analogue is a conjecture posed by E. De Giorgi in 1978 for which progress has been made only recently. Here the main results state that bounded solutions in the whole space which are monotone in one variable are always local minimizers of the energy, and that in low space dimensions they are necessarily functions of only one Euclidean variable (1d symmetry). Related to the previous point is the existence of singular minimal cones (such as the Simons cone) in high dimensions. The semilinear analogue concerns the instability or stability (depending on the dimension) of saddle-shaped solutions to semilinear equations. We will explain some recent results in this direction, and also an open problem on saddle-shaped solutions that would lead to a counterexample in high dimensions to the conjecture of De Giorgi mentioned above.

MATHEMATICAL MODELATION FOR THE FEEDING OF THE BOVINE LIVESTOCK

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Universidad de Cienfuegos, Cuba.

In the Process of Managerial Improvement in the one that are our immersion. Cuban companies, inside them the Farm cattle " Walls ", is necessary the search of high productive yields and efficiency. The

Mathematical one Applied it is an universal tool of application and of search of parameters and good conditions, reason why if the methods and models that it provides this discipline commit to the purposes of the Managerial Improvement very favorable results they should be obtained. The work was developed on the base of investigations carried out in the mark of the project of development of grasses and forages, having as purpose the obtaining of a model of necessary for the development of certain grasses. The necessity is based of looking for alternative of production, viable to the contribution of the alimentary problem of the livestock. This work offers a mathematical model using the whole lineal programming for the feeding of the livestock and in turn make an analysis of the necessary financing under the conditions of the farm " Walls " of the Cattle Company The plank." The obtained pattern and their results support the taking of decisions about the investment to carry out to foment the cane cultivations, leucaena, guinea, available kingrass and to obtain bigger meat production. For obtaining the results the package used was STORM and the software Calrac to know the content of gross protein, energy and minerals of the cultivations to use. A general model of whole lineal programming was carried out.

COUNTING KNIGHT'S TOURS THROUGH THE RANDOMIZED WARNSDORFF RULE

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We give an estimate of the number of geometrically distinct open tours G or a knight on a chessboard. We use a randomization of Warnsdorff rule to implement importance sampling in a backtracking scheme, correcting the observed bias of the original rule, according to the proposed principle that most solutions follow Warnsdorff rule most of the time". After some experiments in order to test this principle and to calibrate a parameter, interpreted as a distance of a general solution from a Warnsdorff solution, we conjecture that $G = 1.22E + 15$.

COMBINING UNSUPERVISED AND SUPERVISED NEURAL NETWORKS ANALYSIS IN GAMMA RAY BURST PATTERNS CLASSIFICATION

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A neural network analysis of the BATSE Gamma Ray Burst (GRB) catalogue is performed to discover classes of GRBs. All the variables of the catalogue were initially considered: coordinates, burst duration, fluence and spectral hardness. We applied two neural network models with the 3D catalogue to compare results with those obtained by other authors. The paper proposes a neural network approach that uses an unsupervised neural algorithm (SOM) for clustering as in and a supervised algorithm (MLP with Bayesian regularization) to discard irrelevant or interrelated inputs. The entire analysis is repeated in a classic approach by applying Principal Component Analysis to find the main original variables and then the proposed clustering method. The results obtained agree partially with [3] that summarize the properties of three classes found as follows: a first class with long duration, bright fluence an soft spectrum; a second class with short duration, faint fluence and hard spectrum; and, a third class with intermediate duration, intermediate fluence and soft spectrum. The other two classes characterized by intermediate duration, faint fluence and hard spectrum and intermediate duration, faint fluence and soft spectrum. This paper suggests the existence of other two classes similar to class 2 that needs to be investigated and characterized in future works.
Keywords: Clustering and classification; Gamma ray burst; unsupervised neural networks.

ECUACIÓN DE RICCATI PARA LA MATRIZ DE DISPERSIÓN EN MEDIOS PERIÓDICOS NO HOMOGÉNEOS

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En este trabajo estudiamos un problema de dispersión asociado a medios periódicos. Específicamente, abordamos un modelo físico que conduce a un problema de valor de frontera para la ecuación de Helmholtz bidimensional con coeficiente variable y con apropiadas condiciones de radiación; este coeficiente representa el índice de refracción perturbado por una función periódica en una dirección y de soporte compacto en la dirección perpendicular. Utilizando una superposición de ondas planas como campo incidente, definimos y estudiamos las propiedades fundamentales de la matriz de dispersión, la cual transforma los coeficientes de Fourier de la onda incidente en los correspondientes modos del campo dispersado, para un medio no homogéneo específico. En este contexto, deducimos una ecuación diferencial de tipo Riccati que es satisfecha por la matriz de dispersión usando la transformación de Dirichlet-to-Neumann; esto constituye una vía alternativa al método de inmersión invariante de Bellman.

FLOW CONTROL IN THE PRESENCE OF SHOCKS

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Flow control is one of the most challenging and relevant topics connecting the theory of Partial Differential Equations (PDE) and Control Theory. On one hand the number of possible applications is huge including optimal shape design in aeronautics. On the other hand, from a purely mathematical point of view it involves sophisticated models such as Navier-Stokes and Euler equations, hyperbolic systems of conservations laws, that constitute, certainly, one of the main challenges of the theory of PDE. Indeed, some of the main issues concerning existence, uniqueness and regularity of solutions are still open in this field. Moreover, Control Theory also faces some added difficulties when addressing these issues since the possible presence of singularities on solutions makes often classical approaches fail. In this lecture we present recent joint work in collaboration with Carlos Castro and Francisco Palacios in which we propose a new alternate direction method that allows not only dealing with shocks but also taking advantage of their presence to make the optimization processes to converge much faster.

FORECASTING THE DIRECTION OF CHANGES IN CROATIAS INDUSTRIAL PRODUCTION WITH ICI AND CROLEI

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The Industrial Confidence Indicator (ICI) and the Croatian Leading Economic Indicator (CROLEI) can be used to forecast developments in the national economy, especially for the manufacturing industry. Both indicators have predictive properties and there is a stable and highly significant accordance between the indicators and the referent series (volume of industrial production). These indicators are very important tools in manufacturing activity prognostics. The Croatian experience has shown that ICI correctly predicts direction of changes in industrial production with one or two quarters lead (quarterly data) and CROLEI with about six months lead (monthly data). ICI and CROLEI are two leading indicators calculated on different methodological grounds. In spite of the methodological differences, they are mutually highly correlated, and they also correlate with the industrial production. Some results of regression and correlation analysis in Croatia confirm these conclusions. Empirical modifications are conducted to make a comparison of the two indicators. Monthly values of CROLEI are expressed as quarterly data in order to align it with ICI which is based on quarterly surveys.

Keywords: Business Survey, Industrial Confidence Indicator (ICI), Croatian Leading Economic Indicator (CROLEI), forecasting, regression analysis.

USE OF BAYESIAN NETWORKS OBTAINED BY PARTICLE SWARM OPTIMIZATION FOR HIGH BLOOD PRESSURE DIAGNOSIS

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The present work, different Artificial Intelligence techniques are combined to model the diagnosis of hypertensive people, starting from the study of risks factors. To develop the work a data base of Arterial Hypertension was used, which is result of a preliminary study made in five polyclinics of Santa Clara city, with supposedly healthy individuals. One of the ways to model the relations between variables is using a bayesian network. The computational cost of the learning of a bayesian network from data, grows with the number of variables and the number of cases, therefore, the problem of identifying a good heuristic to explore the space of possible networks arises. The evolutionary algorithms are being very valuable methods to find good solutions to concrete problems, that is why the Particle Swarm Optimization (PSO) algorithm is used for the network structure search. An extension to the Weka platform (Waikato for Environment Knowledge Analysis) was done, in which the new algorithm becomes part of the global score metrics implemented in the Bayesnet class. The obtained results show good classification of the Arterial Hypertension with bayesians networks.

ESTIMATION IN A STOCHASTIC SIR MODEL WITH CONTACT TRACING

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We consider a stochastic model for the AIDS epidemics in Cuba. There are two ways of detection of seropositive individuals: the usual random screening system and the contact-tracing detection, where detected individuals may contribute to identifying other infectious individuals by providing information related to persons with whom they have had possibly infectious contacts. We describe the evolution of the epidemics by a Markov process with a measure-valued component for the population of detected individuals, in order to account for the time since which an individual has been detected. We study a large population renormalization of this process and link it with the weak solution of a PDE system. In this limit, the properties of the maximum likelihood estimators of the detection rates (random screening and contact-tracing) are obtained. Numerical simulations and estimations are presented.

EXISTENCE OF FINANCIAL EQUILIBRIA IN A MULTI-PERIOD STOCHASTIC ECONOMY

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We consider the model of a stochastic financial exchange economy with finitely many periods. Time and uncertainty are represented by a finite event-tree D and consumers may have constraints on their portfolios. W e provide a general existence result of financial equilibria, which allows to cover several important cases of financial structures in the literature with or without constraints on portfolios.
Key words: Incomplete markets, financial equilibria, constrained portfolios, multiperiod model.

DESARROLLO DE UN SISTEMA DE GESTIÓN DE INVENTARIO. EJEMPLO DE APLICACIÓN EN UNA ENTIDAD COMERCIALIZADORA

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El programa informático AUTOGEST, implantado con buenos resultados en una empresa de servicios (Aguas de La Habana S.A.), se ha continuado desarrollando e introduciendo en empresas con otras características (hoteles y entidades comercializadoras). Se mejoró sustancialmente, cambiando su plataforma de gestión de base de datos hacia SQL SERVER, que permite ampliar sus prestaciones en redes multiusuario, con el manejo de grandes volúmenes de información. Se inició la elaboración de una interfase desde un programa integral de gestión que se generalizará en empresas del MINCIN (VERSAT SARASOLA), posibilitando la aplicación de técnicas avanzadas de gestión de inventarios a una escala mucho más amplia que la actual.

DYNAMICAL EQUILIBRIUM, TRAJECTORIES STUDY IN AN ECONOMICAL SYSTEM. THE CASE OF THE LABOR MARKET

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The paper deals with the study of labor market dynamics, and aims to characterize its equilibriums and possible trajectories. The theoretical background is the theory of the segmented labor market. The main idea is that this theory is well adapted to interpret the observed trajectories, due to the heterogeneity of the work situations. The Kohonen algorithm is used to define the segments of the labor market. The trajectories are reconstructed by means of a non homogeneous Markov model and classified by using a Kohonen algorithm again.

COVERAGE PROCESSES ON SPHERES AND CONDITION NUMBERS FOR LINEAR PROGRAMMING

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This talk has two agendas. Firstly, we exhibit new results for coverage processes. Let $p(n, m, \alpha)$ be the probability that n spherical caps of angular radius α in S^m do not cover the whole sphere S^m. We give an exact formula for $p(n, m, \alpha)$ in the case $[\pi/2, \pi]$ and an upper bound for $p(n, m, \alpha)$ in the case $\alpha \in [0, \pi/2]$, which tends to $p(n, m, \pi/2)$ when $\alpha \to \pi/2$. In the case $\alpha \in [0, \pi/2]]$ this yields upper bounds for the expected number of spherical caps of radius α that are needed to cover S^m. Secondly, we study the condition number $C(A)$ of the linear programming feasibility problem $\exists x \in R^{m+1},\ Ax \leq 0,\ x \geq 0$ where $A \in R^{n(m+1)}$ is randomly chosen according to the standard normal distribution. We exactly determine the distribution of $C(A)$ conditioned to A being feasible and provide an upper bound on the distribution function in the infeasible case. Using these results, we show that $E(\ln(C(A))) \leq 2ln(m+1) + 3.57$ for all $n > m$, the sharpest bound for this expectancy as of today. Both agendas are related through a result which translates between coverage and condition.

RESOURCE SCHEDULING IN GARBAGE COLLECTION

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During the last decades the *garbage collection* became more and more a financial (and therefore a political) problem for local government. For this reason many discussion have been made to develop much better and also cost-saving solutions. An important step was to apply quantitative methods of operations research to solve the *garbage truck routing*, which normally is formulated as a *Capacitated Arc Routing Problem (CARP)*. In many cases the attained results show significant reductions regarding the traveled distances of the operating trucks but not the expected cutting down in labor costs. This situation originates from handling truck, driver, and loading crew in the planning process as a self-contained object, which starts and end their duty at a given home depot. Because the truck capacity is restricted, after a certain time period a deadhead trip becomes necessary to empty the collected garbage in a *dumping ground* or at a *transshipment point*, so that (beside the pull-out and pull-in trips) additional non productive trips evolve. During these trips the loading crew is traveling but not working and, that is a cost factor, they are paid for this (non productive) time. Therefore to attain sustainable reductions in labor costs the planning problem must be divided into two *(synchronized)* sub problems, a *routing problem* (to minimize the costs of truck operations) and a *loading crew scheduling problem* (to minimize the personal costs). A concept to solve this modified garbage collection problem is presented and the different problems to realize it are discussed.

ESTIMACIÓN DE PARÁMETROS EN DIFUSIONES CON SALTOS A PARTIR DE OBSERVACIONES DISCRETAS USANDO FUNCIONES ESTIMANTES

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En este trabajo se obtienen estimadores para la parte del drift de un proceso de difusión con saltos observado discretamente. Para la obtención de estos estimadores se emplea un método basado en Funciones Estimantes, y en una previa detección de los saltos. Para comprobar el buen comportamiento de los estimadores se realiza un estudio de simulación para uno de los ejemplos desarrollados donde se obtuvieron expresiones explícitas para los estimadores. Se realizan simulaciones en el caso de difusión sin saltos y con saltos con el fin de comparar, y se observan resultados similares en ambos casos.

MODELING HIV-AIDS IN CUBA: ANALYSIS OF NON LINEAR MODELS

Héctor de Arazoza Rodríguez*, Rachid Lounes**,Gonzalo Joya Caparros***, Jorge * and Aymee Marrero Severo*

* University of Havana, Cuba, ** University Paris Descartes Equipe MAP5, France, *** University of Malaga, Spain.

We propose and analyze a group of models for the HIV-AIDS epidemic in Cuba. We look at the Basic Reproduction Model for the epidemic, and give threshold conditions for the control of the growth of the epidemic. We look at various results with numerical values estimated for the different parameters of the models using a numerical tool specifically designed for the problem. We find that the Basic Reproduction Number for the epidemic is close to 1, but this doesn't necessarily means that we are close to controlling the epidemic. We give some ideas for the future work in this area.

MODELING DENGUE FEVER: AN OVERVIEW AND SOME WORKING IDEAS

Héctor De Arazosa Rodríguez, Andrés Sánchez Pérez and Teresita Noriega Sánchez

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We give an overview of some of the work done in the modeling of Dengue Fever. In particular the work done at the Grupo de Biomatemáticas at UNAM University in Mexico and at the University of Sao Paulo in Brazil. Starting from the work done at this two research centers we give some ideas to buid models that could be useful in the analysis of an epidemic of Dengue. This is a work that is in progress.

PRICE DYNAMICS ON A STOCK MARKET WITH ASYMMETRIC INFORMATION

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The appearance of a Brownian term in the price dynamics on a stock market was interpreted in [De Meyer, Moussa-Saley (2003)] as a consequence of the informational asymmetries between agents. To take benefit of their private information without revealing it to fast, the informed agents have to introduce a noise on their actions, and all these noises introduced in the day after day transactions for strategic reasons will aggregate in a Brownian Motion. We prove in the present paper that this kind of argument leads not only to the appearance of the Brownian motion, but it also narrows the class of the price dynamics: the price process will be, as defined in this paper, a continuous martingale of maximal variation. This class of dynamics contains in particular Black and Scholes' as well as Bachelier's dynamics. The main result in this paper is that this class is quite universal and independent of a particular model: the informed agent can choose the speed of revelation of his private information. He determines in this way the posterior martingale L, where L_q is the expected value of an asset at stage q given the information of the uninformed agents. The payoff of the informed agent at stage q can typically be expressed as a 1-homogeneous function M of $L_{q+1} - L_q$. In a game with n stages, the informed agent will therefore chose the martingale L_n that maximizes the M-variation. Under a mere continuity hypothesis on M, we prove in this paper that L_n will converge to a continuous martingale of maximal variation. This limit is independent of M.

CLASSIFICATION BY MEANS OF ANT COLONY AND PARAMETERS CONFIGURATION

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In the work are described modifications to the algorithm ACO-Clustering to continue the study of the application of Ant Colony Optimization meta-heuristic to the problem of classification by partitioning. The problem consists in the separation of a set of n elements or observations, with m characteristics measured on each one of them, in k homogeneous and clear-cut classes. By means of the implementation of an algorithm (F-Race) proposed in the literature, configurations of the before mentioned parameters of the meta-heuristic are obtained to evaluate the algorithm.

AUTOMATIC LINEAR MODEL SELECTION FOR A LEAST SQUARES DATA FITTING PROBLEM WITH CONTINUOUSLY DIFFERENTIABLE PIECEWISE DEFINED MODELS

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The goal of this work is to design an algorithm to find the best model to fit a set of two dimensional data, where the data seems to describe different functions in different intervals. Infinite models are considered as candidates, and every model is piecewise defined in a way that at the points where the definition of the function changes, the model is continuous and differentiable. The infinite set of possible models is represented as a formal language and a grammar is used to generate its elements. To make sure that the selected function is continuously differentiable at the change points, additional constraints are added to the optimization problem solved to find the best parameters. As the model is formed by linear functions in the parameters, the solution of the constrained optimization problem becomes the solution of a system of linear equations. The best model is selected using the metaheuristic Simulated Annealing.

MODELLING OF A GREENHOUSE SYSTEM BY MEANS OF PARAMETER ESTIMATION WITH HOPFIELD NEURAL NETWORKS

Samir Didi*, Miguel Atencia**, Esther García-Garaluz*, Gonzalo Joya**, Abdeslam Lachhab*, Abdelali Eddahhak*, Latifa Ezzine*, Benachir Bouchikhi*
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In this work, an original technique for parameter estimation of dynamical systems is applied to the identification of a greenhouse system. The final aim is to design a control algorithm for maintaining the interior temperature (and eventually, other variables) within preestablished limits. Based upon previous work, the computational paradigm of Hopfield neural networks is adapted to estimating the uncertain and possibly time-varying parameters of a dynamical system. In the case of a greenhouse system, no previous model is easily deduced from physical laws or experts' knowledge; instead, a set of empirical data is obtained from an experimental station. As a first approximation, a linear model is formulated, in which the interior temperature is considered as the unique state variable, whereas the control signal to a heater/ventilator device is an external factor. The order of the model and initial values for the estimated parameters are obtained from classical statistic techniques, such as those based on auto-regressive regression with exogenous inputs (ARX). The simulation of the proposed method provides valuable insight into the behaviour of the system, suggesting seasonal variation of the considered parameters. These results are a first step towards the construction of an adaptive control system for the greenhouse based upon computational intelligence techniques. (This work has been partially supported by the Agencia Española de Cooperación Internacional AECI. Project N A/5560/06)

ABOUT INSENSITIZING CONTROLS FOR THE HEAT EQUATION

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Let $\Omega \subset R^n$ be an open, bounded and smooth set. Consider $\omega, \mathcal{O} \subset \Omega$ be two nonempty open subsets. We consider the following parabolic system:

$$\begin{cases} v_t - \Delta v + f(v) = \xi + h1_\omega \quad \text{in } Q = \Omega \times (0,T)\,, \\ v = 0 \quad \text{on} \quad \Sigma\partial\Omega \times (0,T)\,, \\ v(x,0) = y^0(x) + \tau v^0 \quad \text{in} \quad \Omega\,, \end{cases} \tag{1}$$

where 1_ω denotes the characteristic function of the set ω; ξ , y^0 are given in $L^2(Q)$, $L^2(\Omega)$, respectively and $h = h(x,t)$ is a control term in $L^2(Q)$. The data of the state equation (1) are incomplete in the following sense:

- $v^0 \in L^2(\Omega)$ is unknown and $\|v^0\|_{L^2(\Omega)} = 1$;

- $\tau \in I\!R$ is unknown and small enough.

The problem of insensitizing controls can be stated, roughly, as follows: Let

$$\Phi(v) = \frac{1}{2}\int_0^T \int_{\mathcal{O}} v^2(x,t)dxdt.$$

We say that the control h *insensitizes* $\Phi(v)$ if

$$\Big| \frac{\partial \Phi(v(x,t;h,\tau))}{\partial \tau}\Big|_{\tau=0} \Big| = 0. \tag{2}$$

It can be shown that condition (2) is equivalent to the null-controllability of a *cascade* system of parabolic equations. This condition can be weakened asking only the approximate controllability of the cascade system. The aim of this talk is to present a survey on this topic, presenting the existing results in both null and approximate controllability as well as the open problems on the subject.

THE TWO-DIMENSIONAL KELLER-EGEL MODEL AFTER BLOW-UP

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The Keller-Segel system describes the collective motion of cells which are attracted by a chemical substance and are able to emit it. In its simplest form it is a conservative drift-diffusion equation for the cell density coupled to an elliptic equation for the chemo-attractant concentration. Based on estimates for a free energy functional, existence of weak solutions in the two-dimensional euclidean space can be established below the critical mass, above which any solution blows-up in finite time.
In the super-critical case, blow-up of solutions occurs in finite time. Blow-up is a concentration event, where point aggregates are created. Global existence of generalized solutions can still be proven, allowing for measure valued densities. This extends the solution concept after blow-up.
The existence result is an application of a theory developed by F. Poupaud, where the cell distribution is characterized by an additional defect measure, which vanishes for smooth cell densities. The global solutions are constructed as limits of solutions of a regularized problem.
A strong formulation is derived under the assumption that the generalized solution consists of a smooth part and a number of smoothly varying point aggregates. Comparison with earlier asymptotic results obtained by Velázquez shows that the choice of a solution concept after blow-up is not unique and depends on the type of regularization.
An equation for local density profiles close to point aggregates can be derived by passing to the limit in a rescaled version of the regularized model. Solvability of the profile equation can also be obtained by minimizing a free energy functional.

A NONLINEAR PROGRAMMING APPROACH FOR SCHEDULING PROBLEMS IN PORTS

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In this paper we present a continuous nonlinear programming approach to scheduling problems of cargo ships in ports. The main idea is to consider the schedule as a dynamic system which must operate under certain constraints. As the optimal control theory is well-fit for optimizing the operation of dynamic

systems, our scheduling problem is modeled as an optimal control problem, where transfer operations are carried out by flows from the ships to the port facilities (tanks or storages). Such flows are mapped as control variables, whilst equipment contents (identified by volume and properties) are mapped as state variables. Boolean decisions are modeled with the use of complementarity constraints, instead of with the use of discrete variables, allowing a continuous nonlinear model. We illustrate this approach by presenting some computational examples from the continuous process industry, which were solved to (local) optimality in reasonable computational time. It is important to highlight that the ideas presented herein can be extended to other scheduling problems, as the same structures can be found in many discrete optimization problems.

ON THE MAXIMUM AND MINIMUM RADIUS PROBLEMS OVER A POLYHEDRAL SET

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The School of Mathematics and Computer Sciences Abstract. Problems of finding inscribed or circumscribed balls defined over a polyhedral set are classical. It is known that finding minimal ellipsoid circumscribing a polytope is NP-hard. Many combinatorial, clustering, data mining, and pattern recognition problems require to find a ball set circum-scribing a given set. On the other hand, from computational point of view, it is interesting to find a center of a ball inscribed in a given set defined by a system of linear inequalities. In this talk, we consider a problem of finding the maximum and minimum radiuses of inscribed and circumscribed balls defined over a polyhedral set. We formulate the above problem as optimization problems and then propose some algorithms for solving them. Some computational results are provided.

TOWARD A RATIONALITY OF DECISION BASED ON THE LANGUAGE: THEORETICAL LINKS AND EXPERIMENTAL OF THE COMPENSATORY FUZYY LOGIC, THE EXPECTED UTILITY THEORY AND PROSPECTS

Rafael Espín Andrade
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Linguistic Possibilities of Compensatory Fuzzy Logic and the inclusion of reasoning and decision making in the same theoretical framework allows to build a link among the system of values and knowledge with preferences, and a flexible way to model thinking, anchoring the classical rational point of view. Last works have been dealing with its relation with Boolean Logic; this one is about theoretical and experimental evidences of its relation with Utility Theory and Prospect Theory.

MUSICAL GENRE RECOGNITION AND CLUSTER ANALYSIS

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Automatic musical genre recognition has appeared as a real necessity with continuous and unmanageable growing of musical's databases in the World Wide Web. Data could be enormous and, by handmade, classify each song is a difficult and slow work. Trying to solve this problem with machines is a really complex task because it is not evident which characteristics to measure, and once we have some approach, how to proceed for finding classes that matches the correct grouping is also an open path. First, we show the "mathematical" abstraction of the problem and some of the most used characteristics defined by important works that give base to this one. Those extracted data will be the base of our work and will

then help us to discriminate between the genres. Then we will stay in front of a problem of kind: a set of n individuals (an individual means a song), each one described by a defined number of quantitative data. And then, clearly, we will stay in front of a problem of Cluster Analysis which could seems a simple idea but that could take us to a dead end because the normally distance used, the Euclidean distance, does not have a good behavior with this problem, concerning musical genre. We propose to vary the distance that will be used in cluster methods: Forgy's Method and diffuse classification. We developed a software with some cluster Analysis methods to have the possibility to prove different distances for approaching a measure that could give us a better discrimination of the correct musical genre sets.

HARDY-LIKE INEQUALITIES AND APPLICATIONS

Maria J. Esteban
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In this talk I will present various extensions of Hardy inequalities. These extensions will cover the case of multipolar potentials and also to adapt the idea of Hardy inequalities to other operators, like the Dirac one, which plays an important role in relativistic quantum mechanics. These inequalities are important when studying very general classes of partial differential equations because they are instrumental to obtain a priori estimates for the possible solutions and also comparison between the different terms of the equations.

A POLYNOMIAL TIME ALGORITHM FOR THE CONTEXT FREE SATISFIABILITY PROBLEM

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Given a Boolean Formula F, does F have a satisfying assignment? This is the satisfiability problem, and when no conditions are imposed on F, this problem is NP-hard. In this work the class of Context Free Boolean Formulas is presented as well as a polynomial time algorithm to decide if any context free boolean formula has a satisfying assignment. The set of every satisfying assignment for a Context Free Boolean Formula is a context free language. To find out if there is a satisfying assignment for a context free formula, the set of the satisfying assignments is built and, as it is a context free language, it can be easily checked if the language is empty. For any context free boolean formula, the complexity of the algorithm is $O(n^3)$ where n is the length of the formula, but if the formula is in conjunctive normal form, the running time and space of the algorithm is $O(n)$. As the algorithm builds a grammar which generates the language formed by the satisfying assignments, if the formula has satisfying statements it is possible to generate them all.

UN ALGORITMO PARA LA DETECCIÓN DE CASOS EXCEPCIONALES BASADO EN EL MODELO DE CONJUNTOS APROXIMADOS DE PRECISIÓN VARIABLE (VPRS)

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En una primera versión del algoritmo para la detección de casos excepcionales (outliers) basado en el modelo clásico de Conjuntos Aproximados (Rough Sets) propuesto por Pawlak, se le señalaba como principal limitación el hecho de que por estar basado en el modelo referido, era criticable su incapacidad para modelar información incierta. La clasificación con un grado controlado de incertidumbre, o un posible error de clasificación esta fuera del alcance de este modelo. Sin embargo, en la práctica, poder

admitir algún nivel de incertidumbre en el proceso de clasificación puede llevar a una comprensión más profunda y a una mejor utilización de las propiedades de los datos analizados. La definición estándar de inclusión de conjunto tenida en cuenta en el modelo clásico de conjuntos aproximados, es demasiado rigurosa para modelar una inclusión de conjuntos "casi" completa. A partir de estas limitaciones, se propone un algoritmo basado en el Modelo de Conjuntos Aproximados de Precisión Variable (PVRS) propuesto por el profesor Ziarko en 1993 como solución a las dificultades básicas que se le señalan al modelo básico de Conjuntos Aproximados (RS) planteado por Pawlak, el cual, se considera como un caso particular del modelo de precisión variable. Basado en la idea general teórica del PVRS se presenta un algoritmo para la detección de casos excepcionales outliers que presenta como aspecto novedoso el hecho de que libera al usuario de la necesidad de estimar el error (grado de incertidumbre) y el nivel de excepcionalidad μ (umbral que permite la clasificación de outliers) para a partir de ellos determinar el conjunto de outliers que puede presentarse en una muestra de objetos pertenecientes a un universo U dado. En la versión actual del algoritmo, el enfoque se basa en determinar para todo objeto del universo, el rango de valores de y μ para los cuales el sería un outlier en U. Posteriormente, basado en estos valores se puede dar un criterio probabilístico para cada objeto de U con relación a su condición de outlier.

PATENT LICENSING IN A COURNOT DUOPOLY FROM HIGH COST FIRM TO LOW COST FIRM

Fernanda A. Ferreira
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We study the optimal patent licensing under Cournot duopoly where the technology transfer takes place from an innovative firm, which is relatively inefficient rival. We determine the output levels at the Nash equilibrium and the corresponding profits of the firms. We found that the optimal licensing arrangement often involves a two part tariff, fixed fee plus a linear per unit output royalty.

ENDOGENOUS LEADER-FOLLOWER RELATIONS WHEN DEMAND IS UNCERTAIN

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Escola Superior de Estudos Industriais e de Gesto - IPP, Portugal.

We consider an oligopolistic industry where production is time-consuming, so that each firm needs to make quantity commitment by producing before the market opens. If demand uncertainty resolves some time before the market opens. If demand uncertainty resolves some time before the market arrives, then those firms who produce early behave as simultaneous leaders (co-leaders), whilst those who wait until demand becomes observable will be followers. We determine the output levels at equilibrium for the co-leaders and for the followers, as well the corresponding profits. Furthermore, we analyse the variations of the outcomes with some parameters of the model.

PUBLIC GOODS PROVISION: GENERAL VERSUS LINDAHL EQUILIBRIUM

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A good is said to be a (pure) pubic good (by opposition to a private good) when consumption of a unit of the good by one agent does not prevent its availability to other consumers. In this paper, two equilibrium concepts for a private ownership production economy with private and public goods are compared. In the first one, Villanacci-Zenginobuz (2005), public goods bought by consumers at a same market price are privately provided by them for common using. Charities, subscriptions are examples of

such a private provision. In the second one, Foley (1970), public goods, still competitively produced, are paid by consumers at a personalized price. The two equilibrium concepts are compared as much from the point of view of their conditions of existence as for their optimality properties.

ALGORITMO PARA LA GENERACIÓN ALEATORIA DE MATRICES BOOLEANAS INVERSIBLES

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En el presente artículo mostramos un nuevo algoritmo para la generación aleatoria de matrices booleanas cuadradas nxn e inversibles, el cual tiene una complejidad de $O(n^3 lognloglogn)$ y que utiliza al menos n^2-1 elementos binarios seleccionados aleatóriamente. Este algoritmo tiene, como parámetro de entrada, una matriz booleana $A = \{a_{i,j}\}_{nxn}$, cuyos componentes se seleccionan aleatoriamente y que tiene, como única restricción, que no exista $i \in \{1 \ldots, n\}$ tal que $a_{i,i} = a_{i,i+1} = \ldots a_{i,n} = 0$. El algoritmo propuesto tiene la ventaja, con relación a otros conocidos, de que, para efectuar la multiplicación de un vector por la matriz booleana inversible, seleccionada aleatoriamente, o por su inversa, no es necesario expresar explícitamente la matriz. Esto hace que la complejidad, en ambos casos, sea de $O(n^2 lognloglogn)$. El algoritmo se expone programado en lenguaje Mathemática versión (4.0).

DESCRIPTIVE ANALYSIS OF TIME SERIES

Antonio Miguel Fuentes Jiménez, Miguel Ángel Montero Alonso and Juan Antonio Marmolejo Martín, Department of Statistics and Operations Research, Faculty of Social Sciences, University of Granada, Melilla, Spain.

In the real world we were constantly with variables that present a variation throughout the time. A time or chronological series is a succession of observed values of a variable referred to moments or different periods of the time. The Time Series Analysis, pursues, the description of the time series, and the prediction of the future evolution of series. If the causes of the variations are known, then it is possible to can give an explanation or complete description of the behaviour of the temporary series and, therefore, to make predictions about values futures. To study this question there are three approach, a classic, a causal and a modern approach. Within the classic approach the method of decomposition is used, consisting of supposition that the time variations of the variable are been from the conjunction of the four components of a time series: tendency, seasonal, cyclical and irregular variation. Established the model, we can decompose the series in their components, next we will analyze them, with which we will have described the series and we'll be able to formulate future predictions.

GLOBAL OPTIMIZATION TECHNIQUES FOR SOME OPTIMIZATION PROBLEMS ON STIEFEL MANIFOLDS

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Several practical problems can be formalized as optimization over Stiefel manifolds but they may be difficult to solve due to nonconvexity properties. We deal with some special optimization problems over Stiefel manifolds including the weighted orthogonal Procrustes problem and other least squares problems. Branch-and-bound methods are proposed for finding the global optimal solutions. Computational experience is also presented.

SMALL DATA EXISTENCE FOR THE BOLTZMANN EQUATIONS IN L^1

Rafael Galeano Andrades, Bernando Orozco Herrera and Maria Ofelia Vasquez Avila
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Let us consider the following problem: find $f(t,x,v) \geq 0$, $f \in L^1(\mathbb{R} \times \mathbb{R}^3 \times \mathbb{R}^3)$ such that

$$\begin{cases} \frac{\partial f}{\partial t} + v\nabla_x f + F\nabla_v f + \frac{\partial F}{\partial t}\nabla_v f &= Q(f,f) \qquad (1.1) \\ f(0,x,v) = f_0(x,v) &= \phi(x,v) \end{cases}$$

The external field

$$F : \mathbb{R}^7 \to \mathbb{R}^3$$

$$(t,x,v) \to F(t,x,v) = (F_1(t,x,v), F_2(t,x,v), F_3(t,x,v))$$

Differentiable is supposed with regard to the time, it is observed that if F doesn't depend on the time, then (1.1) decreases to

$$\begin{cases} \frac{\partial f}{\partial t} + v\nabla_x f + F\nabla_v f &= Q(f,f) \qquad (1.2) \\ f(0,x,v) = f_0(x,v) &= \phi(x,v) \end{cases}$$

(1.2) That is the problem considered in the literature, in this sense (1.1) it is a generalization of (1.2), here,

$$Q(f,f) = \int_{\mathbb{R}^3} \int_{|v|=1} [w(v-u)]w[f(u')f(v') - f(u)f(v)]dwdv$$

It is the collision operator, being

$$\begin{aligned} v' &= v - [w \centerdot (v-u)]w \\ u' &= u - [w \centerdot (v-u)]w \end{aligned}$$

u and v they are speeds precollision, u' , v' they are speeds postcollision and w is a unitary vector, here we use the notation $f(u) = f(t,x,u)$, $f(v) = f(t,x,v)$, etc., and $w \centerdot (v-u)w$ it is the kernel of collision operator. Let $D = \mathbb{R}^3 \times I_T$, where $I_T = [0,T]$. Let us define

$$V = \left\{ f(t,x,v) \geq 0,\ \frac{\partial f}{\partial t} + v\nabla_x f + F\nabla_v f + \frac{\partial F}{\partial t}\nabla_v f \in L^1(D,\mathbb{R}^3),\ f_0(x,v) \in L^1(\mathbb{R}^3 \times \mathbb{R}^3) \right\}.$$

If

$$\|f\|_v = \|f_0\|_{L^1(\mathbb{R}^3 \times \mathbb{R}^3)} + \left\| \frac{\partial f}{\partial t} + v\nabla_x f + F\nabla_v f + \frac{\partial F}{\partial t}\nabla_v f \right\|_{L^1(D,\mathbb{R}^3)}$$

Then V is a Banach space. We will demonstrate that in the space V the problem(1.1) is well-posed with some additional considerations.

CONSISTENCY AND NON-CAUSAL MODELS FOR LONG TERM PLANNING VIA UNIFORM SMALL SAMPLE RANDOM NUMBER GENERATION

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The notion of consistency for optimal plans introduced in [F.E. Kydland and E.C. Prescott, Rules rather than discretion: The inconsistency of optimal plans, J. of Polit. Econ. 85 (3) (1977) 473-491] is studied in relation to dynamic programming and to multi-objective optimization. It is demonstrated that the consistency condition for an optimal sequence of n policies for periods from 1 to n corresponding to a sequence of n economic agents' decisions that together constitute an optimal plan for an agreed-upon

social objective function is equivalent to a multi-objective problem with $n+1$ criteria. An optimal plan is consistent if and only if the corresponding $(n+1)$-criteria problem is balanced, and consistent optimal plans do exist in such situations. Otherwise, the consistency requirement generates the balance set and a set of Pareto solutions, and both can be computed as illustrated in the inflation-unemployment example extended for two periods with three objectives to optimize. Finitely causal and non-causal models are introduced for long term planning to take into account certain rational expectations about possible future options that are always considered by economic agents in competitive environment of market economy. Such non-causal problems in a multi-objective (Pareto) framework can be effectively solved making use of the new random number generator that yields uniformly distributed points in all samples of any dimension. The results are illustrated by examples with visual representation on the screen of computer.
Keywords: Multi-objective optimization, Long term planning, Noncausal models

NEW CONDITION CHARACTERIZING SOLUTIONS OF VARIATIONAL INEQUALITY PROBLEMS

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This paper is devoted to the study of a new necessary condition in variational inequality problems: approximated gradient projection (AGP). A feasible point satisfies such condition if it is the limit of a sequence of the approximated solutions of approximations of the variational problem. This condition comes from optimization where the error in the approximated solution is measured by the projected gradient onto the approximated feasible set, which is obtained from a linearization of the constraints with slack variables to make the current point feasible. We state the AGP condition for variational inequality problems and show that it is necessary for a point being a solution even without constraint qualifications (e.g., Abadie's). Moreover, the AGP condition is sufficient in convex variational inequalities. Sufficiency also holds for variational inequalities involving maximal monotone operators subject to boundedness of the vectors in the image of the operator (playing the role of the gradients). Since AGP is a condition verified by a sequence, it is particularly interesting for iterative methods.

NEW TRENDS FOR TEACHING PROBABILITY USING CDPYE

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Teaching procedures in European universities are immersed in a process of change in the last years motivated, mainly, by the establishment of the European Space of Higher Education. In this respect, Spanish universities, and in particular University of Granada, are doing an effort for incorporating its teaching staff to this process in a progressive form and with guarantees. In this process, students have a leading role. In effect, the new educational trends assign a more important role to the own work of the student, which must develop the directives marked by the teacher. With these ideas in mind, and focusing the attention on Probability, our actual interest is to adapt its teaching to the new technologies as well as to provide to the student some pleasant, and easy to use, material of support to its study. These questions leaded us to develop CDPYE, an interactive environment with which we have tried to replace some lacks that we had detected in our habitual educational task. Our main aim has been to provide to students an attractive material that complements the contents developed in classroom by the teacher, allowing them to have a mechanism of autonomous learning. This fact is carried out by means of several interrelated modules including the different steps that a student follows in its learning process. This process leads to the student to have an la carte process for studying Probability. In this paper we show a teaching scheme with CDPYE focused on mathematic students.

A DIDACTIC EXPERIENCE ABOUT PROBABILITY BY MEANS A CASINO

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Since the Probability has its origin in gambling, we have thought suitable to use them as pedagogic resource. Thus, there has been realized a didactic experience, based on a "Casino", to introduce non-university students in the Probability of funny form. Also this learning experience has been used, through data collected in its development and an opinion poll, to introduce them in the Descriptive Statistics and Survey Sampling. The experience was carried out in several phases. First, the basic concepts necessary to carry out the experiment were explained to the selected students. Later, we chose the games that would constitute the Casino, drafted its rules and calculated the probabilities of winning. Likewise, there were designed tables of data collection results in each game and a questionnaire opinion on the experience. Finally we set the Casino, with explanatory panels for each game, and the students received the rest of theirs colleagues, invited them to play after explaining to them the rules of each game and the probabilities of winning. With this experience, the selected students learned, of pleasant form, the calculation of basic probabilities associated with gambling and, with the information obtained in the gaming tables, verified of empirical form the frequentists' definition of the probability. In addition, taking into account the results of the opinion poll we can note that the experience was very enjoyable and satisfying, both for the students involved in it, as for the rest of the students who played at the Casino.

INTERACTIVE MATERIALS FOR THE RESOLUTION OF A LINEAR PROGRAMMING PROBLEM USING THE SIMPLEX METHOD

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In this paper we present educational interactive materials for a pleasant learning of the resolution of a Linear Programming Problem using the Simplex method. First of them provides, through an example, the steps involved in the graphic resolution of a Linear Programming Problem with two variables (representing of the feasible region, identification of the extreme points, and finally obtaining the solution). In this case, our aim is not only that the students learn the mechanism for the resolution, but also familiarize with basic concepts and visually understand the mechanism of the simplex algorithm. The following materials correspond to the different steps to solve a Linear Programming Problem:

- Transformation of a Linear Problem to standard form: in this application the student is going to select the type of problem and the associated restrictions and, then it will indicate how the student should act in every case. Finally, it outlines the procedure to be applied to their particular problem.

- Construction of the first simplex table: a visually attractive presentation shows students how to arrange the necessary elements for its construction and how to identify the basic variables.

- Simplex Algorithm: this application guides the student in the steps forward in the resolution of an example by means of the simplex algorithm. The main advantage of this implementation is that the student, interactively, can select at each step the level of detail in the explanations displayed.

INTERACTIVE APPROACHES TO MULTI-CRITERIA OPTIMIZATION AND DECISION SUPPORT - PRINCIPLES, METHODS, AND APPLICATIONS

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Multi-criteria approaches to complex optimization models have drawn considerable attention in recent research. In fact, most practical problems comprise several aspects that simultaneously have to be taken into consideration when solving the problem at hand. As many criteria are however of conflicting nature, not a single optimal solution exists that maximizes (minimizes) all relevant objective functions at once. Consequently, two important views on multi-objective problem solving exist. First, the identification of Pareto-optimal alternatives, that is the solution of the underlying vector optimization problem. Second, the choice of a most-preferred solution by the decision maker. While both areas have developed into separated areas of research, optimization versus decision making, more recent approaches aim to combine both aspects into integrated interactive optimization and decision making approaches.
In our talk, we are first going to outline possible ways of combining optimization (search) and decision making in such interactive approaches with the focus on recent developments in multi-objective metaheuristics. Thorough investigations of such concepts follow. In particular, we are going to present approaches to interactively solve

(i) multi-objective knapsack problems and

(ii) multi-objective vehicle routing problems.

Both application areas present difficult combinatorial optimization problems, and even in less constrained single-objective cases the solution of problem instances from these domains has to rely on heuristic approaches.
The presented concepts are implemented in interactive decision support systems. Numerical experiments have been carried out, investigating the effectiveness of the proposed approaches. In brief, we are able to show that such methodologies may be used to effectively solve the tackled problems, however still leaving room for further research and improvements.

A NEW STABILIZED FINITE ELEMENT METHOD FOR TWO SECOND ORDER PDES: THE GALERKIN PROJECTED RESIDUAL METHOD

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A new stabilized finite element method for scalar and linear second-order boundary value problems is introduced. The method is obtained adding to the Galerkin formulation appropriate multiple projections of residual of the differential equation within each element. These multiple projections of the residual allow that the element matrix has a maximum number of free parameters. The number of these parameters will depend on the local space of approximation and the differential operator. The free parameters can be determined seeking to satisfy some a-priori criteria (either based on the physics or on the underlying mathematics, for example, convergence and/or stability criterion). The element matrix of several stabilized methods (such like, GLS and GGLS methods, etc.) can be obtained starting from new method for an appropriate choice of the free parameters.
It is well known that the Galerkin finite element method is unstable and inaccuracy for several problems described by scalar and linear second-order partial differential equations. Its numerical solution presents spurious oscillations that do not corresponding with the physical solution of problem. The advection-diffusion equation, reaction-diffusion equation and Helmholtz equation are representative examples of the

little approximation capability of the Galerkin finite element method. The GPR method can be used to stabilize a variety of problems. Here it is applied to two PED: Helmholtz equation and diffusion-reaction equation. Error estimates and several numerical experiments confirm the robust of the GPR method in the sense of stability and accuracy. Finite element method; Stabilization; GPR; GLS; EDP; Helmholtz equation; Diffusion-reaction equation.

PARAMETER ESTIMATION OF DIFFUSION PROCESSES USING EDAS

Zochil González Arenas*, Juan Carlos Jiménez Sobrino*, Li-Vang Lozada Chang** and Roberto Santana Hermida***

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Estimation of Distribution Algorithms (EDAs) comprise a group of stochastic optimization heuristics which base the search on a population of individuals. In the population, each individual represents a solution to the considered optimization problem. EDAs use probabilistic models of the solutions to extract relevant information about a set of selected solutions and to sample new solutions afterward. In this way, the algorithm evolves in successive generations toward the more promising regions of the search space until a stopping criterion is satisfied. Diffusion processes form a large class of continuous time processes that have been widely used for the stochastic modeling of dynamical phenomena in physical, engineering, social and life sciences. Statistical inference is of great importance from the theoretical as well as from the applied point of view in model building and model selection. In practical applications, the typical inference problem consists in the estimation of the unknown parameters and unobserved components of the diffusion process given a set of discrete and noisy observations of some of its components. In this situation the innovation method have been very useful. The computation of the innovation estimators involves the minimization of an objective function, which could be a non-quadratic function. These optimization process is usually carried out by means of local optimization algorithm. ling of dynamical phenomena in physical, engineering, social and life sciences. Statistical inference is of great importance from the theoretical as well as from the applied point of view in model building and model selection. In practical applications, the typical inference problem consists in the estimation of the unknown parameters and unobserved components of the diffusion process given a set of discrete and noisy observations of some of its components. In this situation the innovation method have been very useful. The computation of the innovation estimators involves the minimization of an objective function, which could be a non-quadratic function. This optimization process is usually carried out by means of local optimization algorithm.
In this work we introduced a specific EDA, a continuous version of the Univariate Marginal Distribution Algorithm (UMDAc), to seek a solution for the optimization problem related with the estimation of unknown parameters in a diffusion process. There were considered two different examples for evaluating our proposal behavior and a comparison was made with the case of using a local search algorithm.

DETERMINACIÓN DE LOS ATRIBUTOS CLAVES DEL SERVICIO SPA "AGUAS DE ORO" DEL HOTEL PARADISUS RÍO DE ORO RESORT & SPA

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La presente investigación, con título: Determinación de los atributos claves del servicio SPA "Aguas de Oro" del Hotel Paradisus Río de Oro Resorte & SPA, se desarrolló en la mencionada entidad hotelera con el objetivo de conocer los atributos o variables claves que determinan el buen funcionamiento de este servicio y proponer estrategias de mejora que conduzcan al incremento de su calidad y a elevar la satisfacción de los clientes. Para la realización del trabajo se emplearon métodos teóricos como el análisis y la síntesis, teórico-histórico, modelación, sistémico, hipotético-deductivo; y métodos empíricos como la

observación participante, métodos estadísticos (métodos descriptivos y métodos de análisis multivariados como Análisis Factorial Clásico y Análisis de Componentes Principales), técnicas cualitativas (entrevistas, encuestas), tormenta de ideas y el filtraje de ideas. Los principales resultados obtenidos son el diagnóstico de los atributos claves del servicio SPA ya mencionado y la propuesta de mejoras para elevar la calidad del mismo.

GRASP CON BÚSQUEDA DE VECINDAD VARIABLE APLICADA AL PROBLEMA DE ASIGNACIÓN CUADRÁTICA PARA INSTANCIAS DE GRAN ESCALA

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En este trabajo se encuentran soluciones para el Problema de Asignación Cuadrática (Quadratic Assignment problem, QAP), este problema es clásico en optimización combinatoria y es clasificado como NP-completo, es decir no existe un algoritmo eficiente que lo pueda resolver exactamente en un tiempo razonable y que consiste en encontrar una asignación óptima que minimice el costo de transporte de materiales entre n instalaciones ubicadas en n localidades considerando la distancia entre las localidades y el flujo de materiales entre las instalaciones. Muchos problemas de optimización combinatoria pueden ser formulados mediante el modelo matemático del QAP, algunos de estos son: El problema del agente viajero (TSP, Traveling Salesman Problem), diseño de teclados de computadora, diseño de hospitales, diseño de circuitos integrados (VLSI very large scale integrateded), el problema de flujo en línea generalizado, asignación de radio frecuencias, asignación de espacio para archivos en disco, asignación de puertas a aviones en aeropuertos, diseño de centros comerciales con tráfico con modelos de líneas de espera $M/G/\infty$, entre otras. El propósito en este trabajo es la implementación de la combinación de dos metaheurístcas:GRASP (Greedy Randomized Adaptive Search Procedures) y la Búsqueda de Vecindad Variable (Variable Neighbourhood Search, VNS) son metaheurísticas diseñadas para resolver problemas de optimización combinatoria. GRASP es un procedimiento iterativo en donde cada paso consiste en una fase de construcción y una de mejora y la idea principal de VNS consiste en cambiar de estructura vecinal en una búsqueda local, la cual es utilizada como fase de mejoramiento en GRASP. La implementación de la metaheurística VNS al QAP consiste en generar una solución usando la primera etapa de GRASP para luego mediante una búsqueda local aplicarle tres estructuras vecinales distintas. En general se espera que en la primera estructura vecinal se encuentre un óptimo local y sobre este aplicar la siguiente estructura vecinal y así sucesivamente pasando por cada estructura definida. Finalmente se muestra la experiencia computacional para instancias consideradas de gran escala propuestas por J. Skorin-Kapov disponibles en Internet en la página de QAPLIB. **Palabras clave:** Metaheurística, NP-completo, Optimización Combinatoria, asignación cuadrática.

REGULARIZATION METHODS FOR SLICED INVERSE REGRESSION

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Sliced Inverse Regression (SIR) is an effective method for dimension reduction in high-dimensional regression problems. The original method, however, requires the inversion of the predictors covariance matrix. In case of colinearity between these predictors or small sample sizes compared to the dimension, the inversion is not possible and a regularization technique has to be used. Our approach is based on an interpretation of SIR axes as solutions of an inverse regression problem. A prior distribution is then introduced on the unknown parameters of the inverse regression problem in order to regularize their estimation. We show that some existing SIR regularizations can enter our framework, which permits a global understanding of these methods. Three new priors are proposed, leading to new regularizations

of the SIR method, and compared on simulated data. An application to the estimation of Mars surface physical properties from hyperspectral images is provided.

SCIENTIFIC COOPERATION IN LATIN AMERICA

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This lecture gives an overview about the scientific collaboration especially between several Cuban and German Universities or research institutes. It reflects the scientific impact of the academic contacts provided by different cooperation projects in the fields of mathematics, computer science and economics. It enlightens furthermore the active role of Humboldt University within the promotion and institutionalization of exchange of knowledge between existing Alumni-networks in Cuba, Colombia, Costa Rica, Guatemala, Mexico, Nicaragua and Venezuela with those in Africa, Asia and Europe.

ADJOINT BROYDEN A LA GMRES

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It is shown here that a compact storage implementation of a quasi-Newton method based on the adjoint Broyden update reduces in the affine case exactly to the well established GMRES procedure. Generally, storage and linear algebra effort per step are small multiples of $n?k$, where n is the number of variables and k the number of steps taken in the current cycle. In the affine case the storage is exactly $(n+k)?k$ and in the nonlinear case the same bound can be achieved if adjoints, i.e. transposed Jacobian-vector products are available. A transposed-free variant that relies exclusively on Jacobian-vector products (or possibly their approximation by divided differences) requires roughly twice the storage and turns out to be somewhat slower in our numerical experiments reported at the end.

UNCERTAINTY EVALUATION OF INPUT-OUTPUT MODELS USING INTERVAL ARITHMETIC

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Economic input-output (I-O) models are empirical realizations of general equilibrium economic model, which are based on the linear structure of inter-industry production linkages. The amount of the goods needed to satisfy a given demand can be found by solving a linear system, which relates sectorial outputs, the input-output technical coefficient matrix and the vector of final demands. In general, these variables are not known but must be estimated and therefore are subject to some level of uncertainty. Some sources of uncertainties in I-O models are due to source data, assumptions inherent in I-O analysis such as linearity or proportionality, allocation and aggregation. This paper shows the use of Interval Arithmetic as an alternative method to calculate how system outputs vary as input parameters vary, that is, calculate how uncertainties are propagated in I-O models. Interval arithmetic originates from the recognition that frequently there is uncertainty associated with the parameters used in a computation. This form of mathematics uses interval "numbers", which are actually an ordered pair of real numbers representing the lower and upper bound of the parameter range. By using this approach, for example, simultaneously variation on all input-output technical coefficients can be considered. It is also shown that it is possible to perform sensitivity and uncertainty analysis by using Interval Arithmetic, assigning bounds to some or all of the input parameters and observing the effect on the final interval outcome, that will contain all possible solutions due to the variations in input parameters. Strict bounds are obtained with only one

linear system evaluation. An example related to an economic input-output model is presented.
Keyword: Input-Output Models, Sensitivity, Uncertainty and Interval Arithmetic

A MODIFIED STANDARD EMBEDDING FOR USING IN NONLINEAR GLOBAL OPTIMIZATION

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We consider the following global optimization problem
$glob \min\{F(x)|x \in M\}$,
$M := \{x \in \mathbb{R}^n | h_i(x) = 0, i \in I, g_j(x) \leq 0, h \in J, \|x - x^0\|^2 - \alpha$ where
$F(x), h_i(x), g_j(x) \in C^3(\mathbb{R}^n, \mathbb{R}), i \in I, j \in J, I := \{1, \ldots, m\}, I := \{1, \ldots, s\}, x^0 \in \mathbb{R}^n, \alpha > 0$ sufficiently large. We use a 2-step algorithm. In the 1. step we calculate a stationary point $\bar{x}$ of $\min\{F(x)|x \in M\}$ and in the 2. step we have to calculate a feasible point of the following set $\{x \in M|F(x) - F(\bar{x}) + \epsilon \leq 0\}$. For the 2. step we use the modified standard embedding described in Guddat et al. (A modified standard embedding with jumps in nonlinear optimization. European Journal of Operation Research 169 (2006)) with an additional variable w.

PROBLEMA DE CUBRIMIENTO DE CONJUNTOS

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Este trabajo se dedica al estudio de la metaheurística de búsqueda tabú para la implementación de este método para dar solución al problema de cubrimiento de conjuntos. Se obtienen resultados, que aunque no son los mejores, se encuentran muy próximos al rango de lo aceptable. Se hace una comparación entre distintas fases y variantes de la implementación, así como con resultados publicados por otros autores para poder llegar a una conclusión en cuanto al comportamiento del algoritmo. Debido a que el método al que se arriba en este trabajo no es del todo eficiente se propone la continuación de esta investigación para poder obtener mejores resultados.

LARGE ECONOMIES AND TWO-PLAYER GAMES

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We characterize the competitive allocations of a continuum economy as the Nash equilibria of an associated game with only two players.
Keywords: Competitive equilibrium, Nash equilibrium, Aubin veto, core-Walras equivalence.

DISTINTOS CONTRASTES DE COINTEGRACION EN ECONOMETRIA. APLICACIONES

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NUMERICAL AND SIMULATION METHODS FOR THE APPROXIMATION OF THE PROBABILITY OF RUIN WITH HEAVY TAILED CLAIMS

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Brazil.

One of the main subjects in ruin theory is the computation of the probability of ruin of a risk process. In the case of the classical risk process, several exact formulas, bounds and approximations for this quantity have been found, when the claims follow a light tailed distribution. The case of heavy tailed claims is more difficult. Many approximate methods have been proposed in this case. We may distinguish among them approximation methods based on the numerical inversion of the Laplace transform and methods based on Monte Carlo simulations. In this work, we make a comparison between such methods. We implement the Gaver- Wynn-Rho algorithm for the Laplace transform inversion using variable precision computing and compare the results with those obtained from Monte Carlo simulation algorithms for the approximation of the probability of ruin that have been proposed recently in the literature.

SUPPLIER-CUSTOMER ENTROPIC-RELATED COMPLEXITY FOR CUSTOMISED PRODUCTS: BEFORE VS. AFTER CORE PROCESS REDESIGN

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Two case studies ("Before CPR" and "After CPR") were carried out at a UK-based chemical company in order to assess entropic-related complexity transfers between suppliers and customers. Entropic-related complexity is defined as the expected amount of information in order to describe the state of the system. This complexity is calculated using an information-theoretic point of view. The definition of states was kept the same as much as possible between the two case studies in order to allow comparison. The results show that complexity was better managed "After CPR" than "Before CPR". Firstly, the suppliers seem to be importing more complexity than "Before CPR". Secondly, the internal complexity has been effectively reduced, which was one of the main motivations for carrying the CPR process. Finally, the Chemical company seems to exporting a similar amount of complexity to customers, however the sources of that complexity are due to earliness in "After CPR" rather than lateness in "Before CPR".

AN APPLICATION OF DATA ENVELOPMENT ANALYSIS IN INDUSTRIAL EFFICIENCY ASSESSMENT

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Industrial efficiency of counties of the Republic of Croatia is studied in this paper. Using methodology of Data Envelopment Analysis (DEA), with counties of the Republic of Croatia as Decision Making Units (DMUs), relative industrial efficiency is evaluated by the Charnes-Cooper-Rhodes (CCR) model and the Banker-Charnes-Cooper (BCC) model. Number of employed workers and employed assets are considered as inputs and income is considered as output. Computational results are obtained using the available software and presented in the paper.

Keywords: Data envelopment analysis, industrial efficiency, counties.

MEAN FIELD LIMIT FOR INTERACTING PARTICLES WITH SINGULAR POTENTIALS

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We derive Vlasov equations from systems of interacting particles. More precisely, consider N interacting particles whose positions $X_i(t)$ and velocities $V_i(t)$ at time t satisfy after rescaling

$$\frac{d\,X_i}{dt} = V_i, \qquad \frac{d\,V_i}{dt} = \frac{1}{N}\sum_{j\neq i} K(X_i - X_j).$$

This situation covers many cases of physical interest, among them for example electostatic or gravitational interactions : $K = -\nabla\Phi$ with $\Phi = \frac{\alpha}{|x|^{n-2}}$ in dimension n. Formally when the number of particles converges to infinity, this system tends to the Vlasov equation for the particle distribution $f(t,x,v)$ in the phase space

$$\partial_t f + v\cdot\nabla_x f + K \star_x \rho\cdot\nabla_v f = 0, \quad \rho(t,x) = \int f(t,x,v)\,dv.$$

We are able to rigourously prove this limit provided $|K| \sim \frac{1}{|x|^k}$ with $k < n-1$.

MATHEMATICAL PROGRAMMING BASED SCHEDULING OF PARALLEL BATCH PROCESSING MACHINES UNDER MULTI RESOURCE CONSTRAINTS

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Motivated by scheduling challenges of burn-in ovens in back-end semiconductor manufacturing, this paper proposes two linear and integer programming based algorithms to schedule non-homogenous parallel batch machines with non-identical job sizes and incompatible job families. We demonstrate how efficient, effective and robust local scheduling algorithms can be developed to manage a complex supply chain manufacturing system by striving to maintain an appropriate dynamic WIP profile. We use short-term production targets to coordinate local decentralized schedulers to achieve supply chain objectives. The common scheduling of consecutive steps that are linked together through secondary scarce resources is addressed in this paper. This approach addresses the availability and compatibility of several resources required to make each process possible. We show how the established short-term targets can be used in these algorithms to sustain a desirable WIP profile. Efficiency, effectiveness and robustness of the algorithms are analyzed, managerial insights are provided, and recommendations and directions for future research are presented.

INDEPENDENCE TESTING OF VARIABLES WITH NOMINAL MEASURE - CUSTOMS COMPONENT IN CROATIAN BRAND

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The most common procedure of testing independence of variables with nominal measure in classical statistic sense is Chi-square. It is rather complex procedure and sometimes it does not lead to final conclusions, because of statistic-technical backsets. There are two typical situations when statistic-technical backset appears: a great number of variations of nominal variable/s that on artificial way increases degrees of freedom and a great number of expected counts less than 5. Both situations result with wrong, usually opposite conclusion about independence of variables with nominal measure. That

is reason why a much more precise procedure based on proportions testing is established in this paper. Namely, authors have perceived that in such kind of testing valid results can be realized using hypothesis testing about difference of two proportions. During quantitative researches in social science authors have recognized it as the most appropriate approach to survey research analysis. So, in this paper a survey research on customs component in Croatian brand is presented to verify those statements. Case study is very interested and useful in scientific sense by itself, not only as the practical example used to sustain mathematical-statistic analysis conclusions. This research was initiated in order to discover possibilities of including Zabiokovlje, as a part of Split-Dalmatian County, in Croatian brand in sense of sustainable development. A survey has been carried out in this area and more than 600 questionnaires have been analysed. Comparative research results analysis by proportions testing confirms the same conclusions as Chi-square of independence.

RESOLUCIÓN DE GRANDES SISTEMAS DE ECUACIONES CON MATRICES SPARSES

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CONJECTURAL VARIATIONS EQUILIBRIUM: APPLICATIONS TO MIXED DUOPOLY

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We study a mixed duopoly mode, in which a state-owned public (domestic) firm maximizing domestic social surplus, and a private (foreign) firm compete. Our aim is to establish existence and uniqueness results for the conjectural variations equilibrium in the described duopoly. In our previous works, a new gamma of conjectural variations equilibria (CVE) was introduced and investigated, in which the conjectural variations (represented via the influence coefficients of each agent) affected the structure of the Nash equilibrium. Various equilibrium existence and uniqueness results were obtained in the authors' previous works. In the proposed paper, we extend the previously obtained results to the case of mixed duopoly.

HUMAN MIGRATION MODEL APPLIED TO LAGUNA REGION IN MEXICO

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We extend a human migration model and apply it to study the growth of population in three agglomerated cities in the Laguna region in Mexico. Three different types of utility functions for various groups of population are proposed, and a conjectural variations equilibrium is investigated. Numerical experiments demonstrate the strong influence of conjectural coefficients upon the expected migration activity.
Keywords: human migration model, conjectural variations equilibrium.

NUMERICAL SOLUTION OF COMPLEMENTARITY PROBLEMS WITH PERTURBATION ALGORITHMS

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We present an algorithm solving implicit complementarity problems using a perturbation approach. After having established the existence of solutions to a perturbed implicit complementarity problem, we show

that these solutions converge to the solution of the original problem and examine the convergence rate. Finally, we describe a numerical procedure of prediction-correction type to solve the perturbed problem at each step. Convergence of this procedure is also demonstrated.
Keywords: implicit complementarity problem, pertubation algorithm.

AVERAGE CASE SOLUTION TO AN OPTIMZATION PROBLEM IN HUSIMI LATTICES

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After having defined the model and briefly presented the technic called Cavity Method, we solve the Edward-Anderson model (EA) in different Husimi lattices, as a toy model for discrete optimization. We show that the structure of the solution space depends on the parity of the loop sizes. Highly frustrated Husimi lattices with odd loop sizes have always a trivial paramagnetic solution stable under 1RSB perturbations while, in Husimi lattices with even loop sizes, this solution is absent. The simplest of all Husimi lattices (triangular), is solved in detail, including a rigorous proof of the zero complexity in highly frustrated systems. A general description of the solution is given for other lattices (square, pentagon). Finally, an indirect measure of the relevant loop sizes is obtained by comparing the model in Husimi lattices, to the model in an Erdos Renyi graph.

AN APPLICATION OF COXS PROPORTIONAL HAZARD MODEL TO PATIENTS WITH AIDS IN SPAIN

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In the last years there has been a rapid development of probability models and statistical analysis for technological and medical survival data. The proportional hazard model formulated by Cox (1972) has rapidly become one of the most widely used methods for the analysis of clinical data, turning into a very powerful tool that has served to generalize the use of the analysis of survival This model is particulary useful examining treatment comparisons based on the times to some event while adjusting for the effects of concomitant variables and easily adapts to the incomplete data which are frequent in medical research. We work with censored data on the right, for which we used the statistical package *S*-Plus. In this paper we applied the Coxs proportional hazard model in a study of 1366 women infected with AIDS in Andalusia (Spain) between the years 1982 and 2001 focusing on the following variables: age, time of diagnosis, province of residence and level of transmission. The main result has been an increase in the survival of women with the introduction of the "Antiretroviral Therapy Very Active" in 1996, women diagnosed in the period 1993-1995 have an irrigation die 2.3 times greater than that diagnosed after 1996. As for age, women 35 years and older have a risk of death 1.8 times higher than in women under 30. The province with the largest survival is Grenada. We have not found any differences in the category of transmission.

NEW METHODOLOGIES IN STATISTICS: A DIFFERENT WAY OF STUDYING SPSS

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A new way of learning statistics with computers is presented. For this purpose an interactive guide, comprising a web site and a SPSS statistics package emulator program, has been developed. These have

been prepared for the Biostatistics subject of the 1^{st} year of the Universidad de Granada BA in Biology, though they might be used by anyone who needs to get started in data managing with SPSS.

The web site includes different cases (based on exercises with SPSS) with a theoretical and practical introduction about it and an exercise solved with a SPSS program emulator. Finally an exercise, to be solved by the student with the SPSS program itself, is proposed.

The program emulator aims a student's approach to the SPSS program, guiding him in the interactive execution of a specific exercise. The emulator has enabled only the needed options in order to properly perform the guided practice, and monitors the user's actions, always informing him with warning pop-up windows in case of wrong actions in particular or even with some hints to help the student to find out what his mistake was and to correct it.

In this project we present the Interactive SPSS Self-learning Guide version 1.3 which comprises five different practices: the first one is an introduction to the program and Data Editor; the second one is about Descriptive Statistics; the third one is about Regression Analysis; the fourth, about Probability Calculation; and the fifth one focuses on Confidence Intervals. This guide is available in the Universidad de Granada web server through this link http://www.ugr.es/local/bioestad, where this guide can be browsed online or if you prefer it can be downloaded to view it locally.

STATISTICS BY MEANS OF ICT, E-FOLDERS AND REAL DATA

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The incorporation, in general terms, of Statistics to the curriculum in primary and secondary education in mathematics as well as to the various university curriculums, encourages teachers to activate the learning of this area. Nowadays, teaching methodology is focused on the strengthening of abilities, knowledge and values to learn. During the last few years, the authors of this work have tried to make further advance, developing with our students the steps of a "learning to learn" method. In order to achieve this, we have used technological advances (ICT, information and communication technologies) as a valuable resource and complement to the teaching of diverse subjects in any educational stage. To get to reach our goal, we have used the e-folder as a very important supporting tool for making easier the diary work of our pupils. In the other hand, the incorporation of the ECTS credit system gives us the possibility of using a methodology based on the handling of real data.

STATISTICS USING A MESSAGE IN CODE AND SOME LITERARY TEXTS

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The goal of our paper is to motivate the student to study Statistics. Our experience has shown that it is necessary the student wants to learn, to get the statistic concepts can be assimilated. With this purpose we consider that it is necessary our students develop a positive attitude with respect to the subject. This attitude will make easy the learning process, the students will be able to argue the statistical concepts and to acquire the capability to reason facing up to different real situations. In this paper we propose a different method to teach Statistics. We propose to use messages in code and literary texts to show the students that statistical concepts are in everywhere. The student will know a different point of view and will look for Statistics. In this way we get a more easy assimilation of different statistical aspects and methods and we get to improve learning process. We hope that the students can be able by themselves to elaborate the concepts and to acquire the necessary knowledge.

TIMBER HARVEST SCHEDULING IN CUBA USING A MULTIOBJECTIVE APPROACH

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In this paper we propose a Multi-Objective Programming (MOP) model to solve a timber harvest scheduling problem in Cuba. The formulation of a timber harvest plan involves important economic and sustainability criteria, amongst others. In addition, spatial considerations are also studied and included in the model through the use of integer variables, resulting in a complex mixed-integer MOP problem. The model, as formulated, is un-treatable with a standard solver. Therefore, a multi-objective meta-heuristic has been implemented to solve it. We report results and methodological development

ANALYZING MULTI-SOURCE MEDICAL DATA BY NEURAL NETWORKS

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Summary The localization of intercerebral dipole sources in order to detect pathological events is one purpose of magnetoencephalography (MEG). Another concept is the analysis of brain processes and brain structures. A system of two different types of Artificial Neural networks is presented. The structure of a feedworward Neural Network with two layers and a learning rule designed for the task of Blind Signal Separation (BSS) is used to separate temporally overlapping neuron activities in the brain. Based on the separated signals, the task of a second type of Neural network is to determine the position and strength of the different underlying magnetic dipoles. Several Concepts of Neural networks, their limits and potentials concerning both tasks of mining medical data are discussed briefly.

SOLVING THE PRODUCTION-TRANSPORTATION PROBLEM IN THE PETROLEUM INDUSTRY

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In this paper we formulate two new models of the production-transportation problem which can be described as follows. Let us suppose that there are several plants at different locations producing certain number of products and large number of customers of their products. Each plant can operate in several modes characterized by different quantities of products and variable production costs. The customers' demand for each product during the considered time period is known. We consider the problem of finding the production program for each plant as well as the transportation of products to customers for which the sum of the production and transportation costs is minimized given the condition that each customer can satisfy its demand for a given type of product from one plant only. We also formulate the problem as a bilevel mixed-integer programming problem. We solve the models for the available data from a petroleum industry and compare the results.

COMPARISON OF OPTIMAL PROTFOLIOS SELECTED BY MULTICITERIAL MOEL USINF ABSOLUTE AND RELATIVE CRITERIA VALUES

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In this paper we select an optimal portfolio on the Croatian capital market by using the multicriterial programming. In accordance with the modern portfolio theory maximisation of returns at minimal risk

should be the investment goal of any successful investor. However, contrary to the expectations of the modern portfolio theory, the tests carried out on a number of financial markets reveal the existence of other indicators important in portfolio selection. Considering the importance of variables other than return and risk, selection of the optimal portfolio becomes a multicriterial problem which should be solved by using the appropriate techniques. In order to select an optimal portfolio, absolute values of criteria, like return, risk, price to earning value ratio (P/E), price to book value ratio (P/B) and price to sale value ratio (P/S) are included in our multicriterial model. However the problem might occur as the mean values of some criteria are significantly different for different sectors and because financial managers emphasize that comparison of the same criteria for different sectors could lead us on wrong conclusion. In the second part of the paper, relative values of previously stated criteria (in relation to mean value of sector) are included in model for selecting optimal portfolio. Furthermore, the paper shows that if relative values of criteria are included in multicriterial model for selecting optimal portfolio, return in subsequent period is considerably higher than if absolute values of the same criteria were used.

ON THE OPTION DELTA IN DISCRETE TIME

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In the case of discrete trading the sensitivity of the Black-Scholes delta with respect to time has been rarely considered. The objective of the paper is to analyze the time dependence of the delta in the discrete time case. An example of the European call option is given. In the case where the delta is more sensitive with respect to time a simple explicit formula for a discrete time adjusted Black-Scholes delta is provided. The order of the hedging error can be preserved while the local maximum and the mean absolute value of the hedging error can be reduced

EDUCATION STATISTICS OF THE AUTONOMOUS CITY OF MELILLA

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In this work we try to explain the main results obtained in a statistical study at the request of made the Council of Economy, Employment and Tourism of Autonomous City of Melilla, which have been used for the elaboration of the Strategic Plan in its first phase: Diagnosis and Analysis Situation of Melilla. Once analyzed the data of the Scholastic Council of the State, the Ministry of Education and Science and of the National Institute of Statistic of Spain we obtained conclusions that we detail in this communication. To compare the results collected, we also made an exhaustive situation analysis of the real situation of the population in the area of Education, including a comparative study with the Autonomous City of Ceuta. Both cities show similar characteristics, in general, being strategic Spanish enclaves in the north of Africa. Key words and phrases: Education, Strategic Planning.

MODELACIÓN DEL CRECIMIENTO EN EL SERVICIO DE TELEVISIÓN POR CABLE

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Se quiere modelar el crecimiento del mercado para el servicio de televisión por cable en ciertas zonas residenciales del Gran Área Metropolitana de Costa Rica. Para ello, se dispone de información suministrada por la empresa acerca de sus clientes según distritos o nodos, además de información nacional disponible e información obtenida de la competencia. Con base en estos datos, se hace en primer lugar un estudio descriptivo y exploratorio, y con base en un análisis en componentes principales se reduce el conjunto de

variables explicativas. Luego se probaron diversos modelos de regresión con distintas variables a explicar, como la penetración en un distrito (o transformaciones de ella) y las ventas. Se aplicaron métodos paso a paso, para llegar a un modelo de regresión lineal satisfactorio. Por otro lado, se realizó una clasificación de los distritos y el modelo obtenido permite caracterizarlos para estudiar el posible crecimiento del mercado en cada uno.

PROPAGATION AND CREATION OF L^1 AND L^∞ ESTIMATES FOR THE BOLTZMANN EQUATION FOR VARIABLE HARD POTENTIALS

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We prove the propagation of L^1 and $L\infty$ Maxwellian weighted global bounds for solutions, and to any of its derivative, of the space homogeneous elastic Boltzmann equation in n-dimensions, for realistic intra-molecular potentials leading to collisional kernels of variable hard potentials type with for unbounded, integrable angular cross sections (Grad's forms).
One of the interesting new development is the sharp Povzner estimates and summability of moments to variable hard potentials and unbounded, integrable cross section, which carries on to all derivatives. A fundamental implications of this work leads also to the creation of moments and summability properties (that give exponentially weighted bounds) for unbounded, integrable cross sections.

APLICACIÓN DE LA MODELACIÓN MATEMÁTICA EN EL FUNCIONAMIENTO HIDROGEOLÓGICO DE LAS AGUAS SUBTERRÁNEAS

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Los modelos matemáticos son ampliamente usados en las diferentes ramas del saber, como herramientas para las investigaciones, pronósticos o predicciones de las variables que lo componen. La aplicación de la tecnología de la modelación matemática de acuíferos contribuye a mejorar el conocimiento de las disponibilidades de estos recursos y a desarrollar políticas racionales de administración que garanticen su desarrollo sustentable. En el presente trabajo se hace un exhaustivo análisis del desarrollo matemático que soporta al flujo de las aguas subterráneas en acuíferos confinados y no confinados. Se aplica además, la tecnología de la modelación para simular el funcionamiento hidrogeológico de la región acuífera del Noreste de Villa Clara, utilizando el software "AQÜIMPE", desarrollado por el Centro de Investigaciones Hidráulicas del ISPJAE, el cual emplea el MEF como técnica numérica y constituye un paquete modular integrado de programas, que permite la simulación matemática del flujo lineal libre o confinado en medio poroso, en dos dimensiones del espacio y con impermanencia gradual. La base de datos que se maneja en la aplicación del software, está soportada en tecnología "SIG" con el uso del ArcView como software de interfase.

A MULTICRITERIA APPROACH FOR MEASURING AIRPORT VISITORS' PERCEPTION

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Airports are the gateways to the nations' aviation system, providing access to air transportation for the surrounding community. Cities, towns and regions with good airport facilities profit from tourism. Our case is an international airport of the island of Crete, where tourism plays an important economic role.

The purpose of this study is to examine visitors' perceptions of infrastructure and services of the airport in terms of importance and satisfaction. This is a multivariate evaluation problem given that passenger's global satisfaction depends on a set of variables. The implementation of MUlticriteria Satisfaction Analysis (MUSA) method in satisfaction evaluation problems refers mostly to customers or employees of business organizations. Furthermore, satisfaction evaluation problems may refer to any human activity or social field. In our case data were collected through a research performed on a representative sample of 500 passengers during May and June 2006. The multicriteria methodology used for the analysis of the data, estimates the satisfaction of a number of people based on their system of values and preferences and develops unique satisfaction functions. The results focus on the detection of the critical points to which the Airport Authority must pay attention, the attitude of the passengers is analyzed in depth and the strategy of the Authority is specified. Furthermore, the results analyze the criteria which determine the satisfaction of the passengers and provide a complete set of conclusions and suggestions. Closer analysis of the passengers' country of origin, however, shows that there are some differences in the criteria seen as important as well as in levels of satisfaction.
Keywords: multicriteria decision analysis, customer satisfaction analysis, airport infrastructure and services.

TRACE THEOREM ON INFINITE TREE AND APPLICATION TO THE HUMAN LUNG

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This lecture is devoted to the mathematical description of the human lung, seen as an infinite dyadic resistive tree: to model the airflow, we assume that the pressure field satisfies Poiseuille's law and that the flux satisfies Kirchoff's law. We obtain that the pressure field is solution of a non homogenous Dirichlet equation over the tree. We then focus our attention on the three following points. First, we give a necessary and sufficient condition on the resistances of the tree to have a well-posed non-homogenous Dirichlet problem. This condition is related to the fact that the total resistance of the tree is finite and allows us to deal with pressure fields with finite energy. Secondly, the question is to define and describe a trace space where the functions are defined on the space of ends of the tree, allowing us in particular to have uniqueness of the Dirichlet problem. Thirdly, we embed under some conditions this trace space in an usual functional space with Sobolev regularity depending on the resistances of the tree and where the functions are defined on a domain of 3 which models the parenchyma. All this study allows us to define pressure fields in the parenchyma and to quantify the regularity of those pressure fields with respect to the resistances of the tree.

APPLYING FUZZY TECHNIQUES TO CORRUPT-COLLUSION ANALYSIS

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The paper studies the application of fuzzy methods to analyzing corrupt-collusive behavior. It develops a fuzzy coalitional-game that models incentives and deterring factors under a principal-agent framework. The principal is the public interest and the agent is a medium rank officer who may shirk, colluded with a private agent, for achieving mutual benefits. The Fuzzy Core and the Fuzzy Shapley Value are used as solution concepts. The fuzzy modeling constitutes a suitable approach to the problem since it handles efficiently the combination of uncertainties and institutional factors that characterize the "opportunity spaces" for corruption.

HEURÍSTICAS PARA EL JOB SHOP SCHEDULING

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Este trabajo exponemos una descripción detallada del Job Shop Scheduling Problem. (JSSP). Proponemos e implementamos una nueva heurística (HBM) para la solución del JSSP con tiempo de completamiento de las operaciones del problema (Makespan) como objetivo. Se presenta el uso de la simulación para la implementación de las heurísticas Largest Processing Times (LPT) ,Shortest Processing Times (SPT) , Short Queue Next Operations (SQNO) tomando también el tiempo de completamiento como objetivo como objetivo,. Se establecen comparaciones entre la implementación HBM y LPT , SQNO SPT que estan implemantadas en el Lekin Scheduling Systems.

ANT COLONY OPTIMIZATION FOR $\mathbb{R}^N$ FUNCTIONS

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Ant Colony Optimization was introduced in 1992. It's a meta-heuristic algorithm designed to solve combinatorial problems in graphs. It's based on the concept of pheromone as a memory of good solutions, and a probabilistic selection of the solution at each step. They have been successful at solving the traveling salesman problem and when the graph may change dynamically they have proven to be very effective. This work is about adapting the problem of minimizing a function of real variables in order to solve it using the original ACO algorithm. Discretization of the problem is done using standards worldwide accepted. Box-Constrains will be easily included within the algorithm and several extensions can be considered for later work. Mixed problems with continuous and discrete variables could be solved using this approach.

UN TEOREMA DE REPRESENTACIÓN PARA EL ÁLGEBRA DE LAS FUNCIONES DE p-VARIACIÓN ACOTADA

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En este trabajo se estudia el espacio de las funciones complejas de variable real de p-variación acotada $(Vp, (p > 1))$ desde el punto de vista de la Teoría de Gelfand sobre las álgebras de Funciones. Con el interés de responder a la pregunta sobre la representación del espacio dual a Vp se demuestra que este es un álgebra de Banach conmutativa unitaria y semisimple, se estudia su espacio de ideales maximales y se obtiene un teorema de representación de tipo teórico.

NONPARAMETRIC ESTIMATION OF COVARIANCE FUNCTIONS: AN APPROACH BASED ON COVARIANCE FUNCTION EXPANSIONS AND REGRESSION METHODS FOR SECOND ORDER MOMENTS UNDER QUADRATIC LOSS

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In this work we propose a nonparametric method for the estimation of covariance functions of nonstationary process based on covariance function expansions and regression methods for second order moments under quadratic loss. We show some non-asymptotics results that are obtained using model selection theory.

Let T be some subset of $\mathbb{R}^d$, $d \in \mathbb{N}$ and let $X = (X(t))_{t \in T}$ be a stochastic process with values in $\mathbb{R}$. We will be mainly interested in the case in which X is a random field on some region $T \in \mathbb{R}^2$. It is assumed that X has zero mean $E(X(t)) = 0$ for all $t \in T$, and finite covariance $\sigma(s,t) = cov(X(s), X(t))$ for all $s, t \in T$. Suppose that we observe $X_i(t_j)$ for $i = 1, \ldots, N$, $j = 1, \ldots, n$, where the points $t_i, \ldots, t_n \in T$ are fixed (spatial design points), and $X_1, \ldots, X_N$ are independent copies of the process X. The focus of the present work is the problem of estimating the covariance function σ on the basis of these data. Neither stationarity nor a parametric model is assumed for σ.

The approach that we will develop to estimate the covariance function σ has several advantages: i) The estimation procedure is a least squares linear problem and therefore its computation is quite simple. ii) Methods and results from the theory of linear regression models can be applied to the present context. iii) The estimate that we obtain is a definite non negative matrix. iv) Only assumptions about moments, not specific distributions of the data, are involved in the estimation procedure. v) Suitable regularization terms or constraints may be incorporated to impose desired properties for the resulting estimator, such as smoothness or sparseness.

Let $\{G_m : m \in M_{N,n}\}$ be a finite family of design matrices G_m and let Σ_m, $m \in M_{N,n}$ be the corresponding least squares covariance estimators of $\Sigma = (\sigma(t_j, t_k))$. The problem of interest is to select the best of these estimators in the sense of the the quadratic risk $E(\|\Sigma_m - \Sigma|)^2$. The main result of this work provides a non-asymptotic bound for the risk of a penalized strategy for this problem, which is obtained using concentration inequalities and others tools from model selection theory.

QUASI-EQUILIBRIUM INCLUSION PROBLEM OF BLUM-OETTLI TYPE AND RELATED PROBLEMS

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The quasi-equilibrium inclusion problems of Blum-Oettli type are formulated and sufficient conditions on the existence of the solutions are shown. As special cases, we obtain several results on the existence of solutions of general vector ideal(resp. proper, Pareto, weak) quasi-optimization problems of quasi-variational inequalities and of quasi0variational inclusion problems.

NEW TENDENCIES IN THE TEACHING AND THE LEARNING IN STATISTIC

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If they are used suitably, the technologies of information and communication (TIC), can contribute substantially to improve the quality of the education and the formation, and to adapt them to the requirements of a society based on the knowledge. In this work we try to explain the methodology used in the teaching of Statistic under a virtual environment. Therefore, the objective is to share the experience about the changes in the way of teaching that we are having in a present future and the changes about learning into new technological platforms of information, since in those learning atmospheres, enriched by means of the use of the TIC, are that can really transform the quality of the education. With this structure and organization of subject are described the results that are expected to be obtained and that have also been obtained during the current course are showed.

HYPOCOERCIVITY FOR KINETIC MODELS WITH A CONFINING POTENTIAL

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Hypocoercivity for kinetic models has become an active research field in the late years. In this work we present some results on hypocoercivity estimates for collisional kinetic models of charged particles, that is mathematically for pdes in the phase space with an integral (or integro-differential) collision term which is partially coercive (relaxing towards a local thermodynamical equilibrium in the velocity space) and a transport term along curves prescribed by a given vector field.

EXISTENCE AND A PRIORI ESTIMATE FOR ELLIPTIC PROBLEMS WITH SUBQUADRATIC GRADIENT DEPENDENT TERMS

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In this lecture I will consider the nonlinear elliptic model problem

$$u \in H_0^1(\Omega), \quad -divA(x)Du + \alpha_0 u = \gamma|Du|^q + f(x), \ \text{ in } D'(\Omega)$$

with A a coercive matrix with bounded coefficients, $\alpha_0 \geq 0$, $0 \leq q \leq 2$ and $f \in L^m(\Omega)$ for some suitable m. This is a model problem, and there are many possible variants of it. In the case where $0 \leq q < 1$, existence is classical for $f \in H^{-1}(\Omega)$. When γ is large, the case where $q = 1$ and $f \in H^{-1}(\Omega)$ is difficult but has been solved by G. Bottaro and M.E. Marina in 1973. On the other hand, the case $q = 2$ has been treated by many authors, including in particular in a series of papers by L. Boccardo, J.-P. Puel and myself. In a more recent paper, V. Ferone and myself proved the existence of a solution u which further satisfies $e^{\gamma u} - 1 \in H_0^{-1}(\Omega)$, and an a priori estimate for such solutions, when $f \in L^{N/2}(\Omega)$. In this lecture I will mainly report about recent joint work with Nathalie Grenon and Alessio Porretta, the announcement of which has been published in C. R. Acad. Sci. Paris, Série I, 342, (2006), pp. 23-28. When $1+\frac{N}{2} \leq q < 2$ and $f \in L^m(\Omega)$ with $m = N(q-1)/q$ (we also solved the case where $1 \leq q < 1+2/N$, but I will not discuss it since it uses the notion of renormalized solution), and when either $\alpha_0 > 0$ or f is sufficiently small in $L^m(\Omega)$, we prove the existence of a solution u which enjoys the further regularity $|u|^\sigma \in H_0^1(\Omega)$ with $\sigma = (N-2)(q-1)/2(2-q)$, as well as an a priori estimate for any solution which enjoys this further regularity. One of the main interests of our result lies in the priori estimate, the proof of which is non standard.

REPRESENTACIÓN DE OBJETOS Y SUS CONGLOMERADOS

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La representación de objetos en un espacio de dimensión baja ha sido muy estudiado por las técnicas de MDS, así como las técnicas de clasificación han analizado las relaciones entre los objetos, sin embargo, estas tcnicas adolecen de óptimos locales. En este trabajo se presenta un novedoso modelo que logra representar simultáneamente, tanto los objetos como sus respectivas clases en un mismo espacio de dimensión baja, utilizando el sobrecalentamiento simulado para lograr la optimización global.
Keywords: Multidimensional Scaling, Optimización, Simulated Annealing, Clasificación.

PROCEDURE FOR THE MANAGEMENT OF INVENTORIES IN COMMERCIAL AND SERVICE COMPANIES, BY USING MODELS OF OPTIMIZATION

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Any kind of company -big, medium, or small- needs the provisioning process and with it, the existence of inventories. The logistical focus in the management of the inventories should consider the influential factors in the inventory politics's design, in such a way that the actions and strategies allow the efficient negotiation of the system. This research was guided to the study and improvement of the management of inventories with independent demand in commercial companies and in service companies by using optimization models. The author designed a procedure that was guided to combine quantitative and qualitative method which allowed the establishment of politics of inventory that were economically advantageous for the organization. The procedure is named GISERCOM and it has been applied in more than 60 commercial and service companies; nevertheless the author considers that its methodological bases, can be generalized to companies of other sectors by adapting it to its particular characteristics. The economic results reached in the studied companies demonstrated the validity of the proposed procedure, because it diminished the mount of inventory, the Circulating Asset decreased, and therefore, it was reached a rise of the Economic Profitability of the companies, as well as in the Rotation of Inventory for this concept. All of the previous results are vital for obtaining the required efficiency levels that the Cuban companies should necessarily reach nowadays.

RETAILER COORDINATION UNDER BACKORDERED AND LOST SALES

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We consider coordination among stocking locations through replenishment strategies that explicitly take into account lateral transshipments, i.e., transfer of a product among locations at the same echelon level. The basic contribution of our research is the incorporation of supply capacity into the traditional emergency transshipment model. We formulate the capacitated production case as a network flow problem embedded in a stochastic optimization problem. Moreover, our model extends the existing literature by considering backordered and lost demand, simultaneously. We develop a solution procedure based on infinitesimal perturbation analysis (IPA) to solve the stochastic optimization problem numerically. We analyze the impact on system behavior and on stocking locations' performance when the supplier may fail to fulfill all the replenishment orders. We assume that certain amount of the unmet demand is satisfied in the coming periods while rest of the unmet demand is lost.

GENETIC REGULATORY NETWORKS: A PDE APPROACH

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Genetic regulatory networks are responsible, in combination with other control factors, of the major decisions in developmental biology. We present a general framework that allows us to use experimental information to construct models that are predictive both quantitatively and qualitatively. In particular we consider two examples: First, the subnetwork that is responsible for the cell fate determination prior to the flowering process in Arabidopsis thaliana and Second, the homologous networks in root and leaves of the same plant leading to hair formation. In both cases, PDE's equations appear as part of the mathematical modeling of these processes.

APLICACION DEL ALGORITMO DE ALIZADEH EN LA SOLUCIÓN DE PROBLEMAS DE PROGRAMACION CUADRATICA CONVEXA DISCRETA

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Se transforma un problema de Programación Cuadrática Convexa en un Problema de Programación Cónica de Segundo Orden basándose en las propiedades de las matrices simétricas Semi-Definidas Positivas. A este nuevo problema se le aplica el Algoritmo de Alizadeh en la solución del problema Cuadrático Convexo Discreto usando la técnica de Branch and Bound. Se implementa un algoritmo y se realizan experimentos numéricos para verificar su efectividad.

CLASSICAL AND LOGARITHMIC-QUADRATIC PROXIMAL METHODS FOR QUASICONVEX FUNCTIONS

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This paper extends the full convergence of the classical and Logarithmic-Quadratic proximal point methods to solve continuous minimization problems with quasiconvex objective functions defined in euclidean spaces and the nonnegative orthant. Under the assumption that the global minimizer set is nonempty we prove the full convergence of the sequence generated by the classical proximal method to a generalized critical point of the problem and convergence to a KKT point for the Logarithmic-Quadratic method when the objective function is continuously differentiable. **Keywords:** Proximal point method, Quasiconvex functions, Limiting subdifferential, Frèchet Subdifferential.

STATISTICAL LINEARIZATION AND IDENTIFICATION OF NONLINEAR SYSTEMS

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Increase of requirements to efficiency of control systems entails increase of requirements to accuracy and adequacy of models of operated objects. As real objects are usually characterized by nonlinear, complex structure, and also incompleteness of the mathematical description and the information as about the object itself and signals and the noises acting on it, there are two approaches to the decision of a problem of identification. The first approach is connected with approximation of object by a set of elementary parts of known structure, and construction of model is reduced to an estimation of characteristics of these parts according to normal operation data. The essence of the second approach consists in desire to weaken dependence of result of the decision of a problem of identification from the restrictions imposed by aprioristic assumptions, and creation more general unified approach to the decision of a problem of identification. Examples of such approach are development of methods of statistical linearization, a method of functional transformations and dispersive methods of identification.
In work the method of identification based on a method of functional transformations and ideas statistical linearization is offered. The offered method represents nonlinear analogue of a method of statistical linearization.
Are considered, basically, two criteria of approximation of stochastic functions. The first criterion consists in performance of a condition of equality of mathematical expectations and the dispersions generalized or the maximal correlation moments accordingly of output random signals of object and model. The second criterion consists in minimization of a mathematical expectation of a square of a difference of a true

output signal of object and an output signal of model. For each of the considered criteria the equations of identification and a condition of existence of models in a class of semilinear systems are received. Special case of the offered method are traditional methods statistical linearization and methods of dispersive identification. Examples of the decision of a problem of identification in a class of the systems described by equations of Hammerstein are resulted.

PROBLEMS OF MODELLING OF STOCHASTIC SYSTEMS AND CONSISTENT METHODS OF IDENTIFICATION

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At construction of models of stochastic systems the essential role is played with a choice of measures of dependence between random variables and processes. The most widespread are correlation and dispersive measures. It is known, that for nonlinear stochastic systems, and also for systems on which inputs signals with nonlinear structure operate, use of correlation and dispersive functions often leads to undesirable results. It speaks that the specified functions are not exhaustive characteristics of dependence between casual processes. In work some problems and the paradoxes arising at the analysis of statistical dependences and identification of nonlinear systems by traditional correlation methods which essentially influence results of modelling are considered. So at construction of mathematical models on experimental data the method of the least squares (LSM) and Wiener-Hopf method are widely used. Thus it is supposed, that the structure of system is known. In a real situation the structure of model is usually unknown. In work it is shown, that ignoring of this fact leads to mistakes at application even such universal methods as ??? and Wiener-Hopf method. For the decision of arising problems it is offered to use the mathematical device of the generalized correlation functions which are consistent measures of dependence (A.N.Kolmogorov). On the basis of these functions the consistent method of identification which allows to define presence of the stochastic or determined communication is constructed; quantitatively to estimate this dependence; to solve the problem on existence of model and to receive the mathematical description of model of system in the parametrical or nonparametric form. It is proved, that at presence of stochastic dependence between input and output signals of system the decision of a problem of identification exists in a class of semilinear (block) models. Consistent analogues of the equation of Wiener-Sonja and LSM for nonlinear stochastic systems are constructed.

TOWARDS TRAFFIC LIGHTS CONTROL THROUGH AN HYBRID METHOD OF SOLUTION

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In this paper we study the optimal traffic light control problem for an intersection of two two-way streets. We want to compute the traffic light switching scheme that minimizes a given criterion, such as average queue length over all queues, worst case queue length, average waiting time, ... We interpret the constraints of our problem as an Extended Linear Complementarity Problem (ELCP); in order to determinate the optimal switching time sequence we could minimize the objective function over the solution set of the ELCP, this is an NP-hard problem, and the algorithm to compute it requires exponential execution times, this implies that the ELCP approach is not feasible if the number of switching cycles is large. This justifies the application of an heuristic algorithm of solution. In addition, we expose a model with complementarity constraints and we propose an hybrid method of solution. This method will consist of an heuristic to fix the values of *, plus an efficient algorithm to solve the problem LCP(*). This approach is single, adaptable to variations in the data, quick for execution and heuristics offer the option to explore the solutions' region, going away from local extremes.
Keywords: Optimization, Traffic, Traffic Light control, Switching time sequence, heuristic.

INDICADORES SINTÉTICOS PARA DESTINOS DE TURISMO RURAL: EL CASO ANDALUZ

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El turismo es uno de los sectores más dinámicos de la economía a nivel mundial, por lo que se pretende que su desarrollo en el contexto actual sea económicamente viable, socialmente compatible y que ocasione el menor daño posible de los recursos de la zona donde tiene lugar. Esto no es más que garantizar que esta actividad sea sostenible. Para ello, el desarrollo de un sistema de indicadores que permitan gestionar la sostenibilidad sobresale como una de las principales opciones a tener en cuenta. En el presente trabajo se muestra un sistema de indicadores para la evaluación de la sostenibilidad en las zonas de turismo rural, en concreto, aplicado a los destinos de Andalucía. A partir de este sistema se construyen indicadores sintéticos que permiten medir el fenómeno de la sostenibilidad turística y facilitan la interpretación de la información por parte de los grupos implicados en la toma de decisiones. Estos indicadores se caracterizan por ser de fácil comprensión, pues reducen el número inicial de indicadores con la menor pérdida de información, además, pueden emplearse para establecer comparaciones entre las diferentes zonas y permitir la evaluación de su comportamiento a lo largo del tiempo. La construcción de los indicadores sintéticos se lleva a cabo mediante técnicas de agregación alternativas, tales como el Análisis de Componentes Principales (ACP) y el indicador sintético de distancia DP_2.

NUEVO MÉTODO DE TRABAJO CON LOS REGRESORES EN LAS SERIES CRONOLOGICAS DE LLUVIA

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El presente trabajo estudia el comportamiento de las series cronológicas de precipitaciones de la Cuenca Hidrológica Sagua la Chica, a partir de una base de datos con que cuenta la empresa de Investigaciones de Proyectos Hidráulicos para la realización de los gráficos de despacho, Se logran modelos matemáticos del tipo ARIMA y se realizan pronósticos a corto plazo en base a los mismos. Un aporte importante desde el punto de vista práctico es el nuevo trabajo con los regresores dado que se ha cambiado la teoría de introducirlos en las series, debido a que años anteriores la forma de trabajo expuestas en otras tesis no era la correcta debido a que el SPSS propone un método de trabajo que no es al adecuado influyendo esto en un mal resultado de los pronósticos. En este trabajo se muestran la tabla del error que presenta el SPSS cuando pronostica una serie y se compara con el nuevo método de trabajo reflejando este la mayor precisión del pronóstico a la serie original. Los resultados fundamentalmente son dados en tablas resúmenes y gráficos. La metodología usada es la de Box-Jenkins para series y el software utilizado es el SPSS.13.

APLICACIÓN DE LOS SISTEMAS DE SIMULACIÓN AL PROCESO DE ABASTECIMIENTO DE COMBUSTIBLE A LOS AVIONES DE PEQUEÑO Y GRAN TAMAÑO EN LA EMPRESA SONANGOL DISTRIBUIDORA- AEROINSTALACIÓN DE LUANDA

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Para desarrollar esta investigación se usan técnicas de simulación aplicadas a los modelos de servicios analizando el proceso de abastecimiento de combustible a los aviones de pequeño y gran tamaño en la empresa Sonangol Distribuidora de Luanda - Aeroinstalación de Luanda (SDL-AL), que es una de las empresas encargadas de abastecer el combustible a un gran número de compañías de aviones. La

utilización de los modelos de simulación permitió detectar dificultades existentes en la prestación del servicio, siendo la más señalada, el tiempo de permanencia de los clientes en el sistema, y la ociosidad de algunos servidores por períodos largos de tiempo. A partir de estos resultados, se proponen algunas alternativas de soluciones, que permiten aumentar la calidad en el servicio.

TRADERS-INVESTORS DECISION STRATEGY BY ROLLING ESTIMATES

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The point of this paper is to make traders-investors decision strategies based on technical analysis. Technicians, sometimes called chartists, study supply and demand in a market in an attempt to determine what direction, or trend, will continue in the future. Technical analysis is a method of evaluating stocks by analyzing the statistics of the past prices movements and volume. Therefore, it uses charts and other tools such as indicators and oscillators to identify patterns that can suggest future movements. In technical analysis it has been shown that after a trend of price movements has been established, the future price movement is more likely to be in the same direction. Most technical trading strategies are based on this assumption. Different time ranges of investing and getting return in financial theory and practice are suggested by John Bollinger. Bollinger Bands are plotted at standard deviation levels above and below a moving average (EWMA). In this paper the rolling standard deviation of relevant prices is a measure of volatility. Using exponential smoothing methodology difference between short-term and long-term investment strategy is defined according to bull and bear signals. All theoretical statements are confirmed by estimation and prognostic movements of one of the most frequent component of CROBEX index on Zagreb Stock Exchange. According to the final technical analysis results, precise suggestions to buy or to sell on the Stock market are presented from the point of view of short-term and long-term strategy

CIRCULAR CHAINS OF CHINESE DICE

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In this paper we study the *Chinese dice*, mathematical objects similar to the ordinary dice but allowing repetition in its face values. We say that a die A is *preferred over* a die B (written $A \succ B$) if A wins more frequently than B do. We study first the existence of a circular chain of three dice A, B, C such that $A \succ B \succ C \succ A$, using a mixed integer programming algorithm. Then we generalize the problem to n-dimensional dice—that is, dice of n faces (with $n \geq 4$)—and we search circular chains of length m (with $m \geq 3$) by using a simulated annealing algorithm. We compare some different objective functions and also obtain good solutions to the problem with very efficient algorithms. Finally we obtain a theoretical result concerning the existence of general circular chains.

PLANNING MODERN INTENSIVE LIVESTOCK PRODUCTION: THE CASE OF THE SPANISH PIG SECTOR

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Traditional livestock herd models have been focused on individual farms. The increasing competition in markets and the reduction of commercial margins makes the production to concentrate and specialize. For instance, nowadays pig production in Spain is organized in farms at different levels. Thus, companies own many different farms along the pork chain to maintain the levels of benefit. A lack of quantitative

models to support tactical decisions in this context is detected and has motivated the present study. Therefore, a lineal programming model is proposed to optimize the supply chain of a typical Spanish company of the pig sector owning specialized farms at three different levels: farms producing piglets, farms rearing pigs and farms fattening pigs in a number to satisfy the slaughterhouse demand. It is considered a time horizon of one year, seasonal variations in production and prices and a deterministic demand. The decision variables define the flows between farms, the inventory of animals at different growing stages in the farms at each stage during the time horizon and the replacement strategy of sows. The aim is to maximize profit subject to transportation costs among different farms and between farms and the slaughterhouse, feeding cost of animals and other variable costs depending on the inventory of animals. Incomes are represented by animals sold to the slaughterhouse.

ON UNIQUENESS PROPERTIES OF SOLUTIONS TO THE CLASSICAL DISPERSIVE EQUATIONS

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We study unique continuation properties of solutions of the socalled k-generalized Korteweg-de Vries equation

$$\partial_t u + \partial_x^3 u + u^k \partial_x u = 0, \quad (1)$$

and Schrdinger equations of the following type

$$i\partial_t u = \Delta u + F(u, \overline{u}), \quad (2)$$

and

$$i\partial_t u = \Delta u + V(x)u \quad (3).$$

The goal is to obtain sufficient conditions on the behavior of the difference $u_1 - u_2$ of two solutions u_1, u_2 of (1), (2) or (3) which guarantee that $u_1 \cong u_2$. These kind of uniqueness results have been deduced under the assumption that the solutions coincide in a large sub-domain of R^2 or by using the inverse scattering method (case k = 1, 2) and assuming that $u_2 = 0$. We shall deduce sufficient conditions just on the asymptotic behavior of the difference of two solutions u_1, u_2 of (1), (2) or (3) at two different times $t_1 < t_2$ which show that $u_1 \cong u_2$.

MATHEMATICAL MODEL AND DECISION SUPPORT SYSTEM FOR DETERMINING THE MARGINAL RESERVE REQUIREMENT AS A MONETARY POLICY INSTRUMENT

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This paper studies the problem of interdependency between the central bank's and commercial banks' goals. The basic central bank's task is to achieve and to maintain the price stability. The Croatian external debt has been increasing for years and because of this Croatian National Bank's activities are oriented to destimulate this situation. In order to stop the further increase of the external debt, Croatian National Bank uses several monetary policy instruments among which is the marginal reserve requirement. On the other hand, the goal of commercial banks is to make as much profit as possible. Banks take loans from abroad at a lower interest rate and invest this money in Croatia at a higher interest rate thus fulfilling their goal. In order to obtain the desired effects of the marginal reserve requirement, its optimal percentage value should be determined. This problem is modeled as a bilevel mixed 0-1 programming problem. The objective of the leader (Croatian National Bank) is to minimize the increase in household

loans by setting different percentages of the reserve requirements for loans extended to households and for those granted to enterprises. The objective of the followers (banks) is to maximize the profit. In order to solve this NP-hard problem a heuristic is proposed. In order to verify the model, the paper ends with simulations, econometric estimations and the presentation of computational results.

AFTER PASCAL, LAPLACE AND BACHELIER (RIGHT BEFORE PONTRYAGIN)

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Mathematical economics is somewhat strange: neither mathematical nor truly economical. While (or because?) anybody can specify on economics, mathematical economics is far too mathematical for economists since the eighteenth century. On the other hand, it is far too impure for true mathematicians: they overlook it as a mere compilation of theorems without generality. Hence, there has been a criticism of mathematics in economic theory from as far in the past as we can remember: the economists have always resisted the "frightening hieroglyphs" of mathematical symbols, claiming that "human liberty could not be put into equations". Jean-Baptiste Say opposed the bizarre maths of both lost encyclopaedists and utopian socialists, the French doctrinarians of Political Economy then attacked the mad equations of Walras, now resistance has changed side: Philip Mirowski's [1989] celebrated title mocked a theory that brought More heat than light, and the latest student contest that led to Post-Autistic Economics (http://www.paecon.net/) that will end, for sure, jargon, isolation of economists, and any social problems they are dealing with.
The present paper recalls that probability theory is not an alien (and hence, unlawful) language imported into social science from "hard" sciences. Probability calculus is a scientific answer to question that arose in the field of social interactions, in trade, gamble, politics, or even religious contexts. Le Bras [2000] has shown in his landmark Naissance de la mortalité ("Birth of mortality") how statisticians tried during centuries to hide this infamous birth of probabilistic and statistical science. This paper is a tribute to Le Bras' groundbreaking work, showing other instances of how probabilistic decision theory (hence economic theory) were at the beginning, mathematical rationalization came after.
At least four moments could attract our attention: the birth of probability calculus with the problem of points, the elaboration of statistical estimation with the Laplace method, the modelling of asset prices by a Brownian motion (Bachelier), and stochastic dynamic programming (Massé). While the three first items are yet beginning to be known, it is not useless to recall them, in order to draw a perspective that converges to Ramsey and especially Massé's work. We will thus show how questions of political economy and water resource management led to discover an unknown country then surveyed by Pontryagin and his team.

MINIMUM TIME PATH AND LAW

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For this, we have to consider the acceleration and velocity vectors. The angle between these vectors is θ. The angle's maximum value is 180 degrees. Then, acceleration separates the two components upon velocity. There is both straightforward and centrifugal acceleration. We can consider a polar coordinate, because these vectors can occur anytime on a plane. The axis is in the same direction of velocity and the pole is the origin of velocity. Straightforward acceleration is tangent to the axis and centrifugal acceleration is normal to the axis. Straightforward magnitude is given by Newton's second law. Centrifugal magnitude can be expressed the product of velocity and angular velocity.

$$\begin{array}{rclrcl} a_1 & = & \frac{dv}{dt} & a_2 & = & v\frac{d\theta}{dt} \\ a_1 & = & a\cos(\theta) & a_2 & = & a\sin(\theta) \end{array}$$

where the acceleration, a, is assumed to be a known function of time.

$$\frac{\sin(\theta)}{\cos(\theta)} = v\frac{d\theta}{dt} \Rightarrow \frac{dv}{v} = \frac{\cos(\theta)}{\sin(\theta)}d\theta.$$

Thus, the minimum time law is:

$$\begin{cases} v & = & C\sin(\theta) \\ C\frac{d\theta}{dt} & = & a \end{cases}$$

and includes the law of refraction. The law has been used for brachistochrone problems. Velocity wants to be without any adverse effect of acceleration in the minimum time motion. Let us describe two dimensions of acceleration motion. Let us consider a polar coordinate because velocity and acceleration are on a plane. The axis is in the same direction of acceleration and the pole is the origin of acceleration. With that, velocity divides two components on the coordinate. One component is parallel of the axis, and the other is perpendicular to the axis. Their components use Newton's second law.

$$\begin{array}{rcl} \frac{d}{dt}(v\cos(\theta)) & = & a \\ \frac{d}{dt}(v\sin(\theta)) & = & 0. \end{array}$$

Thus, the natural motion law is

$$\begin{array}{rcl} v & = & \frac{C}{\sin(\theta)} \\ -\frac{C}{\sin^2(\theta)}\frac{d\theta}{dt} & = & a. \end{array}$$

We know that projectile motion follows the above equation. The direction of velocity wants to be the same as acceleration in the natural motion.

SECTIONAL CURVATURES IN NONLINEAR OPTIMIZATION

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In differential geometry, one of the main tools for studying the structure of the Riemannian manifolds seems to be the sectional curvature. A famous result is that the fundamental Euclidean, Riemannian elliptic and Bolyai-Lobachevsky hyperbolic manifolds are characterized by zero, positive and negative constant sectional curvature, respectively. The definition of the sectional curvature is based on the fourth-order Riemannian curvature tensor field and the Riemannian metric (e.g., Udriste, 1994), so concrete calculations need extremly diffcult procedures. For classifying the constraints of smooth nonlinear optimization problems, a possibility is to use the sectional curvatures. Let

$$M[h] = \{x \in \mathbb{R}^n |\ h_j(x) = 0; j = 1, \ldots, n-k\}$$

where $k > 0$, $h_j \in C^2$, $j = 1, \ldots, n-k$, and 0 is a regular value of the map h, *i.e.*, the $(n-k)\times n$-Jacobian matrix $Jh(x)$ of h at x is of full rank $(n-k)$ for all $x \in M[h]$. Under these assumptions, the set $M[h]$ is a k-dimensional submanifold of C^2 in $\mathbb{R}^n$ which can be endowed with a Riemannian metric G. In optimization theory, the Riemannian metric is often induced by the Euclidean metric of Rn (Rapcsák, 1997).

The aim of the lecture is to show how to explicitly express the function of sectional curvature with the first and second derivatives of the problem's functions on the submanifold $M[h]$ with the induced Riemannian metric, and how to formulate the minimization problems of sectional curvatures related to $M[h]$. At an arbitrary point $x_0 \in M[h]$, this minimization problem leads to a global minimization one on Stiefel manifolds (Stiefel, 1935) which seems to be an interesting new branch of nonlinear optimization (Edelman et al., 1998; Rapcsák, 2002). After obtaining the optimality conditions for the minimization problems

of sectional curvatures, the sectional curvatures of Stiefel manifolds are analysed, and the maximal and minimal sectional curvatures on an ellipsoid are determined. These curvatures are proportional with the condition number of the given matrix. The talk is ended with some open problems.

CARTERAS SOCIALMENTE RESPONSABLES SELECCIONADAS CON REFERENCIA A BENCHMARKS Y METODOLOGÍA DIFUSA

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En este trabajo se aborda la selección de carteras a partir de una población con fondos Socialmente Responsables: carteras que incluyen, además de fondos de inversión tradicionales, fondos de inversión que tienen en cuenta criterios éticos y medioambientales a la hora de elegir su cartera de inversión. El diseño de la cartera se lleva a cabo optimizando su comportamiento respecto a varios benchmarks: se diseñaran carteras que se encuentren lo más cerca posible, en un sentido "soft", del benchmark de referencia. El diseño de la cartera se realizará mediante un modelo de Programación Multiobjetivo Difusa basado en la minimización de distancias. Los objetivos de la cartera, rentabilidad esperada y el riesgo medido por su Beta, se evaluaran mediante números difusos trapezoidales

APPROXIMATIONS FOR THE DISTRIBUTION OF FUZZY SCAN STATISTICS

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The classical temporal scan statistic is often used to identify disease clusters. In recent years, this method has become a very popular technique and its application field has notably increased. Many bioinformatic problems have been solved with this technique. In this paper a new scan method is proposed: fuzzy scan. Three approximations for the distribution of fuzzy scan statistic are presented. The behaviors of classic and fuzzy scan techniques are studied with simulated data. ROC curves are also calculated, being demonstrated statistically the superiority of the fuzzy scan techniques.

ESPACIO DE FUNCIONES ABSTRACTAS DE P-VARIACIÓN ACOTADA

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En este trabajo se introducen los espacios de las funciones abstractas de p-variación acotada fuerte y débil en un intervalo y se estudian sus principales propiedades así como las del espacio de las funciones abstractas absolutamente p-continuas. Se define la integral abstracta de Stieltjes en la búsqueda de un teorema análogo al de Representación de Riesz y se encuentra una representación de los operadores lineales continuos del espacio de las funciones absolutamente p-continuas sobre un intervalo en un espacio normado débilmente completo a través de las funciones abstractas de q-variación acotada, p y q conjugados. Este problema se encuentra relacionado con la Teoría geométrica de la medida, muy importante para el estudio de curvas que sirvan de camino en problemas de optimización en general.

DEPENDENCE BETWEEN VOLATILITY PERSISTENCE, KURTOSIS AND DEGREES OF FREEDOM

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In this paper the dependence between volatility persistence, kurtosis and degrees of freedom from Student's t-distribution will be presented in estimation alternative risk measures on generated returns. As the most used measure of market risk is standard deviation of returns, i.e. volatility. However, based on volatility alternative risk measures can be estimated, for example Value-at-Risk (VaR). There are many methodologies for calculating VaR, but for simplicity they can be classified into parametric and nonparametric models. In category of parametric models the most are used $GARCH(p,q)$ models and within nonparametric Monte Carlo simulation is most popular. Even so, $GARCH(p,q)$ models are used for modeling time-varying variance of returns. It isn't easy to estimate VaR when stochastic process which generates distribution of returns is not known. Unfortunately the assumption that the returns are independently and identically normally distributed is often unrealistic. Therefore, high kurtosis exists within financial time series of high frequencies. This confirms the fact that distribution of returns generated by $GARCH(p,q)$ model is always leptokurtic, even when normality assumption is introduced. It can be concluded that risk measures under distribution with heavier tails (distribution generated using $GARCH(1,1)$ process with volatility persistence of 90%) are much higher in comparison to distribution which is generated using GARCH model with volatility persistence of 70%. This confirms that Student's t-distribution is more adequate in risk estimation when fat tails are present. These risk measures can reach more extremely values at lower probability level, i.e. 1%.

ESTIMATING LINEAR PARAMETERS FROM SURVEY DATA USING NONPARAMETRIC REGRESSION

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Nonparametric methods are rich classes of statistical tools that have gained acceptance in most areas of statistics. In the survey context, their use is much less widespread. This paper consider some important problems related with the nonparametric methods of estimation of linear parameters when the data are obtained by mean of a sample survey.

APPLICATION OF MULTIVARIATE STATISTICAL TECHNIQUES IN THE IDENTIFICATION OF INTERRELATION AMONG SOME OF THE METAHEURISTIC METHODS AVAILABLE TO SOLVE QAP PROBLEMS

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This project presents the application of multivariate statistical techniques in the analysis of interrelation among some of the metaheuristic algorithms available to solve the quadratic allocation problem (QAP), considered one of the most difficult NP-hard problems to solve and of great scientific investigation, based on the performance obtained for a set of instances selected from the QAPLIB classified into two categories: (1) the irregular and structured and (2) the regular and non structured. The algorithms considered in the analysis correspond to some of the most recognized within each of the principal metaheuristics, the tabu search algorhythms, Tabu Search (TS) and Reactive Tabu Search (RTS), the Hybrid Genetic algorhythm with tabu search (GH), the Simulated Annealing algorhythm (SA) and the Hybrid Ant System-QAP (HAS-QAP) and the Hybrid Ant System-QAP-R (HAS-QAP-R). The techniques used where, anova (test of equality of measures), principal components and principal factors, run using the SAS software. The

test of equality of measures allowed to identify the algorithms with the best performance within each one of the categories of instances. Finally, the results obtained with the principal components and factor techniques were congruent, as expected. They established the same levels of association among the algorithms, which obeyed to the same set of variables representing the characteristics in common.

RANDOM SEQUENTIAL ADSORPTION ALGORITHM TO GENERATE GEOMETRIES OF COMPOSITE MATERIALS

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In the present contribution two implementations of the Random Sequential Adsorption Algorithm are developed. The first one considers the random generation of spherical inclusions in a cube and the other one considers the generation of ellipsoids. These geometries are used to model two-phase composite materials, where one phase is called the matrix and the other one the inclusion. The user can generate the inclusions fixing some parameters like the total volume fraction or the number of inclusions or the size of the particles. The implementation could be easily adapted to include other geometries for the inclusions.

LA OPTIMIZACIÓN DEL CULTIVO DE VARIEDADES DE CAÑA DE AZÚCAR

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Actualmente en Brasil existe un gran número de variedades de caña de azúcar recomendada para su cultivo, sin embargo existe la posibilidad de que espontáneamente una variedad se impusiera sobre el resto y ello podría representar un riesgo fitosanitario dentro de algunos años en Brasil. Este trabajo propone un modelo de programación lineal que ayude a determinar la combinación óptima de distintas variedades de caña entre las disponibles, facilitando así la planificación agrícola del cultivo de caña y dificultando la proliferación de agentes patógenos. El modelo pretende ser implantado en los centrales que gestionan directamente plantaciones y apoyar su toma de decisiones en lo concerniente al cultivo de variedades de caña de azúcar para hacer más sostenible y eficiente la producción de azúcar. El modelo matemático tiene en cuenta las variedades de caña de azúcar disponibles, los factores ambientales de producción agrupados en varias clases y las productividades esperadas en los meses de zafra. Restricciones adicionales se imponen al porcentaje de cultivo máximo y la cantidad de caña suministrada al central. La solución del problema indicó el máximo porcentaje a plantar de cada una de las variedades y el ambiente más propicio, optimizando el plan de cultivo en el central azucarero y su potencial productivo
12pt

INEQUALITY, POVERTY AND HAPPINESS IN GERMANY

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We analyze the evolution of inequality and poverty in Germany for a period from 1992 to 2006 and investigate its impact on happiness. The analysis is carried out on the state as well as on the country level. In a first step we perform a spatial price adjustment over the German states in order to obtain real income data which we then use to estimate inequality and poverty. For both, poverty and inequality analyses, we apply additively decomposable measures which enable us to deal with states as subgroups of the entire country. Income dispersion is found to increase slightly while over the entire period inequality in East Germany is significantly smaller than in the West. We decompose overall inequality into within and between states inequality and discover that there is no between-state inequality in Germany. Examining

poverty in Germany we find a clear increase in the poverty headcount which is sustained by a rise in both parts of Germany. Again, the poverty measures in the West of Germany are always higher than in the East. By decomposing for the states contributions to overall poverty we discover surprising differences in the states poverty risks. Finally, we regress the calculated inequality and poverty indices on happiness. We apply various econometric models such as ordered response but also linear and binary choice specifications with fixed effects exploring the panel structure of our data. The results suggest that inequality does not influence the happiness level of the Germans while poverty clearly does.

REPROGRAMMING OF MAINTENANCE WORK ORDERS WITH PRIORITIZATION OF DELAY TIME AND EQUIPMENT CRITICITY USING LINEAR PROGRAMMING MODELS

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Over the years, the maintenance management has faced problems of various natures; some of the most common are related to the scheduling of maintenance activities managed by work orders (WO), in particular those ones with the goal of reprogramming WO not fulfilled in the dates originally scheduled. This article presents two models of linear programming that intent to reprogram a group of non-executed maintenance WO in a pasta factory located in the state of Paraiba, Brazil. The models were built based on existing structures presented in the literature and adapted in order to respect organizational and technical characteristics of the maintenance department of the company, such as the limit of hours available for the realization of the delayed services, the ability of each technical in execute a given service and the criticity of the equipment linked to the WO. To determinate the amount of hours allocated in the fulfilling of this WO, a time series was built based on historical data of equipments failures. The result of the allocation served to program the activities of the maintenance team during the period pre-determined by the company for the completion of the delayed services.
Keywords: Maintenance management; Work orders; Linear programming; Assignment problem.

INFORMATION IDENTITY IN PARAMETER ESTIMATION ASSUMING NONCONSTANT VARIANCE

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Maximum likelihood estimation (MLE) is concerned in parameters evaluation in models with nonstacionary variance (heteroscedasticity).Analytical solution of maximization of the likelihood function using first and second derivatives is too complex when the variance is not constant over time. In this paper usefulness of quasi-Newton iteration procedure in parameter estimation of the conditional variance equation within BHHH algorithm is presented. To simplify optimization procedure BHHH algorithm uses the approximation of the matrix of second derivatives according to information identity: "at the true value of parameter vector the expected value of the outer product of the first derivatives is equal to minus the expected value of the second derivatives". Convergence is assured because the approximation of the inverse of the Hessian matrix is guaranteed to be a positive definite. In practice as the most appropriate, GARCH models are used in forecasting volatility. Maximum of the likelihood function can be founded by iteration procedure until no further increase can be found. Because the solutions of the numerical optimization are very sensitive to the initial values, but no so sensitive to the tolerance, GARCH(1,1) model starting parameters are defined. Procedure is stepping forward if initial step is good, and it is backing up if initial step is bad (step is then reduced). Although BHHH algorithm is slower, the number of iterations could be reduced using starting values close to the global maximum. Optimization procedure will be illustrated by modeling volatility on daily basis of the most traded stocks on Croatian capital market.

UTILIZACIÓN DEL ALGORITMO DEL GIBBS SAMPLER EN MODELOS DE REGRESIÓN

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Los MCMC (Markov Chain Monte Carlo) son métodos numéricos muy utilizados cuando se trabaja el enfoque bayesiano. Ellos simulan una cadena de Markov convergente a la distribución posterior o final que en muchos ocasiones no es posible calcular por vía analítica, debido a lo complicado o casi imposible de resolver las integrales o sumas que aparecen en el método. Uno de los casos particulares de estos métodos es el algoritmo Gibbs Sampler el cual se emplea para estimar los parámetros de la distribución posterior de los modelos de interés al abordar el problema de la modelación bajo el enfoque bayesiano. Este algoritmo aparece implementado en el software libre WinBugs. En el trabajo se muestra la aplicación de este algoritmo a través de dos problemas cuya solución se obtiene utilizando el modelo de regresión. Estos problemas se refieren uno a la predicción de poblaciones de una plaga agrícola y el otro al pronóstico de riesgo de dislexia.

DISPERSIVE PROPERTIES AND STABILITY OF SOLUTIONS FOR RELATIVISTIC AND NON-RELATIVISTIC MODELS IN ASTROPHYSICS: APPLICATION TO BLACK MATTER HALOS

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With the aim of giving some insight on the asymptotic behavior in time of solutions to gravitational Vlasov's type equations, we propose different criteria to study the possible dispersive character of solutions. In terms of the initial mass, energy and other invariants of the system we establish a map of regions characterizing statistical dispersion. Examples of other weaker dispersive criteria will be shown such us loss of mass at infinity or dichotomy. This kind of results can be also analyzed in the relativistic context of the Nordströom-Vlasov system and the spherically symmetric Einstein-Vlasov system. In the non-dispersive regions we study the non-linear (orbital) stability of steady states. We use some of these static solutions (the isotropic polytropes) as a model to unify different theories (observational and numerical) involved in the modelling and explanation of the black matter halos.

STABILITY AND ILL-POSEDNESS IN CONTINUOUS LINEAR OPTIMIZATION

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UDLA, Puebla, Mexico and IMI-BAS, Sofia, Bulgary.

In this talk we consider the parameter space of continuous linear optimization problems with a given decision space and a given index set. We consider different partitions of this space, on the base of the primal, the dual, and the primal-dual status of each parameter. We define stability, ill-posedness and relative ill-posedness w.r.t. a given set and absolute ill-posedness w.r.t. a given family of sets. These concepts are illustrated for the elements of the partitions considered in this presentation.

UN ESPACIO DE FUNCIONES DE TIPO JAMES

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El espacio de sucesiones James es conocido como ejemplo de espacio semireflexivo de orden 1 isométricamente isomorfo a su bidual y su estudio ha servido de base al estudio de los espacios de funciones de p-variación

acotada. Las particulares características de este espacio destacan su utilidad en la practica a través de las representaciones de funcionales. Lindenstrauss y Stegall, en su artículo "Examples of separable space which do not contain and whose duals are non-separable" definen lo que denominan espacio de funciones de James y estudian sus propiedades.

En este trabajo partimos de esta definición y de los espacios de p-variación acotada para definir un espacio de funciones de tipo James y estudiamos sus propiedades fundamentales, en particular su relación con los espacios anteriormente mencionados.

CORRELATION AND AUTHENTICATION IN REPEATED GAMES WITH NETWORK MONITORING

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We study repeated games with network monitoring where players observe the moves of their neighbors. To get a Folk Theorem, i.e. to implement all feasible and individually rational payoff by strategic equilibria, identification of players deviating from prescribed actions is needed. The aim of this paper is to find necessary and sufficient conditions on the topology of the network for the existence of a communication protocol that identifies unilateral deviations. We analyze the role played by correlated inputs, that is, how the possibility of pre-play exchange of authentication keys modifies the connectivity required. Without correlated inputs, the graph has to be 2-connected: no single node deletion disconnects the graph. With correlated inputs, the condition is weaker: the graph has to be 2-edge-connected, no single edge deletion disconnects the graph. We derive a Folk Theorem for correlated equilibria.

AN APPLICATION OF ALTERNATIVE RISK MEASURE IN ESTIMATION OF THE EFFICIENT FRONTIERS FOR TRANSITIONAL EUROPEAN CAPITAL MARKETS

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The contemporary theory of portfolio management as introduced by H. M. Markowitz is based on observation of relative increase in the securities prices and the definition of return as their mathematical expectation, and risk as their variance. It is important to point out that in this mean-variance (M-V) model, the assumption of the normal distribution of stock's returns must be satisfied, but in practice it has almost never been verified. In such cases the variance is not the adequate risk measure. Because of the non-normality of the data in this study, the lower semi-variance as alternative risk measure is applied. It can be said that it is the measure of risk which retains good properties of variance and overcomes its disadvantages. After presenting the elements of the theory, we calculate the efficient (optimal) portfolios i.e. efficient frontiers on the capital markets of 5 transition countries from the group of the South Eastern European (SEE) countries: Bosnia and Herzegovina, Bulgaria, Croatia, Romania and Serbia.

The obtained results show the conditions on SEE capital markets and possibilities for investors in accordance with their preferences and risk aversion. In that sense Serbia's and Croatia's capital markets are the most attractive in region. Such results are expected in the case of Croatia because of its leading economic-financial position. The attractiveness of Serbia can be explained with young increasing capital market where the prices of shares have the constant rise tendency. Such situation gives a big possibility of earnings for potential investors.

NEURAL MASS MODEL BASED EEG-FMRI FUSION

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Neural mass models expressed as random dynamical equations may be fitted to EEEG and/or fMRI data by:

a) Discretising model dynamics by means of the local linearization approximation (Exponential Euler)

b) Kalman Filtering of EEG and fMRI state and observation models to obtain innovations.

c) Estimation of model parameters by maximizing the likelihood obtained from the innovations.

This approach (pioneered by T. Ozaki) has already been applied to neural mass modeling of the EEG (Valdes et al., 1997; Sotero et al, 2006a) , of the fMRI (Sotero et al., 2006b) as well as EEG-fMRI (Riera et al., 2005a,b, Sotero et al., 2007). While basing inference on all the dynamical invariants of the original continuous model, the scenarios considered to date are those of only a single or a very small number of active regions. This limitation is as much due to the paucity of data (relative to the amount of parameters to estimate) as to computational limitations since the exponential Euler technique requires the calculation of the matrix exponential of the Jacobian of the random dynamical system over each time step-a daunting task even using efficient Krylov subspace methods. Additionally traditional models do not address the issue of synchronization within the neural masses imposing simplistic relations between EEG and fMRI.
In this presentation we review some recent methodological advances that overcome these shortcomings. It is shown that the proper framework for this type of modeling is that of random differential-algebraic equations expressed in a canonical form that allows separate integration of each neural mass. Extremely efficient computations are possible with the explicit formulation of a discrete time neural mass model coupled with Kalman Filtering techniques developed for massive data assimilation projects. Finally the discrete time neural mass equations are augmented to model neural synchrony. This framework is applied to analyze real and simulated relations between EEG oscillations and BOLD measurements. Stumbling blocks to apply this type of modeling to spatially continuous neural models will be discussed.

ON THE STABILITY OF A SINGULAR VORTEX DYNAMIC

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We prove that small self-similar solutions of the Local Induction Approximation to the dynamics of a vortex flament are stable in a suitable sense. In particular the formation of a corner starting with a real analytic curve is proved to remain under appropriate perturbations. Our approach is based on the so-called Hasimoto transformation which links this problem with cubic non-linear Schrodinger equation in one dimension.

OPTEX MATHEMATICAL MODELING SYSTEM

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OPTEX Mathematical Modeling System, software oriented to the design, implementation and start up of Decision Support Systems (DSS) based on large scale optimization models, through the integration of optimization technologies with the most advanced information systems using visual interfaces of last generation.
The most important characteristics of OPTEX are:

- Model formulation with algebraic language based on database tables.
- Algebraic Language similar to GAMS, AMPL or GNU MathProg
- Visual interface based on MS-Windows standards.
- Database and server integration with optimization models.
- Solution of LP, MIP, QP, MQP models, depend on solver capacities.
- Model generation using programs in algebraic languages of general purpose such as GNU MathProg, GAMS y AMPL.
- Model generation with low level languages such as C ANSI, using links to free libraries such as: GLPK, LPSOLVE, SYMPHONY, CoinMP and MINTO and links to commercial libraries such as CPLEX and XPRESS
- Problem solution, through programs in C ANSI, based on large scale methodologies using Nested Benders.
- Automatic generation of stochastic multi-stage non anticipative optimization models, including CVaR risk control constraints
- Solution using grid of parallel computers/processors
- Interface with GIS systems with commercial or free licenses.
- Concurrent operation in LAN or WAN networks.

FEATURE SELECTION WITH LOW-DIMENSIONAL MUTUAL INFORMATION

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When dealing with high-dimensional data, parametric models (including artificial neural networks, support-vector machines, etc.) suffer from the "curse of dimensionality". Among other difficulties, this means that overfitting can only be avoided if a large number of samples is available (with respect to the number of parameters in the model) or, conversely, is the number of parameters is small enough with respect to the size of the learning set. Feature selection, i.e. reducing the dimensionality of rough data before processing or learning, is thus often necessary. Information theory, and in particular the concepts of conditional entropy and mutual information, are increasingly used for feature selection. The principle is to assess the relevance of features in a model-free way, i.e. avoiding the costly learning of a large number of models. However, assessing features individually is not sufficient, as interactions between them, including correlation, are not taken into account. Some estimators of mutual information (and/or conditional entropy) are able to assess groups of features instead of individual ones only. Nevertheless, these estimators are themselves prone to the curse of dimensionality, therefore showing low accuracy, variability to sample, etc. This paper will show how to assess the variability of mutual information estimators and to use the information about this variability in the context of feature selection. It will also be shown that even if in theory using more features is always an advantage with respect to the information content (and regardless of the modeling aspects), in practice the question is different, as irrelevant features add noise and pollute the concept of similarity between data, which is used in most parametric models.

ADAPTIVE DESIGNS FOR ONGOING PHASE II OR PHASE III CANCER CLINICAL TRIALS IN CUBA

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The Center of Molecular Immunology (CIM) has come developing of their principles, a series of molecules for the treatment of the cancer. In the measure that you advance in the development of these products, you advance in the phases of the clinical trials. This brings consequently the increment of patient's number in the study and also the number of hospitals that it includes the patients. In these moments, we are working with 15 different products, with more than 50 clinical trials, with a prognostic of the inclusion of 2500 patients per year, besides maintaining the treatment and following to more than 350 included per year.
With the objective of accelerating the process of development of the biotechnical products, to reduce the time of the scene in the market of a new product and to reduce the costs of the investigations was introduced the adaptive designs of ongoing clinical trials that includes sample size re-estimation, early stopping due to efficacy or futility, response adaptive randomization, and dropping inferior treatment groups. In this work, we were described the advantages and disadvantages of the adaptive designs compared with the conventional designs and it is shown the modifications of the design of 8 clinical trials in breast, lung and prostate cancer of our center through the adaptive designs.

PROBLEM STRUCTURING AND DECISIÓN TAKING IN VENEZUELA. TWO ACTION EXPERIENCES: INSTITUTIONAL AND COMUNITARY

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Two experiences and reflexions on Operational Research, the application of Problem Structuring methods, and the Strategic Choice Approach (SCA) as an aid for decision making and taking, at different situations: institutional and communitarian. The SCA, alone or with other methods, has been applied in situations in which conventional models based on validated historical data, and in socio-economical and political conditions of low uncertainty, has been demonstrated not useful; in those cases it has required a permanent interaction between different, and often disagreeing, actors. Currently, Venezuelan society is trying to give answers to complex social, political and economical situations, characterized by significant political changes that require new ways to take decisions and act at both the institutional and social grassroots levels. In this regard, the use of planning tools that provide opportunities for protagonist participation for all players, can be applied to help strengthen the function and responsibilities of the planners, constructing together a set of policies that is viable, coherent, concertated, sustainable, and articulated, and that provides answers to the actual needs and realities perceived. This paper presents and discusses the results, difficulties and reflections that came out of two recent experiences in Venezuela: one institutional in nature, the construction of productive chains in the public sector; and another at the community level, in the framework of the Integral Habilitation project for Barrio San Julián in Vargas state.

MODELACIÓN Y CONVERGENCIA DEL ALGORITMO DEL SISTEMA INMUNE ARTIFICIALES MULTIOBJETIVO

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Este trabajo presenta la modelación y convergencia de un algoritmo del Sistema Inmune Artificiales (ASIA) multiobjectivo (basado en la teoría selección clonal).

A pesar de la considerable cantidad de investigaciones relacionadas con el algoritmo del Sistema Inmune Artificial en los últimos años, Dasgupta (99) y Decastro- Timmis 02, todavía hay poco trabajo relacionados con cuestiones tan importantes como la elaboración de modelos matemáticos (véase, por Ejemplo Tarakanov- Dasgupta 00 y Saab02). Otros aspectos, tales como la convergencia, Han sido prácticamente ignorado en el actual bibliografía especializada.
Este trabajo estudia la convergencia del ASIA utilizado para problemas de optimización multiobjectivo. En primer lugar, se presenta una modelacion y convergencia de una versión simplificada del algoritmo. Después nos ocupamos con el modelo general.

A FREE BOUNDARY PROBLEM FOR THE $P(X)$-LAPLACIAN

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Let $\mathbb{K};=\{v\in W^{1,p(x)}(\Omega)\,,\, v=\phi \text{ on } \partial\Omega\}$ where Ω is a smooth bounded domain, $0\le\phi\in W^{1,p(x)}(\Omega)\cap L^\infty(\Omega)$.
$W^{1,p(x)}(\Omega)$ is the set of functions in $L^{p(x)}(\Omega)$ with first derivatives in $L^{p(x)}(\Omega)$: the set of measurable functions f in Ω such that $\int_\Omega |f(x)|^{p(x)}\,dx<\infty$.
We study the following minimization problem; Find $u\in\mathbb{K}$ that minimizes the functional

$$J(v)=\int_\Omega |\nabla v(x)|^{p(x)}+\lambda\chi_{\{v>0\}}\,dx \quad \text{for } v\in\mathbb{K}.$$

This problem may be of interest in the study of electrorheological fluids. These are fluids such that their properties are strongly influenced by the presence of an electromagnetic field.
We assume throughout this work that there exist $1<p_1\le p_2<\infty$ such that $p_1\le p(x)\le p_2$ in Ω and prove that minimizers do exist and that they are nonnegative and bounded.
Then, if $p\in C(\Omega)$ we prove that any minimizer u is locally Holder continuous and deduce that

$$\Delta_{p(x)}u;=\operatorname{div}\big(p(x)|\nabla u(x)|^{p(x)-2}\nabla u(x)\big)=0 \quad \text{in } \{u>0\}.$$

If, moreover $p\in C^{0,1}_{loc}(\Omega)$ and $p_1\ge 2$, we prove that u is locally Lipschitz continuous.
Still under the assumption that $p\in C^{0,1}_{loc}(\Omega)$, with $p_1>1$ we prove that any locally Lipschitz minimizer is a weak solution of the following free boundary problem;

$$\begin{aligned}&\Delta_{p(x)}u=0 && \text{in } \{u>0\}\\ &u=0,\quad |\nabla u(x)|=q(x):=\Big(\frac{\lambda}{p(x)-1}\Big)^{1/p(x)} && \text{on } \partial\{u>0\}\end{aligned}$$

in the sense that, for every $\varphi\in C^\infty_0(\Omega)$,

$$-\int_\Omega p(x)|\nabla u(x)|^{p(x)-2}\nabla u(x)\nabla\varphi(x)\,dx=\int_{\partial_{red}\{u>0\}} q(x)\varphi(x)\,d\mathcal{H}^{N-1}.$$

Moreover, $\mathcal{H}^{N-1}\big(\partial\{u>0\}\setminus\partial_{red}\{u>0\}\big)=0$.
Finally, we consider minimizers $u^\varepsilon\in\mathbb{K}$ of the functional

$$J_\varepsilon(v)=\int_\Omega |\nabla v(x)|^{p(x)}+B_\varepsilon(v)\,dx$$

where $B_\varepsilon(s)=B\big(\frac{s}{\varepsilon}\big)$ with $B\in C^{1,1}(\mathbb{R})$ such that $B(s)=0$ is $s<0$, $B(s)=\lambda$ if $s>1$ and $B(s)$ is strictly increasing for $0<s<1$.
When $p\in C^{0,1}_{loc}(\Omega)$, with $p_1>1$, we prove that for any sequence $\varepsilon_j\to 0$ there is a subsequence ε_{j_n} and a function u such that $u^{\varepsilon_{j_n}}\to u$ uniformly on compact subsets of Ω and u is a locally Lipschitz minimizer of J in $\mathbb{K}$.

A NOVEL SOFT CLUSTERING ALGORITHM VIA THE HYPERBOLIC SMOOTHING APPROACH

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Cluster analysis deals with the problems of classification of a set of patterns or observations, in general represented as points in a multidimensional space, into clusters, following two basic and simultaneous objectives: patterns in the same clusters must be similar to another (homogeneity objective) and different from patterns of other clusters (separation objective).
Clustering is an important problem that appears in the broadest spectrum of applications, whose intrinsic characteristics engender many approaches to this problem.
Hard clustering algorithms assign patterns to a single cluster whereas soft clustering algorithms assign a given pattern to all clusters with a certain probability of membership. In this paper, a soft clustering methodology is developed inside a framework of hard clustering.
A particular hard clustering problem formulation is considered. Among many criteria used in cluster analysis, the most natural, intuitive and frequently adopted criterion is the minimum sum-of-squares clustering (MSSC). This criterion corresponds to the minimization of the sum-of-squares of distances of observations to their cluster means, or equivalently, to the minimization of within-group sum-of-squares. It is a criterion for both the homogeneity and the separation objectives.
The minimum sum-of-squares clustering (MSSC) formulation produces a mathematical problem of global optimization. It is both non-differentiable and non-convex mathematical problem, with a large number of local minimum points.
The core focus of this paper is the smoothing of the min-sum-min problem engendered by the modeling of the clustering problem. In a sense, the process whereby this is achieved is an extension of a smoothing scheme, called Hyperbolic Smoothing.
By smoothing we fundamentally mean the substitution of an intrinsically non-differentiable two-level problem by a C^{∞} differentiable single-level alternative. This is achieved through the solution of a sequence of differentiable sub-problems which gradually approaches the original problem. In the present application, each sub-problem, by using the Implicit Function Theorem, can be transformed into a low dimension unconstrained one, which, owing to its being indefinitely differentiable, can be comfortably solved by using the most powerful and efficient algorithms, such as, conjugate gradient, quasi-Newton or Newton methods.
By using the intermediary solutions of differentiable sub-problems, it is possible to derive soft clustering within the MSSC reference.
For the purpose of illustrating the features of method, a set of computational results on the Fisher Iris data set is presented.

STATISTICAL INFERENCE FOR MARKOVIAN FORESTRY MODELS

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The Usher model is a matrix model describing a size-structured population and is used to mimic the future evolution of the population. This model is characterised by a restriction on the transitions between the state classes. It is well adapted to describe the dynamic of a forest stand and is used to deal with forest management. The study turns on predictions in the stationary state of the model in order to construct confidence intervals of these predictions. First, we stand in the basic Usher model based on the homogeneity in time on transition parameters and the independence between the individual evolutions. The results are after extending to the more general density-dependant Usher model, where the parameters depend on the varying characteristics of the population during time.

LIST OF PARTICIPANTS