

Introduction à la statistique non-paramétrique 2019/20
 M1 Math Université Paris Dauphine - PSL
 G. Turinici

→ site cours pour version recente poly

→ R → python

$$f(x) = \int_{\mathbb{R}} f(w) e^{iwx} dw$$

↓ param ?

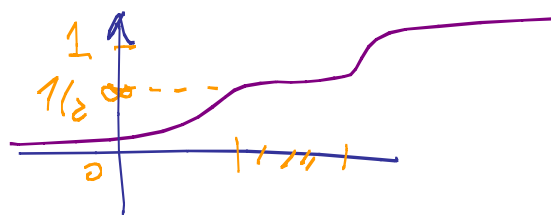
$$f(x) = \sum_{n \in \mathbb{Z}} a_n e^{inx}$$

↓ param ?

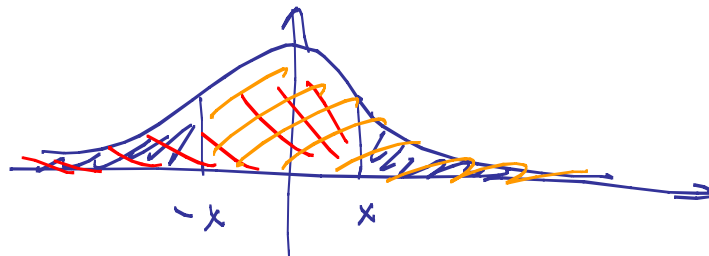
$$\int f(x) dx$$

↓ densité

Quantiles



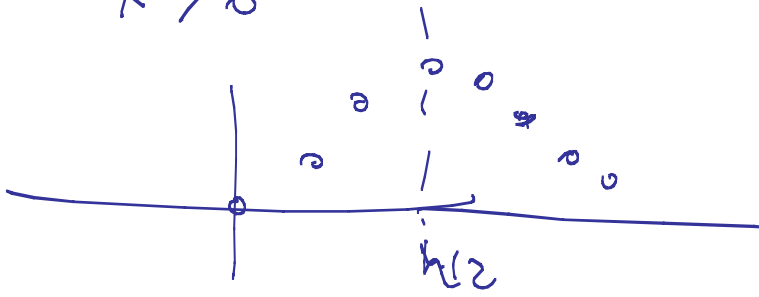
Sym



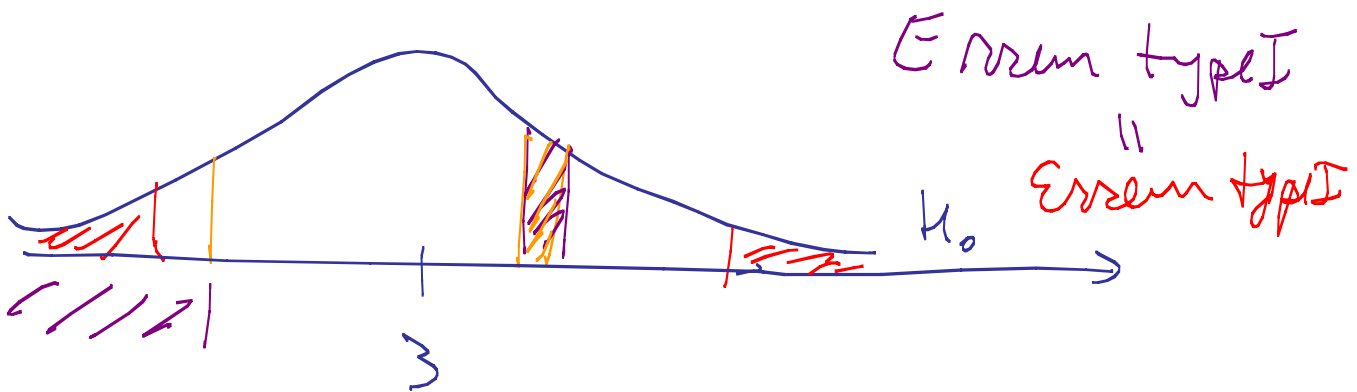
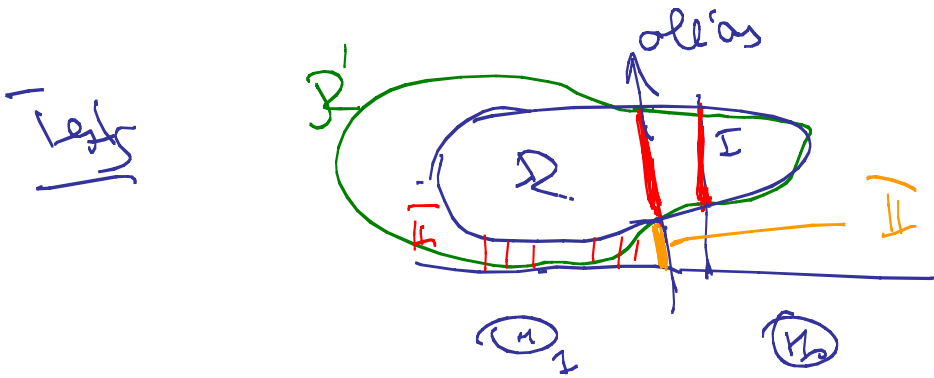
$$X \perp Y \quad \forall A \in \sigma(X), B \in \sigma(Y)$$

$$P(X \in A, Y \in B) = P(X \in A) P(Y \in B).$$

$X \rightarrow |X|$
 $\gamma \rightarrow \mathbb{1}_{X > 0}$



1.7 H_1 aussi noté H_a



$$P(X) = \inf \{ \alpha \in]0, 1[: \phi_\alpha(X) = 1 \}$$

$P(X) < \alpha$ on rejette H_0 au niveau α

$$\inf \{ \alpha \mid \phi_\alpha(X) = 1 \} < \alpha$$

\mathbb{R}^2

$$\phi_{\mathbb{R}^2}(X) = 1$$

$$\mathbb{R}^2 \subset \mathbb{R}^2$$

$$X \in \mathbb{R} \text{ pour } \mathbb{R}^2. \quad \mathbb{R}^2$$

Question $\mathbb{R}^2 \subset \mathbb{R}^2 \Rightarrow \mathbb{R}^2 \subset \mathbb{R}^2?$

Prop 2.4

$$Y_k(\omega) = \mathbb{1}_{X_k \leq x}(\omega)$$

$$\mathbb{E}(Y_k) = \mathbb{E}(\mathbb{1}_{X_k \leq x}) = P(X_k \leq x)$$

$$= F(x).$$

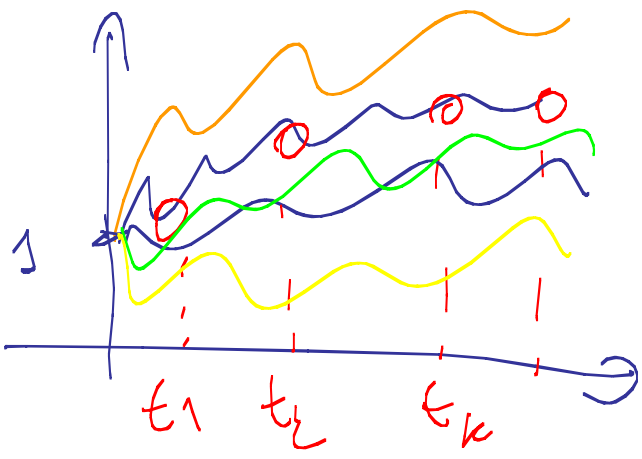
$$Y_n \sim \text{Be}(F(x))$$

$$\text{Var}(Y_n) = F(x)(1-F(x))$$

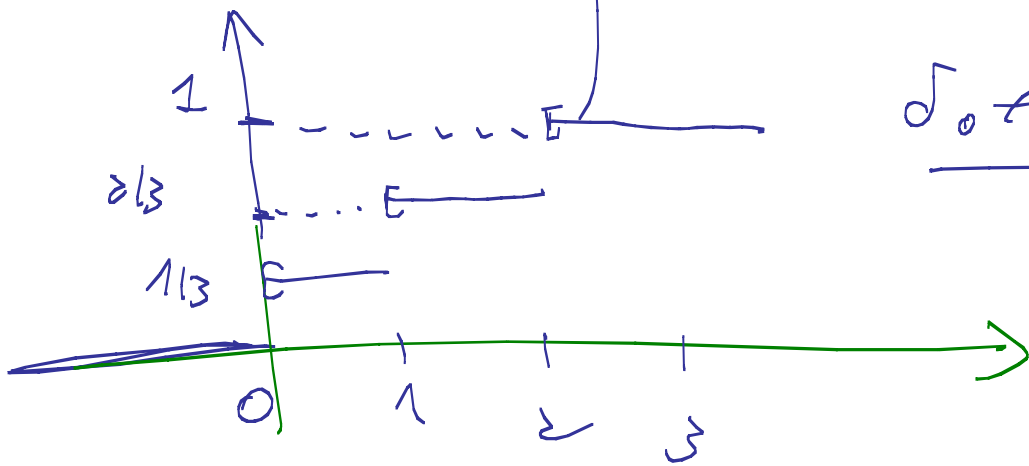
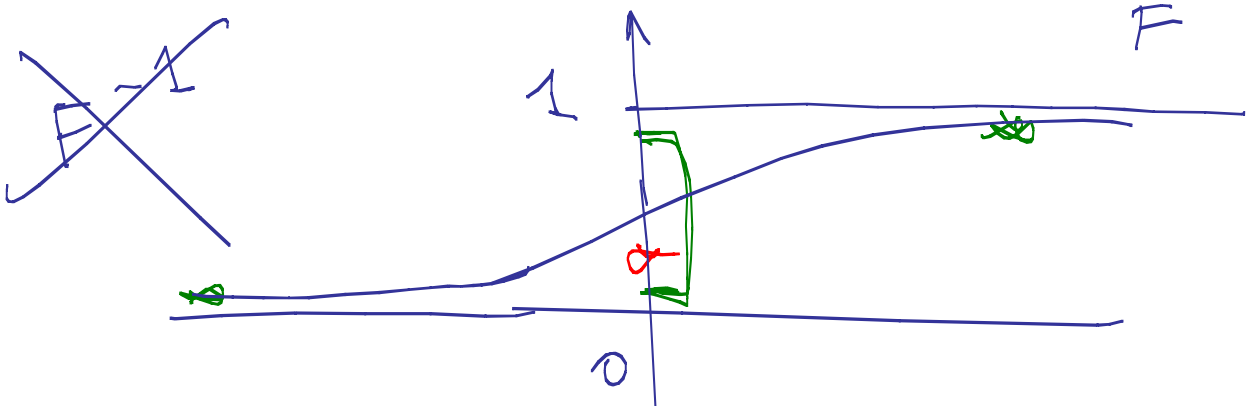
$$\hat{F}_n = \frac{\sum_{e=1}^n Y_e}{n}.$$

Question loi μ CDF: F

X_n, \dots, X_1, \dots i.i.d.



$$1 + w_t \sim \mathcal{N}(1, t)$$



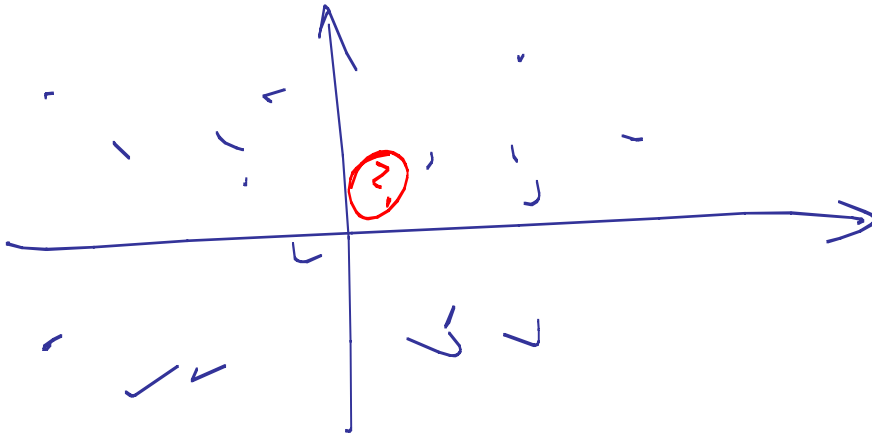
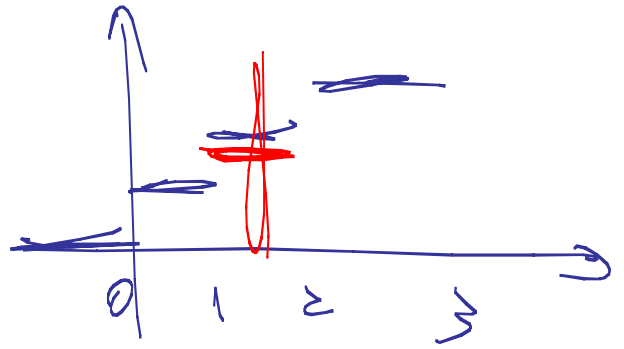
$$\frac{\sigma_0 + \sigma_1 + \sigma_2}{3}$$

$$2_{25\%} = 0$$

$$2_{75\%} = 2$$



$$\delta_0 + \delta_1 + \delta_2 + \delta_3$$



$$X \xrightarrow{\sigma} \Omega \rightarrow \mathbb{R}^2$$

$$\# |X - m|$$