# APPLICATION OF SIGNATURES FOR FORECASTING

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#### **PURPOSE OF PROJECT**

→ UNDERSTANDING SIGNATURE AND TO USE IT ON SIMPLE SMOOTH DETERMINISTIC FUNCTIONS

→ TRY TO USE IT FOR FORECASTING A CHOSEN TIME SERIES

## **FIRST SEMESTER**



02

03

#### DEFINITIONS

What is the signature of a path?

MAIN GOAL

01

What is the purpose of the project?

<u>EXAMPLES</u>

Listing some examples of calculations





We denote a path ([a,b]  $\Rightarrow \mathbb{R}^{m}$ ) by **X** or **X**<sub>t</sub> parameterized by t, which belongs to [a,b] coordinate paths :

$$X_{t} = (X_{t}^{1}, X_{t}^{2}, X_{t}^{3}, \dots X_{t}^{m})$$

 $X_{t}^{i}$  are coordinate paths.





## SIGNATURE OF A PATH

 $S(X)_{a,b} = (1, S(X)_{a,b}^{1}, S(X)_{a,b}^{2}, \dots, S(X)_{a,b}^{1,1}, \dots)$ 

.

### 1 multi index



$$S(X)_{a,t}^{i,j} = \int_{a < s < b} S(X)_{a,s}^i dX_s^j = \int_{a < r < s < t} dX_r^i dX_s^j$$



$$X_t = \{X_t^1, X_t^2\} = \{5+t^2, (t^2+1)^2\},\$$

a=1, b=5

#### so the derivatives are

$$dX_{t} = \{ dX_{t}^{1}, dX_{t}^{2} \} = \{ 2tdt, 2(t^{2}+1)^{*}2tdt \},\$$

### PICTURE OF A ROUGH PATH





## **THANK YOU**

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