Keynote n°8 : **José MAZON**
Université de Valence, ESPAGNE

Title: **Multiscale decomposition of functions in Metric Random Walk Spaces**

Our aim is to study the (BV, L^2)-decomposition and the (BV, L^1)-decomposition in the general framework of metric random walk space (MRWS) For instance, the (BV, L^2)-decomposition in the MRWS $[X, d, m]$ with invariant measure ν reads as

$$\min\left\{\frac{1}{2}\int_X\int_X |u(y)-u(x)|dm_x(y)d\nu(x)+\frac{\lambda}{2}\int_X |u(x)-f(x)|d\nu(x):\ u\in L^1(X,\nu)\right\},$$

which has as particular case the ROF-model in a weighted graph $G=(V(G),E(G),W(G))$:

$$\min\left\{\frac{1}{2}\sum_{x\in V(G)}\sum_{y\in V(G)}|u(y)-u(x)|w_{xy}+\frac{\lambda}{2}\sum_{x\in V(G)}|u(x)-f(x)|^2\sum_{y\sim x}w_{xy}:\ u\in L^2(G)\right\},$$

and also the nonlocal ROF-model

$$\min\left\{\int_{\Omega\times\Omega}J(x-y)|u(x)-u(y)|dxdy+\frac{\lambda}{2}\|u-f\|_2^2\ :\ u\in L^2(\Omega)\right\}.$$

Furthermore, we introduce the concepts of Cheeger and calibrable sets in MRWS and characterize calibrability by using the 1-Laplacian operator. In connection with the Cheeger cut problem we study the eigenvalue problem whereby we give a method to solve the optimal Cheeger cut problem.

Joint work with M. Solera and J. Toledo