June 14th 2012
Amphithéâtre Schwartz – Institut de Mathématiques de Toulouse

10h00 Introduction on the CIMI Labex by directors of IRIT, IMT

10h45 Alfred Hero , Bipartite k-nearest neighbor graphs, entropy, and learning
Abstract
Bipartite k-nearest neighbor (BP-k-NN) graphs are applied to learning functionals of high dimensional probability densities from a set of random samples. Functionals of interest to us include entropy, information divergence, and level sets of the density. We will illustrate how the BP-kNN graph can be used for high performance intrinsic dimension estimation, hyperspectral image segmentation, and anomaly detection.

12h00 Lunch

14 h 30 Introduction by Dominique Le Quéau, Director of FCS STAE

15h00 Jan Mandel Convergence of the Ensemble Kalman Filter in Hilbert Space

Abstract
Convergence of the ensemble Kalman filter to the filtering distribution in the large ensemble asymptotics is of particular interest in the case of a high-dimensional state space. Existing theory gives convergence for any fixed finite-dimensional state space and normal distributions. But, in general, the curse of dimensionality prevails and convergence to the filtering distribution deteriorates with increasing dimension of the state space. Yet, modest ensemble sizes are often sufficient in practice even for very large problems. We argue that one reason is that in such problems, the state consists of solutions of partial differential equations discretized on large grids, with probability distributions which are far from arbitrary, resulting in convergence regardless of the grid size. Such probability distributions approximate those of random smooth functions (random spatial fields), which we understand as a special case of probability distributions on infinitely dimensional spaces. As a first step towards the uniform convergence of the ensemble Kalman filter for high-dimensional problems, we prove convergence in the limit case of gaussian measures on an infinitely dimensional separable Hilbert space. Unlike in the finite dimensional case, however, different types of data likelihood require different arguments. We show convergence when the observation is finite dimensional, and also when the whole state in Hilbert space is observed and the data error is white noise.

16h30 Coffee