# Séminaire ICI : Panayotis Mertikopoulos

06 Mars 2012, 14:00 – 15:30

## Titre du séminaire et orateur

Matrix Exponential Learning: Distributed Optimization in Multiple-Antenna Systems, Panayotis Mertikopoulos, LIG Grenoble.

## Date et lieu

Mardi 6 mars 2012, 14h.
ENSEA, salle 384.

## Abstract

Finding the optimal signal covariance matrix in a multiple-input multiple-output (MIMO) multiple access channel is a challenging optimization problem because the problem's inherent constraints (positive-definiteness of the covariance matrices) are not explicit, so standard optimization techniques do not apply. Moreover, if the channels are not static but fluctuate stochastically over time, the situation gets even worse because standard solution methods based on "waterfilling" lose many of their convergence properties.

This talk will outline a novel optimization method based on "exponential learning", an approach which applies to general (quasi-)convex problems defined over sets of positive-definite matrices. Focusing on the MIMO problem at hand, we will see that if the channels are static, the system users converge to a power allocation profile which attains the sum capacity of the channel exponentially fast (in practice, within a few iterations); otherwise, in the case of ergodically fluctuating channels, users converge to a power profile which attains their ergodic sum capacity instead. Importantly, the convergence speed of this algorithm can be controlled by tuning the users' learning rate; as a result, the algorithm converges within a few iterations even when the number of users and/or antennas per user in the system is very large.

**Short bio**:
Panayotis Mertikopoulos received the B.S. degree in physics with a major in astrophysics from the University of Athens in 2003, the M.Sc. and M.Phil. degrees in mathematics from Brown University in 2005 and 2006 respectively, and the Ph.D. degree in physics from the University of Athens in 2010. In 2010-2011 he was with the Economics Department of Ecole Polytechnique in Paris, France, and he is currently a CNRS Researcher at the Laboratoire d'Informatique de Grenoble, France. His research interests lie in dynamical systems, stochastic analysis, game theory, and their applications to communication networks.