

# Séminaire ICI : Matthieu Bloch

16 Mai 2013, 16:00 – 17:30

## Titre du séminaire et orateur

Coding and Information-Theoretic Aspects of Coordination over Networks.  
Matthieu Bloch, Georgia Tech Lorraine, Metz.

## Date et lieu

Jeudi 16 mai 16h.  
ENSEA, Cergy-Pontoise, salle 384.

## Abstract

While information theory was initially developed specifically for the study of reliable communication systems, it has found broader applications in areas as diverse as biology, cryptography, or machine learning. More recently, motivated in part by the emergence of distributed cyber-physical systems, information theory has also been used to develop the basis of a theory of coordination over networks. The central idea behind the approach is to view the transmission of data between nodes in a network as a means to coordinate their behaviors, and not as an end in itself. From a mathematical perspective, the question is not how much data rate is required to guarantee a small probability of decoding error, but how much data rate is needed to ensure that the joint behavior of nodes, modeled as a joint probability distribution, approximates a targeted joint behavior. Promising applications of this theory include the design of efficient algorithms and protocols to coordinate networks of distributed autonomous agents.

In this talk, we will discuss recent results regarding the design of explicit coding schemes for coordination in two-node and three-node networks. In particular, we will highlight how the problem of coordinating behaviors over networks relates to the problem of simulating processes at the output of noisy channels, also known as channel resolvability. We will leverage this relation to guide the design of practical coding schemes based on polar codes and we will illustrate all our results in the context of the coordination of autonomous robots patrolling a border.

## Speaker's Bio

Matthieu Bloch received the Engineering degree from Supélec, Gif-sur-Yvette, France, the M.S. degree in Electrical Engineering from the Georgia Institute of Technology, Atlanta, in 2003, the Ph.D. degree in Engineering Science from the Université de Franche-Comté, Besançon, France, in 2006, and the Ph.D. degree in Electrical Engineering from the Georgia Institute of Technology in 2008.

In 2008-2009, he was a postdoctoral research associate at the University of Notre Dame, South Bend, IN,

USA. Since July 2009, Dr. Bloch has been on the faculty of the School of Electrical and Computer Engineering at the Georgia Institute of Technology, where he is currently an Assistant Professor based at the Georgia Tech Lorraine campus. His research interests are in the areas of information theory, error-control coding, wireless communications, and cryptography.

Dr. Bloch is a member of the IEEE and has served on the organizing committee of several international conferences; he is the current chair of the Online Committee of the IEEE Information Theory Society. He is the co-recipient of the IEEE Communications Society and IEEE Information Theory Society 2011 Joint Paper Award and the co-author of the textbook *Physical-Layer Security: From Information Theory to Security Engineering* published by Cambridge University Press.