

Inverse problems



Component

École Nationale
Supérieure
d'Électrotechnique
d'Électronique
d'Informatique
d'Hydraulique
et des
Télécommunications

In brief

- > **Ametys Code:** M34HLF5J
- > **Open to exchange students:** Yes

Presentation

Objectives

Know how to identify an inverse problem, understand the concept of ill-posed or ill-conditioned problems, understand the importance of regularization, master a few regularization methods, formulate regularization in a Bayesian context.

Description

Course outline

- Introductory example: deconvolution of sparse signals
- # Direct modeling
- # Naive inversion and least squares solutions
- # Sparse regression (MP, OMP)
- Characterization of inverse problems

- # Ill-posed problems
 - # Conditioning
 - # SVD-based solutions
 - Regularization/penalization
 - # Penalized and constrained formulations
 - # Tikhonov regularizations
 - # Parsimonious regularizations
 - Probabilistic formulation
 - # Inversion and estimation
 - # Linear Gaussian case
 - # Bayesian regularization
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Pre-requisites

- (Digital) signal processing
- Linear algebra
- Probability
- Statistics (estimation)
- Advanced statistics (Bayesian estimation)