## Summary

The goal of this class is to acquire mathematical tools and engineering insight about networks whose structure is random, as well as learning and control techniques applicable to such network data.

## Content

- Random graph models: Erdős-Rényi, random regular, geometric, percolation, small worlds, stochastic block model
- Learning graphs from data: centrality metrics, embeddings, Hawkes processes, network alignment
- Control of processes on graphs: epidemics, navigation

## Keywords

Random graphs, network data, machine learning, graph processes.

## Learning Prerequisites

**Required courses**
- Stochastic models in communication (COM-300), or equivalent.

**Important concepts to start the course**
- Basic probability and statistics; Markov chains; basic combinatorics.

## Teaching methods

Ex cathedra lectures, exercises, mini-project

## Expected student activities

Attending lectures, bi-weekly homeworks, mini-project incl. student presentation at the end of semester, final exam.

## Assessment methods

1. Homeworoks 10%
2. Mini-project 40%
3. Final exam 50%.
Resources

Bibliography


Ressources en bibliothèque

• Random Graphs / Bollobas
• Random Graphs / Janson
• Continuum Percolation / Meester
• Percolation / Grimmett
• Networks, Crowds and Markets / Easley
• Poisson Approximation / Barbour
• Random Graph Dynamics / Durrett

Notes/Handbook

Class notes will be available on the course website.

Moodle Link

• https://go.epfl.ch/COM-512