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-Renyi, 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. Homeworks 10%
2. Mini-project 40%
3. Final exam 50%.

**Supervision**

<table>
<thead>
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<th>Office hours</th>
<th>Yes</th>
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<td>Assistants</td>
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<tr>
<td>Forum</td>
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**Resources**

**Bibliography**


**Ressources en bibliothèque**

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

**Notes/Handbook**

Class notes will be available on the course website.

**Moodle Link**

- [https://go.epfl.ch/COM-512](https://go.epfl.ch/COM-512)