Bayesian Nonparametrics

PhD in Statistics, Bocconi University

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Instructor: Igor Prünster

Course Description:

The course provides an overview of Bayesian nonparametric theory. First a historical account of the discipline and of its success stories is given. Then key probabilistic concepts and tools are provided. Attention is then focused on discrete nonparametric priors in the exchangeable framework and beyond. The techniques used for deriving their distributional properties and sampling algorithms are also showcased.

Course Syllabus:

- Review of the basic notions and history of Bayesian nonparametric inference including the definition and main properties of popular classes of nonparametric priors and their application areas.
- Overview of the main concepts and tools of the theory of processes with independent increments and completely random measures with examples.
- Discrete nonparametric priors as transformations of completely random measures and analysis of their marginal (in particular, predictive distribution and partition structure) and conditional properties (posterior characterizations) with emphasis on normalized completely random measures.
- Dependent nonparametric priors: measuring dependence and classes of priors based on additive, hierarchical and nested structures. Hints at their application potential for species sampling problems in ecology and genomics, meta-analysis, clustering, survival analysis, topic modeling and network theory.

Exam:

Oral presentation