

Bayesian Nonparametric Statistics

Instructor

Name: Garritt Page

Course Information

Description

This course is designed to introduce students to Bayesian nonparametric (BNP) methods. These methods embrace flexibility when modeling, predicting, or learning from data. We will discuss the basics of BNP priors and how to employ them in hierarchical modeling. Computation associated with these methods will be examined. This class will focus on application of BNP methods and all statistical computation will take place in R.

Learning Outcomes

- **Dirichlet Process:** Explain in detail the Dirichlet process and describe how it can be employed in Bayesian hierarchical modeling. Describe computation needed to fit models
- **Regression:** Nonparametric residual distribution, nonparametric mean function and fully nonparametric regression will all be covered
- **Random Partition Models:** Make connections between random partition models and Dirichlet process mixture models. Introduce models in Bayesian hierarchical modeling
- **Dependent Dirichlet Process:** Introduce random measures indexed by covariates, Demonstrate their use in modeling.

Materials

We will follow a few chapters in the book, "Bayesian Nonparametric Data Analysis." This is a well-written text that highlights application of the procedures we will learn in class.

Computation

We will use R in this course for statistical computing purposes.

Exams: There will be one final exam administered.

Classroom Procedures

You are expected to abide the following rules:

- 1) Demonstrate respect for your fellow students.

- 2) Refrain from unauthorized use of computers, cell phones, etc., during class time.
- 3) Be present in the classroom from the beginning to the end, unless there is an illness, emergency, or other extenuating circumstance.

Changes to Syllabus

I reserve the right to amend the syllabus. This will be at my discretion. Changes will be announced in class and/or on Learning Suite.

Tentative Schedule (anticipate changes)

Date	Unit: Content to be Discussed
hour 1	Dirichlet Process: Definition, properties
hour 2	Dirichlet Process Mixture Models: Modeling, Computation, Clustering, Density estimation and Random effects modeling
hour 3	Nonparametric Regression: Residual Distribution
hour 4	Nonparametric Regression: Mean function
hour 5	Nonparametric Regression: Fully nonparametric
hour 6	Random Partition models: EPPFs and the PPM
hour 7	Random Partition models: Using random partition models as a prior in hierarchical models.
hour 8	Dependent Dirichlet Process Mixture Model: Introduce, define, explore properties
hour 9	Dependent Dirichlet Process Mixture Model: Hierarchical modeling
hour 10	Review
-	Final Exam