

**Course Outline for
Bayesian Nonparametrics - Foundations and Applications
Spring 2008 Rm 210a
Tue, Thu 12:30–1:145
Jayaram Sethuraman**

The lectures will be based on journal publications in the literature and on my unpublished research.

- The statistical problem in nonparametrics.
- Introduction to Bayesian methods
- How to introduce a nonparametric prior, namely how to describe distributions for the unknown distribution
- Ferguson's definition of the Dirichlet prior, which is an example of such a prior distribution
- Blackwell and MacQueen's method to introduce a Dirichlet prior
- Properties of the Dirichlet prior and the calculation of the posterior distribution
- Using De Finetti's theorem to obtain all possible nonparametric priors through exchangeable sequences of random variables
- Other methods to obtain nonparametric priors based on an understanding of the structure of a distribution or a probability measure
- Example of nonparametric priors which select absolutely continuous distributions
- The new construction of a Dirichlet prior due to Sethuraman and its applications
- Applications of Bayesian nonparametric methods to standard problems
- Applications of Bayesian nonparametric methods to nonstandard problems
- Computational methods on applications of Bayesian nonparametrics
- Application of Bayesian methods to systems subject to failure and repairs
- Application of Bayes methods to censored data
- Partition bases Bayesian priors and their applications
- Reading of current papers

Grades for this course will be based on classroom presentations of individually assigned projects.

Some References

- Athreya, Krishna B., Doss, Hani and Sethuraman, Jayaram (1996) On the Convergence of the Markov Chain Simulation Method, *Annals of Statistics* **24** 69–100.
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- Doss, H. (1994) Bayesian nonparametric estimation for incomplete data via successive substitution sampling, *Ann. Statist.* **22**: 1763–1786.
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- Gelfand. A. and Smith, A. F. M. (1990) Sampling-based approaches to calculating marginal densities, *J. Amer. Statist. Assoc.* **85** 398–409.
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- Hanson, T., Sethuraman, J. and Xu, L. (2005) On Choosing the Centering Distribution in Dirichlet Process Mixture Models, *Stat. Probab. Letters* **72** 153–162.
- Harris, T. E. (1968) Counting measures, monotone random set functions, *Z. Wahrscheinlichkeitstheorie verw. Geb.* **10** 102–119.
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- Mauldin, R. D., Sudderth, W. D., and Williams, S. C. (1992) Pólya trees and random distributions, *Ann. Statist.* **20**: 1203–1221.
- Sethuraman, J. (1994) A constructive definition of Dirichlet priors, *Stat. Sinica* **4**: 639–650.
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- Susarla, V. and Van Ryzin, J. (1976) Nonparametric Bayesian estimation of survival curves from incomplete observations, *J. Amer. Statist. Assoc.* **71**: 897–902.
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- Yamato, H. (1975) A Bayesian estimation of a measure of the difference between two continuous distributions, *Rep. Fac. Sci. Kagoshima University* **8**: 29–38.
- And many other papers.