# STP 598: Advanced Bayesian Statistical Learning
## Spring 2023
## Arizona State University

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http://hedibert.org/current-teaching
Lectures: Tuesdays and Thursdays, from 9:00am to 10:15am
From January 10th to April 27th
Office hours: Wednesday, from 10am to 11am (by appointment only)
Classroom: Social Sciences 205 (Tempe)

## Course Description

*Attention: this is an advanced Bayesian course! A strong background in calculus, probability, statistics and matrix algebra is highly beneficial.* The end of the course goal is to expose the student to modern Bayesian solutions to highly structured and stochastic real world problems. We will visit well known Bayesian issues, such as prior specification/sensitivity, model comparison/criticism and model averaging, as well as Bayesian computation via various Monte Carlo methods. We approach regularization in linear and log-linear models via Bayesian LASSO, Spike-and-Slab priors and related sparsity-inducing priors. We cover decoupling shrinkage and selection strategies in a fully Bayesian decision framework. Other topics covered are finite and infinite mixtures for Bayesian semi- and non-parametric modeling, large-scale (dynamic/spatial) factor models, Bayesian additive regression trees (BART), Bayesian text modeling and modeling large-scale time-varying covariance matrices. All classroom examples and implementations as well as projects will be carried out by the open-source statistical software R.

## Books

- Gamerman and Lopes (2006) MCMC: Stochastic Simulation for Bayesian Inference, Second Edition. Chapman & Hall/CRC. http://www.dme.ufrj.br/mcmc
- Gelman, Carlin, Stern, Dunson, Vehtari and Rubin (2020) Bayesian Data Analysis, Third Edition. Chapman & Hall/CRC. http://www.stat.columbia.edu/~gelman/book/BDA3.pdf
- Hoff (2009) A First Course in Bayesian Statistical Methods. Springer.
- Migon, Gamerman and Louzada (2015) Statistical Inference: An Integrated Approach, Second Edition, Chapman & Hall/CRC.

## Course Materials

Course materials (including as much of the slides as I can) will be available on my professional page at http://hedibert.org/current-teaching and under the folder Advanced Bayes-PhD-ASU.

## Software

All classroom examples and implementations as well as projects will be carried out by the open-source statistical software R.