CASD 2015 Short Course: Bayesian Inference

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Synopsis:
This course will cover the basics of the Bayesian approach to practical and coherent statistical inference. Particular attention will be paid to computational aspects, including MCMC. Examples/practical hands-on exercises will the run gamut from toy illustration to real-world data analysis from all areas of science, with R implementations/coaching provided.

Texts:
There is no *required* text, however the course closely follows P.D. Hoff's *A First Course in Bayesian Statistical Methods*—Springer 2009. Some examples are borrowed from two other texts which are nice references to have. J. Albert's' *Bayesian Computation with* R—Springer 2nd ed. 2009; A. Gelman, J.B. Carlin, H.S. Stern and D.B. Rubin' s *Bayesian Data Analysis*—2nd ed. 2004

Tentative Schedule:

	Chapters		
Topic	H	A	GCSR
Introduction and brief review & Stats	1,2	–	1
One–parameter models	3	3	2
Monte Carlo Inference	4	1,5.7-5.10	11.1,13.2-13.4
Multi–parameter and normal models	5	4	3
MCMC: Metropolis and Gibbs samplers	6,10.2-10.4	6	11
Multivariate normal and linear models (LMs)	7,9.1-9.2	9	14
Hierarchical models	8	7	5
GLMs and hierarchical LMs & GLMs	10.1,10.5,11	–	15.1-15.4,16

Prerequisites:
Undergraduate level Statistics, Probability, Calculus, Linear Algebra,
and a familiarity with a programming language (e.g, R, Matlab, Python, C or Fortran)

Preparation:
Students are expected to install and familiarize themselves with R in advance of the course. A short tutorial with accompanying R code is provided here:

slides http://bobby.gramacy.com/teaching/bayes/rtutor.pdf
code http://bobby.gramacy.com/teaching/bayes/rtutor.R

Additionally, some other useful resources prepared by others include

video tutorials http://dist.stat.tamu.edu/pub/rvideos/
step-by-step guides http://tryr.codeschool.com