

LTCC Basic Statistics Course

- Title: **Applied Bayesian Methods**
- Basic Details:
 - Core Audience: Statistics
 - Course Format: Basic/Core (10h)
- Course Description:
 - This course will introduce the Bayesian approach to statistical inference and develop relevant theory, methodology and computational techniques for its implementation.
 - Syllabus:
 1. Introduction to Bayesian statistics
 2. Bayesian inference
 3. Prior distributions
 4. Graphical models
 5. Hierarchical models
 6. Markov chain Monte Carlo (MCMC: Gibbs sampling)
 7. WinBUGS (Bayesian inference Using Gibbs Sampling)
- Recommended reading:
 1. P.M. Lee, *Bayesian Statistics: An Introduction* (**Chapters 1-3**, 2004, 3rd Edition: Arnold).
 2. J. Whittaker, *Graphical Models in Applied Multivariate Statistics* (**Chapters 1-3**, 1990, John Wiley & Sons).
 3. C.M. Bishop, *Pattern Recognition and Machine Learning* (**Chapter 8** "Graphical models", 2006, Springer).
 4. A. Gelman, J.B. Carlin, H.S. Stern & D.B. Rubin, *Bayesian Data Analysis* (**Chapter 5** Hierarchical models", 2003, 2nd Edition: Chapman and Hall/CRC).
 5. W.R. Gilks, S. Richardson & D.J. Spiegelhalter (eds), *Markov Chain Monte Carlo in Practice* (**Chapters 1, 2 and 5**, 1996, Chapman & Hall/CRC).
- Prerequisites:
 1. Basic knowledge of probability, random variables, probability distributions (including joint and conditional distributions), frequentist hypothesis tests and confidence intervals.

2. Preliminary reading (if not already familiar with prerequisite concepts): J.A. Rice, *Mathematical Statistics and Data Analysis* (3rd edition, Duxbury, 2007) Sections **1.0-3.6** (probability, random variables, distributions), 4.1-4.4 (expectation, variance, correlation) and **9.1-9.3** (hypothesis testing, confidence intervals).

- Format:
 - No. of discussion/problem sheets: 4
 - Electronic lecture notes: copies of lecture slides will be provided
 - Necessary support facilities: data projector, black- or white-board
 - Necessary software requirements for computing facilities: WinBUGS
 - Lecture/Computer session split: 9/1 hours

- Lecturer details: Dr Jinghao Xue, University College London, Statistics