Fall 2015 Course Announcement
Stat 591: Prior-free Probabilistic Inference

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LECTURE DAY/TIME. TBD

PREREQUISITES. Students should have background in classical and Bayesian statistics, such as that provided in Stat 511. Some computing background (e.g., Stat 451) would also be helpful but is not absolutely essential.

TEXTBOOK. Lectures will be based on current research as well as the instructor's book, *Inferential Models: Reasoning with Uncertainty*, with Chuanhai Liu, to be published this year by Chapman–Hall/CRC Press.

COURSE DESCRIPTION. At a high level, the statistical inference problem concerns the conversion of experience to knowledge, which is an essential part of the scientific method. More specifically, statistical inference should provide a summary of the evidence in the observed data for/against various hypotheses concerning the quantity of interest. It is natural to consider using a probability measure to describe this evidence but, in the absence of genuine prior information, it is not clear where these probabilities should come from and how they should be interpreted. Motivated by various shortcomings of existing methods, this course will present a new approach, called *inferential models*, or IMs for short. The IM framework provides valid prior-free probabilistic inference and is based on a simple idea of predicting unobservable auxiliary variables with a suitable random set. Various key properties of the basic IM will be carefully motivated and developed, and extensions (based on auxiliary variable dimension reduction) will be introduced to improve the basic IM's efficiency. A number of applications will be considered and, finally, some important open problems.

COURSE OBJECTIVES. Students successfully completing this course will understand the strengths and weaknesses of existing modes of inference, will have a working knowledge of the new IM framework, and will be able to apply the IM machinery to new problems.

TENTATIVE COURSE PLAN. (i) Define "statistical inference" and compare existing methods (frequentist, Bayesian, fiducial, etc) relative to this definition; (ii) motivation for and construction of the basic IM, with careful development of its key properties; (iii) dimension reduction techniques to extend the basic IM, improving its efficiency; (iv) applications and discussion of open problems.

GRADES. Grades will be based on a final project, and "class participation."

INTERESTED? Without sufficient enrollment, this special topics course may be canceled, so any students interested in taking this course should let the instructor know. He can also answer any questions that students might have about the prerequisites, etc.