STAT 536D

STATISTICAL THEORY FOR THE DESIGN AND ANALYSIS OF CLINICAL STUDIES

2020/21 – Final third of Term 2 (1.0 credits)

"Bayesian Inference in Latent Variable Models"

Instructor: Dr. Paul Gustafson (e-mail: gustaf@stat.ubc.ca)

Prerequisite: Open to any interested graduate students in the Department of Statistics. Graduate students from other departments are welcome, provided they have sufficient statistical and mathematical backgrounds (statistical theory to the level of UBC STAT 460, ideally). Students from other units should consult the instructor about suitability.

Text: There is no textbook. Readings may be assigned, ideally from texts available via the UBC library e-book collection.

Course description: Statistical models involving latent variables are ubiquitous. They arise very naturally in many health-science applications, such as learning the properties of diagnostic tests, and inferring exposure-disease relationships when exposure cannot be measured well. Bayesian routes to inference in latent variable models are very popular, with hierarchical model specifications implemented standard Bayesian software (based on Markov Chain Monte Carlo computational methods) being quite common.

This course will explore Bayesian latent variable models in some depth. There will be a mix of applied and conceptual material. We will work through examples of specifying and fitting Bayesian models in contexts such diagnostic testing and adjusting for exposure measurement error. We will also discuss topic such as partial identification, where we dig in to the question of how the sharpness of our inferences is driven by the extent of our knowledge about the relationship between latent variables and observables. And we will review how the decision-theoretic optimality of Bayesian procedures plays out in the sorts of models we have been discussing.

Evaluation: based on class participation (10%), short reflective writing exercises (20%), and, in lieu of a final exam, a final project (70%).