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DEPARTMENT OF STATISTICS AND BIostatISTICS
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Seminar

Speaker: **Prof. Jessi Cisewski**
Department of Statistics
Carnegie Mellon University

Title: **Approximate Bayesian Computation for the stellar initial mass function**

Time: **12:00pm – 1:00pm, Monday, February 16, 2015**

Place: **552 Hill Center**

Abstract

Explicitly specifying a likelihood function is becoming increasingly difficult for many problems in astronomy. Astronomers often specify a simpler approximate likelihood - leaving out important aspects of a more realistic model. Estimation of a stellar initial mass function (IMF) is one such example. The stellar IMF is the mass distribution of stars initially formed in a particular volume of space, but is typically not directly observable due to stellar evolution and other disruptions of a cluster. Several difficulties associated with specifying a realistic likelihood function for the stellar IMF will be addressed in this talk.

Approximate Bayesian computation (ABC) provides a framework for performing inference in cases where the likelihood is not available. I will introduce ABC, and demonstrate its merit through a simplified IMF model where a likelihood function is specified and exact posteriors are available. To aid in capturing the dependence structure of the data, a new formation model for stellar clusters using a preferential attachment framework will be presented. The proposed formation model, along with ABC, provides a new mode of analysis of the IMF.

I will also discuss an emerging area of topological data analysis called persistent homology. Persistent homology offers a novel way to represent, visualize, and interpret complex data by extracting topological features, which can be used to infer properties of the underlying structures. Data exhibiting complicated spatial structures are common in many areas of science (e.g. cosmology, biology), but can be difficult to analyze. I will explain how studying the topological features could lead to a significant enhancement of our understanding of complex data structures, such as the large-scale structure of the Universe. Finally, I will introduce a framework for hypothesis testing using the summaries from persistent homology.

**** Refreshments will be served @11:40pm in Room 502 Hill Center***