

A phylogenetic approach to inferring mutation order in cancer



Abstract: The advent of single-cell sequencing data provides the ability to model clonal evolution of tumors within individual patients. Inference of such within-patient tumor phylogenies has the potential to advance our understanding of the variation in the process of tumor progression, with strong clinical implications. Here we consider the problem of rapid and robust inference of the tumor phylogeny from a sample of single-cell genotype data under a Markov model that incorporates error in the observed sequencing process. Using techniques from algebraic statistics, we develop a computationally-efficient method for inference and demonstrate its properties using simulation. Further, we describe a method for mapping mutations onto the inferred phylogeny, and show that comparisons of the mapped mutations across patients can lead to insights into the process of cancer evolution. We demonstrate the methods developed using empirical data.

This is joint work with Yuan Gao, Julia Chifman, and Jeff Gaither.

About the Speaker: Laura Kubatko joined the faculty at OSU as an Associate Professor in 2006, after serving as Assistant Professor of Mathematics and Statistics at the University of New Mexico from 1999-2006. She is currently a jointly appointed Professor in the Departments of Statistics and Evolution, Ecology and Organismal Biology, as well as a Co-Director of the Mathematical Biosciences Institute at OSU. Her research interests are in statistical genetics, particularly in the inference of phylogenetic trees from nucleotide sequence data, with recent work focusing on the application of techniques from algebraic statistics to coalescent-based phylogenomic inference. Kubatko is a Faculty Affiliate of the Institute for Population Research and the Translational Data Analytics Institute, and is an Affiliated Faculty Member of the Battelle Center for Mathematical Medicine at Nationwide Children's Hospital. She is an Associate Editor for the journal *Systematic Biology* and is Section Editor for the Theory and Methods Section of the journal *BMC Ecology and Evolution*. She is currently President of the Society of Systematic Biologists and was named a AAAS Fellow in 2020.

Laura Kubatko, PhD

Friday, February 19th, 11:00am-12:00pm

Carmen Zoom