SWARTHMORE COLLEGE
MATHEMATICS & STATISTICS
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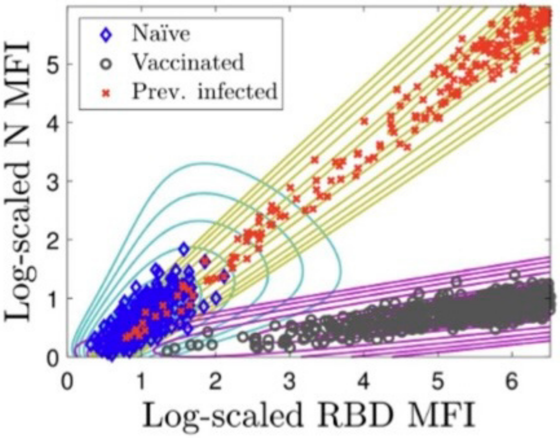

A mathematical understanding of antibody tests: testing accuracy, prevalence estimation, and time-dependence

This talk walks through how we have addressed some emerging challenges of the SARS-CoV-2 pandemic from a mathematical perspective. Of initial importance was the accurate classification of samples as positive or negative, which is difficult when the corresponding measurement values overlap. We separated populations by using more available measurements per person to build probabilistic models that capture structural characteristics of the data. These models are inputs to a framework for minimal-error classification. As vaccines were introduced, we extended this classification to situations with more than two classes. Such a multiclass classification is complicated when the relative prevalence in each class is unknown; we designed a prevalence estimation method that is independent of classification. Of interest now is the time-dependent viral response to infections and vaccinations. In recent work, we developed a Markov chain model for state transitions coupled with a probability distribution modeling framework for post-infection and post-vaccination antibody kinetics. This is an important step towards a comprehensive understanding of antibody kinetics that could allow us to analyze the protective power of natural immunity or vaccination and provide booster timing recommendations. Our work involves collaboration with epidemiologists and immunologists.

TUESDAY, FEBRUARY 17
SCI-199 CUNNIFF HALL
Refreshments 4:15pm, Lecture 4:30pm