Interdisciplinary Data Sciences

* IDSC Seminar Series *
Mathematics &Statistics Colloquium
April 6, 2018 3:00p.m.-4:00pm
Location: CMC 130

Presents
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Title: Modeling complex phenotypes

Abstract: We consider two problems in modeling complex traits: (1) mapping epistatic traits and (2) modeling traits or phenotypes that are surfaces or shapes. We present a novel framework for mapping epistatic effects based on the idea of marginal epistasis—the combined pairwise or higher order interaction effects between a given variant and all other variants. We present a Bayesian approximate kernel regression model (BAKR) which allows us to robustly and efficiently compute the analog of effect sizes for nonlinear regression models, this effect size captures marginal epistasis. We illustrate the utility of BAKR by examining two important problems in statistical genetics: genomic selection (i.e. phenotypic prediction) and association mapping (i.e. inference of significant variants or loci).
In the second half of the talk we introduce an approach based on integral geometry to model variation in shapes without requiring landmarks to correspondence maps between shapes. We apply this method to modeling variation in the heel bone of extinct and extant primates as well as predicting disease free survival in glioblastoma from the shape of tumors based on MRI data.

Biography: Sayan Mukherjee is a Professor in Statistical Science, Mathematics, Computer Science, and Biostatistics & Bioinformatics at Duke University. He completed a PhD from MIT in the Center for Biological and Computational Learning and was a Postdoctoral Fellow at the Broad Institute of MIT and Harvard. His research areas include Bayesian methodology; computational and statistical methods in statistical genetics, quantitative genetics, cancer biology, and morphology; discrete Hodge theory, geometry and topology in statistical inference; inference in dynamical systems; machine learning; stochastic topology.

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