ACMS Statistics Seminar

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154 Hurley Hall
3:30 PM – 4:30 PM

Beyond Rankings: Bayesian Learning of Parity, Tiers, and Dynamic Regimes

Rankings are widely used to summarize comparative information, but they can suggest differences that the data do not strongly support. In paired-comparison data, two competitors may receive different ranks even when their underlying abilities are very similar. This raises a fundamental statistical question: when should competitors be ranked separately, and when should they be regarded as statistically tied? In this talk, I will present a Bayesian framework for learning rank structure and competitive balance directly from paired-comparison data. A geometric constraint on latent abilities controls the extent of ability differences and allows rank tiers to emerge naturally when competitors are not meaningfully distinguishable. I will then extend the framework to longitudinal data using a hidden Markov model, allowing competitive balance and rank structure to change across persistent historical regimes. I will discuss the statistical formulation, computation, and theoretical properties of the model, and illustrate the approach with applications to the National Basketball Association and the English Premier League. These applications show how the framework can identify changes in competitive balance, recover meaningful rank tiers, and quantify uncertainty in rankings. More broadly, the framework provides a way to ask not only who ranks higher, but how much separation the data actually support.