



# THE UNIVERSITY OF CHICAGO

## Computational and Applied Mathematics & Statistics Student Seminar

---

Elias Boshara

Computational and Applied Mathematics  
University of Chicago

Spatial Statistics for  
Voting Rules

Wednesday, May 6, 2026  
12:30 PM  
DSI 103

### ABSTRACT

We introduce a novel statistical and measure-theoretic framework for analyzing spatial voting rules via random planar embeddings. By modeling elections as continuous probability distributions of voters and candidates within a metric space, we evaluate expected election outcomes across a broad class of spatial configurations. This continuous approach allows for the rigorous modeling of complex electorate phenomena, including polarization and bloc voting. We apply this framework to positional scoring rules, deriving analytical formulations for the expected Borda score and its variance. By constructing a mapping onto a continuous function space using Bernstein polynomials, we show that as the number of candidates approaches infinity, the expected score profiles of truncated positional scoring rules converge to the ratio of the voter probability density to the candidate probability density. Furthermore, we model the Single Transferable Vote (STV) as a dynamic, continuous flow characterized by sequential eliminations and surplus transfers. We conduct parallel experimental estimations to corroborate our findings and develop empirical metrics of planar proportionality.