Proposal Defense
Doctor of Philosophy in Computer Science

"**Advancing Machine Learning towards Spatial Fairness**" by **Erhu He**

Date:	April 18, 2024
Time:	9:00 a.m. – 11:00 a.m.
Place:	6106 Eli Lilly Room Sennott Square, S Bouquet St, Pittsburgh, PA 15213

Committee:

- Xiaowei Jia, Assistant Professor, Department of Computer Science, University of Pittsburgh
- Diane Litman, Professor, Department of Computer Science, University of Pittsburgh
- Stephen Lee, Assistant Professor, Department of Computer Science, University of Pittsburgh
- Yiqun Xie, Assistant Professor, Department of Geographical Sciences, University of Maryland, College Park

Abstract:
With the rapid revolution of spatial data (e.g., scale, variety), there has been broad interest in utilizing deep learning models for data analysis and knowledge discovery, and unlocking new opportunities in major sectors including smart cities, agriculture, transportation, climate, etc. However, direct applications of deep learning methods often suffer from spatial biases in model performance due to heterogeneous data, limited observations, and noisy sensor data. Such biases incurred by learning, if left unattended, may cause or exacerbate unfair estimations in disaster or insurance management (e.g., real-time satellite-based maps of floods, damages, or risks), unfair allocation of essential resources to the population in poverty (e.g., urban slums in Africa), unfair carbon tax, etc. Existing studies on fairness-driven learning have provided valuable insights related to non-spatial factors including race, gender, education level, etc., but research to mitigate spatial location-related biases still remains in its infancy.

I have a strong interest in exploring novel methods to promote spatial fairness over different locations without compromising the overall predictive performance. Addressing such disparities in model performance will help to ensure fairness in decision-making and policy development and to better support regions with limited resources. The research study would seek effective proactive steps to identify, quantify, and mitigate location-based biases in decision-making across many domains, including crop mapping, corn yield prediction, and stream temperature prediction.