

Computer Science Seminar

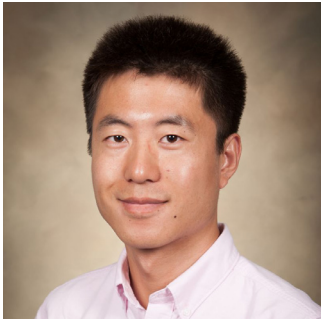
Geospatial Data Science Techniques for Earth Science Applications

Dr. Zhe Jiang, University of Alabama

April 29, 2019

10:00 - 10:50 am

209 Computer Science Building



Geospatial data science is an interdisciplinary field that studies effective and efficient algorithms to identify patterns or make predictions on large spatial data. With the advancement of GPS and remote sensing technology, large amount of geospatial data being collected at an increasing speed. Examples include earth observation imagery, geo-social media, GPS trajectories, and temporally detailed road networks. Analyzing such rich data assets is already transforming our society in applications such as national water forecasting, disaster response, and crime prevention. However, it also poses unique data science challenges. First, nearby sample locations tend to resemble each other, instead of being statistical independent (also called spatial autocorrelation). Thus, traditional data science methods (e.g., decision trees, random forests) may not perform well on spatial data (e.g., salt-and-pepper noise). Second, the spatial dependency across locations are often non-uniform across different directions (anisotropic), and thus cannot be

simply represented as a function of distance. Third, there is often limited ground truth data due to the high costs associated with sending a field crew on the ground. Finally, the large data volume (e.g., terabytes of high-resolution imagery in only one city) requires algorithms to be scalable.

In this talk, I would like to introduce our ongoing research that addresses some of the above challenges. Specifically, I will introduce a novel spatial classification model called geographical hidden Markov tree, which models anisotropic spatial dependency in a reverse tree structure within a hidden class layer. I will discuss efficient algorithms for model construction, parameter learning, and class inference. Preliminary results on real world high-resolution earth imagery for flood mapping in Hurricane Mathew and Hurricane Harvey show that our method outperforms several existing methods. I will also discuss several future research directions.

Bio: Dr. Zhe Jiang is currently an assistant professor in the Department of Computer Science at the University of Alabama. He received Ph.D. in computer science from the University of Minnesota in 2016, and B.E. degree from the University of Science and Technology of China in 2010. His research interests include spatial big data analytics, spatial and spatiotemporal data mining, spatial database, geographic information system, as well as their interdisciplinary applications in earth science, transportation, public safety, public health, etc. He has served/serves as reviewers for reputed conferences such as ACM SIGKDD, SIGSPATIAL, AAAI and journals such as IEEE TKDE. More information is at <http://zhejiang.cs.ua.edu/>.

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