Postdoc Positions in Decision Theory and Big Data for Smart Cities

Two postdoc positions are available in decision theory and big data for smart cities in the ScopeLab (https://scopelab.ai/) at Institute for Software Integrated Systems, Vanderbilt University. Applicants must have a solid technical background and interest in working with cutting-edge practical problems for cities in the context of smart transit (https://smarttransit.ai/) and the statistical response (https://statresp.ai/) projects. Both these projects have decision theory, model estimation, and big data management challenges. Particularly, we are investigating the effect of the sparsity of information, privacy guards, and equitable constraints on the decision theory problem. The postdoctoral scholars will be expected to address these fundamental challenges and work with a team of graduate students and other collaborators active in the project. The initial appointment will be for one year with the possibility of extension dependent on performance. The preferred starting date is in Fall 2021. However, earlier, and later start dates are available. **To apply please send a cover letter, CV, and list of three references by email to Prof. Abhishek Dubey**. Applications will be reviewed on a rolling basis.

1. **Statistical Response**: Emergency response management (ERM) is a critical problem faced by communities across the globe. First-responders are constrained by limited resources and must attend to different types of incidents like traffic accidents, fires, and distress calls. In the prior art, as well as practice, incident forecasting and response are typically siloed by category and department, reducing the effectiveness of prediction, and precluding efficient coordination of resources. Further, most of these approaches are offline and fail to capture the dynamically changing environments under which critical emergency response occurs. Consequently, statistical and algorithmic approaches to emergency response have received significant attention in the last few decades. Our approach to this problem is to conceptualize it as a proactive multi-agent learning problem. Key publications in the area can be seen from the web page https://statresp.ai/publications/. The project is funded by the National Science Foundation and the Tennessee Department of Transportation.

2. **Smart Transit**: Transit Agencies struggle to maintain transit accessibility with reduced resources, changing ridership patterns, vehicle capacity constraints. We have been working for the last several years to design AI-based scheduling systems to solve the problem of allocating vehicles and drivers to transit services, scheduling vehicle maintenance, and electric-vehicle charging, proactive stationing, and dispatch of vehicles for fixed-line service to mitigate unscheduled maintenance and unmet transit demand, aggregating on-demand transit requests, and dispatching and routing on-demand vehicles. Like the incident response, the decision support systems face key challenges - environments are non-stationary and difficult to predict due to human factors and complex processes affecting transit demand and traffic as well as unscheduled maintenance and accidents; simulations are expensive and complex as city-scale simulations need to consider millions of individuals and vehicles. Publications in the area are available at https://smarttransit.ai/publications/. The project is funded by the National Science Foundation and the Department of Energy.

About ScopeLab: ScopeLab (**https://scopelab.ai/**), Smart Computing Lab, is a research group directed by Prof. Abhishek Dubey at Institute for Software Integrated Systems, Vanderbilt University working on design and operation of Cyber-physical Systems (CPS) with Artificial Intelligence (AI) based components

(AI-CPS). The lab focuses on principled design, operation, and optimization methods that not only consider the system operations but also consider resilience, performance, and assurance.

About the Institute for Software Integrated Systems: ISIS (www.isis.vanderbilt.edu) is a premier research institute in the Vanderbilt University School of Engineering with 14 faculty, 6 research scientists, 30 staff engineers, and 35 graduate students with sponsored funding that currently exceeds $18 million a year. ISIS is closely affiliated with the EECS Department (eecs.vuse.vanderbilt.edu), which currently has 49 full-time faculty, 523 undergraduate students, and 200 graduate students

About Vanderbilt University: Vanderbilt University is a private, internationally renowned research university located in vibrant Nashville, Tennessee. Its 10 distinct schools share a single cohesive campus that nurtures interdisciplinary activities. The School of Engineering currently comprises 90 tenured and tenure-track faculty operate with an annual budget of over $100 million including $70 million of externally funded research and teaches 1,450 undergraduate and 500 graduate students. The School of Engineering over the past decade has been on a strong upward trajectory in its national and international stature and prominence and is in a period of growth in terms of faculty and facilities. In the 2015 rankings of graduate engineering programs by U.S. News & World Report, the School ranked 3rd among programs with fewer than 100 faculty.

About Nashville: With a metro population of approximately 1.8 million people, Nashville has been named one of the 15 best U.S. cities for work and family by Fortune magazine, was designated the South's Red Hot Town by TIME magazine, was ranked as the number one most popular U.S. city for corporate relocations by Expansion Management magazine, was ranked the number one U.S. city for economic growth potential by Business Facilities Magazine, was identified by Forbes magazine as one of the cities most likely to have the country's highest job growth over the coming five years, and has been designated as one of the 100 Resilient Cities by the Rockefeller Foundation. Nashville also offers vibrant and eclectic music and food culture, and the middle Tennessee region features a wide array of recreational attractions in both urban and outdoor settings.