Mathematics REU at James Madison University
May 23 2022- July 15 2022
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Undergraduate students who are US citizens or permanent residents are welcome to apply for our NSF funded eight week in person REU program.

Project 1 with mentors Hala Nelson and John Webb: Public Transportation: A Real World AI, Data Science, And Optimization Project

The Harrisonburg Department of Public Transportation (HDPT) aims to transform its bus routing systems, increasing ridership and optimizing operations, given the constraints on various resources, the fact that the data changes drastically when JMU is in session versus when not in session, and from one semester to the other as students' schedules change. The onset of Covid19 and the resulting transition to online classes had another major effect, making predictions less reliable. This is a data driven mathematical modeling and optimization project, where we would use HDPT data to learn optimal bus routes, optimal resource allocation, and to search for improvement avenues. Come to Harrisonburg, and help us help our city.

Project 2 with mentors Behnaz Moradi-Jamei and Dinesh Sharma: Improving Unsupervised Machine Learning Algorithms for Directed Network Data

We focus on developing machine learning methods in the presence of network data, a collection or a system of inter-connected entities, and a graph representing such a system. In many sciences, for example sociology, biology, and computer science, units under study often belong to communities, and units within the same community behave similarly. Identifying these communities is a critical problem given a mathematical framework for network data. We use cyclic structures and renewal non-backtracking random walk to improve the performance of existing community detection algorithms in these networks.