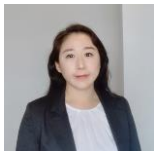
Graduate Opportunities in Safe Transportation and Resilient Systems

GAANN- GOSTARS Fellowship Project



Adviser: Jeong Eun Ahn, Ph.D.

Title: Increasing Flood Resilience of Transportation Systems

Description: Climate change is causing more intense and destructive storms and hurricanes as recorded during the past four decades. Frequent flooding, severe storm, and higher storm surge affect the performance of transportation systems; flooding impacts pavement performance and causes travel disruptions which could affect agriculture, manufacturing, and more. A graduate student fellow will be involved with one of projects described below which contribute to increasing flood resilience of transportation system.

Potential Topics

1. Development of a Model for Real-Time Flood Forecasting: this project will investigate the vulnerability of road to flood events using geospatial techniques, and then the team will develop a model for real-time flood forecasting.

Task1: Collect historical flood data and investigate vulnerable roadways to flood events using geospatial data
Task2: Develop a model for flood predictions based on existing hydrology and hydraulic models
Task3: Develop a model for real-time flood forecasting by applying real-time data

2. Development of a Model to Determine the Optimal Time to Reopen Roadways after Flooding Events: this project will investigate the flooded road and develop a model that determines the optimal time to reopen roadways.

Task1: Collect data (e.g., historical flood data, road data) and assess flood risk of transportation networks
Task2: Develop a model for flood predictions based on existing hydrology and hydraulic models
Task3: Develop a decision-making tool that determines the optimal time to reopen roadways, based on the time when floodwater recedes, road network analysis, critical infrastructure, and socio-economic factors

Impact on GAANN: Current emergency management guidance about road openings and closure heavily relies on historical experience rather than a data-driven approach. Either of the projects described above will develop the model. The model outputs support emergency operations decision-makers for better planning road openings and closures as well as for better emergency operations to reduce the risk of disruption of public services, which could have important societal benefits for disaster relief and recovery.

Impact on GOSTAR: Throughout a three-year project, the graduate student fellow can have responsible research training. They will publish technical papers in peer-reviewed journals and present in conferences (local, regional, national, and international levels). Besides, the graduate student fellow will practice and hone skills in grant writing and developing an inclusive curriculum. The fellow will have an opportunity to co-teach a class in either their 2nd or 3rd year of the program. With this great opportunity, the fellow could reach their potentials to become an excellent teacher and succeed in professional practice.

Tentative Plan

Semester	1	2	3	4	5	6	7	8	9
Task	Task 1			Task 2		Task 3			
Outcome	Assessment of vulnerable roads to floods			Model that predicts floods		Model for real-time forecasting or a decision-making tool			
Deliverable		Publish in conference and journal			Publish in conference and journal			Publish in conference and journal	
Graduation									Summer 2025