The main objective of my research is to develop physics-guided data-driven approaches for drive-by SHM that are scalable to a large stock of structures without requiring training data from every structure. My prior works on this topic have the following accomplishments: 1) Based on the physical understandings of vehicle-structure interaction systems, I have developed damage localization and quantification algorithms for drive-by SHM of bridges and an anomaly detection algorithm for railroad track geometry monitoring. I have published my work in top-tier conferences and journals in both civil and electrical engineering. 2) Collaborating with Port Authority of Allegheny County, I have conducted real-world deployments and multiple field experiments on a light rail system, including a 42.2-km railroad track and multiple bridges, to validate the robustness of my approaches with more complex and realistic infrastructure. I have published a comprehensive dataset collected from vehicles in this light rail system, which is the first open-access dataset for drive-by SHM.

HONORS AND AWARDS

- Leavell Fellowship on Sustainable Built Environment, Civil and Environmental Engineering, Stanford University (2020)
- Dean’s Fellowship, College of Engineering, Carnegie Mellon University (2018)

EDUCATION AND CERTIFICATIONS

- M.S., Carnegie Mellon University, Civil Engineering (2017)

Publications

PUBLICATIONS

- Diagnosis algorithms for indirect structural health monitoring of a bridge model via dimensionality reduction. MECHANICAL SYSTEMS AND SIGNAL PROCESSING
  Liu, J., Chen, S., Berges, M., Garrett, J. H., Kovacevic, J., Noh, H.
  2020; 136

- Dynamic responses, GPS positions and environmental conditions of two light rail vehicles in Pittsburgh. SCIENTIFIC DATA
  2019; 6: 146

- A Damage Localization and Quantification Algorithm for Indirect Structural Health Monitoring of Bridges Using Multi-Task Learning
  Liu, J., Berges, M., Bielak, J., Garrett, J. H., Kovacevic, J., Noh, H., Bond, L. J., Holland, S., Laflamme, S.
  AMER INST PHYSICS.2019

- Detecting Anomalies in Longitudinal Elevation of Track Geometry Using Train Dynamic Responses via a Variational Autoencoder
  SPIE-INT SOC OPTICAL ENGINEERING.2019