

UTC Project Information	
Project Title	Physics-Informed Machine Learning of Fluid-Structure Interaction for Bridge Safety and Reliability
University	Oregon State University
Principal Investigator	Michael Scott
PI Contact Information	michael.scott@oregonstate.edu
Funding Source(s) and Amounts Provided (by each agency or organization)	University of Washington PacTrans \$60,00 Oregon State University \$60,000
Total Project Cost	\$120,000
Agency ID or Contract Number	69A3551747110
Start and End Dates	March 16, 2022-June 30, 2023
Brief Description of Research Project	<p>For many coastal communities, bridges are the only regional transportation lifeline and are critical for the mobility of people, goods, and post-event response. To ensure reliable mobility after extreme events, it is necessary to understand, model, and design for bridge response under tsunami loading. Thus, simulating fluid-structure interaction (FSI) is essential to designing and retrofitting bridges for tsunami loads; however, simulation of FSI is computationally intense, involving both solid and fluid domains. While numerical methods for FSI and computing speed continually improve, more robust and faster computations are required to perform the parametric studies that shape modern bridge design codes for tsunami loading.</p> <p>The objective of this proposal is to use the FSI capabilities of the OpenSees finite element framework to develop a prototype ML algorithm for tsunami loading on bridge superstructures. To ensure robustness, the ML algorithm will be based on deep learning techniques using novel physics-informed neural networks. As the resulting input-output relationships from ML may not obey physical relationships, the learned models will be designed to retain the relevant physics of FSI, whereby momentum and mass balance are preserved throughout the training process by penalizing the learning process if the governing FSI equations are not satisfied.</p>

<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	
<p>Impacts/Benefits of Implementation (actual, or anticipated)</p>	
<p>Web Links</p> <ul style="list-style-type: none">• Reports• Project Website	