



Summer Program on Transportation Statistics August 14-18, 2017

Lecture: *Using Multifidelity Methods to Estimate the Risk Associated with Transportation Systems*

Speaker: Erik Schlicht

Abstract:

Multifidelity methods combine inexpensive low-fidelity simulations with costly but high-fidelity simulations to produce an accurate model of a system of interest at minimal cost. They have proven useful in modeling physical systems and have been applied to engineering problems such as wing-design optimization and robotics. This talk will overview recent efforts to extend multifidelity methods to estimate the risk associated with human-in-the-loop situations where humans are interfacing with technological systems, (e.g., aerospace and transportation). First, theoretical results will be presented that quantitatively evaluate different approaches to multifidelity modeling based on their predictive performance under different data conditions (Schlicht, et al, 2012). Then, the talk will provide a quantitative method for estimating the risk associated with candidate transportation technology, before it is developed and deployed (Schlicht & Morris, 2017). These empirical results utilize transportation data from low-fidelity simulation environments and high-fidelity sources. The multifidelity methods allow for candidate technologies to be evaluated at the stage of conception, and enables a mechanism for only the safest and most effective technology to be developed and released. Finally, the potential for using multifidelity models for other human-technology interactions will be discussed.

Schlicht, E.J., Lee, R., Kochenderfer, M.J., Wolpert, D., & Tracy, B. (2012). Predicting the behavior of interacting humans by fusing data from multiple sources. In the Proceedings of the 28th Conference on Uncertainty in Artificial Intelligence, (UAI-2012). <https://arxiv.org/abs/1408.2053>

Schlicht, E.J., & Morris, N.L. (2017). Estimating the risk associated with transportation technology using multifidelity simulation. Submitted to the International Conference on Machine Learning (ICML-2017). <https://arxiv.org/abs/1701.08588>