Statistics and Actuarial Science Seminar

Title: Bayesian Methods in Design and Decision-Making

Speaker: Anton van Beek (UCD)

Date: Thu 8th February 2024 at 3:00PM

Location: E0.32 (beside Pi restaurant)

Abstract: The design of systems can be viewed as a sequential decision-making process that involves reducing the uncertainty of the designed system while improving its utility. Specifically, decision-making is a process that involves the identification of the admissible space of actions, predicting the value of these actions (e.g., system performance), and then selecting the best action by maximizing the expected utility with respect to all sources of uncertainty. The systematic integration of data (e.g., physical experiments, computer simulations, and expert knowledge) into the design process can greatly improve the quality of the rendered decisions. However, data on these systems are often time and monetary exhaustive commodities to collect. Consequently, engineers often rely on Bayesian methods to systematically account for all sources of uncertainty while simultaneously benefiting from the available data to improve the fidelity of their predictive models. In this talk, we will provide an example of recent advancements in the use of Bayesian methods for the design of systems. Specifically, we will discuss parametric and semi-parametric methods for the calibration of degrading industrial equipment and force field calibration of coarse-grained epoxy models. In addition, we will talk about Bayesian optimization methods for heteroscedasticity noisy data sources that have been used for the design of an organic photovoltaic cell. The purpose of this talk is to give the audience an idea of the importance of Bayesian statistics in the academic field of design and to elucidate

potential future research directions.