



Statistics and Actuarial Science Seminar

Title: Generative Regression Models for Functional and Object Data

Speaker: Edward Gunning (UCC)

Date: Thu 15th October 2026 at 3:00PM

Location: N0.20 – Science North

Abstract: Classical multivariate statistical approaches often view each observation as a vector in Euclidean space. However, modern technologies enable the collection of data in which observations present as more general 'objects', e.g., curves, images, shapes, and networks. Functional data analysis (FDA) is a canonical example, where observations are measured over some continuum and are viewed as smooth, continuous functions rather than sequences of discrete measurements. Developments in functional and object data analysis extend classical multivariate techniques, e.g., for prediction, inference, visualisation and dimension reduction, to operate on more general objects.

In particular, regression methods allow the objects to be used as predictors, outcomes, or both. In this talk, I will present two of my research projects to exemplify the scope of functional and object regression. The first project extends methods for regressing objects on scalar predictors, using random effects to account for dependence structures. Our key contribution is to introduce general non-linear transformations of the objects that can be learned flexibly using modern deep learning methods, e.g., convolutional neural networks, to induce a generative non-linear model for them. In the second project, we develop and extend a framework for regressing a function's highest-order derivative on its lower-order derivatives, thereby estimating a differential equation

that describes the dynamic relations in the data. Again, we take a generative model viewpoint of this approach, and develop bespoke tools for estimation, inference and data generation.