THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON STATISTICS

Engression: Extrapolation for Nonlinear Regression?

By

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Abstract

Extrapolation is crucial in many statistical and machine learning applications, as it is common to encounter test data outside the training support. However, extrapolation is a considerable challenge for nonlinear models. Conventional models typically struggle in this regard: while tree ensembles provide a constant prediction beyond the support, neural network predictions tend to become uncontrollable. This work aims at providing a nonlinear regression methodology whose reliability does not break down immediately at the boundary of the training support. Our primary contribution is a new method called 'engression' which, at its core, is a distributional regression technique for pre-additive noise models, where the noise is added to the covariates before applying a nonlinear transformation. Our experimental results indicate that this model is typically suitable for many real data sets. We show that engression can successfully perform extrapolation under some assumptions such as a strictly monotone function class, whereas traditional regression approaches such as least-squares regression and quantile regression fall short under the same assumptions. We establish the advantages of engression over existing approaches in terms of extrapolation, showing that engression consistently provides a meaningful improvement. Our empirical results, from both simulated and real data, validate these findings, highlighting the effectiveness of the engression method.

Date : **16 October 2023 (Monday)**
Time : **3:00pm**
Zoom : **https://hkust.zoom.us/j/65066347357** **(Passcode: 263777)**

All are Welcome!