ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

Invitation to a Guest Lecture

Dr. Florian Frommlet

Med Uni Wien

"Flexible Bayesian Nonlinear Model Configuration"

N.1.44 | Friday, 28 October 2022 | 9:30 a.m.

Abstract

Regression models are used in a wide range of applications but simple nonlinear models are often not sufficient to describe complex relationships. For large data sets neural networks have become increasingly popular for prediction tasks, but they provide less interpretable models and suffer from potential overfitting. Alternatively nonlinear regression might be used, but correct specification of such models is in general difficult. Here we introduce a method to construct nonlinear parametric regression models. Nonlinear features are generated hierarchically, similarly to deep learning, but even slightly more general. This amount of flexibility is combined with Bayesian variable selection, where model priors are chosen to penalize the complexity of nonlinear features. As a consequence we end up with highly interpretable non-linear models selected from an extremely flexible model space. A genetically modified mode jumping Markov chain Monte Carlo algorithm is adopted to perform Bayesian inference and estimate model posterior probabilities. We illustrate in various applications that our algorithm is capable of delivering meaningful nonlinear models. Additionally, we compare its

predictive performance with several machine learning algorithms. Finally we hint at possible extensions for future work.

Gregor Kastner and the Department of Statistics look forward to seeing you at the talk!