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Title

Bayesian Neural Network Perspectives for Actuarial Science – Review and Motor Claims Analysis Case Study

Speaker/Company

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Abstract

Over the past decade, machine learning (ML) techniques have been widely applied to address various actuarial topics to the point of becoming the norm in some areas of the insurance value chain, such as pricing, reserving, or capital modeling. Regardless of successful implementations in terms of model performance, process automation, or ease of use, some issues remain, including: robustness, trust, continuity and optimality.

Consequences are mainly the absence of confidence value to provide valuable and nuanced decisions, the impossibility to detect adversarial data, the lack of interpretability, missing robustness in predictions through time and the limitation in algorithmic learning guidance, etc. Bayesian Neural Network (BNN), a hybrid of deep neural networks and probabilistic models provides an interesting framework to address such issues.

In this presentation we propose to introduce BNN techniques by listing pros and cons compared to classical ML, presenting different approximation inference methods (SGLD, MCD, Deep ensemble) and introducing uncertainty measures. To illustrate these aspects, we use BNN for serious physical injury claims analysis related to a French motor insurance portfolio. We highlight in particular BNN benefits and evaluation (uncertainty, error and correlation) for regression tasks, the analysis of out of distribution data and model drift. Finally, we discuss further applications in insurance : underwriting, reserving and pricing.

Biography

Aurelien Couloumy is Head of Digital Transformation at CCR Group. He started his career in Paris in 2012 as actuarial consultant at Optimind before moving in 2015 to Brussels, to work for Addactis as Head of Models, and for Reacfin in 2017 as Head of Data Science. Aurélien is a qualified member of the French Institute of Actuaries. He is also a Lecturer at ISFA, and a member of the SAF Laboratory, where he works on various teaching and research topics including machine learning techniques, natural language processing and image processing applied to insurance.

Akli Kais is a Machine Learning Engineer at CCR Group where he works primarily on building machine learning engines to support different company's core products. Before joining CCR Group, Akli obtained an MSc in econometrics and statistics, specializing in applying machine learning in the insurance industry. He started his career in Paris in 2017 as a fraud data scientist at Allianz before moving in 2018 to work as a data scientist consultant at KPMG France where he

successfully developed end-to-end machine learning solutions on real-world applications including insurance fraud detection, financial risk modeling and cybersecurity.