



Computational Intelligence (Impact factor: 1.196)

Special Issue on Explainable Machine Learning in Methodologies and Applications

Aim and Scope

Recent successes in machine learning, particularly deep learning, are reaching critical areas such as medicine, criminal justice systems, financial markets and many other real applications. These developments are increasingly being supported by predictive models involving neural networks, neuro-fuzzy systems, evolutionary methods, and ensembles of diverse approaches. From a mathematical point of view, the search of the model focuses on the minimization of a cost function or the maximization of a likelihood function. Thus, the performance of the model is measured almost exclusively on the results we can get according to some rightly chosen metrics. This tendency has led to more and more sophisticated algorithms to the cost of explainability (i.e. interpretability).

While these models may provide the state-of-the-art and impressive prediction accuracies, they usually offer little insight into the inner workings of the model and how a decision is made. The decision-makers cannot obtain human-intelligible explanations for the decisions of models, which impede the applications in mission-critical areas. This situation is even severely worse in complex data analytics. It is, therefore, imperative to develop explainable computation intelligent learning models with excellent predictive accuracy to provide safe, reliable, and scientific basis for determination.

Numerous recent works have presented various endeavors on this issue but left many important questions unresolved. The first challenging problem is how to construct self-explanatory models or how to improve the explicit understanding and explainability of a model without the loss of accuracy. In addition, high dimensional or ultra-high dimensional data are common in large and complex data analytics. In these cases, the construction of interpretable model becomes quite difficult and complex. Further, how to evaluate and quantify the explainability of a model is lack of consistent and clear description. Moreover, auditable, repeatable, and reliable process of the computational models is crucial to decision-makers. For example, decision-makers need explicit explanation and analysis of the intermediate features produced in a model, thus the interpretation of intermediate processes is requisite. Subsequently, the problem of efficient optimization exists in explainable computational intelligent models. These raise many essential issues on how to develop explainable data analytics in computational intelligence.

This special issue aims to bring together original research articles and review articles that will present the latest theoretical and technical advancements of machine and deep learning models. We hope that this Special Issue will: 1) improve the understanding and explainability of machine learning and deep neural networks; 2) enhance the mathematical foundation of

deep neural networks; and 3) increase the computational efficiency and stability of the machine and deep learning training process with new algorithms that will scale. Potential topics include but are not limited to the following:

- Interpretability of deep learning models
- Quantifying or visualizing the interpretability of deep neural networks
- Neural networks, fuzzy logic, and evolutionary based interpretable control systems
- Supervised, unsupervised, and reinforcement learning
- Extracting understanding from large-scale and heterogeneous data
- Dimensionality reduction of large scale and complex data and sparse modeling
- Stability improvement of deep neural network optimization
- Optimization methods for deep learning
- Privacy preserving machine learning (e.g., federated machine learning, learning over encrypted data)
- Novel deep learning approaches in the applications of image/signal processing, business intelligence, games, healthcare, bioinformatics, and security

Important Dates

- Deadline for Submissions: March 31, 2022
- First Review Decision: May 31, 2022
- Revisions Due: June 30, 2022
- Deadline for 2nd Review: July 31, 2022
- Final Decisions: August 31, 2022
- Final Manuscript: September 30, 2022

Lead Guest Editor

Dr. Nian Zhang, University of the District of Columbia, Washington, D.C., USA.
nzhang@udc.edu

Guest Editors

Dr. Jian Wang, Associate Professor, China University of Petroleum (East China), Qingdao, China. wangjianni@upc.edu.cn

Dr. Kay Chen Tan, Chair Professor, Hong Kong Polytechnic University, Kowloon, Hong Kong. kctan@comp.polyu.edu.hk

Dr. Leszek Rutkowski, Professor, Czestochowa University of Technology, Czestochowa, Poland. leszek.rutkowski@pcz.pl