

# Visual Analytics for Explainable Deep Neural Networks



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Classification is a fundamental problem in machine learning. In practice, interpretability is a desirable property of classification models (classifiers) in critical areas, such as security, medicine and finance. For instance, a quantitative trader may prefer a more interpretable model with less expected return due to its predictability and low risk. Unfortunately, the best-performing classifiers in many applications (e.g., deep neural networks) are complex machines whose predictions are difficult to explain. Thus, there is a growing interest in using visualization to understand, diagnose and explain intelligent systems in both academia and in industry. Many challenges need to be addressed in the formalization of explainability, and the design principles and evaluation of explainable intelligent systems. In this talk, I will first briefly introduce the concept and background of explainable classifiers. After that I will present three works done at HKUST which use visualization to help explain deep neural networks: 1) RNNVis, a visual analytics tool for understanding and comparing recurrent neural networks (RNNs) for text-based applications. 2) CNNComparator, a visual analytics method to compare two different snapshots of a trained CNN model taken after different numbers of epochs. 3) DeepTracker, a visual analytics solution to reveal the rich dynamics of CNN training processes and help machine learning experts better understand, debug, and optimize CNNs.

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Huamin Qu is a full professor in the Department of Computer Science and Engineering (CSE) at the Hong Kong University of Science and Technology and also the coordinator of the Human-Computer Interaction (HCI) group. He leads a 30-people team including 20 PhDs working on visualization and human-computer interaction, with focuses on urban informatics, social network analysis, e-learning, and explainable artificial intelligence. He has co-authored more than 100 refereed papers including more than 40 papers in the IEEE Transactions on Visualization and Computer Graphics (TVCG), making him one of the most productive researchers in the visualization field. His research has been recognized by many awards including 8 best paper/honorable mention awards, 2009 IBM Faculty Award, 2014 Higher Education Scientific and Technological Progress Award (Second Class) from the Ministry of Education of China, 2015 HKICT Best Innovation (Innovative Technology) Silver Award from the Hong Kong Institution of Engineers, 2015 APICTA Merit Award in E-Learning from the Asia Pacific ICT Alliance, and 2016 Distinguished Collaborator Award from Huawei Nah's Ark Lab. He obtained a BS in Mathematics from Xi'an Jiaotong University, China, an MS and a PhD (2004) in Computer Science from the Stony Brook University.

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