Online Adaptation for Big Streaming Data: From Machine Learning Techniques to Applications

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Among machine learning techniques for big data, feature selection as a dimensionality reduction method seeks a curated subset of available features such that they contain sufficient discriminative information for a given learning task. Online streaming feature selection (OSFS) further extends this to the streaming scenario where the model gets only a single pass at features, one at a time. While this problem setting allows for training high performance models with low computational and storage requirements, this setting also makes the assumption that there is a fixed number of samples, which is often invalidated in many real-world problems. In this talk, a new setting called Online Streaming Feature Selection with Streaming Samples (OSFS-SS) with a fixed class label space is considered, where both the features and the samples are simultaneously streamed. Furthermore, a novel algorithm, that has applications in both the OSFS and OSFS-SS settings, called Geometric Online Adaptation (GOA) is introduced. GOA technique uses a graph-based class conditional geometric dependency (CGD) criterion to measure feature relevance and maintain a minimal online adapted feature subset with relatively high classification performance. Several applications of the proposed GOA algorithm on video and image streaming real world datasets are presented by highlighting how in both the OSFS and OSFS-SS settings GOA approach achieves higher performance while maintaining smaller feature subsets than relevant baselines.

Dr. Salimeh Yasaei-Sekeh is an assistant professor of computer science at the School of Computing and Information Science at the University of Maine. Prior to UMaine, Salimeh was a postdoctoral research fellow in the Electrical Engineering and Computer Science Department at the University of Michigan, Ann Arbor. Before that, she was CAPES-PNPD funder postdoctoral fellow at the Federal University of Sao Carlos, Brazil, in 2014 and 2015. Salimeh was visiting scholar at Polytechnic University of Turin, Italy between 2011 and 2013. She received her Ph.D. in inferential Statistics from Ferdowsi University of Mashhad, Iran in 2013. Salimeh works in the area of Machine Learning and Data Science. Her research focuses on designing and analyzing machine learning algorithms, developing theory and algorithms for data analysis, deep learning techniques, applications of machine learning approaches in real-time problems, data mining, pattern recognition, and network structure learning with focus in biological applications.

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