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Lecture Topic 1: Ensemble deep random vector functional link for Alzheimer's disease diagnosis

Abstract: Deep random vector functional link (deep RVFL) and its ensembles are enabled to incorporate privileged information, however, the standard RVFL model and its deep models are unable to use privileged information. Privileged information-based approach commonly seen in human learning. To fill this gap, we incorporate learning using privileged information (LUPI) in a deep RVFL model and develop a deep RVFL with LUPI framework (dRVFL+). Privileged information is available while training the models. To make the model more robust, an ensemble deep RVFL+ with LUPI framework (edRVFL+) is developed. Unlike the traditional ensemble approach wherein multiple base learners are trained, the edRVFL+optimizes a single network and generates an ensemble via optimization at different levels of random projections of the data. Both dRVFL+ and edRVFL+ efficiently utilize the privileged information which results in better generalization performance. In the LUPI framework, half of the available features are used as normal features and the rest as the privileged features. In this talk, we will discuss some novel edRVFL+ based approaches which are employed for the diagnosis of Alzheimer's disease.

Lecture Topic 2: Large scale support vector machine algorithms and applications

Abstract: With the explosive growth in technology, the amount and the variety of data has grown tremendously leading to new challenges in classification scenarios. Support vector machine (SVM) algorithm is considered one of the most popular classification paradigms in machine learning owing to its strong mathematical background, and has lately faced criticism due to its limitations such as unscalability, high time complexity and sensitivity to feature and label noise. Over the past decade, several advancements have been made such as twin SVM and variants which led to significant improvements in terms of fast learning speed, ease of implementation and ability to capture diversity among classes. These models have attracted considerable research attention due to promising results shown in the various real-world applications including Image Retrieval, Computer Vision, Financial Regression, Biomedical Analysis etc. However, there have emerged new challenges along with the existing ones such as high dimensionality in kernel implementations, need for large training data and sensitivity to outliers. There is, thus, a need to improve upon these methods and devise new ones to tackle the limitations. In this talk, some novel large-scale twin SVM based algorithms will be discussed to overcome these shortcomings.

Lecture Topic 3: Graph embedded based randomized algorithms for class imbalance learning

Abstract: Randomized shallow/deep neural networks with closed form solutions avoid the shortcomings that exist in the back propagation (BP) based trained neural networks. Ensemble deep random vector functional link (edRVFL) networks utilize the strength of two growing fields, i.e., deep learning and ensemble learning. However, the edRVFL model doesn't consider the geometrical relationship of the data while calculating the final output parameters corresponding to each layer considered as base model. In the literature, graph embedded frameworks have been successfully used to describe the geometrical relationship within data. In this talk, we discuss the recent developments of the graph embedded approach for RVFL, deep RVFL and edRVFL and applications to the diagnosis of Alzheimer’s disease. Furthermore, the domain of machine learning is confronted with a crucial research area known as class imbalance learning, which presents considerable hurdles in the precise classification of minority classes. This issue can result in biased models where the majority class takes precedence in the training process, leading to the underrepresentation

of the minority class. The recent developments based on graph embedded RVFL techniques will be explored with promising solutions for handling class imbalance data that has the potential to be applied to other classification problems.