First Seminar talk

Title: **Improvement of Multi-Class Classifier Performance using Randomized decision rule and Feature Selection using Evolutionary Optimization**

Abstract:

In various domains such as decision support systems and game prediction in sports, traditional multi-class classifiers constructed using algorithms like Artificial Neural Networks and Support Vector Machines often exhibit subpar performance in terms of achieving reasonable detection rates. This research addresses this issue by treating poorly performing multi-class classifiers as discrete memoryless channel models with known transition probabilities (channel matrix) but unknown priors. A novel approach is proposed utilizing an M-ary Mini-Max technique-based randomized decision rule to enhance the classification accuracy of the multi-class classifier. The prior probabilities and probabilities associated with the M-ary randomized decision rule are determined using particle swarm optimization algorithm. The experimental results, obtained through Monte Carlo simulations using synthetic and real datasets, demonstrate consistent improvement in the performance of the poorly performing classifier using the proposed technique.

Additionally, feature selection plays a vital role in pattern recognition and machine learning applications. It involves reducing the number of features required to describe a large dataset. Irrelevant or redundant features can negatively impact the performance of classification algorithms. The goal of feature selection is to choose a small, relevant subset of features that maintains or enhances the classification algorithm's performance. However, selecting the best subset of features poses a challenge due to the vast search space involved. This task is treated as an optimization problem, aiming to identify the optimal feature subset that improves algorithm performance.

To address this, a binary version of the Social Emotional Optimization Algorithm (BSEOA) is proposed for feature selection in classification problems. The algorithm is evaluated on benchmark datasets using Support Vector Machines (SVM) as the classifier. Furthermore, the algorithm is applied to select features for vocal segmentation in collected songs. Vocal segmentation involves classifying vocal and non-vocal segments of a song. Experimental results demonstrate that the proposed binary SEOA is effective in improving classification accuracy by selecting an optimal set of features.

By employing optimization techniques in both the improvement of multi-class classifier performance and feature selection, this research offers valuable insights into enhancing the accuracy and efficiency of classification algorithms in various application domains.

Publications:

1. Rajasekharreddy Poreddy and E S Gopi, “Improvement of accuracy of under-performing classifier in decision making using discrete memoryless channel model and Particle Swarm Optimization”, Expert Systems with Applications, Elsevier, Volume 213, Part A, 2023, ISSN: 0957-4174 doi: 10.1016/j.eswa.2022.118929.Link
2. P. Rajasekharreddy, E.S. Gopi, Feature selection for vocal segmentation using social emotional optimization algorithm, in Socio-cultural Inspired Metaheuristics, Vol. 828 of Studies in Computational Intelligence, Springer Verlag, Singapore, 2019, pp. 69–91, Series ISSN: 1860-949X doi: 10.1007/978-981-13-6569-0_4. Link