

## **Second Seminar talk**

**Title: Data-driven approximation of Cumulative Distribution Function using Particle Swarm Optimization based Finite Mixtures of Logistic Distribution.**

### **Abstract:**

Most density estimation techniques attempt to approximate the Probability Density Function (PDF), which is then summed or integrated to yield the Cumulative Distribution Function (CDF). As a result, in most cases, a closed-form expression for the CDF cannot be obtained. This research addresses this issue by a data-driven approximation of the Cumulative Distribution Function using the Finite Mixtures of the Cumulative Distribution Function of Logistic distribution. It is not possible to solve the logistic mixture model using the Maximum likelihood method, hence the mixture model is modelled to approximate the empirical cumulative distribution function using the computational intelligence algorithms. The Probability Density Function is obtained by differentiating the estimate of the Cumulative Distribution Function. The proposed technique estimates the Cumulative Distribution Function of different benchmark distributions.

The performance of the proposed technique is compared with the state-of-the-art kernel density estimator and the Gaussian Mixture Model. Experimental results on  $\kappa$ - $\mu$  distribution show that the proposed technique performs equally well in estimating the probability density function. In contrast, the proposed technique outperforms in estimating the cumulative distribution function. Also, it is evident that the proposed technique outperforms the state-of-the-art Gaussian Mixture model and kernel density estimation techniques with less training data.

### **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, doi: 10.1016/j.eswa.2022.118929.
2. P Rajasekharreddy and E.S. Gopi, "Data-driven approximation of Cumulative Distribution Function using Particle Swarm Optimization based Finite Mixtures of Logistic Distribution", *International Journal of Intelligent Systems and Applications*, MECS Press (Accepted). Link: <https://www.mecs-press.org/ijisa/>
3. 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, doi: 10.1007/978-981-13-6569-0\_4.

### **Works under Review:**

1. Particle Swarm Optimization for Gaussian-Distributed Neural Network Weights with Half-Cauchy Variance, *Cybernetics and Systems*, Taylor and Francis.
2. Dimension estimation from the color images using Generative Adversarial Network and Convolutional Autoencoder, *Applied Artificial Intelligence*, Taylor and Francis.