Title: **Fast Convergence of Decentralized FedAvg in the Interpolation Regime**

Speaker: **Dr. B. N. Bharath (Indian Institute of Technology Dharwad)**

Abstract: This talk focuses on answering theoretical questions related to solving Federated Learning (FL) problems using a well known algorithm called Federated Average (FedAvg). FL is a distributed learning paradigm where multiple clients each having access to a local dataset collaborate with a server to solve a joint problem. The FedAvg algorithm is characterized by partial client participation and local updates at each client. Regardless of its popularity, the performance of FedAvg is not very well understood, especially in the interpolation regime, a common phenomenon observed in modern overparameterized neural networks such as deep neural networks. This talk addresses this challenge by performing a rigorous theoretical analysis of FedAvg for a class of non-convex functions satisfying the Polyak-Łojasiewicz (PL) inequality, a condition satisfied by overparameterized neural networks. For the first time, we establish that FedAvg with partial client participation achieves a linear convergence rate of O(log(1/ε)), where \epsilon is the solution accuracy. A decentralized version of this problem will also be discussed. Experiments on multiple real datasets corroborate our theoretical findings. If time permits, generealization capabilities of the FedAvg algorithm will be discussed.

This talk is mostly based on the extended version of the following publication:

Shruti M., Prashant Khanduri and **B. N. Bharath**, "**FedAvg for Minimizing Polyak-Lojasiewicz Objectives: The Interpolation Regime**", accepted at **Asilomar** Conference on Signals, Systems, and Computers, 2023. **(Best Student Paper Award finalist)**

Bio: B. N. Bharath completed his B.E. degree in Electrical and electronics from B. M. S. college of engineering, Bengaluru in 2005, and a direct Ph.D from the ECE Dept. of IISc, Bangalore in 2013. After completion of his Ph.D, he worked at Qualcomm Inc, Bangalore from 2013 July to 2014 August as a senior engineer. From, 2014 to

2017, he worked at PESIT Banglare south campus as a faculty. Since 2017, he has been working as an assistant professor in the Department of Electrical, Electronics and Communication engineering at IIT Dharwad. His research interests are in the broad area of Machine learning, distributed optimization, federated learning, and wireless communication/networks.