

# SAWAN SINGH MAHARA

## M.S Researcher

📧 sawansinghmahara.github.io    ✉ sawan.mahara.19@iitdh.ac.in  
in sawan-singh-mahara-592598136    🌐 github.com/SmellingSalt

☎ +91 9113093431

📍 Bangalore / Dharwad, India

## EDUCATION

### M.S by Research in Electrical Engineering Indian Institute of Technology Dharwad

📅 2019 - Ongoing    📍 Dharwad, India

Communication Efficient Federated Learning.  
Thesis supervisor Dr. Bharath B.N

### B.E in Electronics and Communication Engineering

#### PESIT-Bangalore South Campus

📅 2014 - 2018    📍 Bangalore, India

## SOFTWARE SKILLS

Python, MATLAB



C, Excel, Tensorflow



## INTERESTS

Probability and Random Processes

Machine Learning

Federated Learning

NVIDIA DeepStream

Edge Computing

Reinforcement Learning

Deep Learning

High Performance Computing

Information Theory

Wireless Communication

## COURSES

Probability and Random Processes (Grad)

Statistical Pattern Recognition

Wireless Communication

Linear Algebra (Grad)

## TA WORK

Probability and Random Processes (Grad)

Convex Optimisation

Wireless Communication

Control Systems

## RESEARCH WORK

### NVIDIA Jetson and Federated Learning Ongoing Work

📅 2021

📍 IIT Dharwad

The aim is to network NVIDIA Jetson Nano devices to coordinate and emulate federated edge learning scenarios. The scenarios being looked into are distributed object tracking and detection. Using transfer learning, pre-trained object detection/tracking models are being adapted to work on custom data implemented with the NVIDIA DeepStream SDK. Future plans involve coordinating training on the institute NVIDIA DGXA100 and creating docker containers to ease deployability on any Jetson Nanos or other similar edge devices.

### Multi-task Federated Edge Learning (Mt- Feel) With SignSGD

#### ISIT (International Symposium on Information Theory)

📅 2021

📍 Melbourne, Victoria, Australia

The area of Federated Learning aims to perform machine learning using devices in a network, with data spread (federated) across them. We proposed a federated learning algorithm which reduced communication overhead between devices. Work was done to prove the convergence of the algorithm as well.

Collaborators: Shruti M. and Dr. Bharath B.N

### Multi-task Federated Edge Learning (Mt- Feel) With SignSGD in a Rayleigh Fading Channel

#### IEEE Transactions on Communications

📅 2021

An extension of *Multi-task Federated Edge Learning (MtFeel) With SignSGD* considering a Rayleigh fading wireless channel between the main server and the nodes. An analysis of the convergence rate of the proposed algorithm when the signed gradient vector was corrupted was done, and experimentally verified as well.

Collaborators: Shruti M. and Dr. Bharath B.N

## PROJECT WORK

### Radar Based Projects

#### Internship

📅 2020

📍 Euprime, Bangalore

Created scripts, documented the setup of the hardware for classified projects in signal processing at the company.

## PROJECT WORK (CONT.)

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### Human Activity Recognition Using Wi-Fi Channel State Information

#### Summer Internship Project

📅 2019

📍 IIT Dharwad

Various human actions like running, walking, standing up, etc were classified using the channel state information of commercial wireless networking equipment.

An Inflated 3D Convolutional Neural Network was used for classification.

Collaborated with Dr. Bharath B.N

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### 5G mm-Wave End to End Backhaul Communication System

#### Summer Internship Project (MMRFIC)

📅 2019

📍 IIT Dharwad

Worked on the initial design and development of an end to end 5G mm-Wave backhaul network.

Specifically, the block level design of the system and the packet frame structure design.

Collaborated with Dr. Bharath B.N and Dr. Naveen M.B

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### Offline SSVEP Classification using Riemann Geometry

#### B.E. Final Year Project

📅 2018

📍 PESIT-Bangalore South Campus

A brain computer interfacing project work that deals in classifying EEG signals of people under an SSVEP (Steady State Visually Evoked Potential) state. The objective of the project was to construct a classifier in MATLAB that could extract windows of data from a stored EEG stream and classify them as an SSVEP state or not, using a Riemann distance metric as the crux of the implementation.

## EXTRA COURSE WORK

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### Deep Learning:

An introductory NPTEL course on Deep Learning and Machine Learning.

The general framework of implementing learning algorithms, PCA, auto-encoders, adaptive gradient descent were some of the topics discussed.

**Credential ID:** NPTEL18CS41S11151613

### Applied Optimization for Wireless, Machine Learning, Big Data:

An NPTEL course laying down the fundamentals of general optimisation techniques used in various MIMO systems.

Convex set theory, beamforming fundamentals, compressive sensing were some of the topics discussed.

**Credential ID:** NPTEL18EE31S21151415

### Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning:

Detailing the implementation of Tensorflow.

**Credentials:** Credential Link