Ritesh Chowdhry

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EDUCATION

Ph.D. in Electrical and Computer Engineering   **Aug. 2021 - Present**
University of Florida
Thesis topic: Semi-Supervised Classification of Hyperspectral Images

M.S. in Electrical and Computer Engineering   **Aug. 2019 - Aug. 2021**
University of Florida

B.S. in Electronics and Communication   **Aug. 2014 - Aug. 2018**
Kurukshetra University

SKILLS

- **Languages:** Python, C++, SQL
- **Tools:** PyTorch, TensorFlow, Slurm, Linux, ROS, Git, Comet, Wandb, Jupyter Notebooks
- **Hardware:** HPC, LiDAR, Raspberry Pi, Jetson Nano, Bluetooth/Wi-Fi/GSM modules, ultrasonic, infrared and moisture sensors.

RESEARCH EXPERIENCE

Tree Species Classification using Hyperspectral Imagery   **Aug. 2021 - Present**
Doctoral Student Researcher   *Gainesville, FL*
University of Florida, Machine Learning and Sensing Lab

- Developed a **semi-supervised classification** approach based on pseudo-labeling to utilize a significant amount of unlabeled data (from NEON) containing hyperspectral images of tree crowns created using Deepforest.
- Leveraged statistical analysis techniques, such as pixel average and covariance calculations, to derive valuable insights into the differences in hyperspectral signatures across different tree species. The analysis included data from various North American forest sites starting from the year 2018.
- Employed an ecology-informed hierarchical spectral-spatial attention network to enable hyperspectral image classification of tree species, leading to a marked improvement in classification accuracy.

Signals in the Soil Analysis using Hyperspectral Imagery   **Aug. 2021 - Present**
Doctoral Student Researcher   *Gainesville, FL*
University of Florida, Machine Learning and Sensing Lab

- Compiled a comprehensive dataset of hyperspectral images of plant roots, spanning multiple species, within minirhizotron boxes, for rigorous plant physiology research.
- Developed a two-stage regression model using ResNet architecture to predict water potential/content, a key plant physiology trait.
- Implemented an efficient **semantic segmentation pipeline** for root and soil segmentation in various plant species. Incorporated **active learning** methods to augment the dataset and enhance model performance. Utilized a pre-trained Unet model trained on the PRMI dataset) and also evaluated conventional hyperspectral unmixing algorithms to segment roots from soil using spectral information.

Traffic Noise Analysis (UF Research AI catalyst fund)   **Jan. 2021 - Aug. 2021**
Graduate Research Assistant   *Gainesville, FL*
University of Florida, EAAR Lab

- Conducted comprehensive traffic noise analysis by designing and assembling two weather-resistant, real-time environmental noise recording kits, employing a Raspberry Pi, network module, and 1/2" prepolarized free-field condenser microphone.
- Collaborated with the City of Gainesville to extract traffic information from video feeds of two intersections. Leveraged this data to create a baseline **regression model** for real-time noise prediction, utilizing traffic data from the video feeds as feature vectors.

F1-tenth self driving car (based on UPenn F1tenth project)   **Sept. 2019 - Dec. 2020**
Student Researcher   *Gainesville, FL*
University of Florida, F1-tenth Lab

- Implemented and designed self-driving algorithms like wall following, mapping & localization, path planning using SLAM for a one-tenth model of an F1 car using a LIDAR and camera.
- Used ROS on a Linux system on an NVIDIA Jetson TX-2 (as SOC Board) for running LIDAR and stereo cameras.

KEY PROJECTS, PUBLICATIONS & POSTERS

- **Automatic Number Plate Recognition (ANPR):** Created Indian ANPR that classifies vehicle, plate type (back/front) and characters using single model and works at 25 fps. The data and code were made public to facilitate future research. [arXiv: 2111.06054]
- **Multistream Architecture for Repetetive Action Counting:** Created a multi-stream architecture, utilizing RGB (using MoviNets backbone) and pose estimation (poses extracted using YOLOv7) techniques to accurately count the number of repetitions performed during exercise routines, as well as to effectively classify the specific exercises being executed.
- NSF Signals in the Soils Annual Workshop, 2022: Hyperspectral Signals in the Soil Poster, **R. Chowdhry**, A. Zare.

AWARDS & ACHIEVEMENTS

- Artificial Intelligence Research Catalyst Fund - UF Research (Graduate Assistantship)   *Jan. 2021*
- Reached the final round of Smart India Hackathon Hardware edition   *2018*

TEACHING & OUTREACH ACTIVITIES

Supervised Teaching in ECE Department at the University of Florida   **Aug. 2021 - Dec. 2021**
Supervised Teacher, EEL 5840/4930 Fundamentals of Machine Learning

- Delivered a lecture on Introduction to PyTorch to 175 students
- Designed and graded course assignments and projects and held weekly office hours

Instructor in UF CPET Precollege Scholars program   **July 2022**
Instructor, Survey of Machine Learning

- Designed and taught an introductory level course for high-school students.
- Created interactive notebooks to explain regression, image processing and image classification concepts.