Ritesh Chowdhry

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EDUCATION

Ph.D. in Electrical and Computer Engineering **Aug. 2021 - Present**
University of Florida, GPA: 3.73/4.0
Thesis topic: Semi-Supervised Classification of Hyperspectral Images Using Co-Training

M.S. in Electrical and Computer Engineering **Aug. 2019 - Aug. 2021**
University of Florida, GPA: 3.8/4.0

SKILLS

- **Programming Languages and Libraries:** Python, C/C++, SQL, Latex, Shell, SciPy, OpenCV
- **Frameworks and Tools:** PyTorch, Lightning, Tensorflow, Slurm, Linux, ROS, Git, SLAM, AWS, GCP
- **Domain Skills:** Computer Vision, Machine Learning, Self-Supervised Learning, Remote Sensing, Transformers

RESEARCH EXPERIENCE

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

- Researching a **multi-modal** Contrastive Learning approach using **transformers** with region encoding to leverage cross-site similarities between tree species. Implementing text-supervised training with noisy multi-label ground truth in a CLIP-like framework.
- Developed a self-supervised Stacked Auto-Encoder for hyperspectral pixel **representation learning** (360 bands), achieving 15% improvement in overall F1 score over supervised learning on an imbalanced dataset (1:110 ratio).
- Designed a semi-supervised framework based on multiview co-training integrating SAE-based spectral classifier with a CNN classifier for RGB, utilizing 2M unlabeled samples from NEON. Increased overall accuracy by 8% compared to supervised baselines.

Hyperspectral Image Analysis for Soil Water Content Prediction in Plant Root Systems

- Led the creation of the first publicly available dataset of temporal RGB and hyperspectral imagery from rhizoboxes, capturing plant growth over two months. Developed and implemented a **UNet**-based semantic segmentation model for root-soil separation, enabling precise dataset labeling. HyperPRI Dataset.
- Engineered a soil water content prediction pipeline using hyperspectral data, achieving high pixel-wise estimation accuracy. Used k-means clustering to isolate soil pixels, followed by regression to estimate moisture content.

USDA Appalachian Fruit Research **June 2023 - Aug. 2023**
Machine Learning Intern *Kearneysville, WV (Remote)*
Segmentation Of Leafless Trees From Non-Tree Regions Using Deep Learning

- Developed UNET-based semantic segmentation model for apple tree detection by employing **active learning** for dataset annotation, and implementing connected component analysis and morphological operations for post-processing optimization to automate orchard tasks like tree counting.

F1-Tenth Autonomous Driving Research **Sept. 2019 - Dec. 2020**
Student Researcher *Gainesville, FL*
University of Florida, F1-tenth Lab

- Developed and implemented **autonomous navigation** algorithms including wall-following, mapping & localization, and **SLAM**-based path planning for a one-tenth scale F1 vehicle using **LIDAR** and camera inputs.
- Configured a **ROS**-based system on an NVIDIA Jetson TX2 (Linux) to integrate data from LIDAR and **stereo cameras**, enhancing real-time perception and control.

PUBLICATIONS

- Chang, S. J., **Chowdhry, R.**, Song, Y., ... & Zare, A. (2024). HyperPRI: A dataset of hyperspectral images for underground plant root study. Computers and Electronics in Agriculture, 225, 109307.