

Dhiraj Srivastava

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Education

Virginia Tech

Master of Engineering in Computer Science; GPA: 3.81/4

Blacksburg, VA

January 2021 - May 2023

Virginia Tech

Master of Science in Life Science; GPA: 3.95/4

Blacksburg, VA

January 2021 - May 2023

Indian Institute of Technology (BHU) Varanasi

Bachelor of Technology in Mechanical Engineering; CGPA: 8.31/10

Varanasi, India

July 2016 - July 2020

RESEARCH INTERNSHIP EXPERIENCE

USDA-ARS Graduate Summer Research Intern

High Performance Computing Collaboratory at MSU

June 2022-August 2022

Starkville, Mississippi, United States

- Enhancing Sustainable Weed Management in Turf. This project involves developing deep learning-based segmentation and robust weed classification models, which would be deployed on a ground robot to recognize the locations of weeds. The ultimate goal is to automate the process of spot spraying by integrating the weed classification deep learning model to revolutionize weed management in the turf.
- Neural Network-based High Throughput Field Phenotyping of Horticultural Crops using Hyperspectral UAV Imagery. This project involves neural network based modeling of biophysical parameters such as chlorophyll(Chl-a) content, stem water potential (SWP) from in-situ data and hyperspectral UAV data and monitor them for water stress. Tomato Chl-a and SWP was modelled with an R^2 of 0.90 and 0.94 respectively, and RMSE of 0.45 mg/m³ and 0.03 bar respectively. Melon Chl-a and SWP was modelled with an R^2 of 0.97 and 0.94 respectively, and RMSE of 0.86 mg/m³ and 0.01 bar respectively.
- Assessment of Suitable Vegetation Indices Calculated from Remote and Proximal Sensing to Discriminate Irrigation Treatments. This EU project DATI is aimed to design and develop new Digital Agriculture (DA) technological solutions and procedures for crop and soil monitoring with the purpose of optimizing irrigation management by improving irrigation equipment at the farm scale and scheduling water release according to crop needs. The goal of this work was to identify the most suitable vegetation index (VI) calculated from different remote and proximal sensing and ground soil measurements to discriminate irrigation treatments. Two approaches 1) Analysis of variance and post hoc Tukey tests 2) permutation importance on trained classification deep neural network were implemented to find the most suitable vegetable indices.

Visiting Student Researcher

University of Leicester, England

May 2019 - August 2019

Leicester, United Kingdom

- Proposed a convolutional neural network (CNN) model with Bayesian Optimization to detect cerebral micro-bleeds in the cerebrum of brain achieving an accuracy: 98.97%, sensitivity: 99.66%, specificity: 98.14%, and precision: 98.54%. This model outperformed the state-of-the-art methods.
- Developed a small and low-latency Transfer Learning model on pre-trained MobileNet structure to build pathological brain detection system for mobile and embedded vision applications achieving an accuracy of 92%.
- Developed a CNN model to predict the age of human from samples of 3-D brain MRI images.

PROFESSIONAL EXPERIENCE

Graduate Research Assistant

Eastern Shore of Agricultural Research and Extension Centre, Virginia Tech

January 2021- Present

Painter, VA, United States

- Developing deep learning model to identify common ragweed in soybean farm using DJI M300 drone aerial images to create weed map by implementing image classification, object detection and image segmentation techniques. Precision and recall of common ragweed identification achieved are 84% and 92%, respectively. Proposed new CNN architecture that outperformed state-of-art transfer learning Big Transfer model(BiT) by more than 40% in validation accuracy.
- Built high-performing and efficient computer vision model to identify Italian Ryegrass in grain crop production system. Model scores better than the topmost performers. Achieved the precision and recall of Italian Ryegrass 100% and 97.5% respectively.
- Conducted experiments of spot spray herbicide applications in soybean and broadcast applications in cotton, corn and wheat using Unmanned Aerial System. Achieved 70-100% control of weeds.

Data Scientist

EXL Service

September- December 2020

Gurgaon, India

- Designed and built python based solution using NumPy and Pandas for web scraping the data of NBA, NFL and MLB tournaments.
- Demonstrated data insights using data visualization techniques and received appreciation from client and EXL.

Deep Learning Researcher

Augmenify Infotech Pvt Ltd

June- September 2020

Ahmedabad, India

- Built deep learning based Optical Character Recognition (OCR) system for Indian Government issued ID cards. Proposed model assisted the firm to raise revenue of \$30000 from clients.

PUBLICATIONS

- Dhiraj Srivastava, Alessandro Matese, Chintan B. Maniyar, Piero Toscano, Salvatore Filippo Di Gennaro, Assessment of suitable vegetation indices calculated from remote and proximal sensing to discriminate irrigation treatments. (Under Review EU Precision Agriculture Conference 2022)
- Dhiraj Srivastava, Chintan B. Maniyar, Sathish Samiappan, Joby Czarnecki, Jay McCurdy, Amy Wilber, Deep learning approach for remote sensing of turf weeds using visible spectrum imagery. (Manuscript Ready for Submission)
- Dhiraj Srivastava, Vijay Singh, Michael Flessner, Kevin Kochersberger, Song Li, Integration of Unmanned Aerial System and machine learning for weed detection in row-crops. (Manuscript under Preparation)
- Dhiraj Srivastava, Vijay Singh, Vipin Kumar. Italian Ryegrass detection in wheat using machine learning approach. (Manuscript under Preparation)
- Chintan B. Maniyar, Dhiraj Srivastava, Salvatore F. Di Gennaro, Silvia Baronti, Francesca Ugolini, Piero Toscano, Andrea Berton, Sathish Samiappan, Alessandro Matese, Neural Network-based High Throughput Field Phenotyping of Horticultural Crops using Hyperspectral UAV Imagery. (Under Review Agriculture MDPI)
- Vipin Kumar, Dhiraj Srivastava, Vijay Singh. Use of unmanned aerial system for herbicide spray applications. (Manuscript under Preparation)
- doi.org/10.1007/s00138-020-01087-0. Piyush Doke, Dhiraj Srivastava, Eugene Yu-Dong Zhang, Using CNN with Bayesian optimization to identify cerebral micro-bleeds. Machine Vision and Applications 31, 36 (2020)

GRANT WRITING EXPERIENCE

Submitted 2022 Graduate Student Grant proposal for **Southern Sustainable Agriculture Research and Education (SARE)**. Project title: Integrating Unmanned Aerial System and Machine Learning for Cover Crop Biomass Estimation.

POSTER PRESENTATIONS

- **Envisioning 2050 in the Southeast: AI-Driven Innovations in the Agriculture Conference 2022 :** Dhiraj Srivastava, Vijay Singh, Steven Mirsky, 2022. Integration of Unmanned Aerial System and Machine Learning Approaches for Identifying Common ragweed in row-crops. Won **best research award and a prize money \$2000** at conference organized by United States Department of Agriculture.
- **Southern Weed Science Society (SWSS) Conference 2022:** Dhiraj Srivastava, Michael Flessner and Vijay Singh, 2022. A Deep Learning approach for detecting common ragweed in soybean using unmanned aerial system. Won **first place award** in poster presentation.
- **Southern Weed Science Society (SWSS) Conference 2022:** Vipin Kumar, Dhiraj Srivastava and Vijay Singh, 2022. Use of unmanned aerial system for herbicide spray applications. Won **second place award** in poster presentation.
- **Weed Science Society of America (WSSA) Conference 2022:** Dhiraj Srivastava, Michael Flessner, Vijay Singh, Kevin Kochersberger and John McGee, 2022. Integration of unmanned aerial system and machine learning for weed mapping operations.
- **SPES Symposium Conference 2021, Virginia Tech:** Dhiraj Srivastava and Vijay Singh, 2021. Crop and Weed identification using Deep Learning.
- **Eastern Shore AREC Field day 2021, Virginia Tech:** Dhiraj Srivastava and Vijay Singh, 2021. Italian Ryegrass detection in wheat using Machine Learning approach.

HONORS and AWARDS

- **Envisioning 2050 in the Southeast:AI-Driven Innovations in the Agriculture Conference 2022:** Won best research award and a prize money \$2000 at conference organized by United States Department of Agriculture.
- **75th Annual Southern Weed Science Society (SWSS) of America Conference 2022:** Won first place award in poster presentation.
- Recipient of **Kriton Hatzios Weed Scholarship** by the School of Plant and Environmental Sciences, Virginia Tech
- Recipient of **Panasonic Ratti Chhatr Scholarship 2016** to pursue undergraduate at IIT (BHU) Varanasi

INVITED TALKS, SERVICE, and INVOLVEMENT

- Gave a talk in a training workshop organized by Virginia Cooperative Extension for extension agents and farmers on topic Unmanned Aerial System based remote sensing and its applications in precision agriculture. February 2, 2022
- Organizing and leading a weed science research team at Eastern Shore AREC, Virginia Tech to build deep learning technologies for weed mapping operations. January 2021- present
- Contributing to establish a new graduate student organization of Centre for Advanced Innovation in Agriculture (CAIA) at Virginia Tech. Secretary of CAIA graduate-affiliation. September 2021- present
- Senator in Graduate and Professional Student Senate (GPSS) Virginia Tech, January 2021-present.
- Professional Development Chair of Graduate Student Organization School of Plant and Environmental Sciences, January 2021- May 2021.

MACHINE LEARNING HACKATHONS

- Fraud Insurance Claims Detection. Qualified in Top-6 out of 700 participants for national final round in EXL EQ 2019 competition and received full time job offer by EXL. Proposed machine learning based methodologies to minimize the insurance industry loss due to fraud claims along with minimizing False Negatives.
- GE Healthcare Precision Hackathon Challenge 2020. Qualified in Top-10 out of 92 teams for national finals. Designed the computer vision model to solve case challenge Revolutionising Healthcare with AI and analytics.
- Flipkart Online Machine Learning Challenge 2019. Qualified level-2 round.
- Predicting the Productive Potential of a Natural Gas Resource using Machine Learning. Hackathon organised by Weatherford International plc. Implemented Principal Component Analysis and K-Means unsupervised machine learning algorithm to identify the potential regions of coal using data in the form of geophysical well logs obtained from boreholes.

SKILLS

Programming Languages & Libraries: Python, C++, R, SQL, NumPy, Pandas, Scikit-learn, OpenCV

Software: Pix4D, QGIS, Accustain, JMP, VGG Image Annotator(VIA), Labelme, LabelImg, ArcGIS

Frameworks: Keras, Tensorflow, PyTorch

Areas of Interest: Computer Vision, Science-guided Machine Learning

Behavioral Skills: Conduct and analyze experiments, Designing performance metrics and evaluating metrics, strong communication & collaboration skills