

Dhiraj Srivastava

[Personal Website](#) | [LinkedIn](#) | [Twitter](#)

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 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-crop map by implementing image classification, object detection, and image segmentation techniques. Annotated 12000 images for training object detection models. Proposed new CNN architecture that outperformed state-of-art transfer learning Big Transfer model(BiT) by more than 40% in validation accuracy. Precision and recall of common ragweed identification achieved are 84% and 92%, respectively.
- 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.
- Developing deep learning model to identify palmer amaranth in soybean using aerial images. Collected and labeled more than 10,000 aerial images of palmer amaranth for building object detection models.
- 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.

USDA-ARS Graduate Summer Research Intern

High Performance Computing Collaboratory at MSU

June 2022-August 2022

Starkville, Mississippi, United States

- Developed classification and object detection models to detect weeds in turf. Based on the tradeoff between accuracy, speed, and robustness in complex environments, YOLOv6s was the best model of mAP 0.921 at IoU 0.5 with average inference speed 6.75 ms to be deployed for real-time turf weed detection operations.
- Developed the robust neural network architecture to estimate chlorophyll (Chl) and stem water potential(SWP) in horticultural crops tomato and watermelon using hyperspectral UAV data. Neural network modeled Tomato Chl and SWP 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 and SWP was modeled with an R^2 of 0.97 and 0.94 respectively, and RMSE of 0.86 mg/m³ and 0.01 bar respectively.
- Identifying the most suitable vegetation index calculated from different remote and proximal sensing and ground soil measurements to discriminate irrigation treatments using deep learning approach. SHAP (SHapley Additive exPlanations) and permutation importance were implemented on trained classification networks to extract important features.

Visiting Student Research Intern

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%.

Undergraduate Research Thesis

IIT (BHU) Varanasi

January 2019 - December 2019

Varanasi, India

- Successfully designed a convolutional neural network-based system for conditional health monitoring of the gearbox using vibrational signal frequencies.

PROFESSIONAL EXPERIENCE

Data Scientist

September- December 2020

EXL Service

Gurgaon, India

- Designed and built python based solution using NumPy and Pandas for web scraping the data of NBA, NFL and MLB tournaments.

Deep Learning Researcher

June- September 2020

Augmenify Infotech Pvt Ltd

Ahmedabad, India

- Built deep learning based Optical Character Recognition (OCR) system for Indian Government issued ID cards. Proposed model assisted the firm to raising the funds for INR 30 Lakh (\$30000) from clients.

PUBLICATIONS

*Equal Contribution

- Alessandro Matese*, Dhiraj Srivastava*, Chintan B. Maniyar, Piero Toscano and Salvatore Filippo Di Gennaro, Assessment of suitable vegetation indices calculated from remote and proximal sensing to discriminate irrigation treatments. (To appear in **European Conference On Precision Agriculture 2023 (ECPA 2023)**)
- Chintan B. Maniyar*, Dhiraj Srivastava*, Salvatore F. Di Gennaro, Silvia Baronti, Francesca Ugolini, Piero Toscano, Andrea Berton, Sathish Samiappan and Alessandro Matese, Neural Network-based High Throughput Field Phenotyping of Horticultural Crops using Hyperspectral UAV Imagery. (Under Review **Agriculture MDPI**)
- Dhiraj Srivastava, Chintan B. Maniyar, Sathish Samiappan, Joby Czarnecki, Jay McCurdy and 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 and Song Li, Integration of Unmanned Aerial System and machine learning for weed detection in row-crops. (Manuscript Ready for Submission)
- Dhiraj Srivastava, Vijay Singh and Vipin Kumar. Italian Ryegrass detection in wheat using machine learning approach. (Manuscript under Preparation)
- Vipin Kumar*, Dhiraj Srivastava* and Vijay Singh. Use of unmanned aerial system for herbicide spray applications. (Manuscript under Preparation)
- 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) doi.org/10.1007/s00138-020-01087-0

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 **outstanding 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 outstanding 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 **Spring 2022 GPSS Travel Fund Virginia Tech** for attending conferences.
- Recognized by Virginia Tech as the **most active graduate student** for my efforts in promoting the Center for Advanced Innovation in Agriculture (CAIA), a platform for graduate students researching precision agriculture to bring them close to professors and students across different departments.
- Recipient of **Panasonic Ratti Chhatr Scholarship 2016** to pursue undergraduate at IIT (BHU) Varanasi.

INVITED TALKS, SERVICE, and INVOLVEMENT

- Jugged papers for the **2022 Virginia Governor's School for Agriculture Symposium.**
- Reviewer for **Undergraduate SPES Symposium 2021**, Virginia Tech.
- 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
- **Secretary** of graduate student affiliation of Centre for Advanced Innovation in Agriculture (CAIA) at Virginia Tech. 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 and minimize 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. Designed unsupervised 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 and evaluating performance metrics, Strong communication & collaboration skills