

ATIF BILAL ASAD

Department of Biological and Environmental Engineering, Cornell University, Ithaca, NY

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PROFESSIONAL SUMMARY

Ph.D. candidate in precision agriculture with 5+ years of experience in hyperspectral remote sensing, crop nutrient assessment, and ML-driven agronomic decision support. Hands-on expertise spanning in-field VNIR imaging, agronomic trial design, and autonomous variable-rate fertilization systems across commercial vineyard and orchard environments. Industry background in irrigation engineering, GIS-based environmental assessment, and grower-facing agricultural operations.

TECHNICAL SKILLS

Specialized Area: Machine Learning, Data Engineering, Pattern Recognition, Deep Learning, Computer Vision, Multi-modal Sensing, Hyperspectral Imaging, Remote Sensing

Programming Languages: Python (primary), C/C++, MATLAB

ML and AI: PyTorch, TensorFlow, YOLOv11, Vision Foundation Models, Graph Neural Networks, Scikit-learn, OpenCV, Transformer

Agronomic & Field Skills: Crop nutrient management, Field Scouting, Soil & Leaf Tissue Sampling, Agronomic Trial Design, In-Season Crop Monitoring, Irrigation Scheduling, HEIS Design

Spatial, Environmental & Other Tools: GIS (ArcGIS/QGIS), Surfer, MODFLOW, Drip CAD, Computed Aided Design (CAD)

Hardware: Hyperspectral imaging (HSI) platform, RGB-D Sensors, Stereo Cameras, IMU

RESEARCH AND PROFESSIONAL EXPERIENCE

Graduate Research Assistant, Cornell University, Ithaca, NY

Jan 2025 – Present

- Extending grapevine nutrient assessment beyond nitrogen to a full macro- and micro-nutrient panel using ground-based in-field VNIR hyperspectral imaging at both leaf and canopy levels.
- Developed a sun-angle reflectance correction technique to account for spectral artifacts introduced by camera rotation relative to solar geometry, improving data consistency across field acquisition conditions.
- Developing a vine-level nitrogen fertilization recommendation system that translates seasonal hyperspectral assessments into site-specific fertilization prescriptions for individual vines in the following growing season.
- Designed an indoor hyperspectral imaging platform to assess herbicide resistance in waterhemp (*Amaranthus tuberculatus*) using spectral reflectance, enabling non-destructive screening of resistant biotypes for precision weed management.

Graduate Research Assistant, Washington State University, Pullman, WA

Sep 2021 – Dec 2024

- Developed ML pipelines for grapevine leaf nitrogen assessment using in-field VNIR hyperspectral imaging; applied spectral band feature selection and regression modeling across leaf and canopy levels in commercial vineyard environments.
- Assessed nitrogen status in apple trees using RGB-D imaging during dormant season, leveraging fall color change as a proxy for leaf nitrogen concentration to support non-destructive, field-scale nutrient estimation.

- Collaborated on an integrated autonomous nitrogen application system for apple orchards, coupling RGB-D-based nitrogen assessment with a variable-rate sprayer for targeted, sensing-driven fertilization.
- Designed and conducted field experiments across multiple vineyard and orchard sites; collected leaf tissue samples for laboratory nutrient analysis, recorded pruning weights post-pruning, and measured fruit cluster counts and weights as agronomic response variables for model ground-truthing and experimental validation.
- Presented at ASABE 2023, ASABE 2024, and WAVE 2024; received the **Presentation Excellence Award** at the ASABE Annual International Meeting 2024.

Field Engineer, Roshan Proteins Pvt. Ltd., Pakistan

Aug 2018 – Aug 2021

- Planned, designed, and supervised construction of poultry farm facilities; conducted site surveys, prepared cost estimates, and managed equipment installation within project timelines.
- Implemented quality control through regular field monitoring; oversaw waste management protocols and ensured compliance with EPA environmental guidelines on farm premises.

Field Engineer, AGREX Enterprises & Consultants, Pakistan

Mar 2017 – Jul 2018

- Designed and commissioned High Efficiency Irrigation Systems (HEIS) for agricultural clients; prepared BOQs, irrigation schedules, and installation layouts tailored to individual farm requirements.
- Coordinated with farmers and consultant teams to assess field conditions, review project designs, and deliver irrigation infrastructure on time and within budget.

Research Assistant, University of Agriculture Faisalabad, Pakistan

Jul 2015 – Jan 2017

- Characterized wastewater and sludge to assess pollution loads in drainage systems and their impact on surrounding agricultural lands and groundwater quality.
- Applied GIS-based spatial analysis to map contaminant concentration gradients across agricultural landscapes, supporting evidence-based land and water management decisions.

EDUCATION

Cornell University, Ithaca, NY

Jan 2025 – Present

Ph.D. Candidate in Biological and Environmental Engineering

Advisor: Prof. Manoj Karkee, Focus: Precision Agriculture, Hyperspectral Remote Sensing, and Data-Driven Crop Nutrient Management

Washington State University, Pullman, WA

Sep 2021 – Dec 2024

Ph.D. in Biosystems Engineering (transferred to Cornell), GPA: 3.76

University of Agriculture Faisalabad (UAF), Faisalabad, Pakistan

Aug 2014 – Jan 2017

M.S. in Agricultural Engineering, GPA: 3.32

University of Agriculture Faisalabad (UAF), Faisalabad, Pakistan

Aug 2009 – Jul 2014

B.S. in Agricultural Engineering, GPA: 2.77

SELECTED PUBLICATIONS

1. **Asad, A. B.**, Ahmed, D., Shcherbatyuk, N., Davadant, P., Karkee, M., & Keller, M. (2026). Phenologically Contextualized Deep Learning for Multi-Nutrient Prediction in Grapevine Leaves from In-field Hyperspectral Imaging. Submitted to *ASABE Information and Technology, Systems, and Components (ITSC) Paper Award 2026*.

2. **Asad, A. B.**, Paudel, A., Kshetri, S., Kang, C., Khanal, S. R., Shcherbatyuk, N., ... & Keller, M. (2025). Integrating Feature Selection and Machine Learning for Nitrogen Assessment in Grapevine Leaves using In-Field Hyperspectral Imaging. Submitted to *Computers and Electronics in Agriculture*.
3. Ud-Din, N., Ahmed, S. R., Jameel, S., **Asad, A. B.**, Khan, Z., Gul, N., Umer, A., Ali, S., Aslam, M., & Kurd, A. A. (2025). Gamma radiation-induced mutation breeding for enhanced yield and stress tolerance in grapevine (*Vitis vinifera* L.). *BMC Plant Biology*, 25, 1595. DOI: 10.1186/s12870-025-07614-3
4. Paudel, A., Brown, J., Upadhyaya, P., **Asad, A. B.**, Kshetri, S., Davidson, J. R., Grimm, C., Thompson, A., Sallato, B., Whiting, M. D., & Karkee, M. (2025). Machine vision-based assessment of fall color changes in apple leaves and its relationship with nitrogen concentration. *Computers and Electronics in Agriculture*, 236, 110366. DOI: 10.1016/j.compag.2025.110366
5. Rashid, H., **Asad, A. B.**, Nasir, A., Chaudhary, A., & Sattar, A. (2018). Wastewater characterization of Paharrang drain in Faisalabad and evaluation of subsurface contamination using Geographic Information System. *Pakistan Journal of Geology*, 2(2), 11–17. DOI: 10.26480/pjg.02.2018.11-17

AWARDS AND HONORS

Presentation Excellence Award , ASABE Annual International Meeting, Anaheim, CA	2024
Travel Grant , Department of Biological Systems Engineering, Washington State University	2023
Graduate Student Award , Washington State University	2023
Overseas Ph.D. Scholarship , Higher Education Commission of Pakistan	2021