

Heesup Yun

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EDUCATION

University of California Davis, CA, USA <i>Ph.D. candidate, Biological Systems Engineering</i>	09/2021-Present
Seoul National University, Seoul, Korea <i>Master of Science, Biosystems Engineering</i>	03/2015-02/2017
Seoul National University, Seoul, Korea <i>Bachelor of Science, Biosystems Engineering & Mechanical and Aerospace Engineering</i>	03/2011-02/2015

RESEARCH EXPERIENCE

University of California Davis, CA, USA <i>Graduate Research Assistant, Plant AI and Biophysics Lab</i>	09/2021-Present
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Focus: agricultural AI, plant phenotyping, thermal-RGB sensor fusion, automated plant modeling

G×E×M Innovation in Intelligence for climate adaptation [Website](#)

- iOS app for a low cost image data collection
- 4 years of field data collection using drones and rovers
- Web-app based data processing and analysis software for breeding researchers
- Web-app based leaf angle measurement using smartphone's IMU
- Low cost weather station for plot scale microclimate measurement
- Thermal image super resolution and RGB sensor fusion
- Automated plant modeling using vision language models

Seoul National University, Seoul, Korea <i>Graduate Student Researcher, Biosystems Control and Precision Agriculture Lab.</i>	03/2015-02/2017
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UAV-based remote sensing for growth monitoring of major upland crops

- A three-year iPET-funded project
- UAV remote sensing based growth monitoring of white radish and Chinese cabbage
- Multi-temporal NDVI analysis for crop growth assessment
- 3D digital surface model based plant volume and biomass estimation

Seoul National University, Seoul, Korea <i>Undergraduate Student Researcher, Biosystems Control and Precision Agriculture Lab.</i>	03/2014-03/2015
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UAV remote sensing for hairy vetch cover crop biomass estimation

- UAV and RGB camera based remote sensing for hairy vetch cover crop
- Excess green (ExG) vegetation index monitoring from UAV RGB imagery
- Estimated cover crop volume and biomass

Seoul National University, Seoul, Korea <i>Undergraduate Research Assistant, Off-Road Equipment & Soil-Machine Systems Design Lab.</i>	07/2012-02/2014
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Load-sensitive engine throttle control for improved fuel consumption efficiency

- Tractor RPM filtering using Kalman filter
- Matlab/Simulink simulation model for tractor fuel consumption efficiency
- Programming C codes for ISO 11783/ISOBUS on ATmega microcontroller

PUBLICATIONS

In Progress: Yun, H., Uyehara, K., Ranario, E., Droutsas, I., Bailey, B. N., Diepenbrock, C. H., & Earles, J. M. Image to Plant Architecture: Recovering Plant Architecture from RGB rendered image.

Jeon, Y.-J., Kim, H. S., Lee, T. S., Park, S. H., **Yun, H.**, & Jung, D.-H. (2025). Multimodal Optical Biosensing and 3D-CNN Fusion for Phenotyping Physiological Responses of Basil Under Water Deficit Stress. *Agronomy*, 16(1), 55. [Link](#)

Ranario, E., Lundqvist, L., **Yun, H.**, Bailey, B. N., & Earles, J. M. (2025). AGILE: A Diffusion-Based Attention-Guided Image and Label Translation for Efficient Cross-Domain Plant Trait Identification. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (pp. 5392-5401). [Link](#)

Mayanja, I. K., **Yun, H.**, & Bailey, B. N. (2025). Automated calibration of stomatal conductance models from thermal imagery by leveraging synthetic images generated from Helios 3D biophysical model simulations. *Journal of Experimental Botany*, eraf420. [Link](#)

Berlingeri, J., Fuentes, A., Ranario, E., **Yun, H.**, Rim, E. Y., Garrett, O., Howard, A., et al. (2025). Integration of crop modeling and sensing into molecular breeding for nutritional quality and stress tolerance. *Theoretical and Applied Genetics*, 138(9), 205. [Link](#)

Uyehara, I. K., **Yun, H.**, Ranario, E., & Earles, M. (2025). AgRowStitch: A High-fidelity Image Stitching Pipeline for Ground-based Agricultural Images. arXiv preprint arXiv:2503.21990. [Link](#)

Ranario, E., Mayanja, I., **Yun, H.**, Bailey, B. N., & Earles, J. M. (2025). Enabling Plant Phenotyping in Weedy Environments using Multi-Modal Imagery via Synthetic and Generated Training Data. arXiv preprint arXiv:2509.19208. [Link](#)

Yun, H., Lo, S., Diepenbrock, C. H., Bailey, B. N., & Earles, J. M. (2024). VisTA-SR: Improving the Accuracy and Resolution of Low-Cost Thermal Imaging Cameras for Agriculture. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (pp. 5470-5479). [Link](#)

Kim, D.-W., Jeong, S. J., Lee, W. S., **Yun, H.**, Chung, Y. S., Kwon, Y.-S., & Kim, H.-J. (2023). Growth monitoring of field-grown onion and garlic by CIE L*a*b* color space and region-based crop segmentation of UAV RGB images. *Precision Agriculture*, 24(5), 1982–2001. [Link](#)

Yun, H. S., Kim, H. J., Cho, W. C., Kim, H. S., & Lim, S. J. (2020). Development of an in situ Dead Leaf Weight Monitoring System. *Precision Agriculture Science and Technology*, 2(3), 181. (Korean) [Link](#)

Kim, D. W., **Yun, H. S.**, Jeong, S. J., Kwon, Y. S., Kim, S. G., Lee, W. S., & Kim, H. J. (2018). Modeling and testing of growth status for Chinese cabbage and white radish with UAV-based RGB imagery. *Remote Sensing*, 10(4), 563. [Link](#)

Yun, H. S., Park, S. H., Kim, H. J., Lee, W. D., Lee, K. D., Hong, S. Y., & Jung, G. H. (2016). Use of unmanned aerial vehicle for multi-temporal monitoring of soybean vegetation fraction. *Journal of Biosystems Engineering*, 41(2), 126-137. [Link Cover Article](#)

Lee, K. D., Na, S. I., Baek, S. C., Park, K. D., Choi, J. S., Kim, S. J., **Yun, H. S.** & Hong, S. Y. (2015). Estimating the Amount of Nitrogen in Hairy Vetch on Paddy Fields using Unmanned Aerial Vehicle Imagery. *Korean Journal of Soil Science and Fertilizer*, 48(5), 384-390. (Korean) [Link](#)

PRESENTATIONS

- Yun, H.**, Droutsas, I., Brian Bailey, Diepenbrock, C., & Earles, M. (2024). Closing the Real2Sim Gap Between Real Images and Simulation Models of Cowpea. ASABE 2024 Annual International Meeting, Anaheim, CA.
- Yun, H.**, & Earles, M. (2023). Improving Low-Cost Thermal Images for Estimating Traits of Cowpea and Common Beans. ASABE 2023 Annual International Meeting, Omaha, NE.
- Mayanja, I.K., **Yun, H.**, Earles, M., & Bailey, B.N. (2023). Automated parameterization of stomatal conductance models from thermal imagery by leveraging synthetic images generated from Helios 3D biophysical model simulations. North American Plant Phenotyping Network, West Lafayette, IN. [Link](#)
- Kim, D., Jeong, S. J., **Yun, H.**, Kwon, Y. S., & Kim, H. J. (2017). Validation Testing of UAV-based Vegetable Growth Estimation Models. In 2017 ASABE Annual International Meeting (p. 1). American Society of Agricultural and Biological Engineers. [Link](#)
- Yun, H.**, Jung, S. J., & Kim, H. J. (2016). Radiometric Calibration and Vegetation Index Analysis of Upland-Crop UAV images. Proceedings of the Korean Society for Agricultural Machinery Conference, 21(1), 129-130. [Link](#)
- Yun, H.**, Kim, H. J., Park, K., Lee, K., & Hong, S. (2015). Use of an UAV for biomass monitoring of hairy vetch. In 2015 ASABE Annual International Meeting (p. 1). American Society of Agricultural and Biological Engineers. [Link](#)
- Yun, H.**, Cho, W. J., Jiang, J. S., & Kim, H. J. (2015). Estimation of Leaf Area, Plant Height, and Fresh Weight of Lettuce in Plant factory using Structure from Motion (SfM) Technique. Proceedings of the Korean Society for Agricultural Machinery Conference, 20(2), 171-172. [Link](#)
- Yun, H. S.**, Kim, H. J., Do Lee, K., Hong, S. Y., & Do Park, K. (2015). Monitoring Hairy Vetch Growth using UAV Images. Proceedings of the Korean Society for Agricultural Machinery Conference, 20(1), 73-74. [Link](#)
- Park, S. H., **Yun, H. S.**, Kim, H. J., Do Lee, K., Hong, S. Y., & Jung, G. H. (2014). Multi-temporal Visualizing of Soybean Crop Canopy using Images from an Unmanned Aerial Vehicle (UAV). Proceedings of the Korean Society for Agricultural Machinery Conference, 19(2), 223-223. [Link](#)

TEACHING EXPERIENCE

- University of California, Davis** Fall 2025
Teaching Assistant *EBS165 Bioinstrumentation & Control*
- University of California, Davis** Winter 2025
Guest Lecturer *PLS154 Plant Breeding*
- AI-enabled tools in plant breeding: leaf temperature and angle measurement (01/30/2025)
- Seoul National University, Seoul, Korea** Fall 2015
Teaching Assistant *5261.222 Dynamics*

PATENTS

- Kim, H. J., **Yun, H. S.**, Kim, H. S., Park, J. H., Lim, S. J. Forest Fire Alarm System based on On-site Measurement of Fallen Leave Water Content, Korean Patent 10-1938973-0000 (2019) [Link](#)

WORK EXPERIENCE

A.I.MATICS Inc., Seoul, Korea

02/2017-08/2021

Software Engineer, Division of A.I. Edge Solution

A leading automotive A.I. and vehicle telematics development company in Korea [Website](#)

Focus: computer vision, deep learning, embedded AI, ADAS for automotive applications

Driver action monitoring system for advanced driver-assistance systems (ADAS)

- Driver body key point detection using MobileNet V3 backbone and heatmap estimation
- RCNN based object detection with IR dashcam images
- Driver attention classification using RNN
- Launched advanced driver monitoring system in May 2020

Driver status monitoring system for ADAS

- OpenFace key point detection with IR dashcam images
- CNN based eye status classification
- Face tracking using Kanade-Lucas-Tomasi (KLT) feature tracker
- Showcased at CES 2019 and National Association of Fleet Administrators

Motorcyclist and vehicle detection using aggregate channel features for ADAS

- Motorcyclist detection using feature extraction and random forest
- Low level code optimization for ARM NEON processors

Vehicle detection using histogram of gradients for ADAS

- HW accelerated feature extraction pipeline for Blackfin DSP
- Histogram of gradient and SVM classifier based vehicle detection

HONORS & AWARDS

\$300, 6th AKABFE Research Spotlight Presentation Highlights	07/2024
\$5,000, Farm Robotics Challenge, Elegance in Design Prize	06/2023
Tuition and stipend, Gates Foundation	09/2021-03/2026
Tuition, SNU Agricultural Engineering Aid Foundation	03/2014-02/2017
Tuition, National Science & Technology Fellowship	03/2011-02/2014
Travel award, 11th SNU CALS Global Challenger	06/2013-07/2013