

# Kaiming Fu

## Ph.D. Candidate

☎ (765)-775-0255 ✉ kmfu@ucdavis.edu 🔗 linkedin.com/in/kmfu 🌐 kmfu.github.io

## Skills

**Programming Languages:** C++, Python, R, Matlab.

**Familiar with:** CUDA, Pytorch, Scikit-Learn and TensorFlow.

**Familiar with:** Neural Networks (YOLO, CNN, Fast RCNN, Faster RCNN, ResNet), SVM, Random Forest, etc.

## Education

**University of California, Davis**

*Ph.D. in Electrical and Computer Engineering*

*Double-Major M.S in Statistics*

**GPA:** 3.92

**Davis, CA**

*Sep. 2019 - Present*

**Purdue University, West Lafayette**

*M.S. in Mechanical Engineering*

**GPA:** 3.77

**West Lafayette, IN**

*Jan. 2018 - May. 2019*

## Research Experience

### Simulation Design and Optimization of Agricultural Robotics

*CUDA, Helios, LiDAR*

- Designed a robot-tree-fruit simulation system, including the development of digital models and the research on object interference.
- Enhanced harvester design, assessed fruit collection efficiency, and optimized fruit quality through accelerated CUDA-based simulations and interference analysis.
- Employed RGB imagery, LiDAR, and IMU data for accurate fruit canopy localization, enhancing simulation realism.
- Developed a dynamic harvesting system based on visible fruit distributions obtained from the in-field data acquisition.

### Crop Counting Through Deep Learning Enhanced By Synthetic Images

*Pytorch, YOLOv8*

- Created a dataset of RGB and NIR walnut images, manually annotated, and sourced from a multispectral camera.
- Generated synthetic images to enhance the walnut image set, addressing limitations arising from specific lighting conditions.
- Developed a YOLOv8 model for crop detection, leveraging multispectral imagery to surpass the constraints of using only RGB images.
- Improved F1 score with synthetic data: RGB detection (0.806); NIR detection(0.745); Multispectral detection(0.863).

## Projects

### Annual Farm Robotics Challenge

*Team leader. Grand prize winner among national-wide universities and colleges*

*Feb. 2023 – May 2023*

- Designed a real-time harvesting assistant robot that autonomously follows human operators and transports harvested crops to storage, eliminating manual tractor transport.
- Enhanced robot's ability to monitor and offer real-time feedback on worker posture using a self-designed Human Monitoring System.

### "Inceptio-Tsinghua AIR Cup" Autonomous Driving Challenge

*1st prize winner among 1067 teams*

*Sep. 2022 – Dec. 2022*

- Utilized Imitative learning to generate training data for decision-making planning algorithms, employing an Xbox controller to ensure accurate self-driving track creation for semi-trucks and sedans to reach target destinations.
- Developed an efficient decision-making algorithm for self-driving semi-trucks and sedans to navigate complex urban and highway environments collision-free.

### Fine-Grained Classification in Plant Pathology

*IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR) workshop*

*Mar. 2021 – May. 2021*

- Preprocessed imbalanced dataset using a data sampler, employed ResNet50 as the baseline, achieving an F1 score of 0.70.
- Created an Attention Learning Network for accurate part localization within the classification pipeline.
- Implemented a Generative Data Augmentation model for image augmentation and training dataset balance.
- Improved F1 score to 0.874 using a UNet-ResNet generator and a DenseNet discriminator.

## Selected Publications

### Computer-aided Design and Optimization of a Multi-level Fruit Catching System for Soft Fruit Harvesting.

*Kaiming Fu, Stavros G. Vougioukas, Brian N. Bailey. Computers and Electronics in Agriculture. Submitted.*

### Topological and Spatial Analysis of Within-tree Fruiting Characteristics for Walnut Trees.

*Ying-Tsui Wang, Brian N Bailey, Kaiming Fu, Kenneth Shackel. Scientia Horticulturae. Aug. 2023.*

### The Probability Distribution of Absorbed Direct, Diffuse, and Scattered Radiation in Plant Canopies with Varying Structure.

*Brian N. Bailey, Kaiming Fu. Agricultural and Forest Meteorology. Jul. 2022.*

### Test Set Optimization by Machine Learning Algorithms.

*Kaiming Fu, Yulu Jin, Zhousheng Chen. 2020 IEEE International Conference on Big Data. Dec. 2020.*

## Selected Presentations

### Fusion-Driven Tree Reconstruction and Fruit Localization: Advancing Precision in Agriculture.

*Poster Presentation at IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) Workshop*

**Detroit, Michigan**

*Oct. 2023*

### Walnut Detection Through Deep Learning Enhanced by Multispectral Synthetic Images.

*Poster Presentation at IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) Workshop*

**Detroit, Michigan**

*Oct. 2023*

### Computer-aided Design and Optimization of a Shake-catch Soft Fruit Harvester.

*Oral Presentation at American Society of Agriculture and Biological Engineers Annual International Meeting (ASABE)*

**Houston, Texas**

*Jul. 2022*