

Big
IDEAS

UCDAVIS



Farm Forward

Creating sustainable farming for the future

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Population will reach

**9.7
BILLION**

by

2050

**To meet demand, ag output
will need to increase by**

70%

Challenges facing Agriculture



Photo by TIAA

A close-up photograph of green leaves, likely from a plant, showing significant damage. Numerous leaves have large, irregular holes eaten into them, indicating the presence of pests. The leaves are a vibrant green color and have a serrated edge. The background is a dense cluster of similar leaves.

Pests, Pathogens, Invasive Species

Photo by Nathan Mueller



Resources

Photo by Floki

A photograph of a large iceberg floating in the ocean. The iceberg is covered in numerous long, thin icicles hanging from its top edge. The water is a deep blue, and the sky is a clear, pale blue. In the background, there are snow-capped mountains. The word "Climate" is written in large, white, sans-serif font in the lower-left corner of the image.

Climate

Paul Souders via Getty Images



Farm Labor Scarcity

Knowledge



Effort





Sensing



Animal
Welfare



UAVs



Vertical
Farming

Robots



Big Data



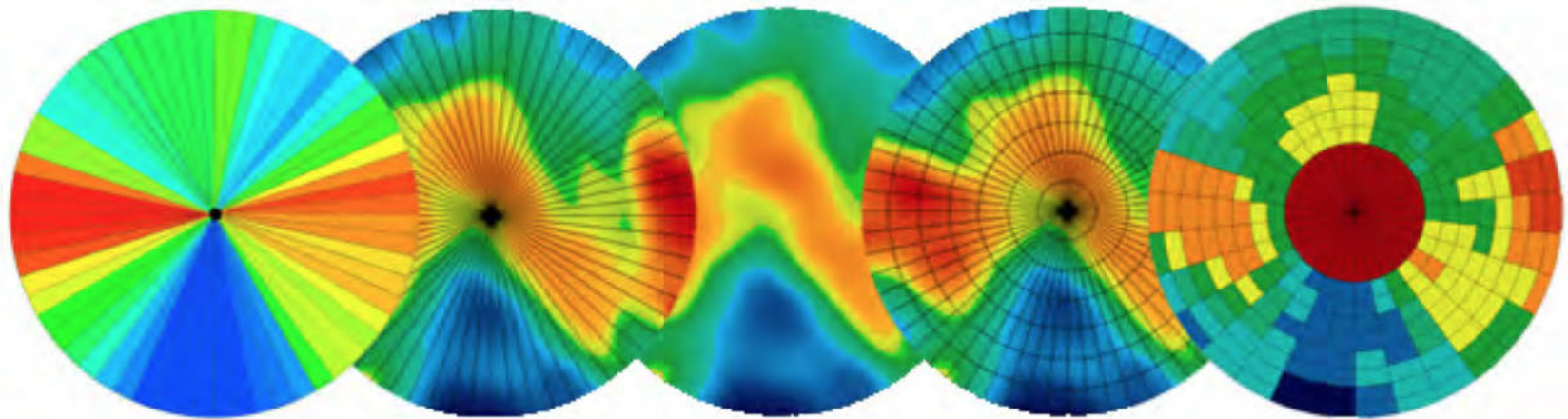
Workforce
Transformation



Breeding



Traditional Precision Ag. Maps





Real-Time Monitoring and Control

Randall Benton

Smart Farm

A conceptual diagram of a smart farm. At the top center is a green plant with two leaves, whose stem is a circuit board with several nodes. Below this, a row of stylized trees is shown. On the left, a vertical probe is labeled 'Plant Water Status Sensing'. Below it, a 'Field Computer' is shown with a screen displaying a map. To the right of the computer, a sensor is labeled 'Soil Water Status Sensing'. In the center, a yellow bottle is labeled 'Variable Rate Irrigation Management'. On the right, a drone is labeled 'Canopy Reflectance Measurement by Drone Copter'. Below the drone, a tractor is labeled 'Canopy PAR Absorption Management'. At the bottom right, a sensor is labeled 'Canopy Shape Measurement by LIDAR'. The background is a gradient from blue at the top to brown at the bottom, representing the sky and soil.

Canopy Reflectance
Measurement by
Drone Copter



Plant Water
Status Sensing



Field
Computer

Soil Water
Status Sensing



Variable Rate
Irrigation Management



Canopy PAR
Absorption
Management



Canopy Shape
Measurement by
LIDAR



Smart Collar



Smart Sensors

2nd Generation

GoPro camera

LIDAR

Protective cage

3d tilt sensor

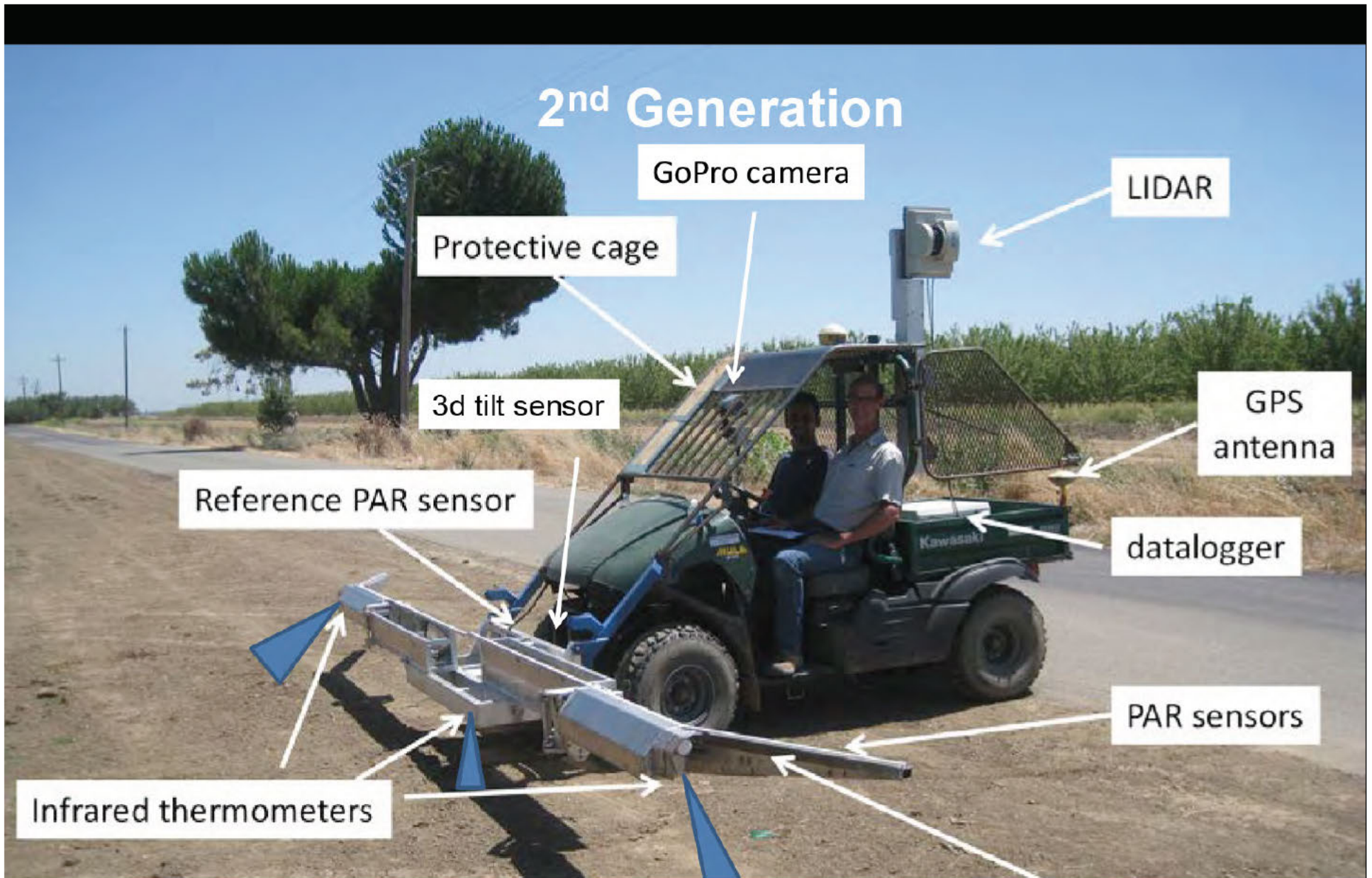
GPS antenna

Reference PAR sensor

datalogger

PAR sensors

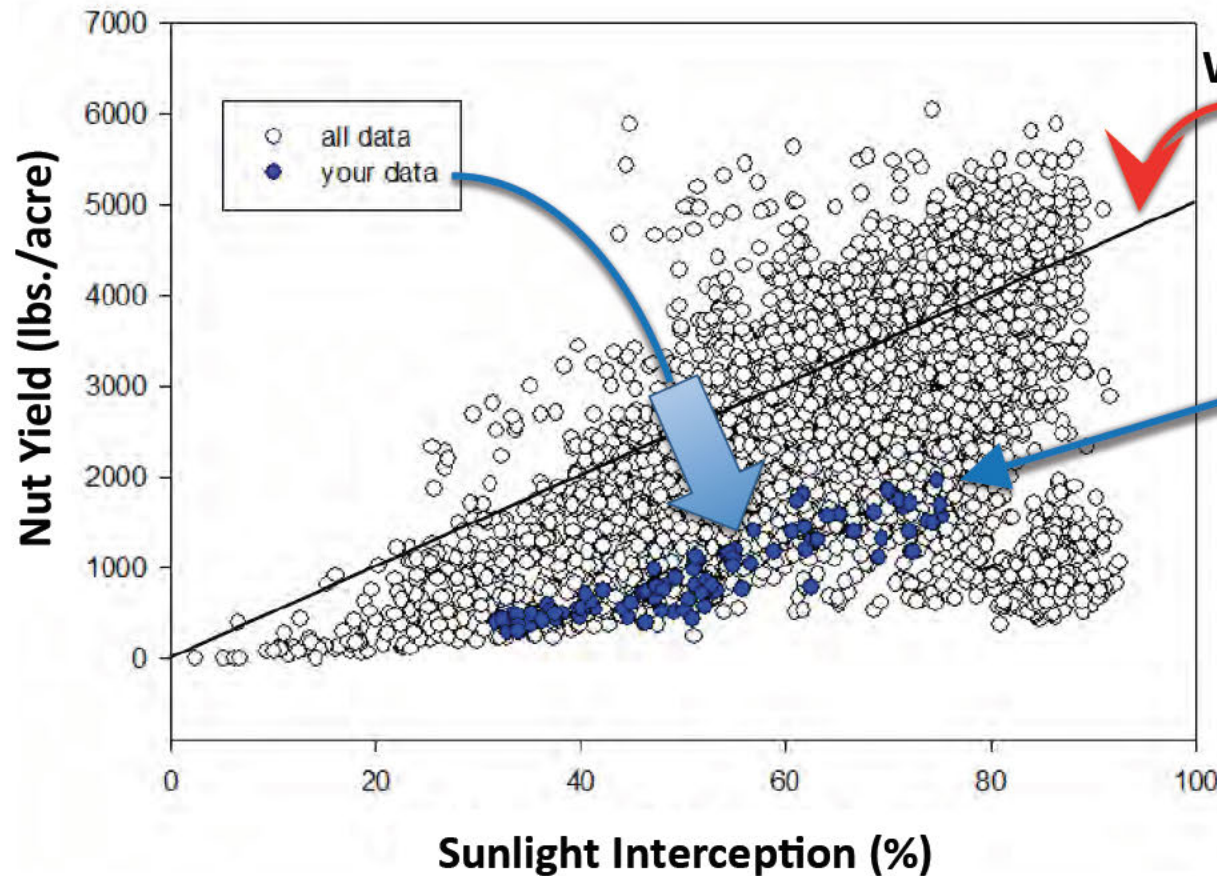
Infrared thermometers



Improving Food Production



Dr. Bruce Lampinen
Plant Science



Well Managed
Orchards

Under performing
Orchard

Big Data Opportunity

- Irrigation?
- Pruning?
- Nutrition?
- Poor Weather at Bloom?

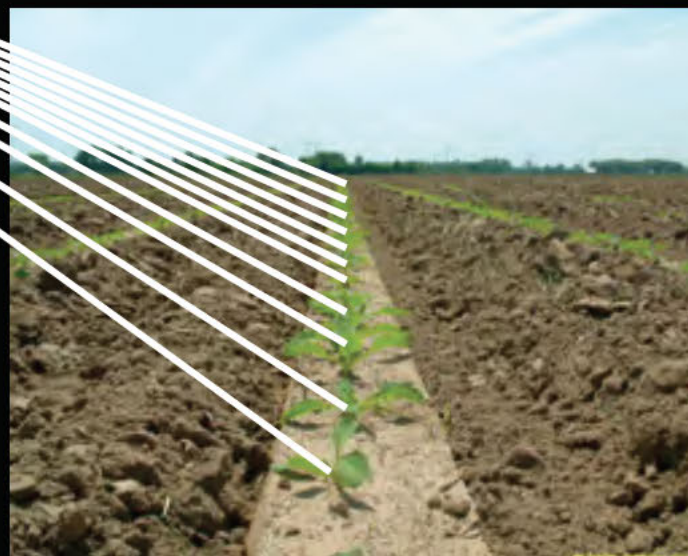


RTK GPS Plant Mapping

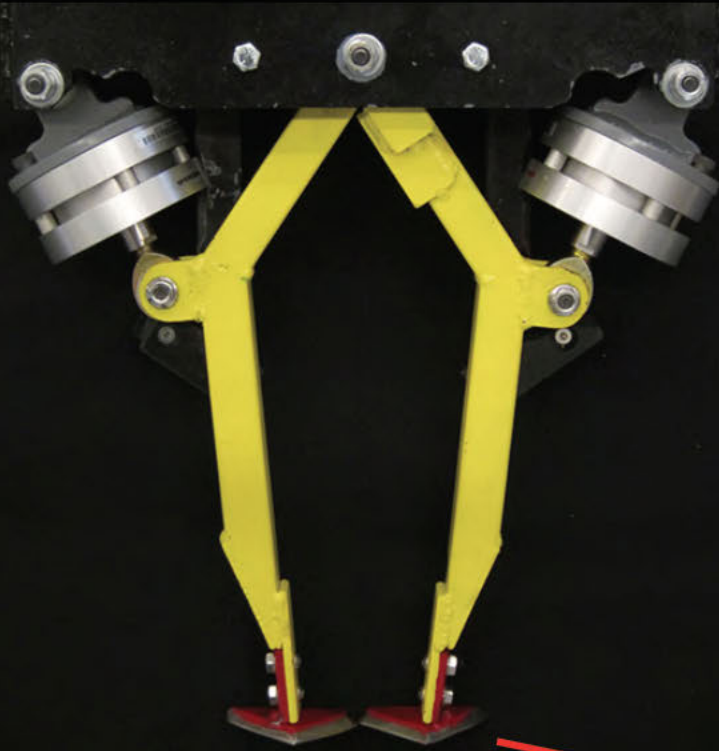
Knowledge



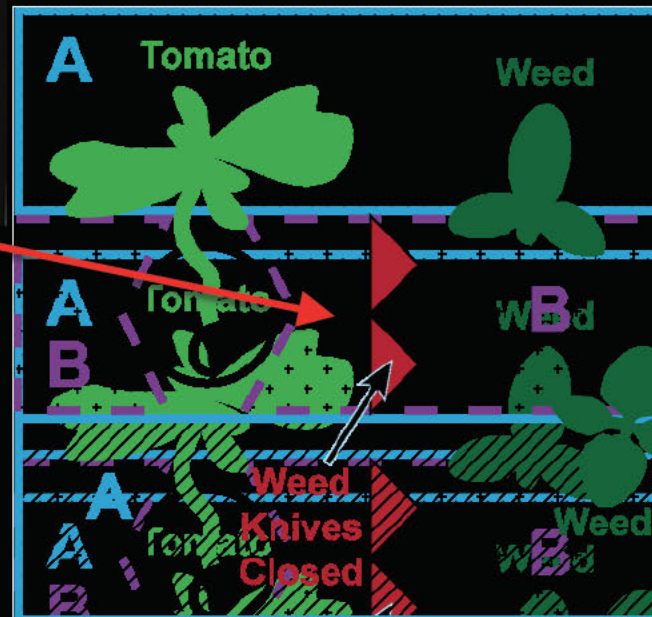
Effort



UC Davis Weeding Robot



Miniature Robotic Hoes



Robotic Hoes Move Around Crop Killing Weeds



Co-Robotics



Co-robots have a symbiotic relationship with a human partner, where, as a team, they combine their relative strengths to jointly perform a task

**FRAIL-Bot
Strawberry
Transport
Co-Robot**
S. Vougioukas

100
YEARS
1915-2015

**BIOLOGICAL AND AGRICULTURAL
ENGINEERING**

Automation

“... our existing social structures—and especially our educational institutions—are not adequately preparing people for the skills that will be needed in the job market of the future.”

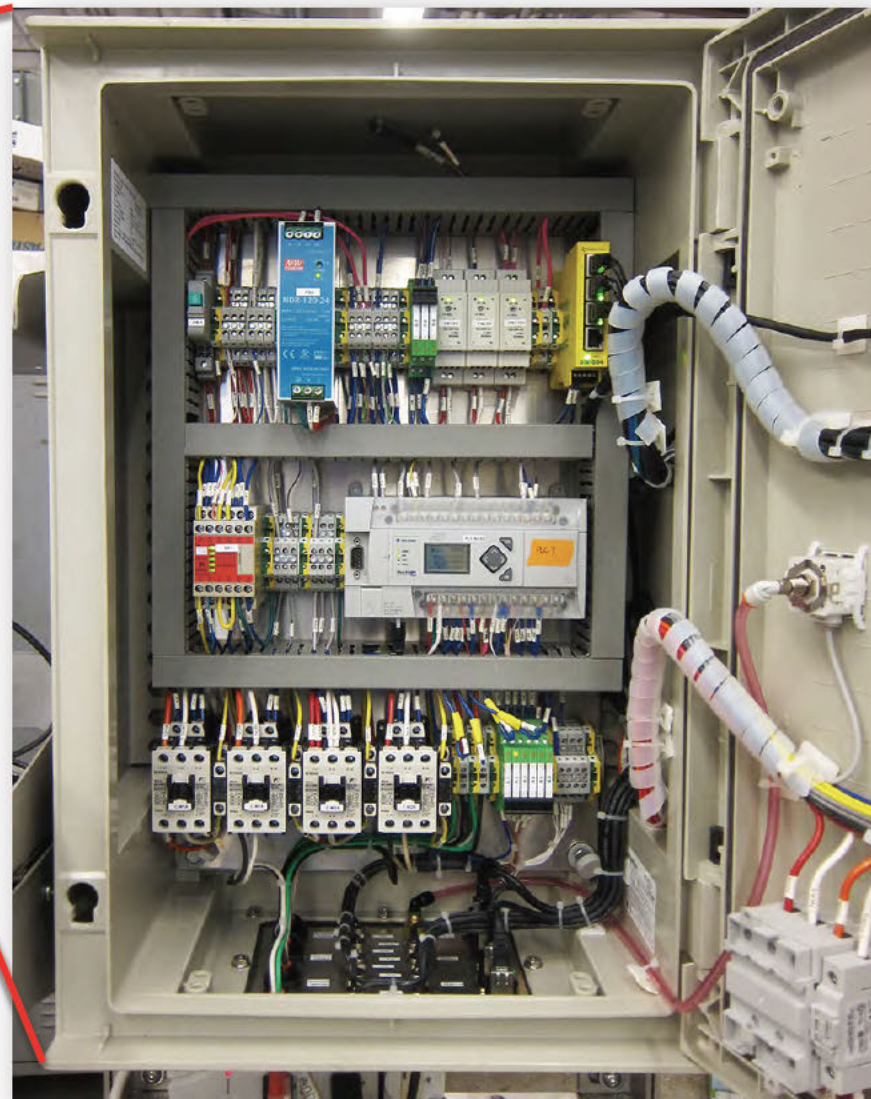
AI, Robotics, and the Future
of Jobs

A. Smith & J. Anderson
-Pew Research Center





Rural Communities



Rural Communities



YouTube

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Digital Agriculture



View MicroLogix 1400 error code

4,241 views



4



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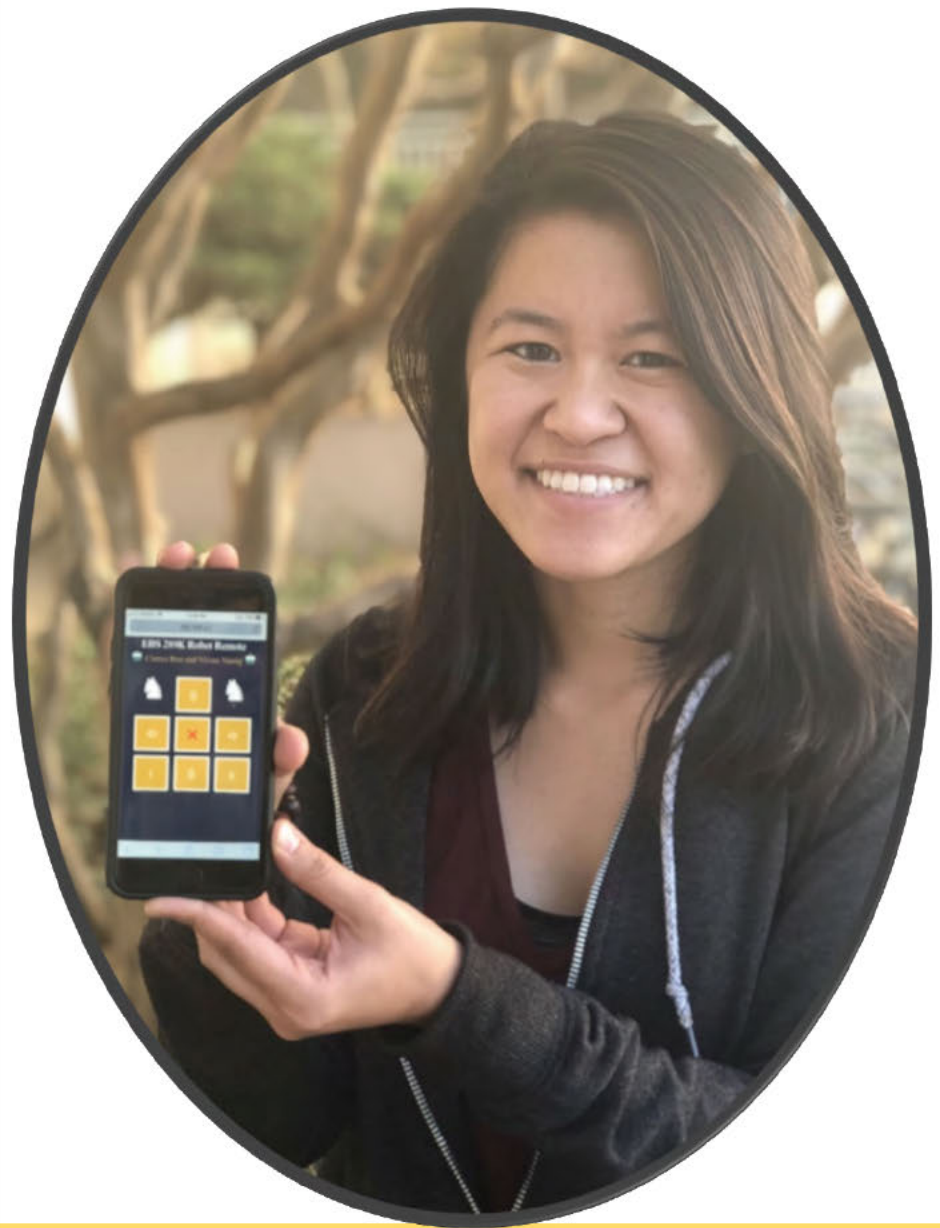
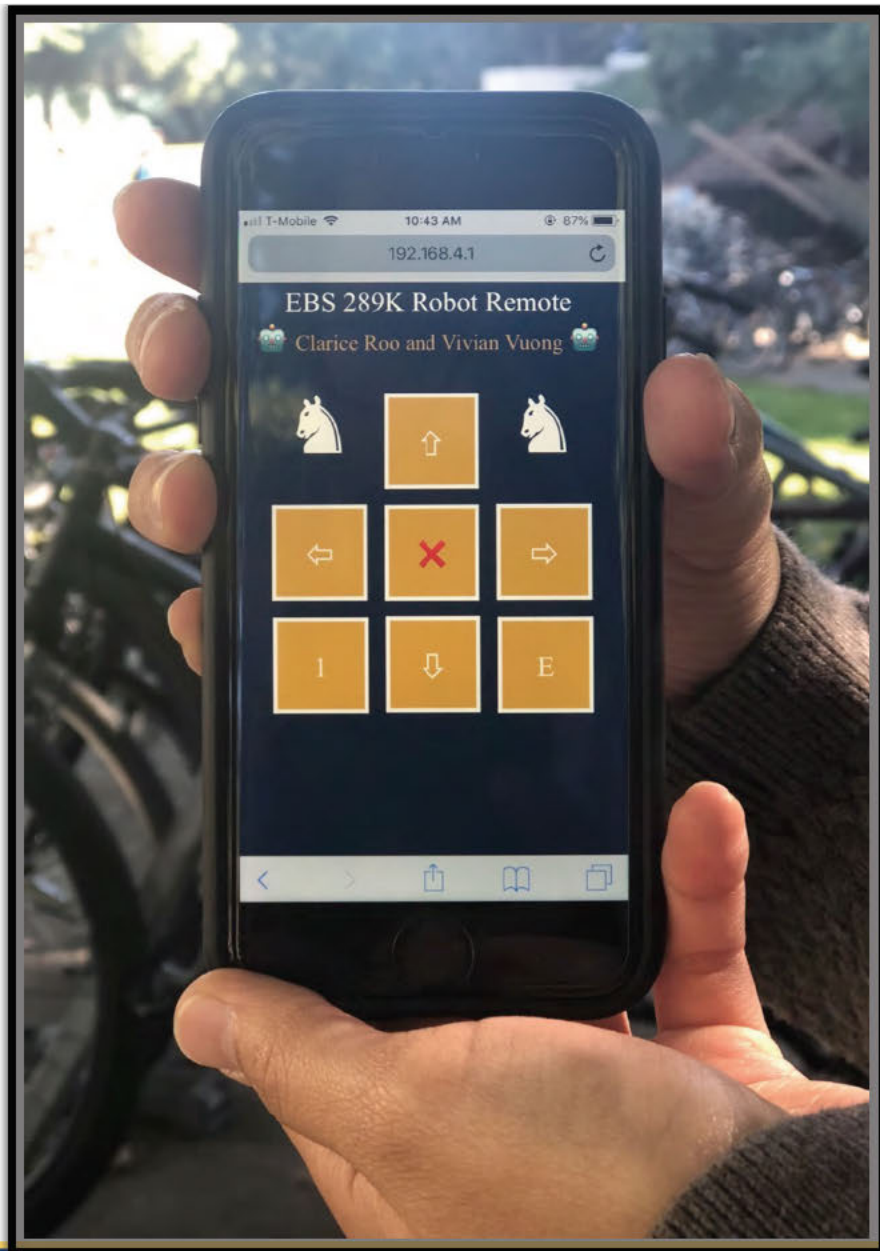


SHARE



SAVE





Autonomous Smart Sprayer

