AI, Technology, and Drones in Agriculture

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AXIS AG
SOLVING FOR AG WITH TECHNOLOGY

Why AI in Agriculture

Uses of AI in Agricultural Equipment

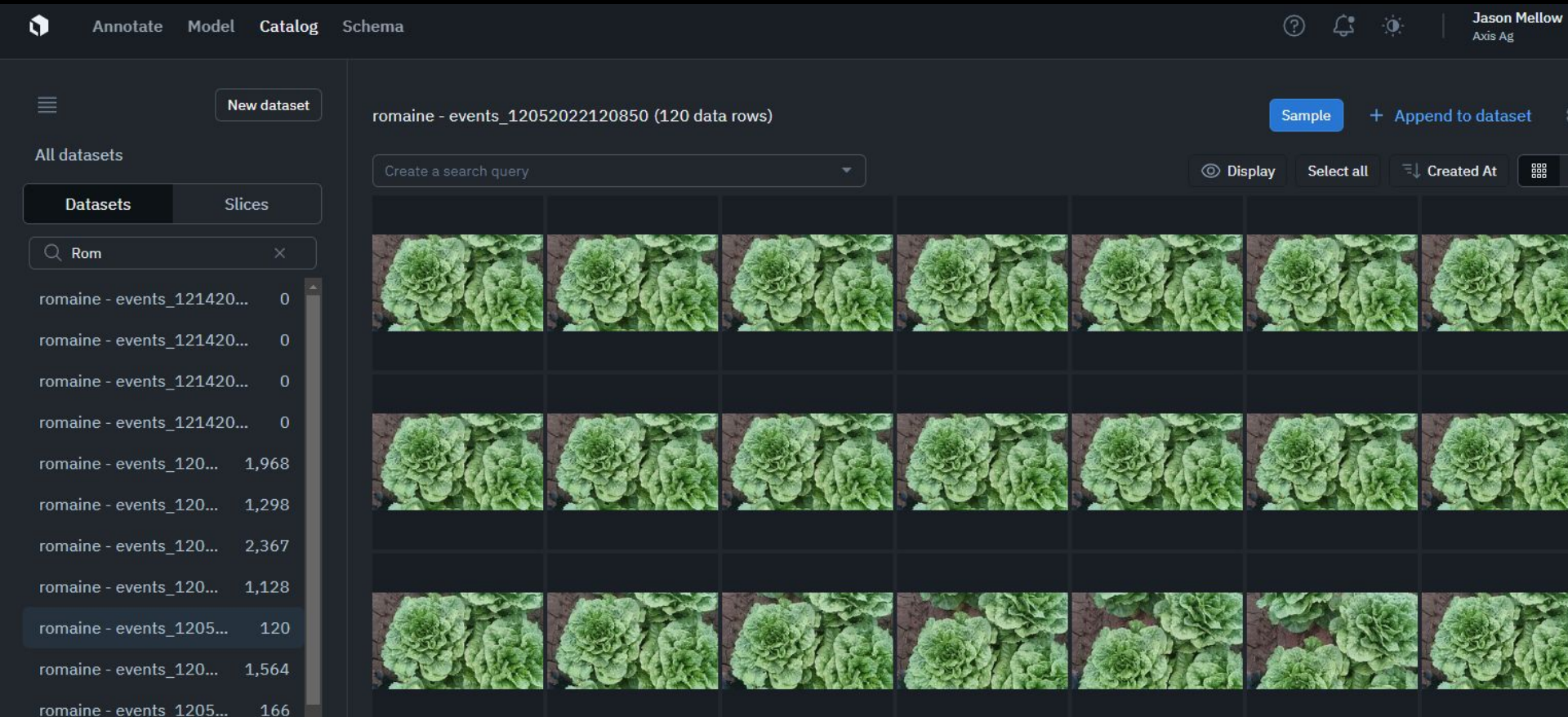
- Automation of tasks
- Operating cost reduction
- Labor augmentation
- Data collection, Help make more informed decisions
- Improve efficiency of inputs
- Reduce quantity of inputs used (ex: chemical reduction)
- Maximize yields
- Reduce environmental impact
- Drive sustainability

Bottom line, reduce costs

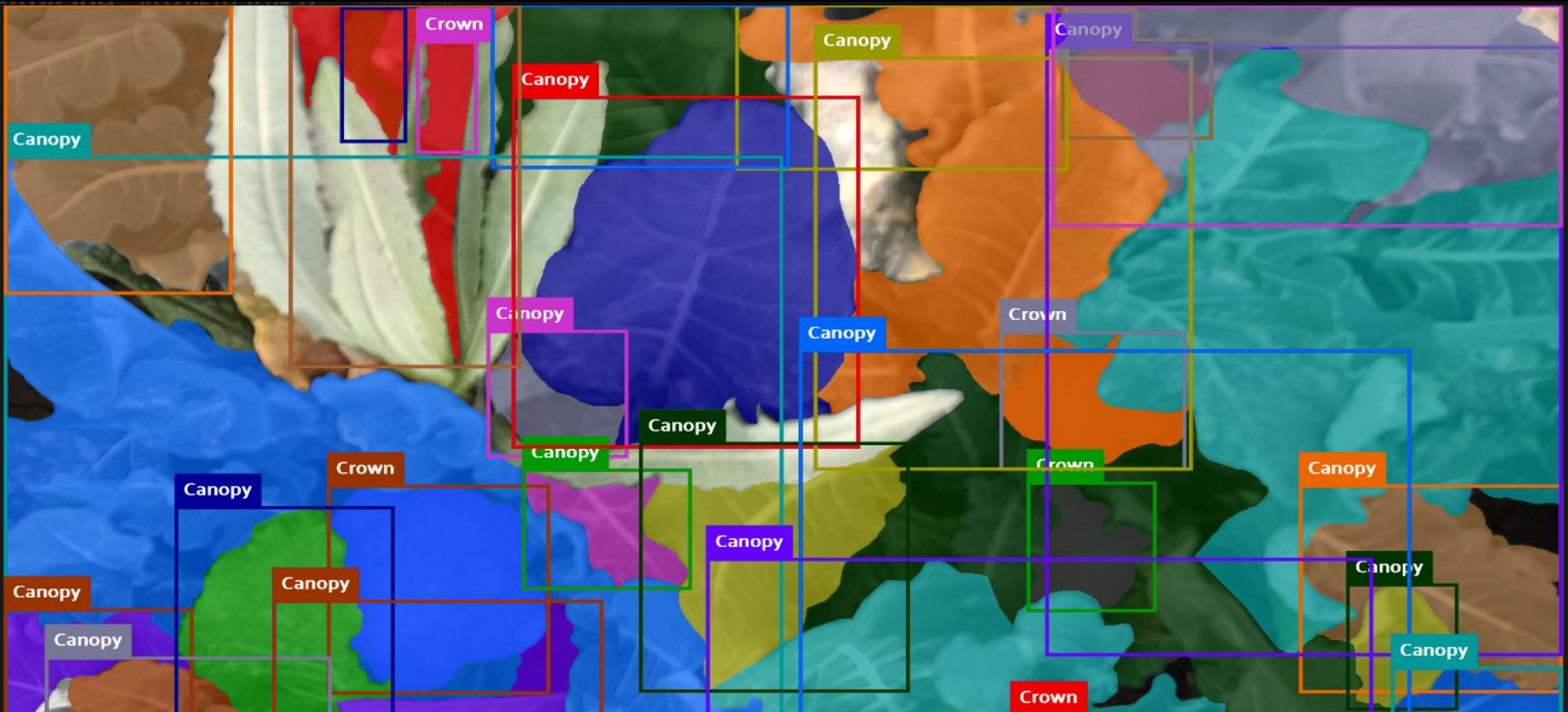
Creating a Visual Machine Learning (ML) Model

Data Gathering

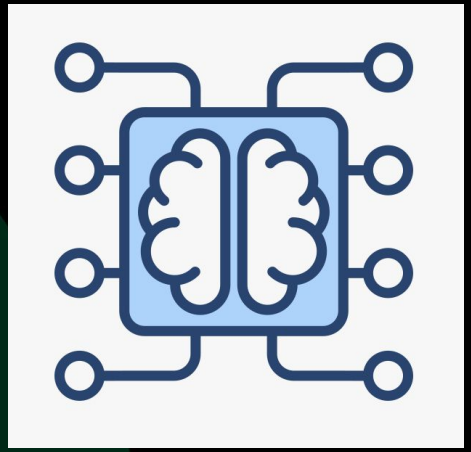
Raw Image Catalog



Annotating Images



Camera, Model, Actuation



It’s that simple, but it’s not that easy

Challenges Implementing AI in Agriculture

Tech Side Challenges

- Machine Learning (ML) models not fully prepared for real world application
- Expensive cost of data gathering for model training
- Lack of trained models to perform in all contexts
- Unable to withstand dynamic environment (ex: Desert climate)
- Lack of overall equipment reliability and durability
- Lack of engineering bandwidth

Tech Side Challenges

- Not obtaining correct or enough market knowledge
- Unwilling, or unable to meet market needs
- Prototyping while trying to sell and provide a service
- Financially unable to continue with equipment / AI progress
- Unable to raise next Venture Capital (VC) funding round
- Go out of business

Farm Side Challenges

- Initial cost of the technology/equipment investment
- Size of the farm (Large to small growing operation)
- Equipment/technology implementation/integration
- Training personnel to run the equipment

Farm Side Challenges

- Necessary personnel to maintain the equipment
- Reliability of the equipment
- Cost to maintain the equipment
- What is the equipment lifespan compared to the cost
- The real ROI (is there an actual savings?)

Farm Side Challenges

- Is the manufacturer going to stay in business?
- Will there be ongoing support?
- Who owns the data?
- Balance between hiring humans vs using technology
- Risk vs Reward

Challenges Using Drones in Agriculture

Drone Challenges

- High initial investment
- Limited payload capacity (especially in spray)
- Short flight times
- Limited battery capacity
- Less scalable for very large operations
- Lack of skilled professionals to operate
- Operational constraints such as weather

Drone Challenges

- Drone selection and configuration
- Requires infrastructure on the part of the grower
- Requires precise testing and tuning to get good performance
- Complex Government regulations
- Supplier and parts risk

Path to Success

- Start with drone services company
- Let them test and understand how to best utilize drones in your operation
- Work with services company to iterate and improve on the process

Path to Success

- Start researching on drones for building out your in-house fleet
- Work with services company on drone selection and how to best operate/utilize the drones
- Use a mix of in-house fleet, supplemented by services company

4 Example Drone Companies in Agriculture

GEOVISUAL
ANALYTICS

GeoVisual Analytics

- Using UAVs for 8 years to deliver field analytics
- Stand counts, yield forecasts, plant size, spacing, health indices, and flower counts
- Leading UAV solution provides VRA fertilization task maps
  - Achieving ~8.5% yield increase and 20% N fertilizer reduction for leafy greens

GeoVisual Analytics

- Holistic data collection strategy
  - Use drones alongside sensors, equipment monitors, and handheld devices
- Choose the most cost-effective and reliable system for your data needs
  - Sometimes drones, often not
- Combining drones and the ground
  - Drone captures weed density data
  - Spray using custom ground rig - Variable Rate Spray Application System

GeoVisual Analytics

https://www.geovisual-analytics.com
Cody Ruiz
831-676-8666
cody.ruiz@geovisual-analytics.com


Skysense

Skysense

- Founded in 2020 by Justin Clune - using drones to scout for male plants on his family's CBD Hemp farm
  - A single drone and well-trained AI model replaced dozens of laborers on foot
  - Locate and remove the male plants before they matured enough to pollinate and damage the yield of the female plants

Skysense

- FAA BVLOS Waiver
  - Drones typically require an experienced pilot to run the mission in-person
  - Skysense has “Beyond Visual Line of Sight” waiver from the FAA
  - Can operate all drones remotely from Remote Operations Control Center (ROCC) in Richland, WA
  - Docking stations installed permanently on farm

Skysense

- Bird mitigation
  - Drone with 120db loud speaker and high intensity LEDs
  - Custom flight plans target hot-spots
- Crop monitoring
  - High-resolution images to track crop health, growth, stress
  - New ML model for any crop/weed in 3 days
- Weed management
  - Heat map of weed size and pressure
  - Create prescription maps for spot spraying

https://www.skysense.ag

Justin Clune

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AGRI SPRAY
DRONES

Agri-Spray Drones

- Founded by Missouri-native Taylor Moreland in 2019 – deep roots in farming and ag expertise
- Provide cutting-edge agronomic technology solutions, nationwide
- Dedicated team of agriculturally minded individuals and seasoned aviation professionals
- Over 100 dealers/providers across the US

Agri-Spray Drones

- EAVision J150
  - 20 gal spray tank
  - 30 mph max spray speed
  - Proven with 20k+ flights prior to launch
- Sales
  - Nationwide dealer network, in-depth sales support
- Service
  - Technical advice, replacement parts
- Support
  - Providing education and experience

https://agrispraydrones.com

573-519-5000

info@agrispraydrones.com


AG - BEE

Ag-Bee

- FAA-approved for aerial spray drone operations since 2019
- First Journeyman UAV Pilot licensed by California DPR
- Tailored drone spray solutions for growers, agronomists, and universities
- 7 years of field experience across vineyards, orchards, vegetables, and other land types
  - Habitat restoration, weed abatement, and fire prevention

Ag-Bee

- Agriculture
  - Row crops, vineyards, orchards, bed crops
- Habitat restoration
  - Rangeland, waterways, seeding, fire damage
- Ornamentals
  - Cut flowers, nurseries, succulents, greenhouses
- Specialty
  - Vector control, beneficials, heavy lift, power washing

Ag-Bee

- Technology verification is vital
  - Different drones apply differently
  - Every drone has unique characteristics that must be tested
  - Weather, terrain, crop type, drone model, products, adjuvants
- Drone testing, verification, development
  - Ceres Air, XAG, DJI, EAVision, Huida Tech

https://www.ag-bee.com

Briana Layfield

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