FOCUS ON PRECISION CONFERENCE 2018

ARTIFICIAL INTELLIGENCE FOR AGRICULTURE
Introductions

1. Background
2. Artificial Intelligence in Agriculture
3. Convolutional Neural Networks
4. Image Classification
5. Object Detection
6. Complementary Technologies
7. Benefits and Opportunities
Pocket Agronomist Demonstration
Agricultural Intelligence Datasets

- Plant Disease
- Nutrient Deficiency
- Insect Pressure
- Weeds
Impact | Corn Loss Attributed to Plant Disease

- 2016 Corn Loss (USA/CA)
  - 817 million bushels

- 2016 Corn Loss (USA/CA)
  - $3 billion

- Overall Value Loss/Grower
  - $6,000
How It Works

Convolutional Neural Network
- Machine Learning
- Mimics Visual Cortex
- No Pre-Programmed Answers
- Educates Itself based on User-Provided Information

Training based on Data-Sets
- Data-Set
  - Categories – Apples, Bananas, Oranges
  - Images – Green Bananas, Peeled Bananas, etc.
- Learning
- Validation-Set
- Cumulative and Categorical Accuracy
Technology Comparisons

**Server-Based**

- Internet | WIFI | Data-Connection Required
- Software requires a data-connection – Processing is done via servers
- Agricultural examples: PlantSnap and Plantix

**On-Device**

- Internet | WIFI | Data-Connection **NOT** Required
- Software is usable 24/7 – only requirement is power
- Promotes availability and provides enhanced data-privacy
- Agricultural examples: Pocket Agronomist
Technology Comparisons

**Image Classification**
- Identification using best “Learned” Label
  - Level 1 Identification – Good for imagery displaying low complexity

**Object Detection**
- Identification of multiple objects is one scene
  - Level 2 Identification – Good for increasingly complex imagery
Technology Comparisons

VS
Technology Considerations

**Rapid Advancement**
Turnaround on datasets
- Deploy > Capture > Label > Train > Deploy

**Optimized**
Small Network Engines
- Efficient deployment and limitless dataset opportunity

**Wild Datasets**
Real-World Imagery
- Lab accuracy translate to real-world accuracy

**Flexible Design**
Any Image-based dataset
- Easy integration of new crops, plants, and agronomic issues
Distracted Driving Demonstration
Airborne Damage Assessment
Complementary Technologies – Augmented Reality
Complementary Technologies

Small Autonomous Vehicles
Opportunities: Ag Virtual Assistants

**Available**  Assistant in your pocket 24/7
- Pocket Agronomist delivers agronomist-level identification abilities to the untrained eye
  - Available on-demand, 24/7, anywhere in the world

**Knowledgeable**  Trained on real-world imagery from the field
- Datasets used to train the software is comprised of in-field images of actual disease cases
  - Contributes to Real-World Accuracy
Opportunities: Ag Virtual Assistants

**Leverage Workforce**

- Untrained employees become more valuable – Farmers/Farmhands/Interns/Applicators/Agronomists/Scouts
- Trained-eye assessing more acres
Questions