# Hands-On Machine Learning with Agricultural Applications

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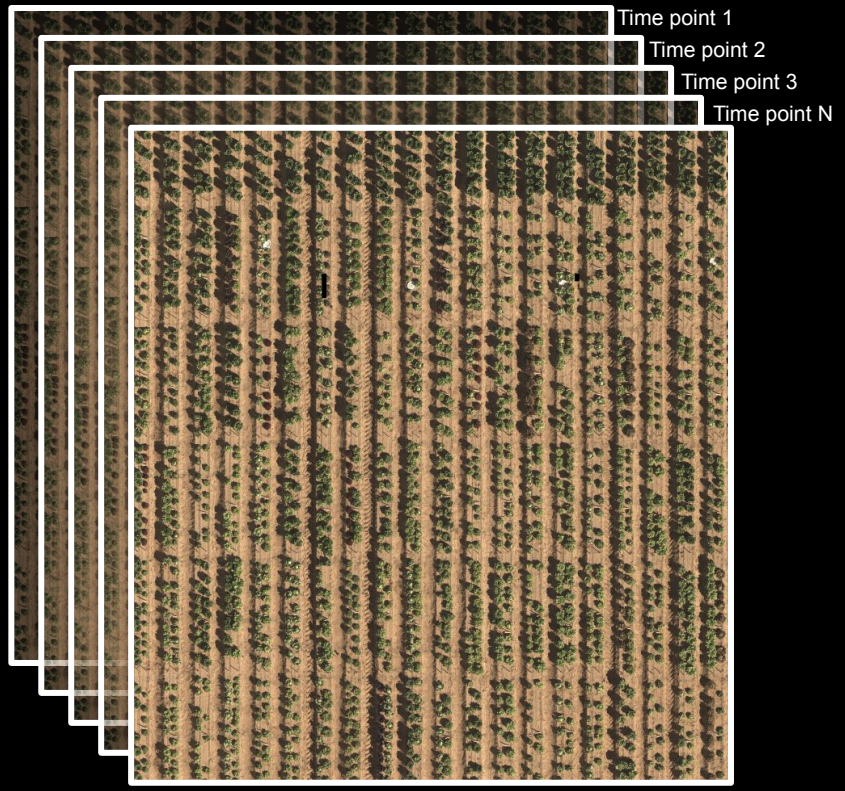
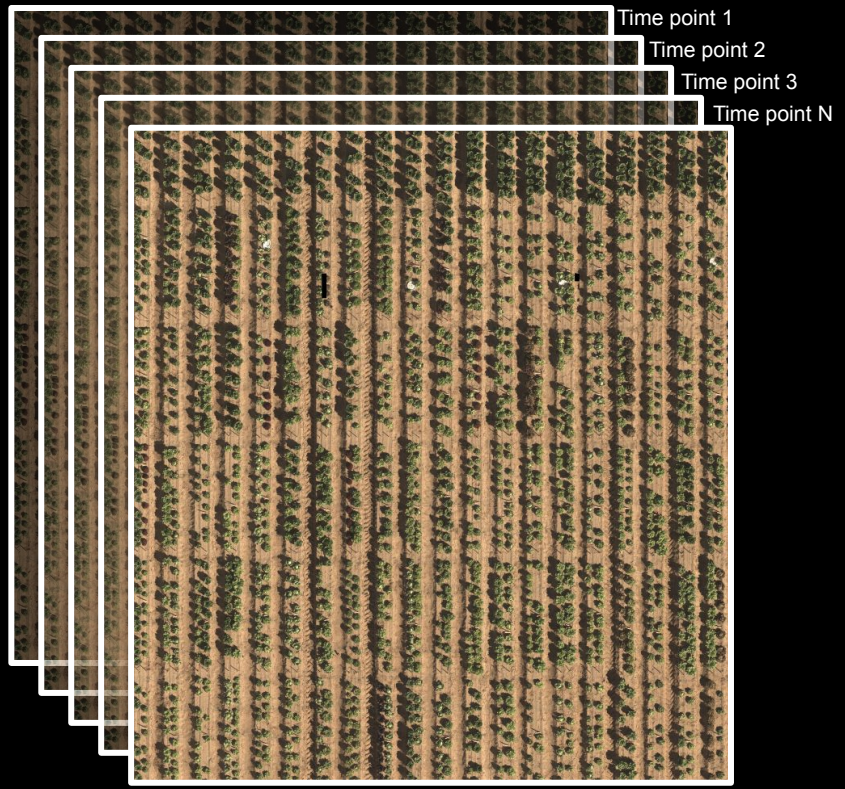
# Problem Framing: Tracking thousands of plants

- Plant Science perspective
  - Quantitative and predictive focus
    - Can we use data to predict yield ?
    - Can we use data to improve crop performance under drought?
    - Can we identify natural and/or induced variation?
    - What ML algorithms can be used and/or combined?



# Problem Framing: Tracking thousands of plants

- Data Science perspective
  - Multiple data time points throughout growing season
    - Lots of training data = good!
  - Other image processing techniques have been unsuccessful
    - Shift to ML methods



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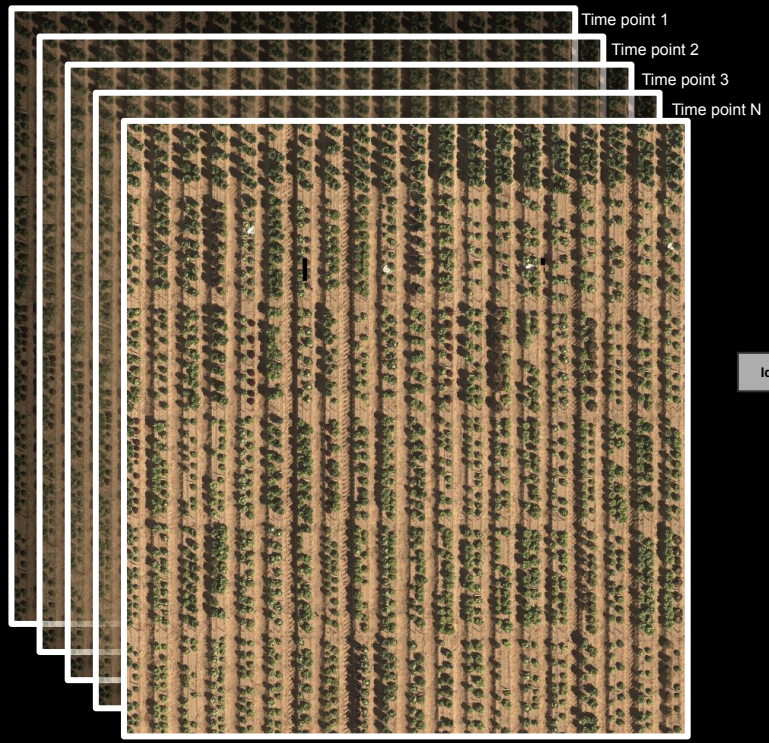



Ideas

**Team**

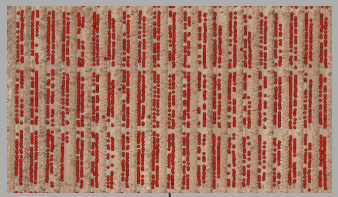
- Engineering
- Data Science
- Plant Science
- Computer Science

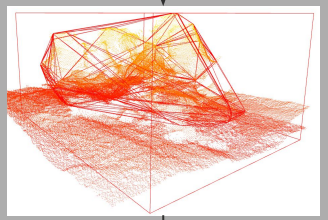
Sweat

Years

Tears

**Team goals!**



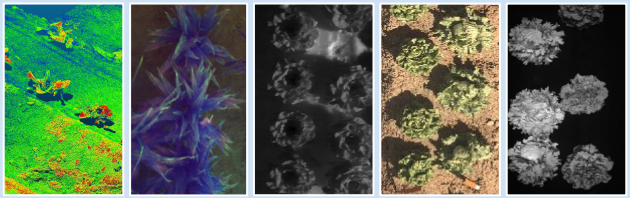


Discovery!

# Data Collection: Converting raw data into gold

## Collection method

## Data management



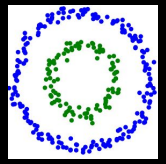
Data volume:

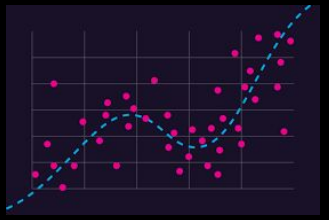
- Max: 10 TB/day
- Typical: 1.5 TB/day

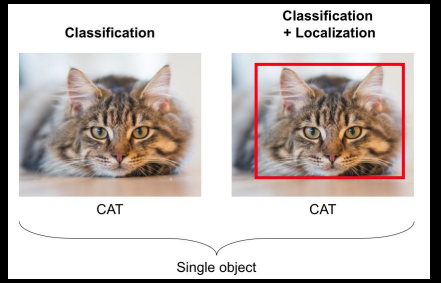
## Data preparation

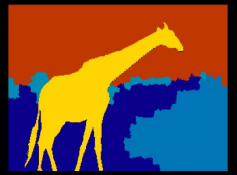
# Machine Learning Tasks

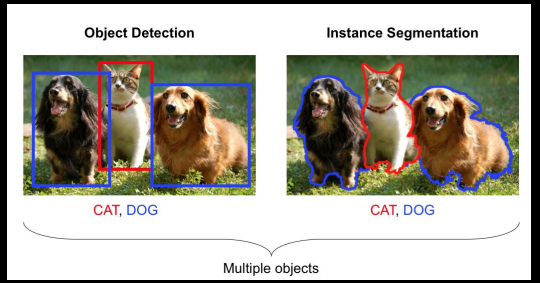
- Supervised
  - Regression
  - Classification
  - Localization
  - Object Detection
  - Segmentation
    - Semantic Segmentation
    - Instance Segmentation
- Unsupervised
  - Clustering





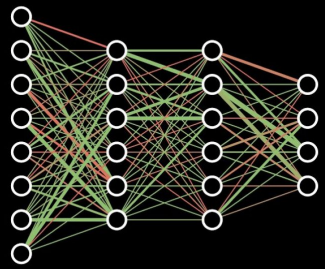




# Neural Networks and Computer Vision

- Visual Perception for Computer
- Learn discriminative models for different CV tasks
- Inspired by brain Neural System
- Adjust parameters by penalizing errors



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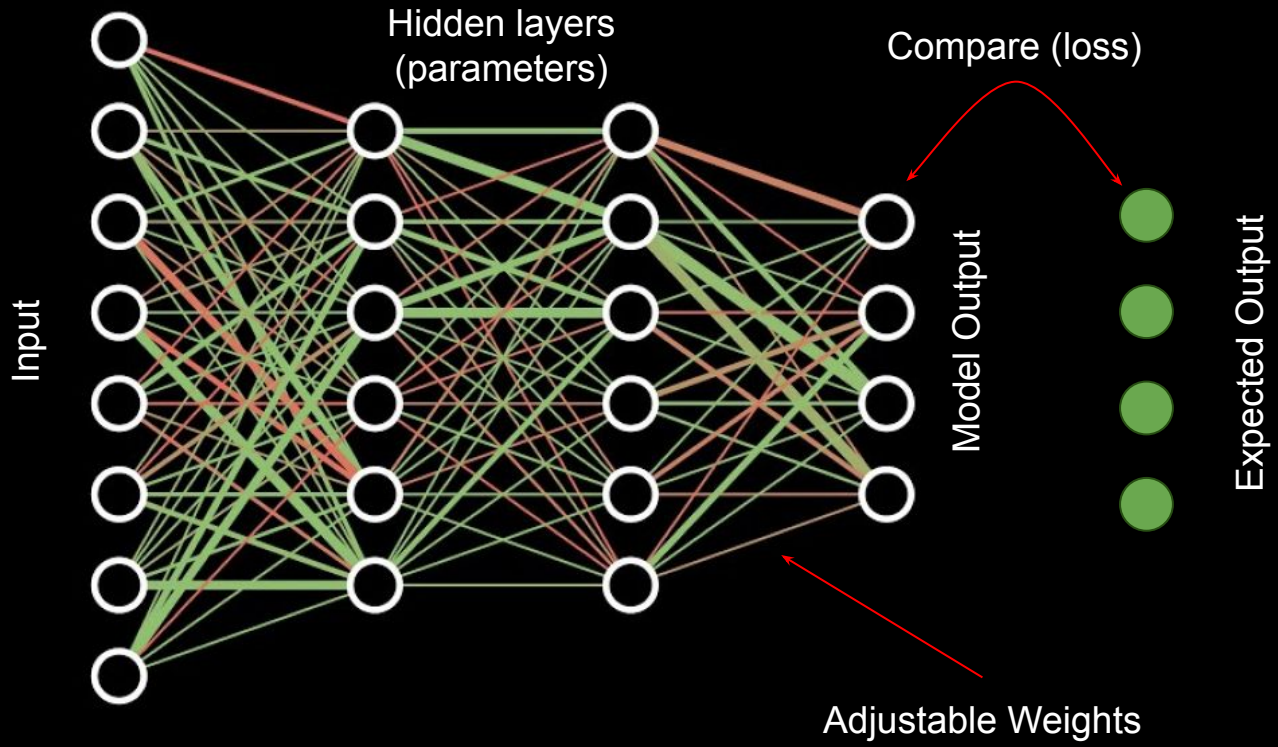
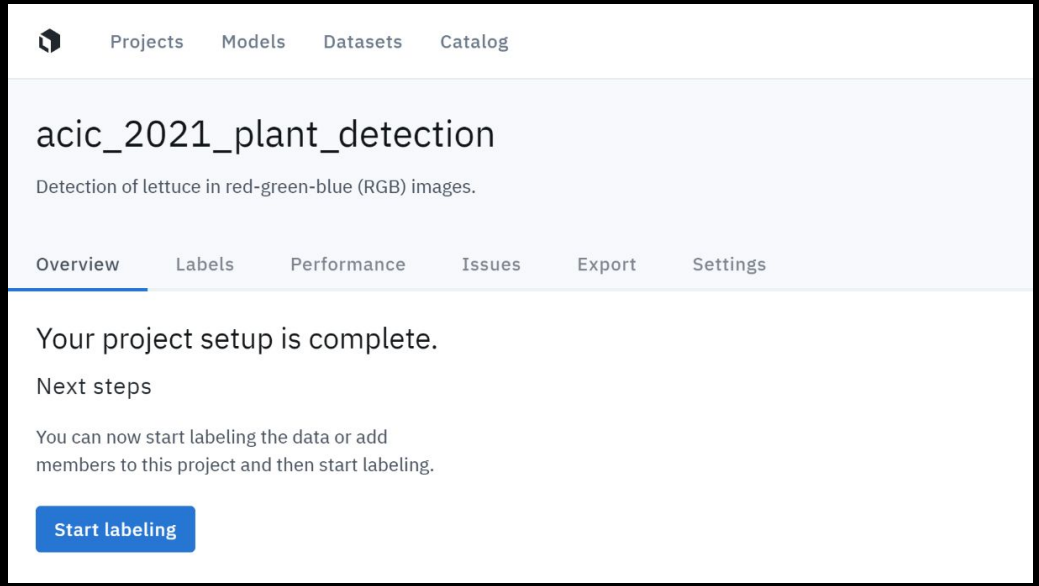
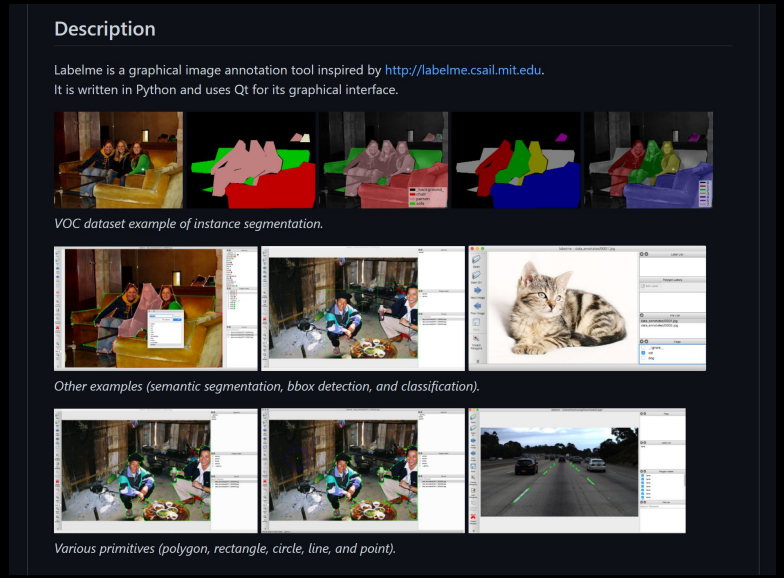


# Data Preparation: Labeling is a crucial step

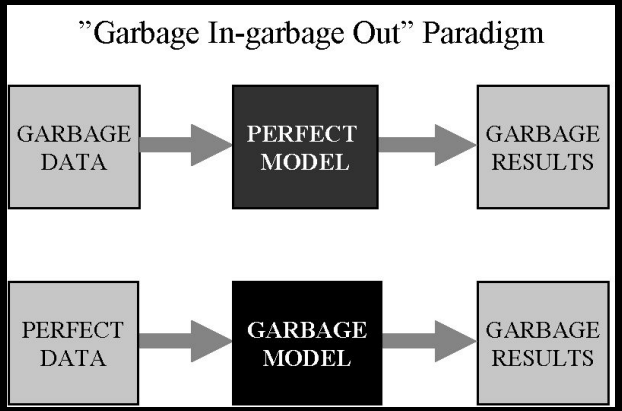
Web-based

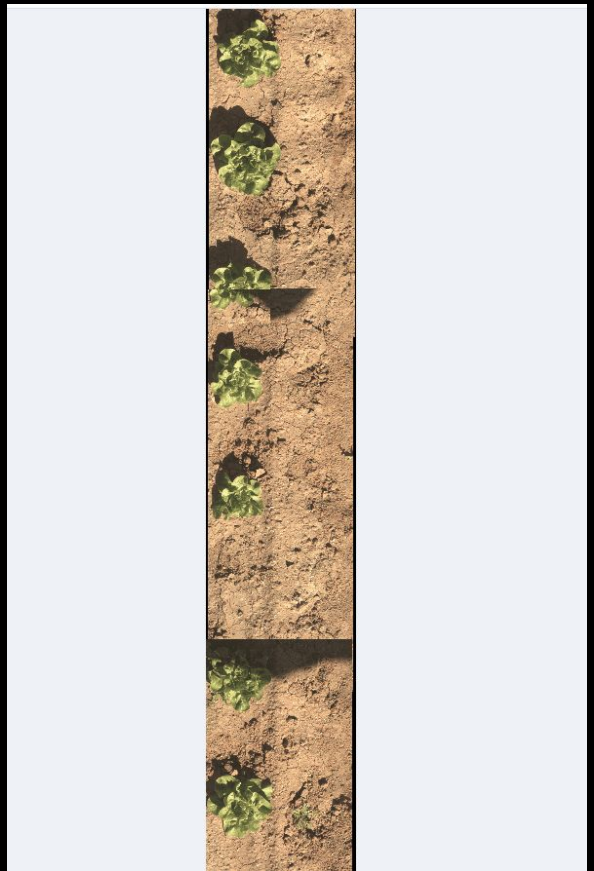



Local, graphical user interface

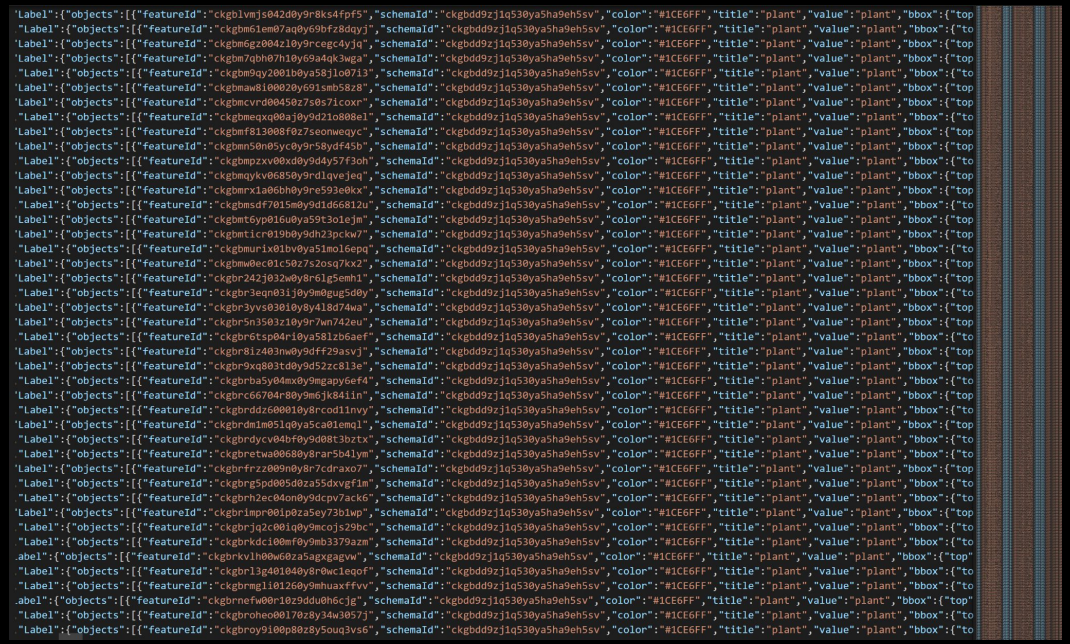


# Data Preparation: Label quality matters



# Data Preparation: Interpreting labels

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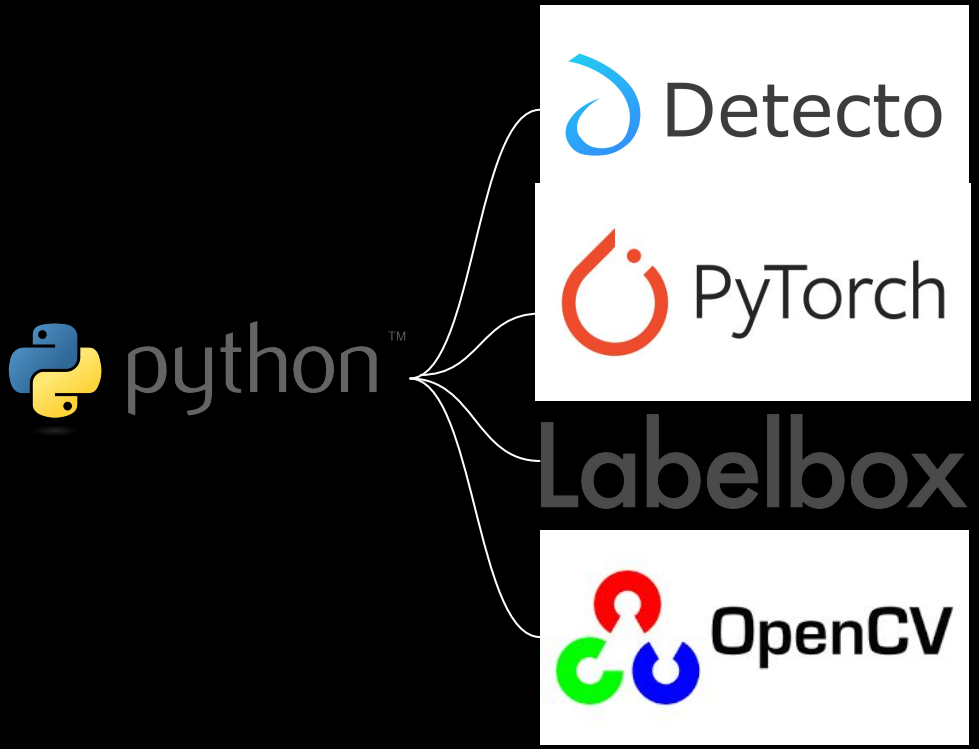
# Model training: The relatively easy part




Object detection: here
Semantic segmentation: here