

# Pest Detection

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# The Goal

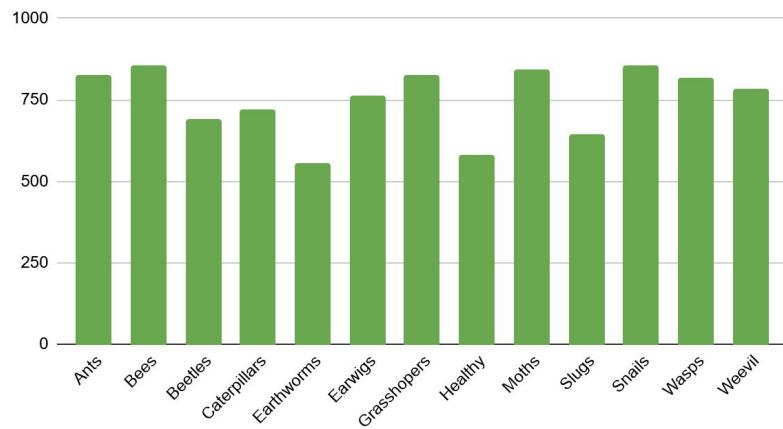
- Sort images based on what insect is present
- Applications:
  - Farming
  - Monitoring invasive species
- Model: Convolutional Neural Network
  - Well suited for spatial data



# The Data

- Images were collected from two datasets
  - AgroPest-12: Image Dataset for Crop Pest Detection
    - 12 classes: Ants, Bees, Beetles, Caterpillars, Earthworms, Earwigs, Grasshoppers, Moths, Slugs, Snails, Wasps, and Weevils.
  - Agricultural crops image classification
    - Originally 30 classes which were combined into one healthy class
- training/validation/test
  - 70/15/15
  - stratified

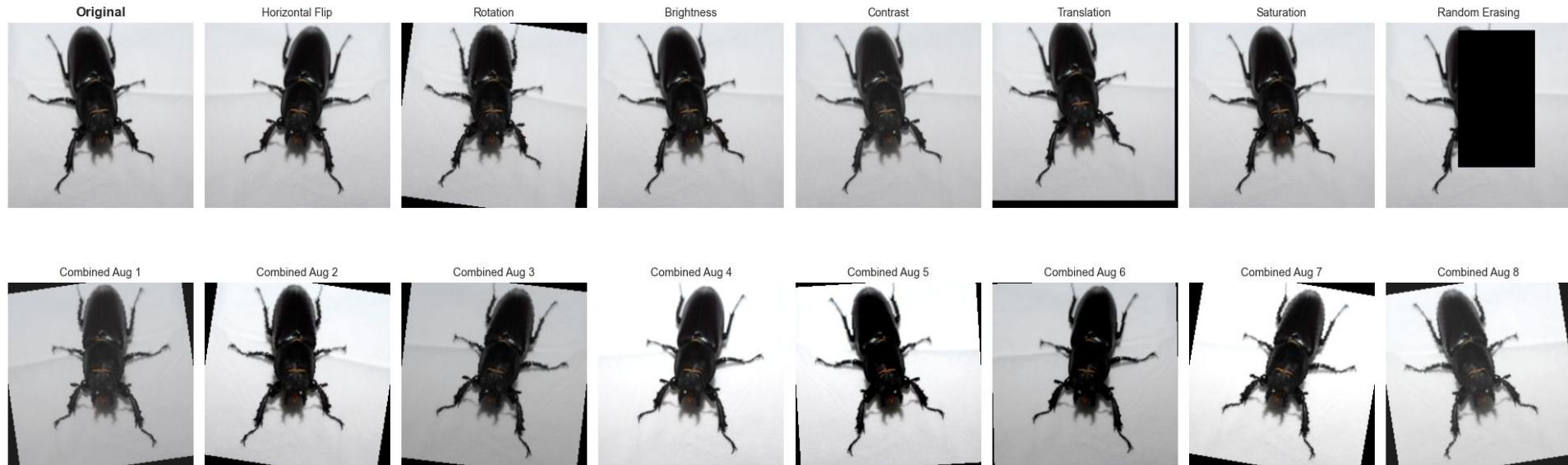
Distribution of Training Dataset



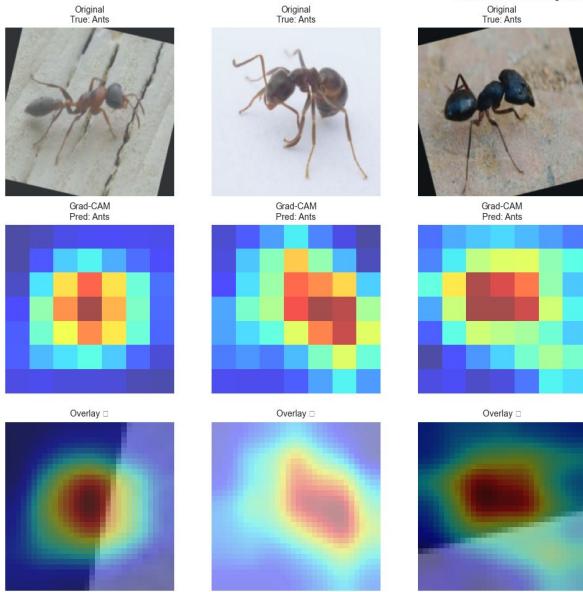
# Approach

- Started with building a model based on previous work
  - Slow
    - Took about 12 hours to go through 7 epochs
  - Inaccurate
    - Had about 20% accuracy by the end
    - Surpasses random chance but disappointing
  - If other options hadn't worked I would have experimented with learning rate
- Moved onto the pretrained PyTorch model Resnet 18
  - Feature Extraction
    - Took 26 minutes
    - Plateaued around 78%, training accuracy and 82% validation accuracy
    - Test accuracy 83%
  - Fine Tuning
    - Took 39 minutes
    - Plateaued around 95%, training accuracy and 93% validation accuracy
    - Test accuracy 95%

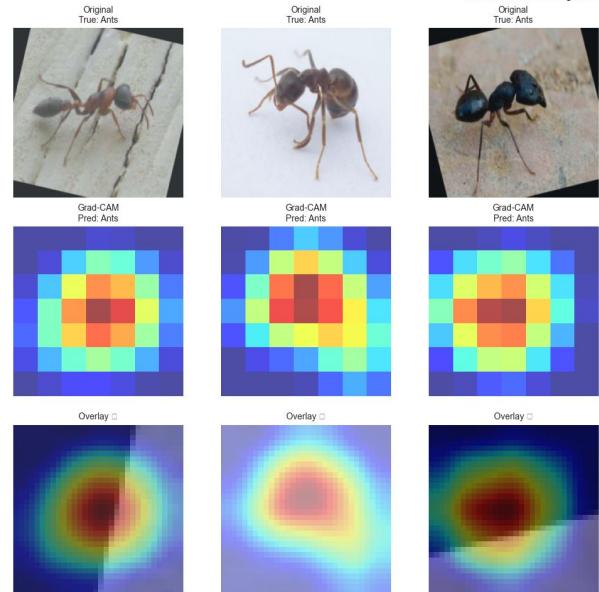
# Data Augmentation



# Grad-Cam Analysis

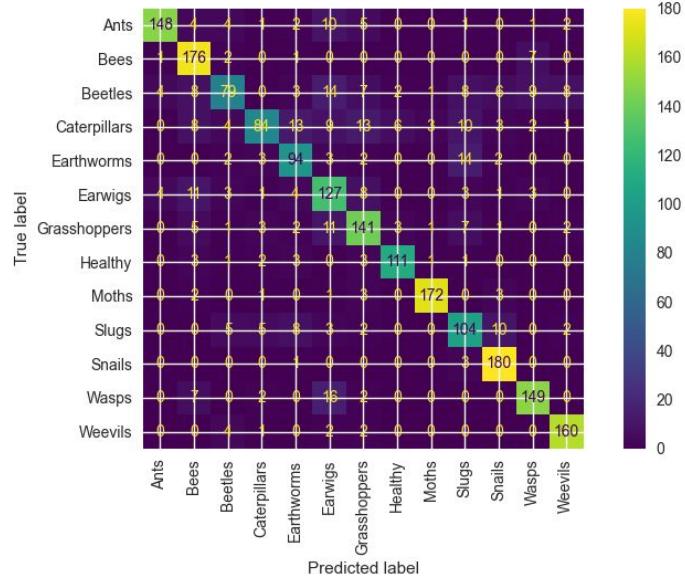


Feature Extraction

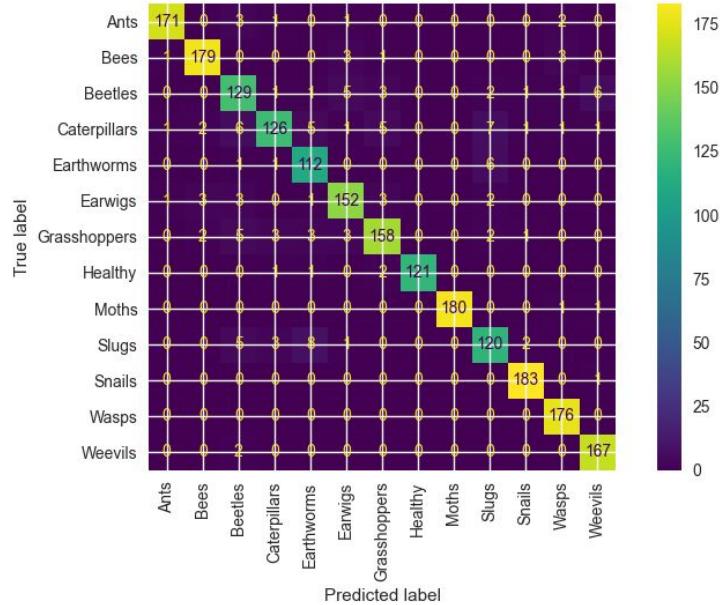


Fine tuning

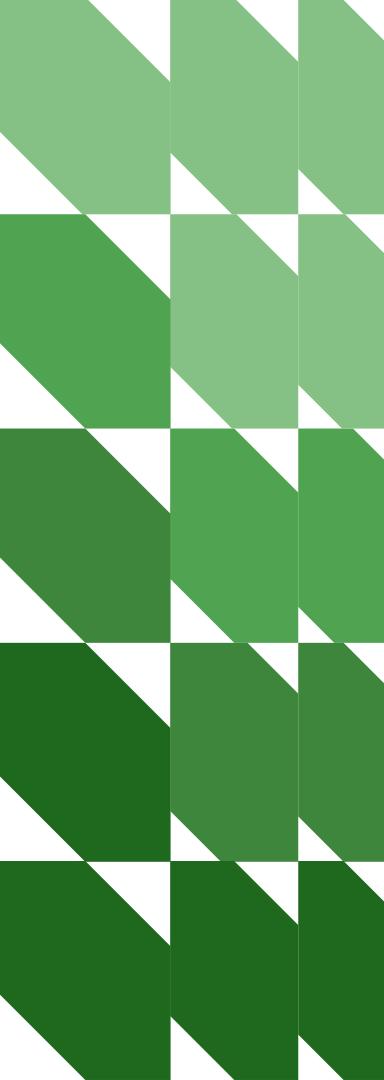
# Results



Feature Extraction  
Accuracy: 81.87



Fine tuning  
Accuracy: 93.69



# Takeaways

- Pre-trained models can be very powerful
  - Can be fast and accurate
  - Might have issues with licensing depending on application
  - Feature Extraction
    - Faster but less accurate
  - Fine tuning
    - Slower but more accurate
- Possible improvements
  - Use more a more powerful computer to train a more specific model
  - Collect more data of insects in desired context