Lost Hope

Objective detection with the Arduino Nano 33 BLE
w/ OV7675 camera

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https://github.com/AntTheToni   https://github.com/aryan-gupta/   https://github.com/ric3b0wl

Introduction

- The goal of the project was to train the model (Arduino Nano 33 ble) to detect a specific target using the Arduino camera.

- The group chose the target "banana" and trained the model to detect a banana when presented to the camera.

- Online images of bananas and real bananas were used to test the accuracy of model.
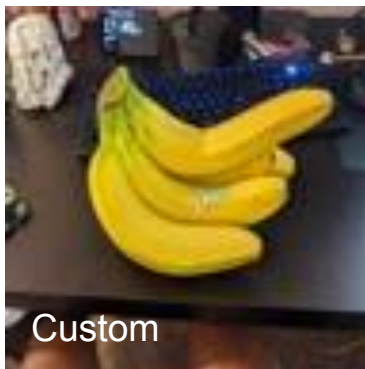
Data Collection

- Fruits 360 Dataset (318 banana images)
- Coco 2017 Dataset (1618 banana / 39,347 not banana images)
- Custom Dataset (27,283 banana images)
  - Recorded ~6min video of bananas in various environments
  - Resized to 96x96 pixels
  - Split into individual frames
- Total Banana: 29,219
- Total Not Banana: 30,347
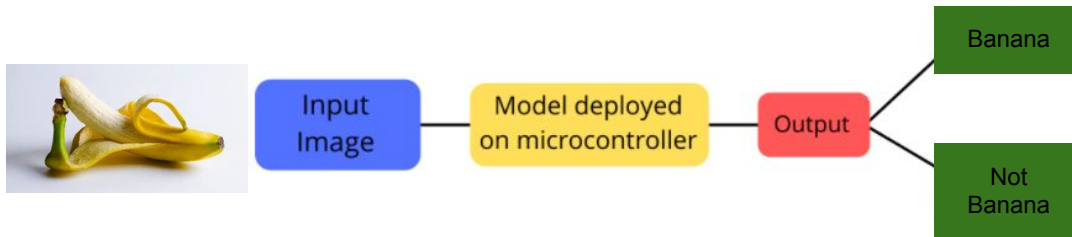

Fruit 360

Custom

Coco

Training

- mlcommons training script (visual wake words)
    - Mobile net v1
    - Google Colab
- Training/Validation

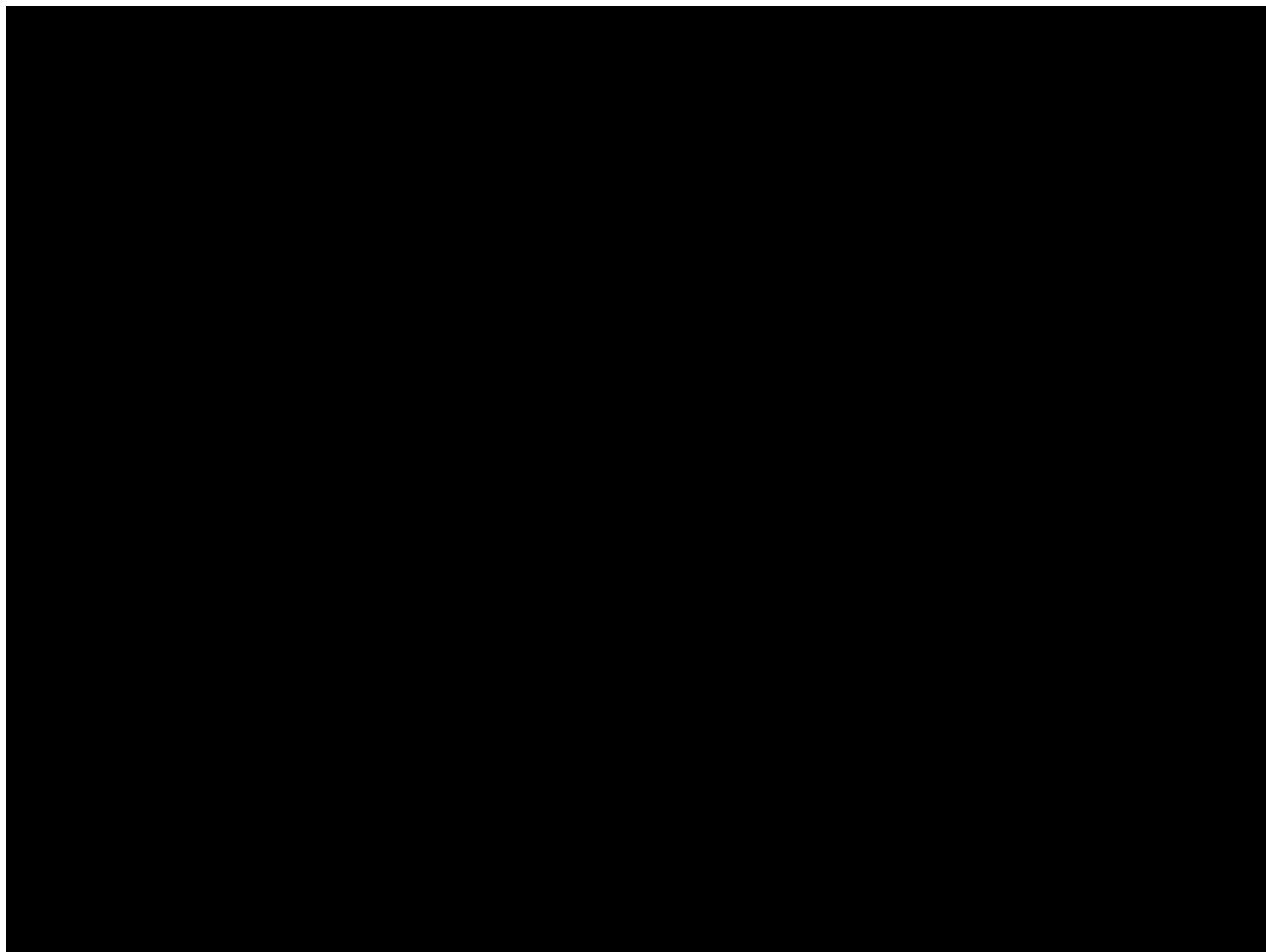| epoch	loss	accuracy	val_loss	val_accuracy
15/100	0.0297	0.9954	0.6286	0.7919
100/100	0.0040	0.9999	2.5840	0.7280

Microcontroller

- Code based off of Harvard TinyML Person Detector Code
- Works with RGB and Grayscale
- Image is sent 5 times per second
- Model is run ~once a second


```
// Switch on the green LED when a person is detected,
// the red when no person is detected
if (person_score > no_person_score) {
  digitalWrite(LEDG, LOW);
  digitalWrite(LEDR, HIGH);
  TF_LITE_REPORT_ERROR(error_reporter, "Banana      found. Banana score: %d No Banana score: %d",
                       person_score, no_person_score);
} else {
  TF_LITE_REPORT_ERROR(error_reporter, "Banana NOT found. Banana score: %d No Banana score: %d",
                       person_score, no_person_score);
  digitalWrite(LEDG, HIGH);
  digitalWrite(LEDR, LOW);
}
```

Video

Conclusion

- Issues
    - Hard to find starting point
    - TensorFlowLite version was outdated
    - More data needed (model was overfitting)
    - Timing the upload with the reset button
- Improvement ideas
    - More training data
    - Better accuracy with color (bananas are yellow)
    - More fruit models
- Real world use cases
    - Groceries Notifier
    - Ripeness Detection (for grocery store restocking)

Questions?

How many
Banana did
you see in
our slides?