Image Classification: Fruits 360

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Fruits 360 Dataset

- 40 Fruits

- 71,000+ Images

- 53,000+ Training Images

- 17,000+ Testing Images

- Image Size: 100x100

- Fruits Planted In Shaft Of Low Speed Motor (3 rpm) & Short Movie Was Recorded

Objective:

Accurately Classify Unseen Images of Fruits Into 1 of 40 Classes

What We See

What Computers See

Original Image, Resized, Greyscale

(nothing fancy here)

Map/Convert values between set range

(break up linearity)

After repeating steps 2-4, insert into artificial neural network

Input Image → Filter → Activation → Pooling → Full Connection

Convolutional Layer:
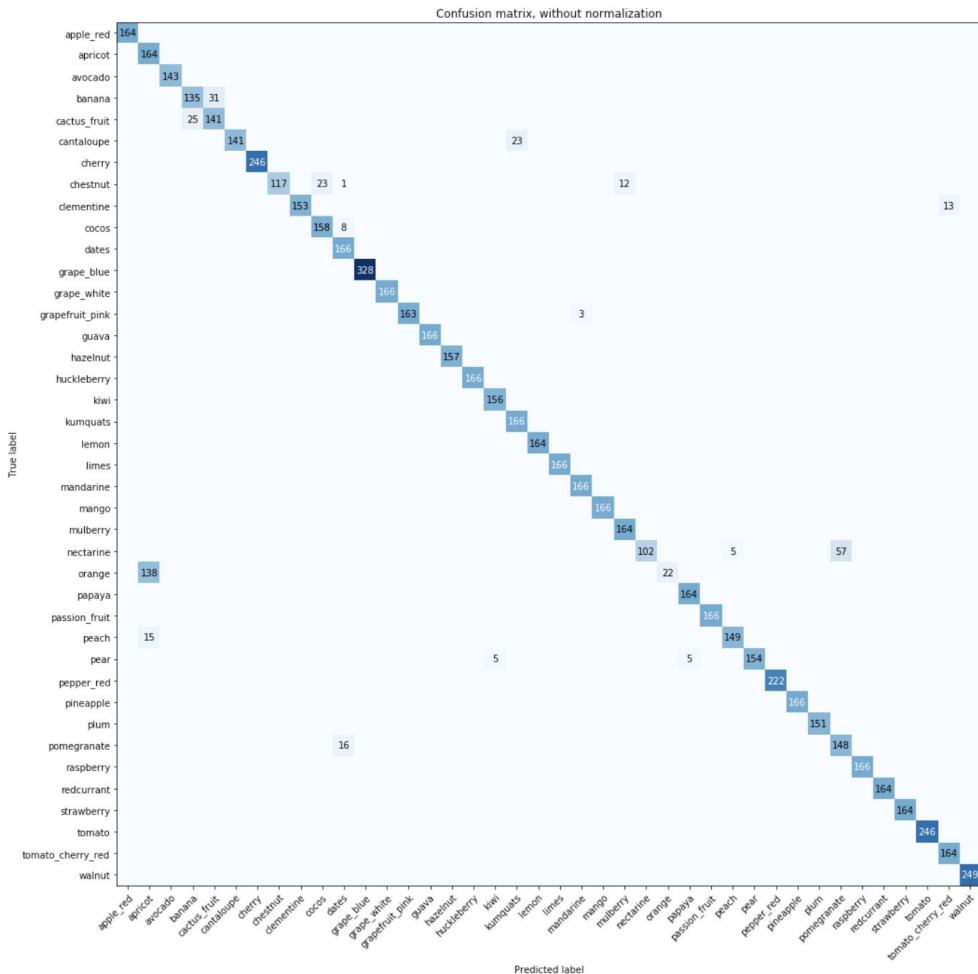
Feature Detection/Patterns (edges, curves)

Spatial Invariance:

Prepare CNN to detect different orientations, positions, angles, etc of object in image

Results

- Training Accuracy: 96.37%

- Validation Accuracy: 96.88%

- Testing Accuracy: 94.57%
 - *the actual important one*

Not terrible...but

Confusion matrix, without normalization

Key Takeaways:

- Out of the 160 Oranges
  - 138 **INCORRECTLY** predicted as apricot (86.25%)
  - 22 CORRECTLY predicted as orange (13.75%)
- Out of the 159 Nectarines
  - 57 **INCORRECTLY** predicted as pomegranate (35.80%)
  - 102 CORRECTLY predicted as nectarine (64.20%)
- Out of the 164 Pears
  - 5 **INCORRECTLY** predicted as kiwi (3%)
  - 5 **INCORRECTLY** predicted as papaya (3%)
  - 154 CORRECTLY predicted as pear (93.9%)

Normalized confusion matrix

Interestingly,

- Prediction accuracy/error was not bidirectional
  - Oranges highly misclassified as nectarines
  - Nectarines not highly misclassified as oranges

- Only one fruit (pear) was misclassified as two different fruits (kiwi, papaya)
  - Every other fruit, when misclassified, was predicted as the same class
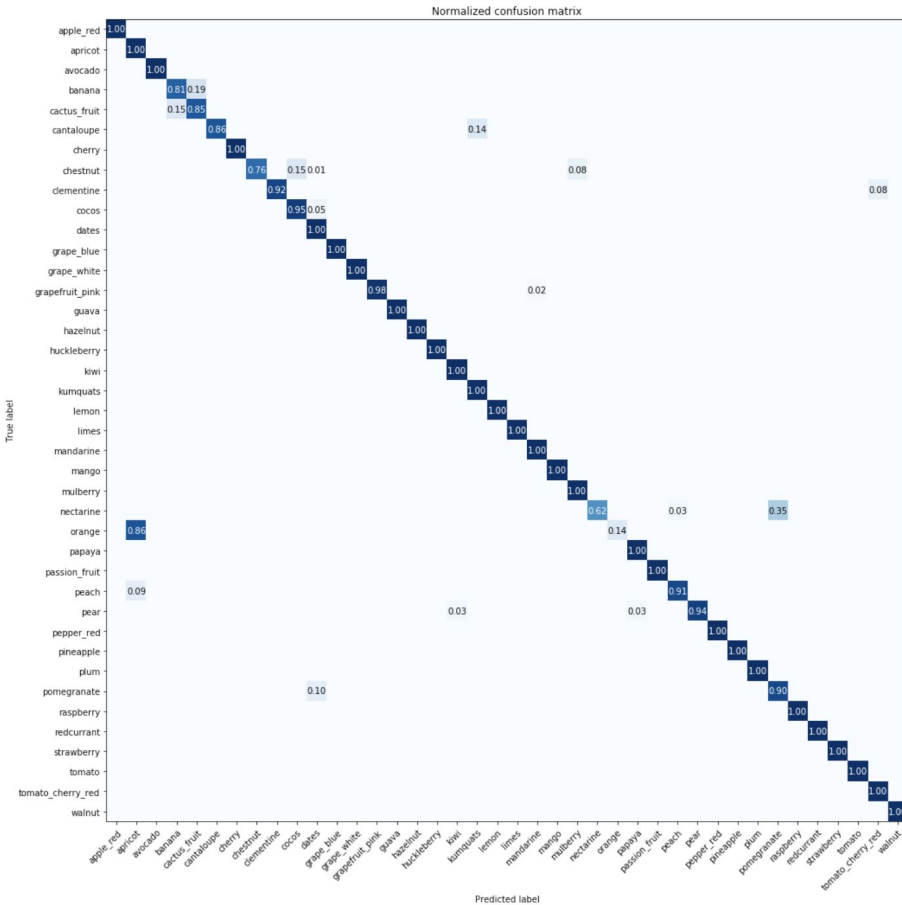
Preview Predictions
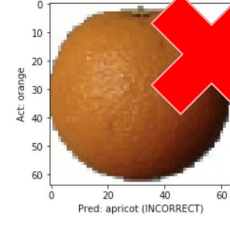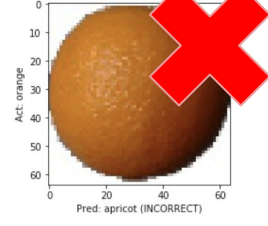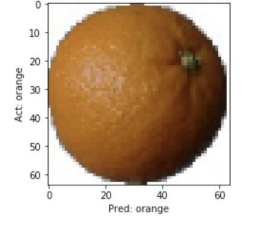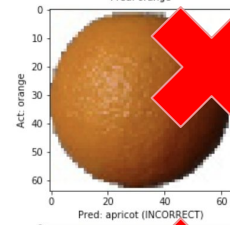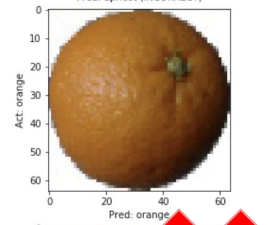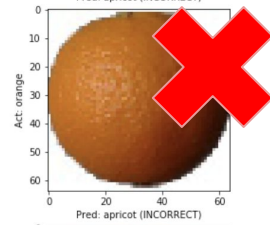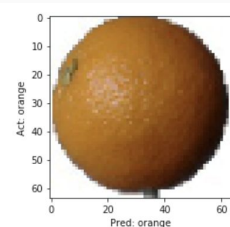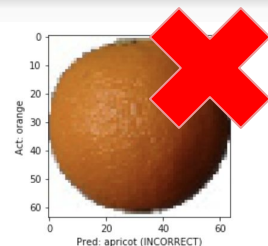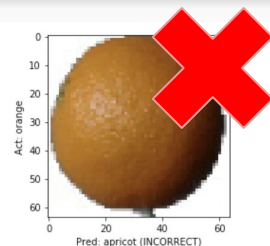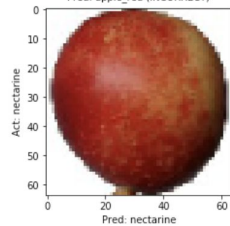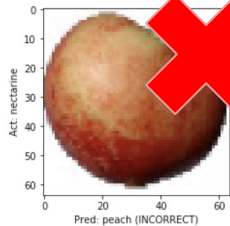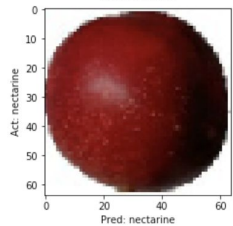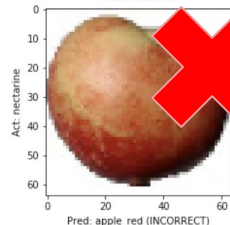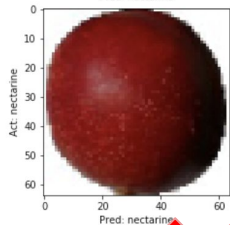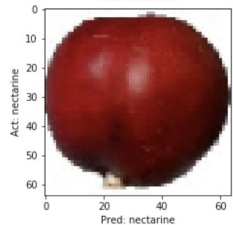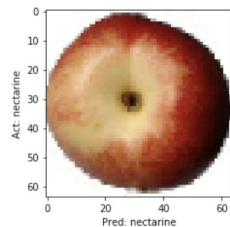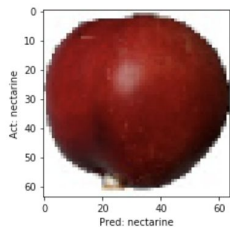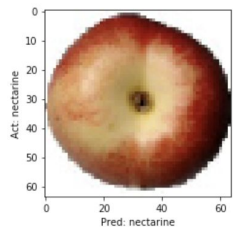
Key Takeaways

- Computers see images in arrays of numbers - they don't naturally see color, edges, or anything until trained

- High Quality dataset (potentially) made image classification challenge less challenging (though it wasn't easy, I promise)
  - All images were centered, on a white screen, and essentially had 360 rotation

- Prediction accuracy is not bilateral
  - When a computer gets "confused" by what it's looking at, it doesn't

- Why were oranges so accurately classified?
  - Why only one class?
  - How do you address this?
    - More data
    - Image augmentation

Any Questions?

Thanks!