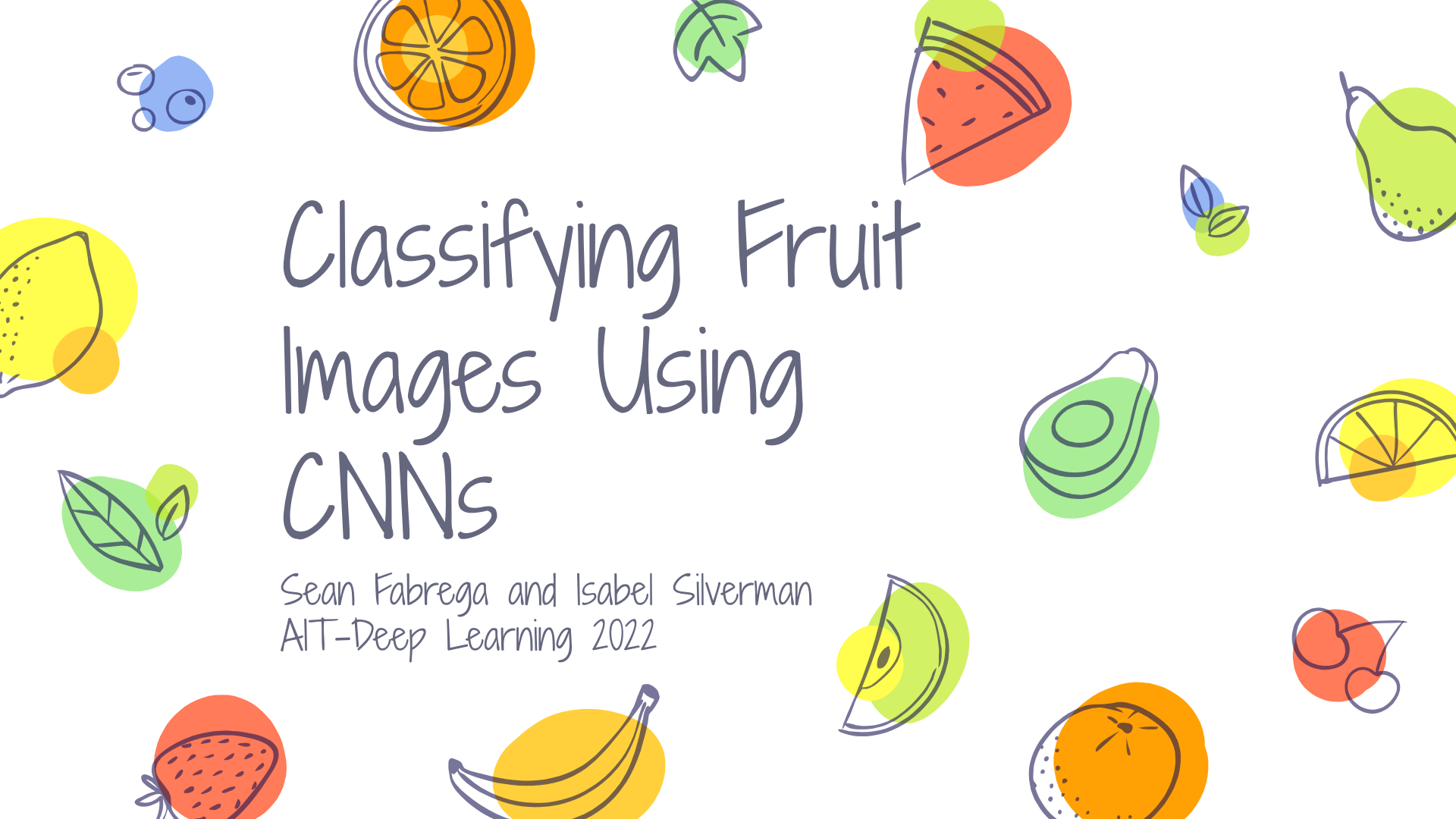


Classifying Fruit Images Using CNNs

Sean Fabrega and Isabel Silverman
AIT-Deep Learning 2022



Our Goal

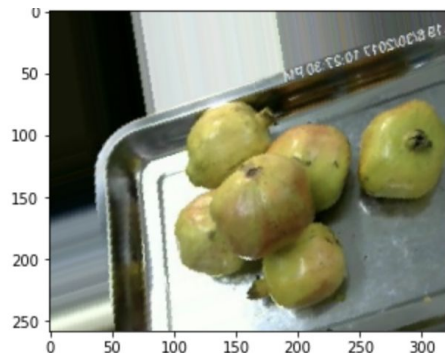
- ✗ Fruit recognition for checkout machines
- ✗ Reduce packaging and waste for labels
- ✗ Aid visually impaired in selecting produce



Datasets

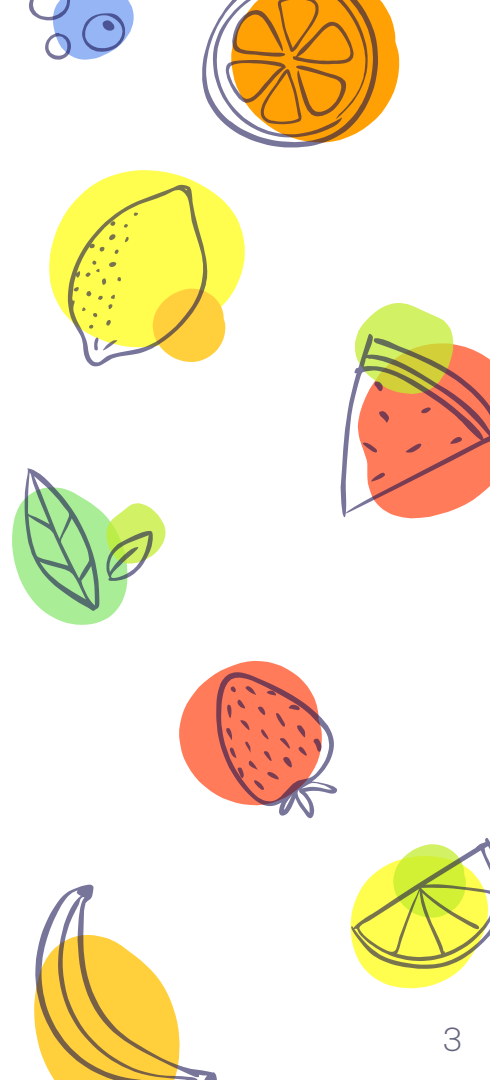
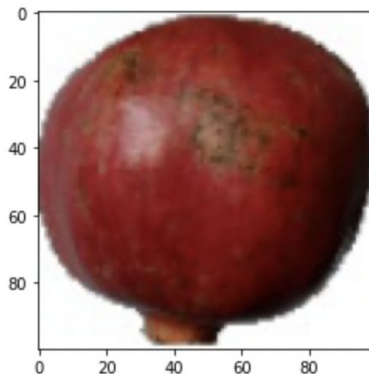
“Fruit-Recognition”

- ✗ 15 classes
- ✗ 44460 images
- ✗ 320 x 258 pixels



“Fruit-360”

- ✗ 131 classes
- ✗ 90483 images
- ✗ 100 x 100 pixels



Previous Solutions

“Classify 15 Fruits with Tensorflow”

- ✗ Kagge.com, by user *Datalira*
- ✗ Compares 27 pre-trained models using ‘Fruit-Recognition’ dataset

“Fruit recognition from images using deep learning” 2018

- ✗ By Horea Muresan and Mihai Oltean
- ✗ Convolutional neural network with 11 layers using TensorFlow and Keras

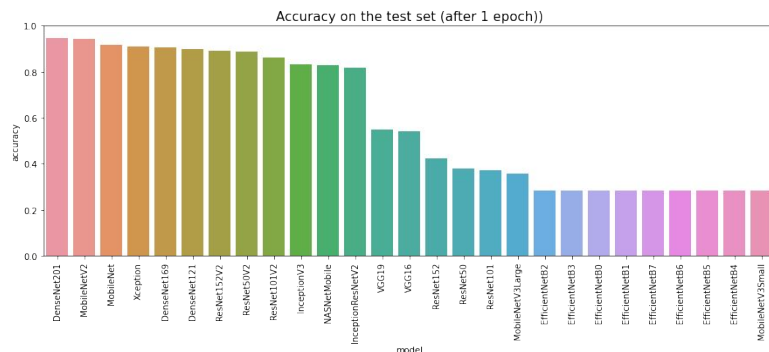


Table 2: The structure of the neural network used in this paper.

Layer type	Dimensions	Output
Convolutional	5 x 5 x 4	16
Max pooling	2 x 2 — Stride: 2	-
Convolutional	5 x 5 x 16	32
Max pooling	2 x 2 — Stride: 2	-
Convolutional	5 x 5 x 32	64
Max pooling	2 x 2 — Stride: 2	-
Convolutional	5 x 5 x 64	128
Max pooling	2 x 2 — Stride: 2	-
Fully connected	5 x 5 x 128	1024
Fully connected	1024	256
Softmax	256	131

Proposed Method

InceptionV3

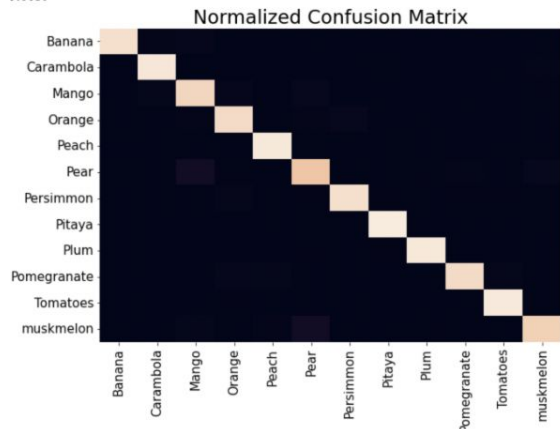
- ✗ +Global_Avg_Pooling
- ✗ + Dense output layer with softmax activation
- ✗ Batch size = 1000
- ✗ Parameters:
 - w/ 'Fruit-Recognition'
 - Trainable: 30,735
 - Total: 21,833,319
 - w/ 'Fruit-360'
 - Trainable: 69,666
 - Total: 21,872,450

DenseNet201

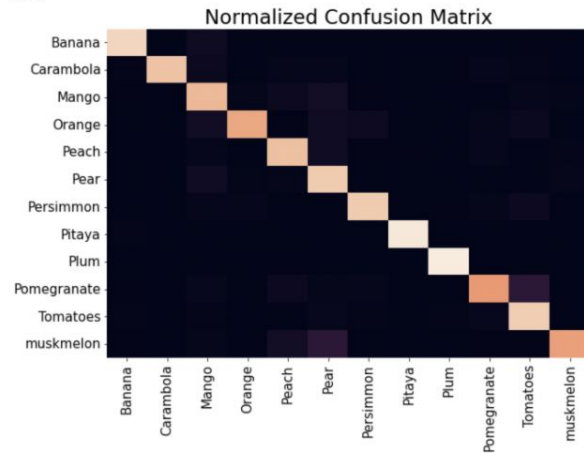
- ✗ +Global_Avg_Pooling
- ✗ + Dense output layer with softmax activation
- ✗ Batch size = 1000
- ✗ Parameters:
 - w/ 'Fruit-Recognition'
 - Trainable: 28,815
 - Total: 18,350,799
 - w/ 'Fruit-360'
 - Trainable:
 - Total:



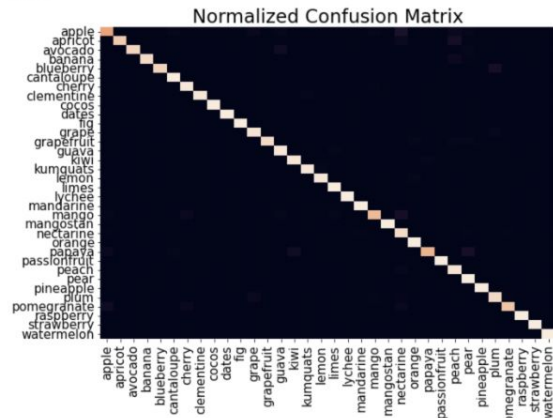
DENSENET 201 MODEL EVALUATION
Accuracy:
0.9614



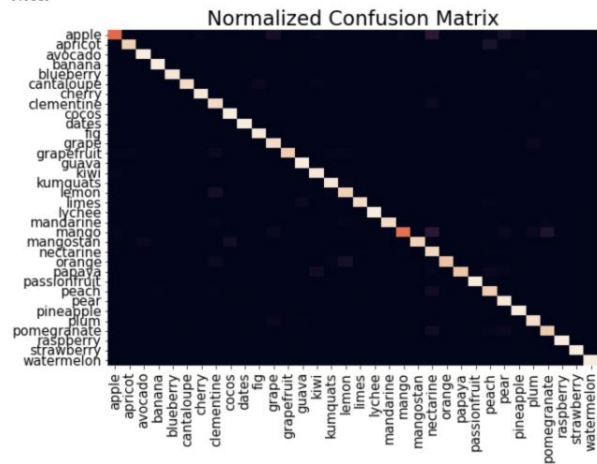
```
INCEPTION V3 MODEL EVALUATION ON FRUIT REC DATA
Accuracy:
0.893
```



DENSENET 201 MODEL EVALUATION ON FRUIT 360 DATA
Accuracy:
0.9683



```
INCEPTION V3 MODEL EVALUATION ON FRUIT 360 DATA
Accuracy:
0.9519
```



Results

Bibliography

Mureșan, Horea & Oltean, Mihai. (2018). Fruit recognition from images using deep learning. Acta Universitatis Sapientiae, Informatica. 10. 26-42. 10.2478/ausi-2018-0002.

Databeru. "Classify 15 Fruits with TensorFlow (Acc: 99,6%)." *Kaggle*, Kaggle, 10 Aug. 2021, www.kaggle.com/databeru/classify-15-fruits-with-tensorflow-acc-99-6.

