

Capstone 3: Image Classification

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Problem Statement

- Image classification categorizes groups of pixels within an image
- Focus: supervised image classification
- Application:
 - Medical imaging
 - Agricultural monitoring
 - Athletic performance
 - ...
- Classifying images of various types of balls

About the Images

- Source: Kaggle.com
- 3100 colored images
 - 2860 training
 - 120 test
 - 120 valid
- 24 classes
- Dimensions: 224 x 224



About the Images

- 13 classes
 - 97 training images per class (1261 total)
 - 5 testing images per class (120 total)

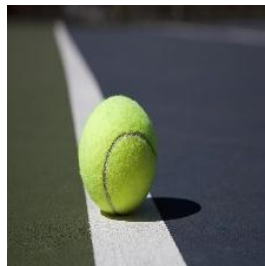


About the Images

Animated vs. Real

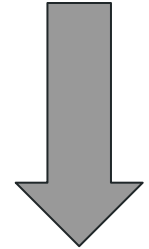
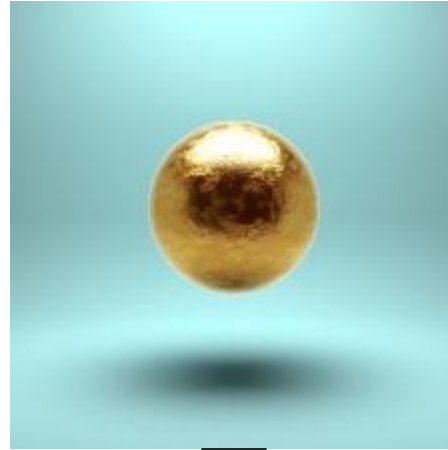


One vs. Multiple



Processing the Data

1. Convert to grayscale
2. Resized:
 - Original: 224 x 224
 - New: 54 x 54



scikit-image
image processing in python

Performance of Models

Decision Tree

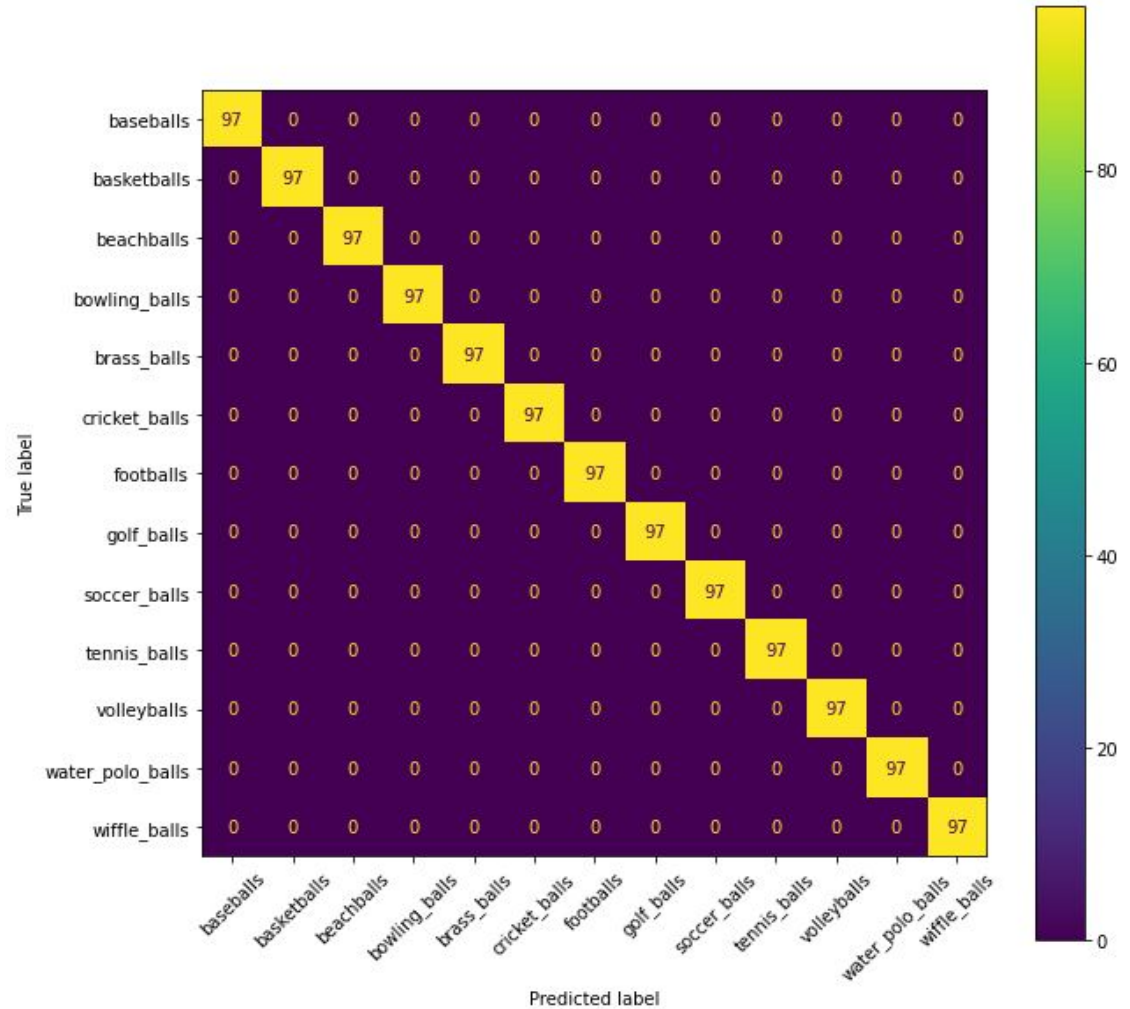
	Accuracy on Training Images	Accuracy on Testing Images
Decision Tree I	1.0	0.3076923077
Decision Tree II	1.0	0.3076923077
Decision Tree III	0.4607454401	0.2153846154



Train set:

Decision Tree I

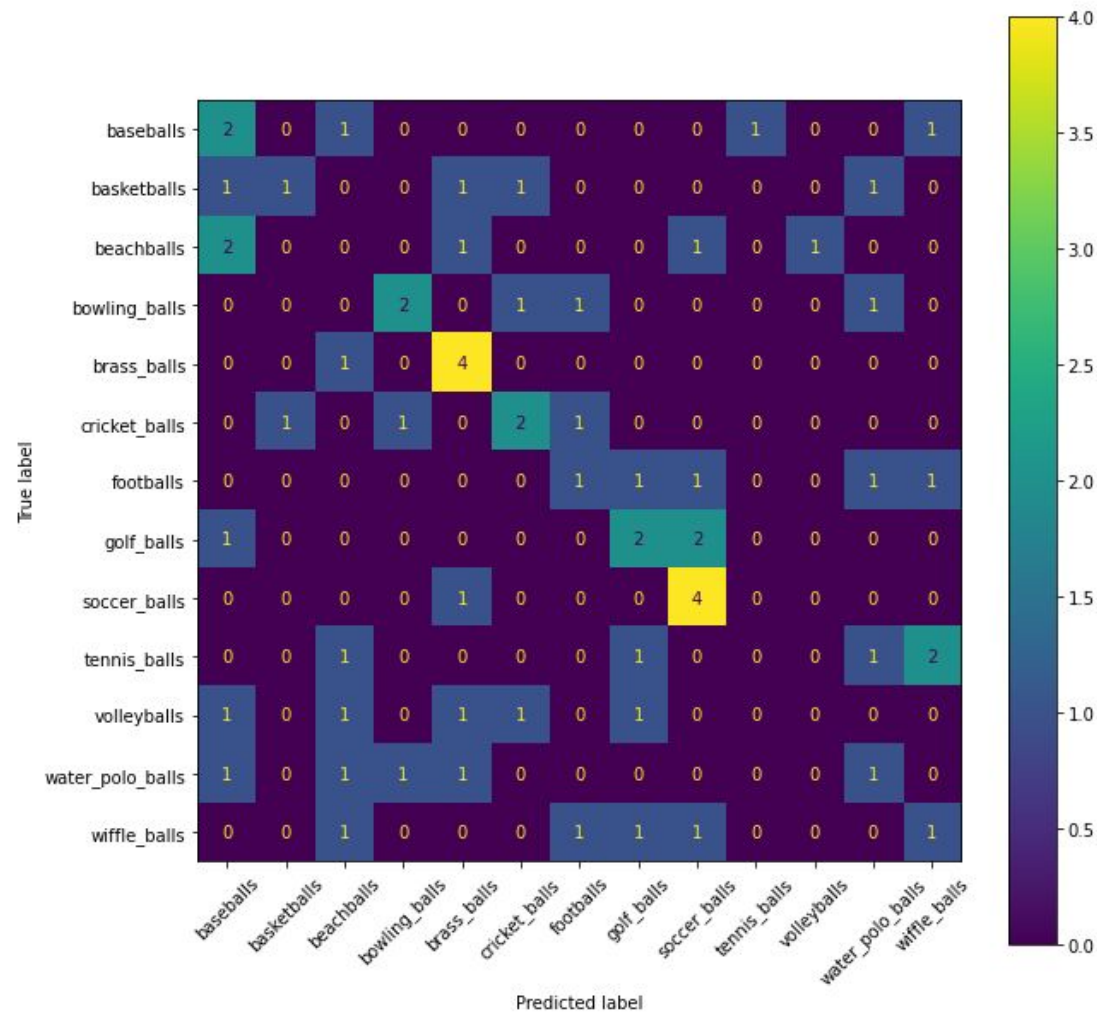
- Accuracy on Training Images: 100%
- 1261 out of 1261



Test set:

Decision Tree I

- Accuracy on Testing Images: 30.8%
- 20 out of 65



Random Forest

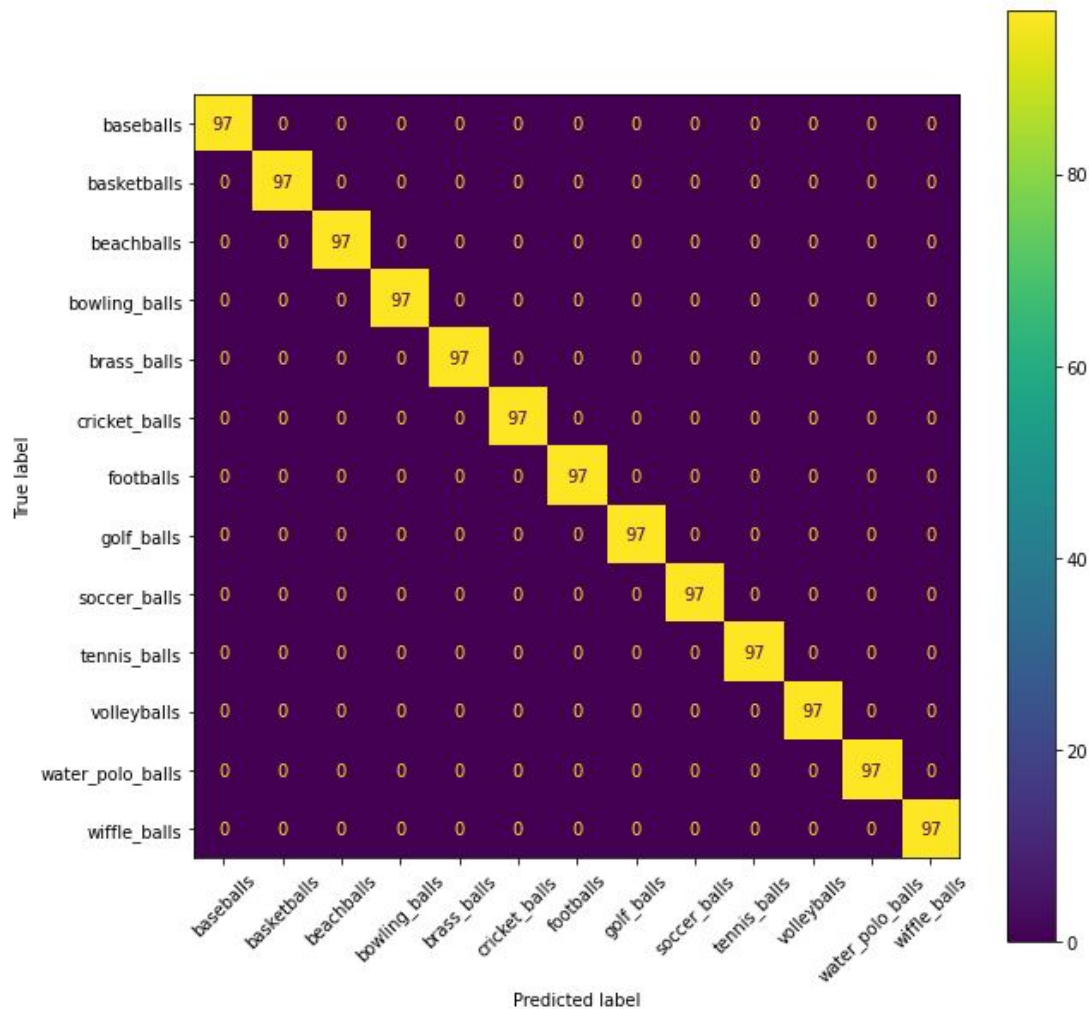
	Accuracy on Training Images	Accuracy on Testing Images
Random Forest I	1.0	0.4923076923
Random Forest II	1.0	0.4461538462
Random Forest III	1.0	0.4461538462
Random Forest IV	0.8437747819	0.4



Train set:

Random Forest I

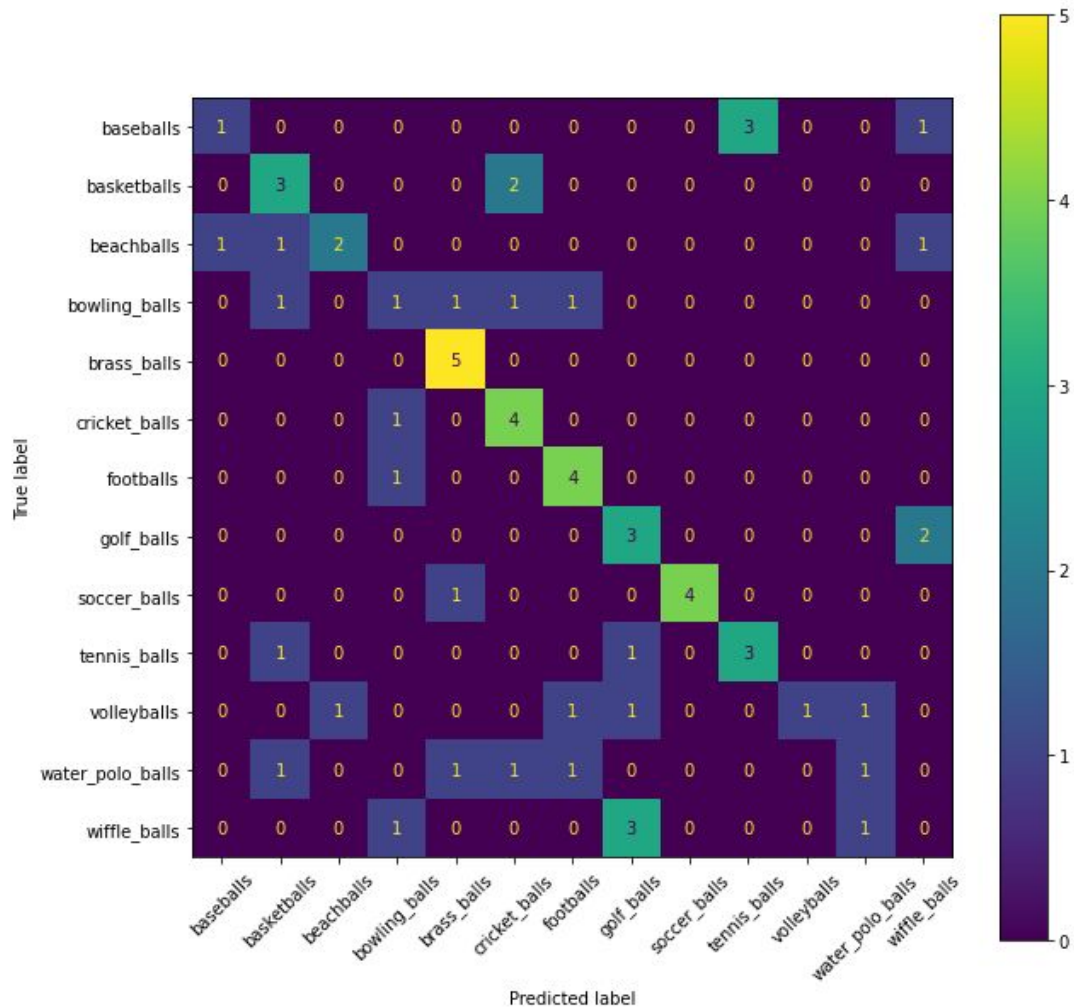
- Accuracy on Training Images: 100%
- 1261 out of 1261



Test set:

Random Forest I

- Accuracy on Testing Images: 49.2%
- 32 out of 65



CNN

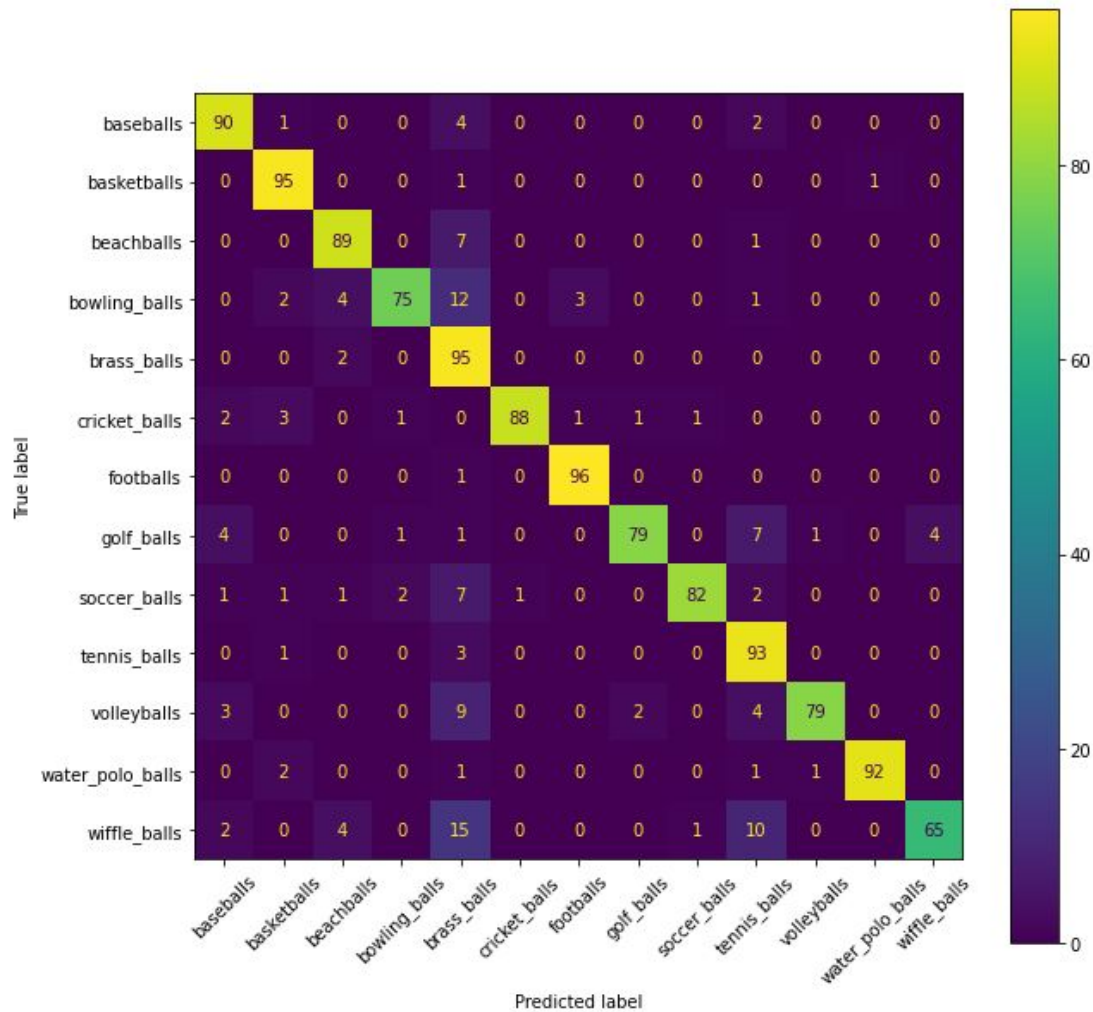
	Accuracy on Training Images	Accuracy on Testing Images
PyTorch CNN I	0.07692307692	0.07692307692
PyTorch CNN II	0.9095955591	0.4307692308
PyTorch CNN III	0.7795400476	0.4615384615
PyTorch CNN IV	1.0	0.5076923077
PyTorch CNN V	0.8865979381	0.6153846154



Train set:

CNN V

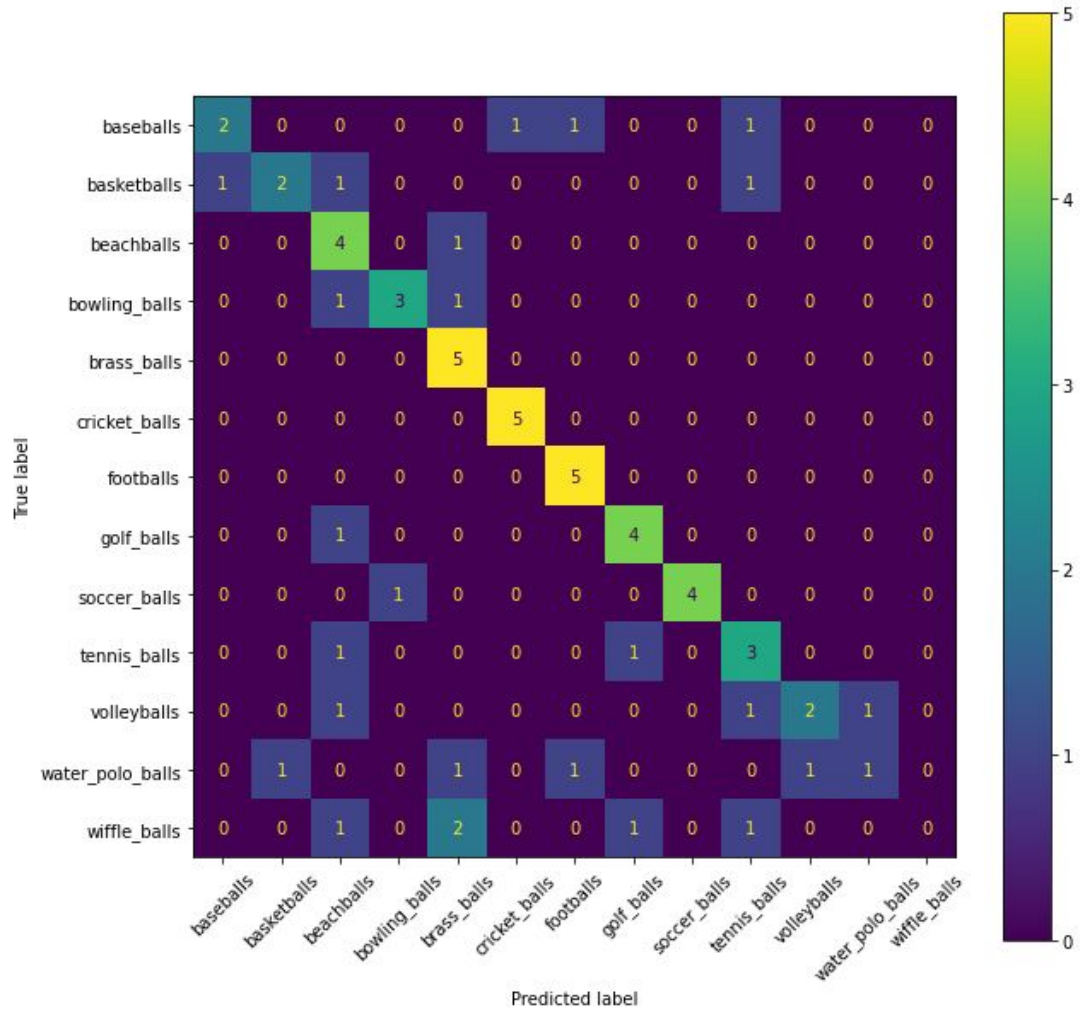
- Accuracy on Training Images: 88.7%
- 1118 out of 1261



Test set:

CNN V

- Accuracy on Testing Images: 61.5%
- 40 out of 65



Recommendation

- PyTorch CNN
- Further Research
- More epochs and more training images

