

# Predicting PSA Grades for Baseball Cards

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# Motivation

- Sports trading card industry is a 1.3 billion-dollar industry
- Factors that impact the value of a card:
  - Player and team
  - Rarity
  - Condition
  - Graded (our focus) vs. non-graded
- Process of getting a card graded is long and expensive
- Deep learning model to predict PSA grade from a single image
- Could be useful for card grading services and collectors/traders

# Method

- Obtain and process our dataset
  - Data are images aggregated from [Collectors.com](https://www.collectors.com)
  - 11,500 images divided into 10 classes of 1,150 images each
  - We split into a training set of 9,200 images and a validation set of 2,300
- Conduct benchmark tests on CNN architectures
  - Our data is images, so convolutional neural networks are the obvious choice
  - We used AlexNet, LeNet, and ResNet50 as base architectures
- Optimize best performing architecture
  - Our metric of interest was overall accuracy (correct PSA grade)
  - Hyperparameter Tuning - learning rate and optimizer type



# Experiments / Results

- AlexNet, LeNet, and ResNet50 as base architectures
  - Loss Function = SparseCategoricalCrossentropy
  - epoch = 100
- Hyperparameter Tuning
  - Learning Rate
    - [0.1, 0.01, 0.001, 0.0001]
  - Optimizer
    - Adam, SGD

Hyperparameter Tuning Metrics			
Hyperparameter	ResNet50	LeNet	AlexNet
0.1 & Adam	0.095217	0.095217	0.097391
0.1 & SGD	<b>0.926087</b>	0.101304	0.099130
0.01 & Adam	0.638261	0.186087	0.101304
0.01 & SGD	0.910870	0.095217	0.652174
0.001 & Adam	0.890000	0.279565	0.646957
0.001 & SGD	0.669565	0.281304	0.503913
0.0001 & Adam	0.886087	<b>0.413913</b>	<b>0.681739</b>
0.0001 & SGD	0.424783	0.365652	0.099130

# Conclusion

- ResNet50 was the best performing model
  - 92.6% accuracy
- Could be useful for baseball card collectors/traders
- Further Work:
  - Improve Accuracy
  - Classifying PSA grades for other types of cards