Image Classification Using Feature Extraction

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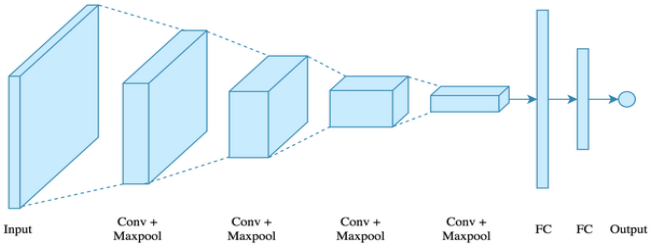
Introduction

The purpose of this research is to find the affects of feature extraction on image classification. Feature extraction of an image is the process of amplifying certain characteristics and augmenting the original to the new picture. Many different features could be extracted. This research tested canny edge detection, histogram of oriented gradients and the shape index of the image.



Convolutional Neural Network

A CNN was used to train the images. A CNN is a layer based neural network commonly used for images. In the figure above the input image has its dimensions reduced to a convergent point. This is done through multiple layers of feature learning.

Methods

- Feature Extraction
- Training / Data Collection

Shape Index

- Looks for specified shapes in image
- Spherical shapes detected

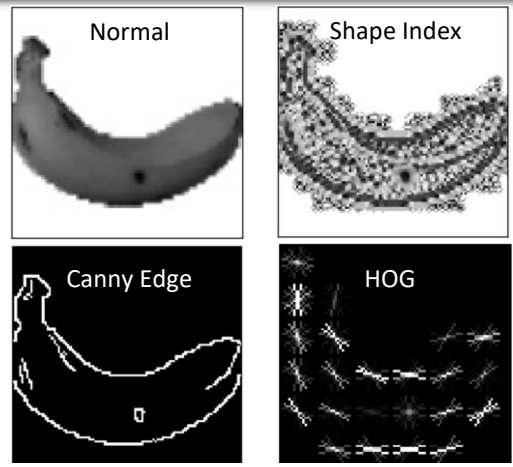
Canny Edge

- Calculates the intensity of the gradients
- Removes non-intense pixels

HOG

- Computes gradient in image
- Computes histogram
- Flatten to a vector

Results



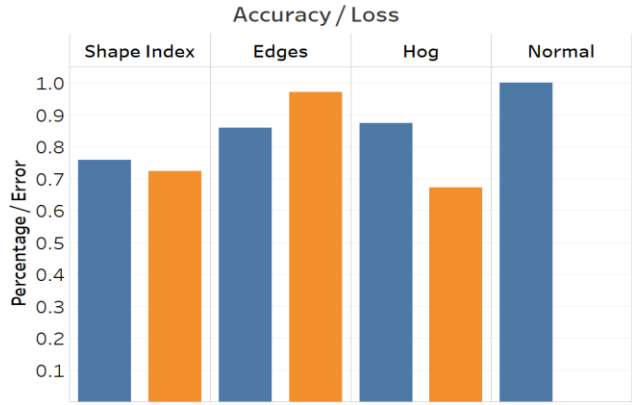


Table 1: **Normal <0.01** Loss

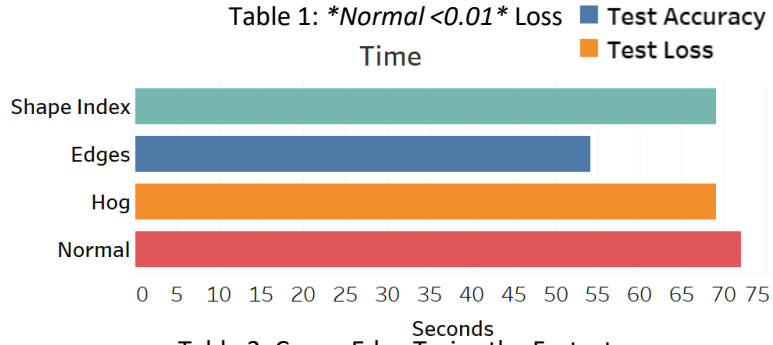


Table 2: Canny Edge Trains the Fastest

Conclusion

Accuracy

Normal has highest accuracy of 100%. Without feature extraction details are not removed from the image. HOG and canny edge similar due to the similarity in the images. They both bring out edge like features. Shape index introduces a lot of noise causes lower accuracy (Table 1).

Loss

Loss is the measure of how well the model trains. Normal model was less than *.01.* This shows that the model could be adjusted to better accommodate for the features extracted, possibly increasing performance (Table 1).

Time

Edge makes only significant difference in time during training. Able to sacrifice accuracy for very large datasets that need to be trained faster. Without GPU acceleration the gaps would be larger (Table 2).

References

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