18-752 PROJECT REPORT: FEATURE EXTRACTION

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1. DATA

In this project, we focus on hand-written digits classification. The data set includes both MNIST data and our own hand-written digits. Given the limits of our own hand-written digits, the neural network approach risks significant overfitting. Therefore, we will use the MNIST data set to train a convolutional neural network. 50 sample data points are included in the zip file for reference.

2. CODE

We used the following three feature extraction methods: Histogram of Gradients (HOG), SIFT corner detector and CNN neural network feature extractor. The code to extract features is included in feature_extraction.ipynb, which also includes sample feature value.

3. FEATURE VISUALIZATION

A sample digit 6 and the visualizations of the features from HOG and SIFT are shown in Figure 1.

Sample Digit   HOG Features   SIFT Features
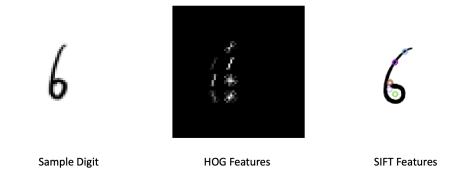
FIGURE 1. Left: a sample image of the digit 8. Middle: visualization of the HOG features. Right: visualization of the SIFT key points.