Assignment 1
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Starter code containing notebooks

Goals

In this assignment you will practice putting together a simple image classification pipeline based on the k-Nearest Neighbor or the SVM/Softmax classifier. The goals of this assignment are as follows:

- Understand the basic **Image Classification pipeline** and the data-driven approach (train/predict stages).
- Understand the train/val/test **splits** and the use of validation data for **hyperparameter tuning**.
- Develop proficiency in writing efficient **vectorized** code with numpy.
- Implement and apply a k-Nearest Neighbor (**kNN**) classifier.
- Implement and apply a Multiclass Support Vector Machine (**SVM**) classifier.
- Implement and apply a **Softmax** classifier.
- Implement and apply a **Two layer neural network** classifier.
- Understand the differences and tradeoffs between these classifiers.
- Get a basic understanding of performance improvements from using **higher-level representations** as opposed to raw pixels, e.g. color histograms, Histogram of Oriented Gradient (HOG) features, etc.

Q1: k-Nearest Neighbor classifier

The notebook **knn.ipynb** will walk you through implementing the kNN classifier.

Q2: Training a Support Vector Machine

The notebook **svm.ipynb** will walk you through implementing the SVM classifier.

Q3: Implement a Softmax classifier

The notebook **softmax.ipynb** will walk you through implementing the Softmax classifier.

Q4: Two-Layer Neural Network

The notebook **two_layer_net.ipynb** will walk you through the implementation of a two-layer neural network classifier.

Q5: Higher Level Representations: Image Features

The notebook **features.ipynb** will examine the improvements gained by using higher-level representations as opposed to using raw pixel values.

Submitting your work

Important. Please make sure that the submitted notebooks have been run and the cell outputs are visible.