Body:

In the task of image classification, feature extraction plays a very important role. For weather images we need to have good features in order for our model to classify them with high accuracy. Starting from low-level feature extraction methods like SURF (Speeded Up Robust Features) and ORB (Oriented FAST and Rotated BRIEF) would be a good start as they are relatively fast methods to compute but have shown poor accuracies for the classification task at hand. An improvement would be using a feature extraction method called HOG (Histogram of oriented gradients) which computes the gradient of each pixel of the image after reshaping. These gradients are used to obtain a histogram of oriented gradients which after flattening give a feature vector. A feature extraction method called Scale invariant feature transform (SIFT) which works on similar principle is also considered for our task. However, extraction methods like SURF/SIFT/ORB are used mainly in image search, object mapping tasks because they are used to describe specific points in an image whereas HOG is used to describe the image as a whole which is very useful in image recognition/classification tasks such as our own.

The features obtained through HOG were put into the classification pipeline consisting of data pre-processing, dimensionality reduction and finally into the classification algorithms. For our experiments, we used classifiers like Support Vector Machine (SVM), Decision Trees, K-Nearest Neighbors and Naïve Bayes Classifier. In addition, ensemble learning methods like Bagging, Random Forests, AdaBoost and Voting Classifier were also applied. The accuracies obtained from the classifiers were not satisfactory enough for the purpose of our experiment. And we sought for a feature extraction method which would improve upon HOG.

We ventured into Deep Learning