# 1-classifier-comparison

November 22, 2018

## 0.1 Classifier Comparison

In this notebook, we compare some of traditional machine learning algorithms on movie review datasets.

```
In [1]: import sys, argparse
        sys.path.append('..')
        import helper
        import numpy as np
        from sklearn.feature_extraction.text import TfidfVectorizer
        from sklearn.neighbors import KNeighborsClassifier
        from sklearn.svm import LinearSVC
        from sklearn.linear_model import SGDClassifier, LogisticRegression
        from sklearn.neural_network import MLPClassifier
        from sklearn.tree import DecisionTreeClassifier
        from sklearn.ensemble import RandomForestClassifier, AdaBoostClassifier
        from sklearn.naive_bayes import GaussianNB
        from sklearn import metrics
```

### 0.1.1 1. Data preprocessing

```
In [2]: pos_examples = [s.decode("utf-8", "ignore").strip() for s in list(open(helper.mr_pos_da
        neg_examples = [s.decode("utf-8", "ignore").strip() for s in list(open(helper.mr_neg_da
        pos_nums, neg_nums = len(pos_examples), len(neg_examples)
        x = pos_examples + neg_examples
        x = [helper.clean_str(sentence) for sentence in x]
        pos_labels = [1 for _ in range(pos_nums)]
        neg_labels = [0 for _ in range(neg_nums)]
        y = pos_labels + neg_labels
        x, y = np.array(x), np.array(y)
        x_train, y_train, x_dev, y_dev = helper.split_train_dev(x, y)
```

```
In [3]: tfidf = TfidfVectorizer(min_df=2, ngram_range=(1,2))
        tfidf.fit(x_train)
        x_train_tf = tfidf.transform(x_train)
        x_dev_tf = tfidf.transform(x_dev)
```

### 0.1.2 2. Classifiers

We investigate the algorithms most used in today's machine learning community. Each classifiy train on the training data and validate on the testing data.

```
In [4]: classifiers = {
            "K-Nearest Neighbors": KNeighborsClassifier(7),
            "Linear SVC": LinearSVC(),
            "Linear Classify with SGD": SGDClassifier(tol=1e-3),
            "Logistic Regression": LogisticRegression(),
            "MLP": MLPClassifier(),
            "Decision Tree": DecisionTreeClassifier(random_state=0),
            "Random Forest": RandomForestClassifier(random_state=0, n_estimators=100),
            "AdaBoost": AdaBoostClassifier(n_estimators=100),
            "Gaussian Naive Bayes": GaussianNB()
        }

        for nam, cla in classifiers.items():
            cla.fit(x_train_tf.toarray(), y_train)
            predicted = cla.predict(x_dev_tf.toarray())
            print("{0} - Accuracy: {1:.4f}".format(nam, metrics.accuracy_score(predicted, y_de
            print(metrics.classification_report(predicted, y_dev))
```

```
K-Nearest Neighbors - Accuracy: 0.6895
             precision    recall  f1-score   support

          0       0.91      0.64      0.75       768
          1       0.47      0.83      0.60       298

avg / total       0.78      0.69      0.71      1066

Linear SVC - Accuracy: 0.7880
             precision    recall  f1-score   support

          0       0.78      0.80      0.79       527
          1       0.80      0.78      0.79       539

avg / total       0.79      0.79      0.79      1066

Linear Classify with SGD - Accuracy: 0.7833
             precision    recall  f1-score   support

          0       0.86      0.75      0.80       614
          1       0.71      0.83      0.76       452

avg / total       0.79      0.78      0.78      1066

Logistic Regression - Accuracy: 0.7664
             precision    recall  f1-score   support
          0       0.76      0.77      0.77       528
          1       0.77      0.76      0.77       538

avg / total       0.77      0.77      0.77      1066

MLP - Accuracy: 0.7777
             precision    recall  f1-score   support

          0       0.78      0.78      0.78       538
          1       0.78      0.77      0.78       528

avg / total       0.78      0.78      0.78      1066

Decision Tree - Accuracy: 0.6107
             precision    recall  f1-score   support

          0       0.62      0.61      0.62       540
          1       0.61      0.61      0.61       526

avg / total       0.61      0.61      0.61      1066

Random Forest - Accuracy: 0.7186
             precision    recall  f1-score   support

          0       0.72      0.72      0.72       541
          1       0.71      0.72      0.71       525

avg / total       0.72      0.72      0.72      1066

AdaBoost - Accuracy: 0.6689
             precision    recall  f1-score   support

          0       0.66      0.68      0.67       528
          1       0.68      0.66      0.67       538

avg / total       0.67      0.67      0.67      1066

Gaussian Naive Bayes - Accuracy: 0.6895
             precision    recall  f1-score   support

          0       0.73      0.68      0.70       578
          1       0.65      0.70      0.67       488

avg / total       0.69      0.69      0.69      1066
```

### 0.1.3 3. Results

The only metrics used in the picture under is accuracy, and from the comparison of all classifiers, the svm with sgd optimization is the best one.

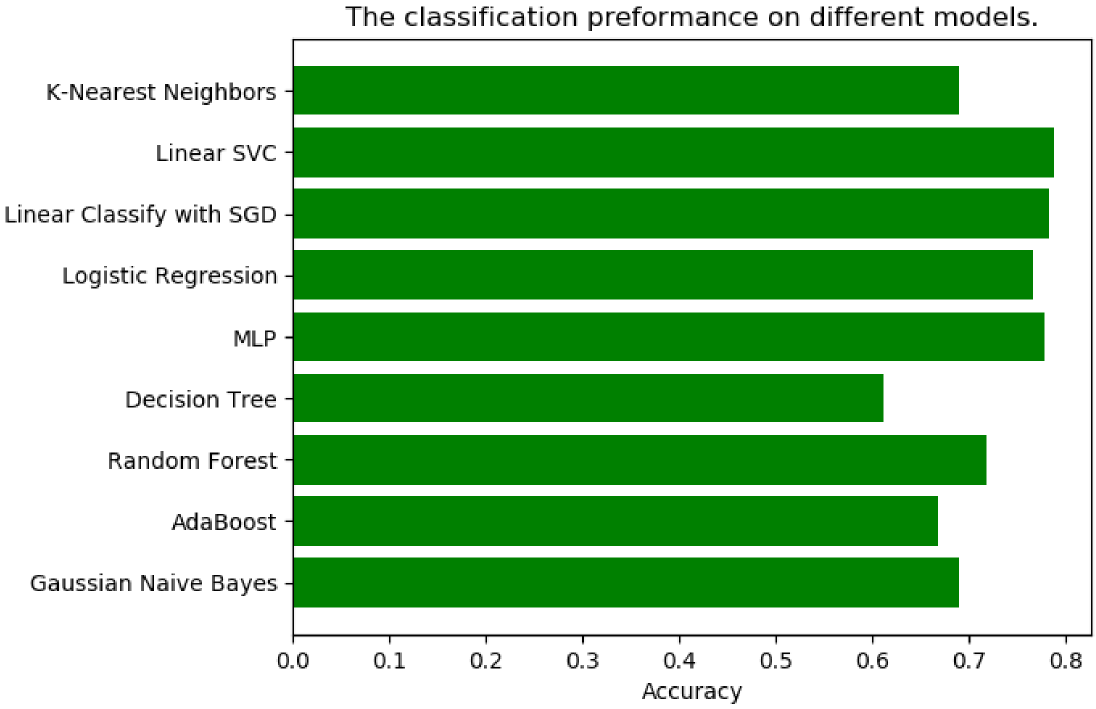
```
In [6]: import matplotlib.pyplot as plt

        plt.rcdefaults()
        fig, ax = plt.subplots()

        models = classifiers.keys()
        y_pos = np.arange(len(models))
        performance = [0.6895, 0.7880, 0.7833, 0.7664, 0.7777, 0.6107, 0.7186, 0.6689, 0.6895]

        ax.barh(y_pos, performance, align='center',color='green')
        ax.set_yticks(y_pos)
        ax.set_yticklabels(models)
        ax.invert_yaxis()  # labels read top-to-bottom
        ax.set_xlabel('Accuracy')
        ax.set_title('The classification preformance on different models.')

        plt.show()
```


The classification preformance on different models.
K-Nearest Neighbors
Linear SVC
Linear Classify with SGD
Logistic Regression
MLP
Decision Tree
Random Forest
AdaBoost
Gaussian Naive Bayes
Accuracy