Task1

November 9, 2017

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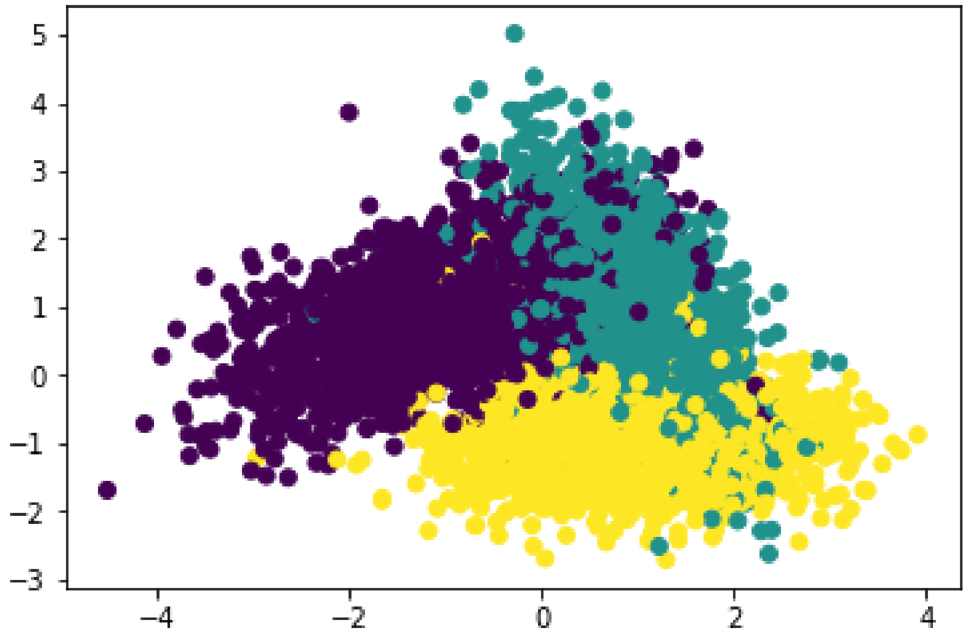
In [22]: import numpy as np
         from matplotlib.colors import ListedColormap
         import matplotlib.pyplot as plt
         from sklearn.model_selection import cross_val_score
         from sklearn.neighbors import KNeighborsClassifier
         from sklearn import datasets, metrics
         %matplotlib inline
```

```
In [23]: colors = ListedColormap(['red', 'blue', 'yellow'])
         light_colors = ListedColormap(['lightcoral', 'lightblue', 'lightyellow'])
```

```
In [24]: X, y = datasets.make_classification(n_samples=5000, n_classes=3, \
                                             n_clusters_per_class=1, n_features=2, \
                                             n_informative=2, n_redundant=0)
         plt.scatter(X[:, 0], X[:, 1], c=y)
         plt.show()
```



```
In [28]: def get_meshgrid(data, step=.05, border=.5,):
             x_min, x_max = data[:, 0].min() - border, data[:, 0].max() + border
             y_min, y_max = data[:, 1].min() - border, data[:, 1].max() + border
             return np.meshgrid(np.arange(x_min, x_max, step), np.arange(y_min, y_max, step))
```

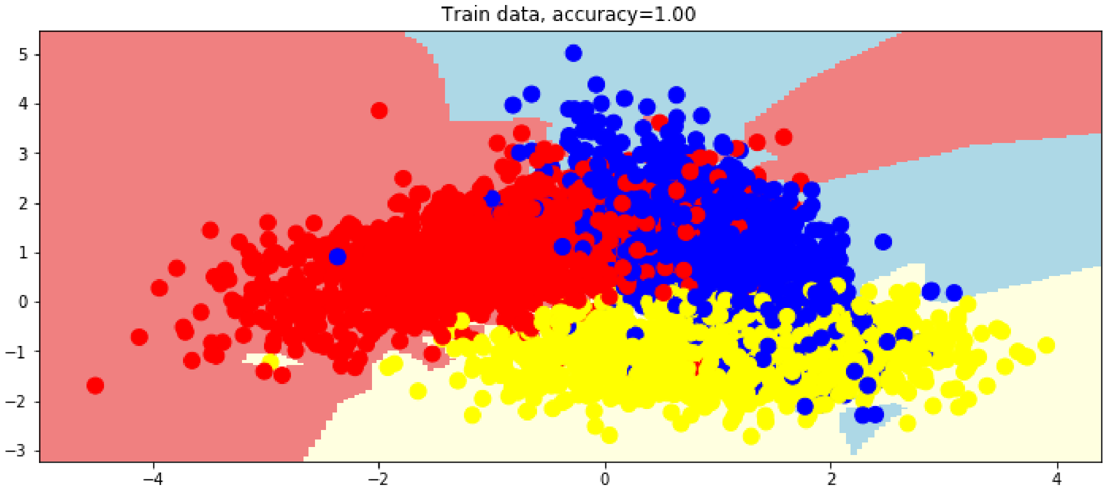
```
In [29]: def plot_decision_surface(estimator, train_data, train_labels, test_data, test_labels,
                                   colors = colors, light_colors = light_colors):
             #fit model
             estimator.fit(train_data, train_labels)

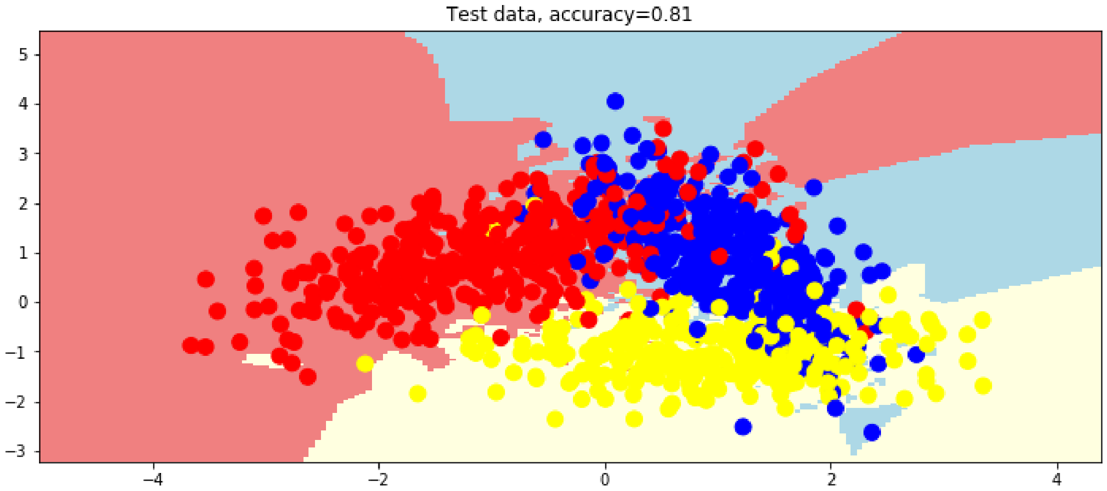
             #set figure size
             plt.figure(figsize = (12, 5))

             #plot decision surface on the train data
             xx, yy = get_meshgrid(train_data)
             mesh_predictions = np.array(estimator.predict(np.c_[xx.ravel(), yy.ravel()])).resha
             plt.pcolormesh(xx, yy, mesh_predictions, cmap = light_colors)
             plt.scatter(train_data[:, 0], train_data[:, 1], c = train_labels, s = 100, cmap = c
             plt.title('Train data, accuracy={:.2f}'.format(metrics.accuracy_score(train_labels,
             plt.show()
             #plot decision surface on the test data
             plt.figure(figsize = (12, 5))
             plt.pcolormesh(xx, yy, mesh_predictions, cmap = light_colors)
             plt.scatter(test_data[:, 0], test_data[:, 1], c = test_labels, s = 100, cmap = colo
             plt.title('Test data, accuracy={:.2f}'.format(metrics.accuracy_score(test_labels, e
             plt.show()
```

```
In [33]: estimator = KNeighborsClassifier(n_neighbors=1)

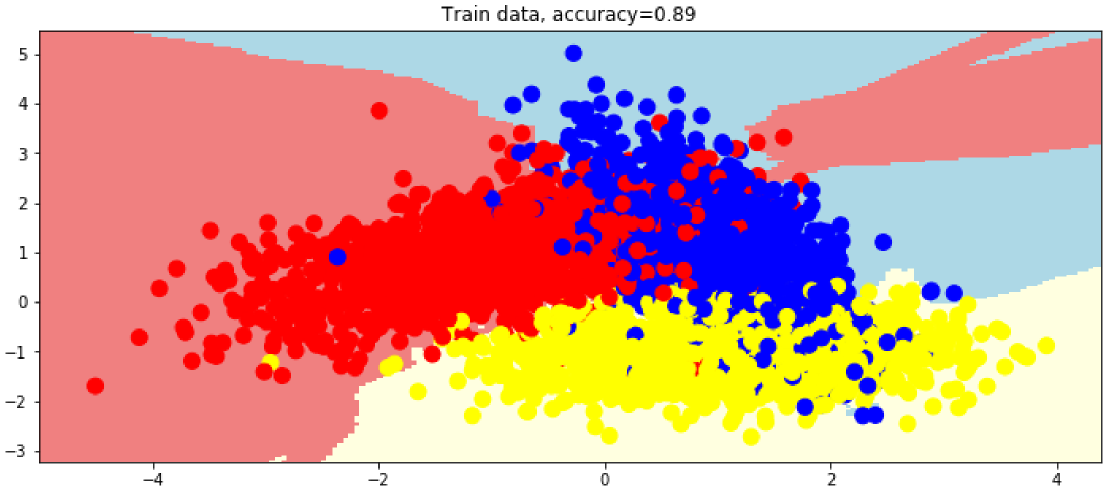
         plot_decision_surface(estimator, X[:-1000], y[:-1000], X[-1000:], y[-1000:])
```

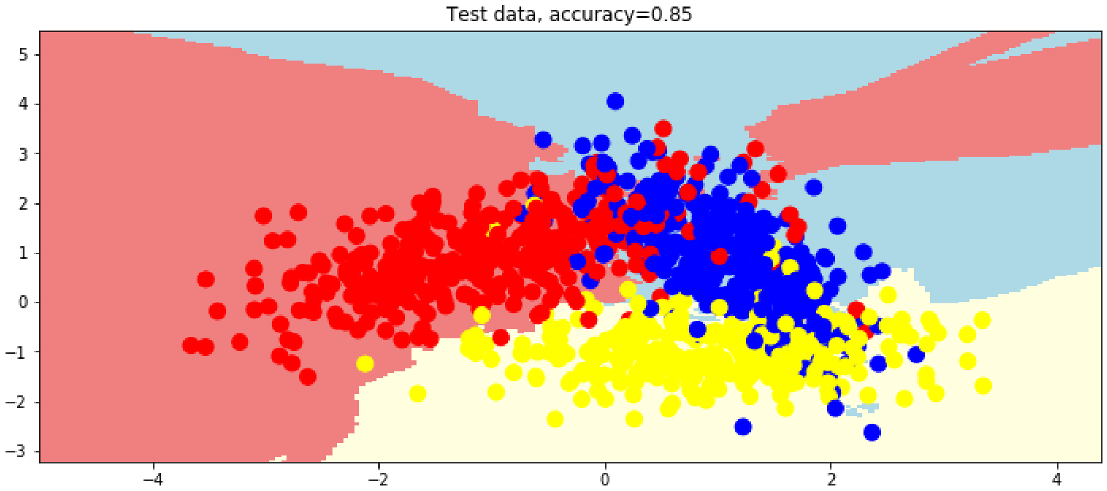




```
In [34]: estimator = KNeighborsClassifier(n_neighbors=5)

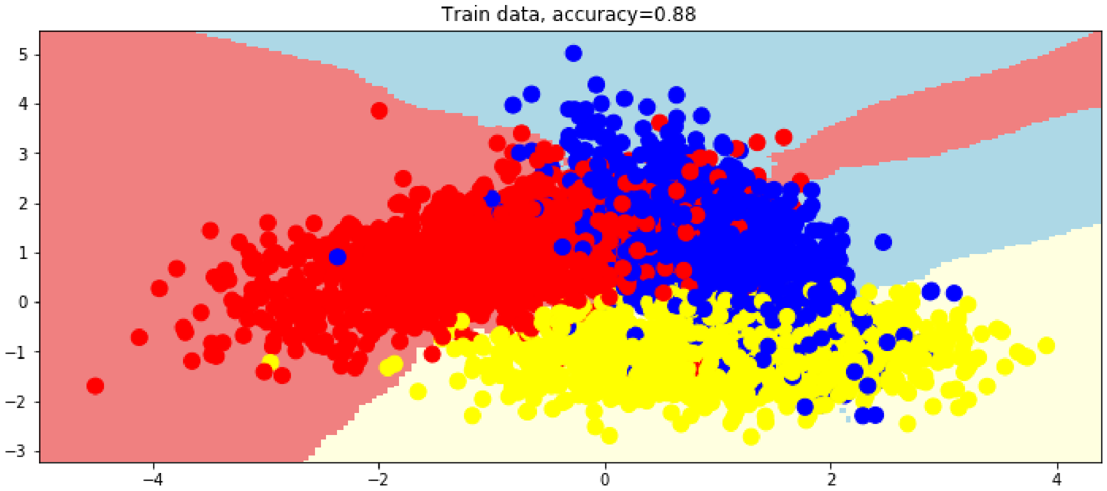
         plot_decision_surface(estimator, X[:-1000], y[:-1000], X[-1000:], y[-1000:])
```

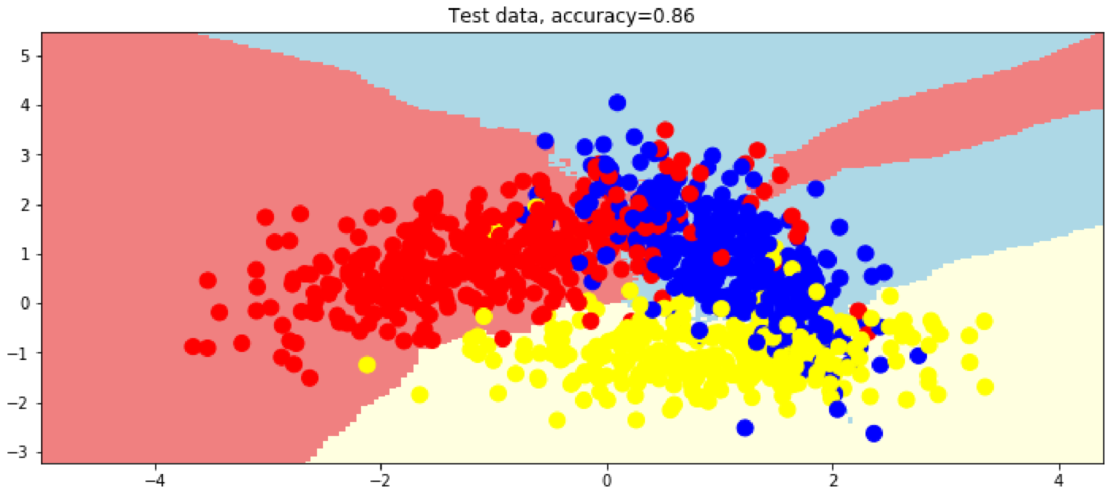




```
In [35]: estimator = KNeighborsClassifier(n_neighbors=10)

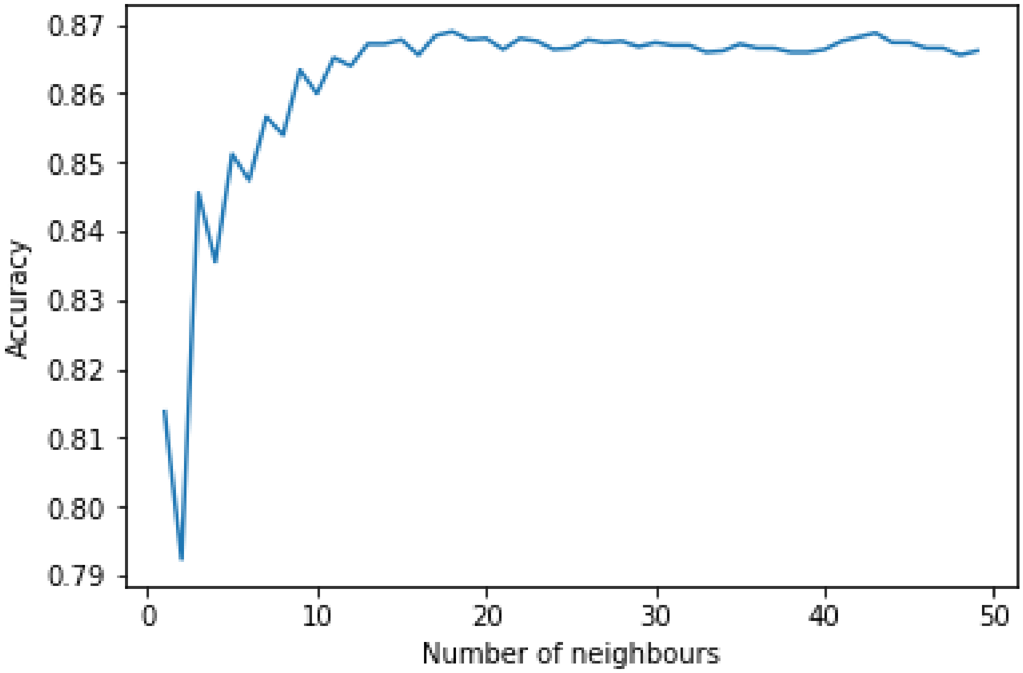
         plot_decision_surface(estimator, X[:-1000], y[:-1000], X[-1000:], y[-1000:])
```





```
In [36]: scores = []
         ns_neighbors = np.arange(1, 50)
         for n_neighbors in ns_neighbors:
             scores.append(cross_val_score(KNeighborsClassifier(n_neighbors=n_neighbors), \
                                           X, y, cv=5).mean())
```

```
In [37]: plt.plot(ns_neighbors, scores)
         plt.xlabel('Number of neighbours')
         plt.ylabel('Accuracy')
         plt.show()
```



```
In [38]: best_n = ns_neighbors[np.argmax(scores)]
         print ('Best value of n_neighbours:', best_n)

         knn_class = KNeighborsClassifier(n_neighbors=best_n).fit(X[:-1000], y[:-1000])
         print ('Best score:', knn_class.score(X[-1000:], y[-1000:]))
```

```
Best value of n_neighbours: 18
Best score: 0.866
```