Week7_3_SVM_linear

May 21, 2021

Support Vector Machine (SVM) Linear

Importing libraries

[1]:
```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd

import warnings
warnings.filterwarnings("ignore")
```

Loading dataset

[2]:
```
datasets = pd.read_csv('~/Downloads/ML_classwork/Week7_srrt/Social_Network_Ads.
 ↪csv')
X_clmns = datasets.iloc[:, [2,3]].values
y_clmns = datasets.iloc[:, 4].values
```

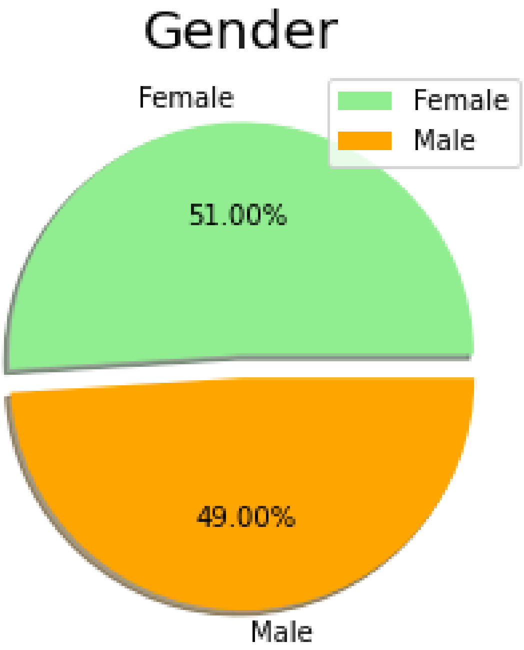
[3]:
```
datasets
```

[3]:
```
      User ID  Gender  Age  EstimatedSalary  Purchased
0    15624510    Male   19            19000          0
1    15810944    Male   35            20000          0
2    15668575  Female   26            43000          0
3    15603246  Female   27            57000          0
4    15804002    Male   19            76000          0
..        …       …  …              …         …
395  15691863  Female   46            41000          1
396  15706071    Male   51            23000          1
397  15654296  Female   50            20000          1
398  15755018    Male   36            33000          0
399  15594041  Female   49            36000          1

[400 rows x 5 columns]
```

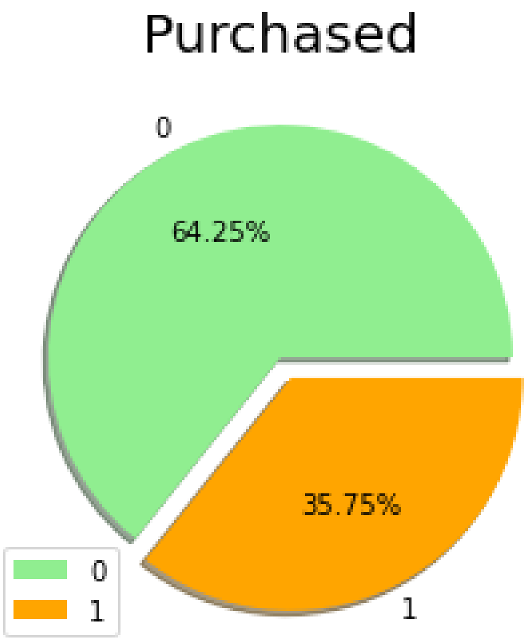
Visualizations

[4]:
```
labels = ['Female', 'Male']
size = datasets['Gender'].value_counts()
```

```
colors = ['lightgreen', 'orange']
explode = [0, 0.1]

plt.rcParams['figure.figsize'] = (4, 4)
plt.pie(size, colors = colors, explode = explode, labels = labels, shadow =␣
 ↪True, autopct = '%.2f%%')
plt.title('Gender', fontsize = 20)
plt.axis('off')
plt.legend()
plt.show()
```



[5]:
```
labels = ['0', '1']
size = datasets['Purchased'].value_counts()
colors = ['lightgreen', 'orange']
explode = [0, 0.1]

plt.rcParams['figure.figsize'] = (4, 4)
plt.pie(size, colors = colors, explode = explode, labels = labels, shadow =␣
 ↪True, autopct = '%.2f%%')
plt.title('Purchased', fontsize = 20)
plt.axis('off')
plt.legend()
plt.show()
```



Support Vector Machine (SVM)

[6]:
```
#Linear support Vector Machine (SVM)
# Splitting the dataset into the Training set and Test set

from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X_clmns, y_clmns,␣
 ↪test_size=0.2,random_state = 0)
```

Support Vector Machine (SVM)

[7]:
```
# Feature Scaling

from sklearn.preprocessing import StandardScaler
sc_X = StandardScaler()
X_train = sc_X.fit_transform(X_train)
X_test = sc_X.transform(X_test)
```

[8]:
```
# Fitting the classifier into the Training set

from sklearn.svm import SVC
classifier = SVC(kernel = 'linear', random_state = 0)
classifier.fit(X_train, y_train)
```

[8]:
```
SVC(kernel='linear', random_state=0)
```

[9]:

```python
# Predicting the test set results

y_pred = classifier.predict(X_test)
```

[10]:

```python
# Visualising the Training set results

from matplotlib.colors import ListedColormap
X_Set, Y_Set = X_train, y_train
X1, X2 = np.meshgrid(np.arange(start = X_Set[:, 0].min() - 1, stop = X_Set[:,␣
 ↪0].max() + 1, step = 0.01),
                     np.arange(start = X_Set[:, 1].min() - 1, stop = X_Set[:,␣
 ↪1].max() + 1, step = 0.01))
plt.contourf(X1, X2, classifier.predict(np.array([X1.ravel(), X2.ravel()]).T).
 ↪reshape(X1.shape),
             alpha = 0.75, cmap = ListedColormap(('#c3ba35', '#35b7c3')))
plt.xlim(X1.min(), X1.max())
plt.ylim(X2.min(), X2.max())
for i, j in enumerate(np.unique(Y_Set)):
    plt.scatter(X_Set[Y_Set == j, 0], X_Set[Y_Set == j, 1],
                c = ListedColormap(('red', 'green'))(i), label = j)
plt.title('Support Vector Machine (Training set)')
plt.xlabel('Age')
plt.ylabel('Estimated Salary')
plt.legend()
plt.show()
```

```
*c* argument looks like a single numeric RGB or RGBA sequence, which should be
avoided as value-mapping will have precedence in case its length matches with
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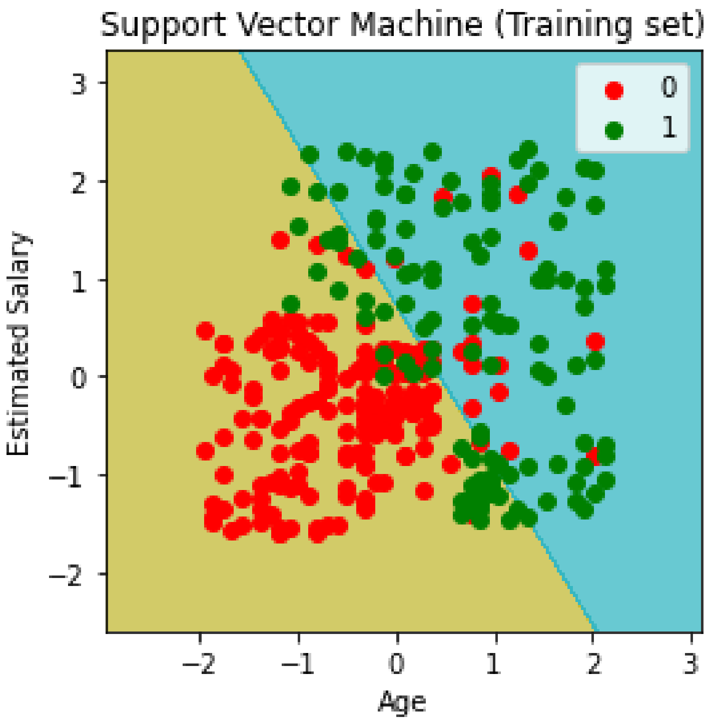
```



[11]:
```
from sklearn.svm import LinearSVC
clf = LinearSVC().fit(X_train, y_train)
print('Social Network dataset')
print('Accuracy of Linear SVC on training set - Known data: {:.3f}'
      .format(clf.score(X_train, y_train)))
print('Accuracy of Linear SVC on test set - Unknown data: {:.3f}'
      .format(clf.score(X_test, y_test)))
```

```
Social Network dataset
Accuracy of Linear SVC on training set - Known data: 0.825
Accuracy of Linear SVC on test set - Unknown data: 0.925
```

[12]:
```
f, (ax1,ax2) = plt.subplots(ncols=2, figsize=(15, 5))

X_Set, Y_Set = X_train, y_train
X1, X2 = np.meshgrid(np.arange(start = X_Set[:, 0].min() - 1, stop = X_Set[:,␣
 ↪0].max() + 1, step = 0.01),
                     np.arange(start = X_Set[:, 1].min() - 1, stop = X_Set[:,␣
 ↪1].max() + 1, step = 0.01))
ax1.contourf(X1, X2, classifier.predict(np.array([X1.ravel(), X2.ravel()]).T).
 ↪reshape(X1.shape),
             alpha = 0.75, cmap = ListedColormap(('#c3ba35', '#35b7c3')))
plt.xlim(X1.min(), X1.max())
plt.ylim(X2.min(), X2.max())
for i, j in enumerate(np.unique(Y_Set)):
    ax1.scatter(X_Set[Y_Set == j, 0], X_Set[Y_Set == j, 1],
                c = ListedColormap(('red', 'green'))(i), label = j)
ax1.set_title('Support Vector Machine (Training set)')
ax1.set_xlabel('Age')
ax1.set_ylabel('Estimated Salary')
ax1.legend()

xx_Set, yy_Set = X_test, y_test
XX1, XX2 = np.meshgrid(np.arange(start = xx_Set[:, 0].min() - 1, stop = xx_Set[:
 ↪, 0].max() + 1, step = 0.01),
                     np.arange(start = xx_Set[:, 1].min() - 1, stop = xx_Set[:,␣
 ↪1].max() + 1, step = 0.01))
ax2.contourf(XX1, XX2, classifier.predict(np.array([XX1.ravel(), XX2.ravel()]).
 ↪T).reshape(XX1.shape),
             alpha = 0.75, cmap = ListedColormap(('#c3ba35', '#35b7c3')))
for i, j in enumerate(np.unique(yy_Set)):
    ax2.scatter(xx_Set[yy_Set == j, 0], xx_Set[yy_Set == j, 1],
                c = ListedColormap(('red', 'green'))(i), label = j)
ax2.set_title('Support Vector Machine (Test set)')
ax2.set_xlabel('Age')
ax2.set_ylabel('Estimated Salary')
ax2.legend()
plt.show()
```

```
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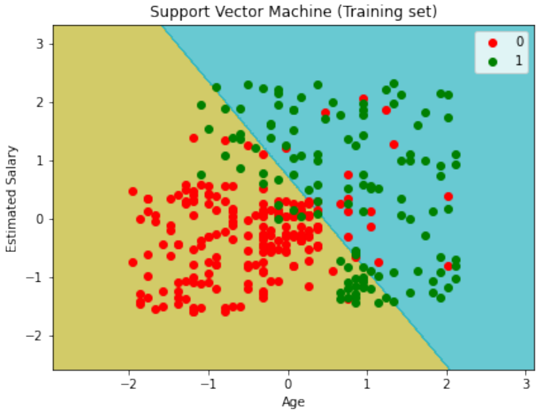

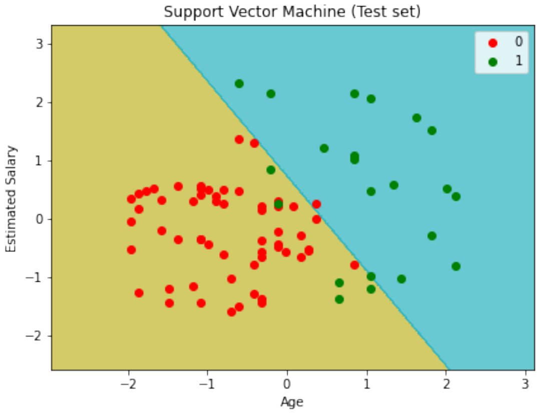

```
[ ]: # $Support Vector Machine Linear and C value
```

```
[28]: from sklearn.svm import SVC
      this_C = 0.001
      classifiern = SVC(kernel = 'linear', C=this_C)
      classifiern.fit(X_train, y_train)
```

```
[28]: SVC(C=0.001, kernel='linear')
```

```
[29]: from matplotlib.colors import ListedColormap
      X_Set, Y_Set = X_train, y_train
      X1, X2 = np.meshgrid(np.arange(start = X_Set[:, 0].min() - 1, stop = X_Set[:,␣
       ↪0].max() + 1, step = 0.01),
                           np.arange(start = X_Set[:, 1].min() - 1, stop = X_Set[:,␣
       ↪1].max() + 1, step = 0.01))
      plt.contourf(X1, X2, classifiern.predict(np.array([X1.ravel(), X2.ravel()]).T).
       ↪reshape(X1.shape),
                   alpha = 0.75, cmap = ListedColormap(('#c3ba35', '#35b7c3')))
      plt.xlim(X1.min(), X1.max())
      plt.ylim(X2.min(), X2.max())
      for i, j in enumerate(np.unique(Y_Set)):
          plt.scatter(X_Set[Y_Set == j, 0], X_Set[Y_Set == j, 1],
                      c = ListedColormap(('red', 'green'))(i), label = j)
      plt.title('Support Vector Machine (Training set)')
      plt.xlabel('Age')
      plt.ylabel('Estimated Salary')
      plt.legend()
      plt.show()
```

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```

```
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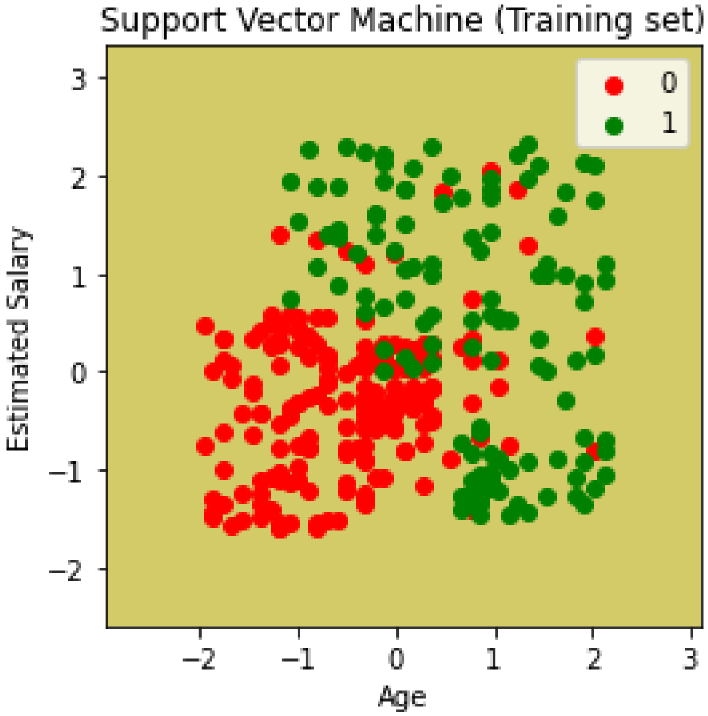

[ ]: