Grid Search

Importing the libraries

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

Importing the dataset

```
dataset = pd.read_csv('Social_Network_Ads.csv')
X = dataset.iloc[:, 2:-1].values
y = dataset.iloc[:, -1].values
```

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, y, test_size = 0.25, randc
```

Feature Scaling

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

Training the Kernel SVM model on the Training set

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

```
    SVC(C=1.0, break_ties=False, cache_size=200, class_weight=None, coef0=0.0,
```

Making the Confusion Matrix

```
from sklearn.metrics import confusion_matrix, accuracy_score
y_pred = classifier.predict(X_test)
cm = confusion_matrix(y_test, y_pred)
print(cm)
accuracy_score(y_test, y_pred)
```

```
[[64  4]
 [ 3 29]]
0.93
```

Applying k-Fold Cross Validation

```
from sklearn.model_selection import cross_val_score
accuracies = cross_val_score(estimator = classifier, X = X_train, y = y_train, cv
print("Accuracy: {:.2f} %".format(accuracies.mean()*100))
print("Standard Deviation: {:.2f} %".format(accuracies.std()*100))
```

```
Accuracy: 90.33 %
Standard Deviation: 6.57 %
```

Applying Grid Search to find the best model and the best parameters

```
from sklearn.model_selection import GridSearchCV
parameters = [{'C': [0.25, 0.5, 0.75, 1], 'kernel': ['linear']},
              {'C': [0.25, 0.5, 0.75, 1], 'kernel': ['rbf'], 'gamma': [0.1, 0.2,
grid_search = GridSearchCV(estimator = classifier,
                           param_grid = parameters,
                           scoring = 'accuracy',
                           cv = 10,
                           n_jobs = -1)
grid_search.fit(X_train, y_train)
best_accuracy = grid_search.best_score_
best_parameters = grid_search.best_params_
print("Best Accuracy: {:.2f} %".format(best_accuracy*100))
print("Best Parameters:", best_parameters)
```

```
Best Accuracy: 90.67 %
Best Parameters: {'C': 0.5, 'gamma': 0.6, 'kernel': 'rbf'}
```

Visualising the Training set results

```
ib.colors import ListedColormap
= X_train, y_train
eshgrid(np.arange(start = X_set[:, 0].min() - 1, stop = X_set[:, 0].max() + 1, st
        np.arange(start = X_set[:, 1].min() - 1, stop = X_set[:, 1].max() + 1, st
X1, X2, classifier.predict(np.array([X1.ravel(), X2.ravel()]).T).reshape(X1.shape
alpha = 0.75, cmap = ListedColormap(('red', 'green')))
in(), X1.max())
in(), X2.max())
numerate(np.unique(y_set)):
er(X_set[y_set == j, 0], X_set[y_set == j, 1],
   c = ListedColormap(('red', 'green'))(i), label = j)
rnel SVM (Training set)')
ge')
stimated Salary')
```

```
*c* argument looks like a single numeric RGB or RGBA sequence, which should be
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```

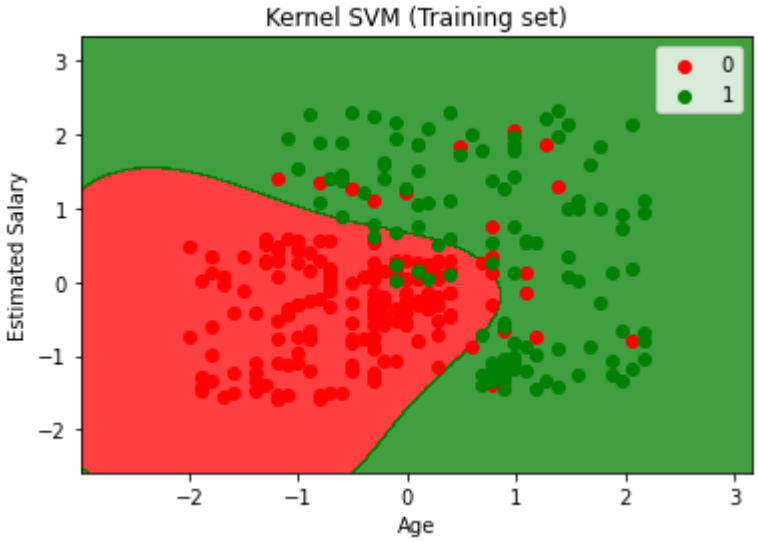

Visualising the Test set results

```
from matplotlib.colors import ListedColormap
X_set, y_set = X_test, y_test
X1, X2 = np.meshgrid(np.arange(start = X_set[:, 0].min() - 1, stop = X_set[:, 0].
                     np.arange(start = X_set[:, 1].min() - 1, stop = X_set[:, 1].
plt.contourf(X1, X2, classifier.predict(np.array([X1.ravel(), X2.ravel()]).T).res
             alpha = 0.75, cmap = ListedColormap(('red', 'green')))
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('Kernel SVM (Test set)')
plt.xlabel('Age')
plt.ylabel('Estimated Salary')
plt.legend()
plt.show()
```

```
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```