Task 7

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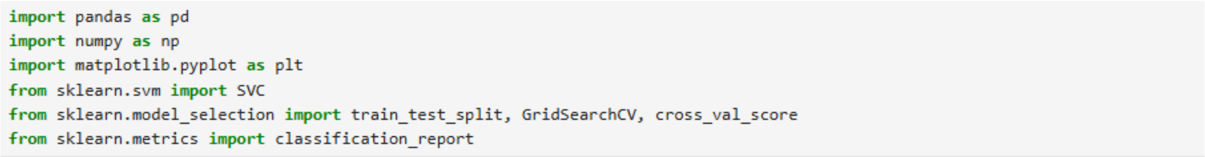
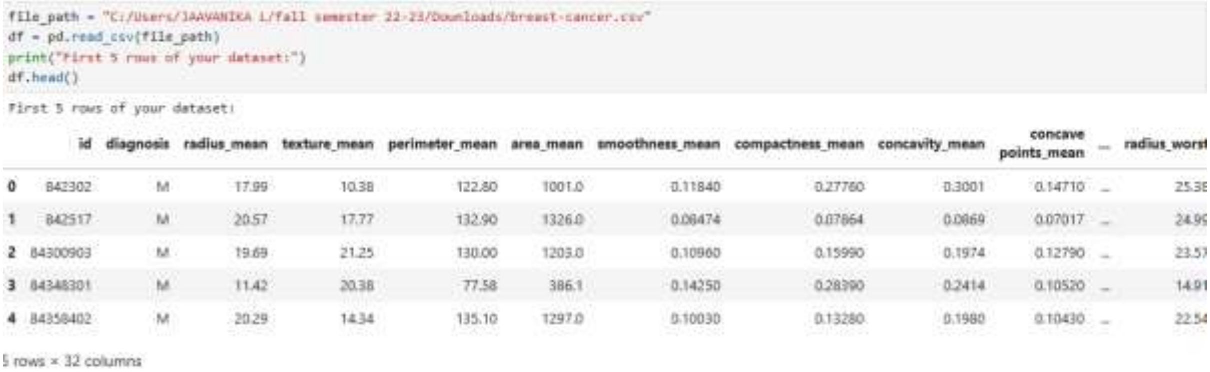


```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.svm import SVC
from sklearn.model_selection import train_test_split, GridSearchCV, cross_val_score
from sklearn.metrics import classification_report
```

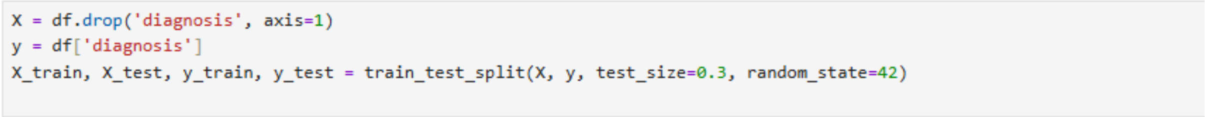


```
file_path = "C:/Users/JAAVANIKA L/fall semester 22-23/Downloads/breast-cancer.csv"
df = pd.read_csv(file_path)
print("First 5 rows of your dataset:")
df.head()
```

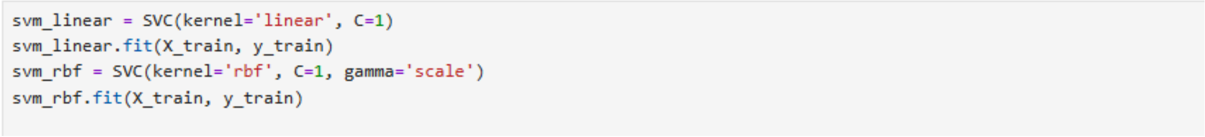
```
First 5 rows of your dataset:
```

	id	diagnosis	radius_mean	texture_mean	perimeter_mean	area_mean	smoothness_mean	compactness_mean	concavity_mean	concave points_mean	...	radius_worst
0	842302	M	17.99	10.38	122.80	1001.0	0.11840	0.27760	0.3001	0.14710	...	25.38
1	842517	M	20.57	17.77	132.90	1326.0	0.08474	0.07864	0.0869	0.07017	...	24.99
2	84300903	M	19.69	21.25	130.00	1203.0	0.10960	0.15990	0.1974	0.12790	...	23.57
3	84348301	M	11.42	20.38	77.58	386.1	0.14250	0.28390	0.2414	0.10520	...	14.91
4	84358402	M	20.29	14.34	135.10	1297.0	0.10030	0.13280	0.1980	0.10430	...	22.54

5 rows × 32 columns



```
X = df.drop('diagnosis', axis=1)
y = df['diagnosis']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42)
```



```
svm_linear = SVC(kernel='linear', C=1)
svm_linear.fit(X_train, y_train)
svm_rbf = SVC(kernel='rbf', C=1, gamma='scale')
svm_rbf.fit(X_train, y_train)
```

```
def plot_decision_boundary(model, X, y, title):
    h = 0.02
    x_min, x_max = X.iloc[:, 0].min() - 1, X.iloc[:, 0].max() + 1
    y_min, y_max = X.iloc[:, 1].min() - 1, X.iloc[:, 1].max() + 1
    xx, yy = np.meshgrid(np.arange(x_min, x_max, h),
                         np.arange(y_min, y_max, h))

    Z = model.predict(np.c_[xx.ravel(), yy.ravel()])
    Z = Z.reshape(xx.shape)

    plt.figure(figsize=(6, 4))
    plt.contourf(xx, yy, Z, alpha=0.3)
    plt.scatter(X.iloc[:, 0], X.iloc[:, 1], c=y, edgecolors='k')
    plt.title(title)
    plt.xlabel(X.columns[0])
    plt.ylabel(X.columns[1])
    plt.show()

plot_decision_boundary(svm_linear, X, y, "SVM with Linear Kernel")
plot_decision_boundary(svm_rbf, X, y, "SVM with RBF Kernel")"
```

```python
param_grid = {
    'C': [0.1, 1, 10],
    'gamma': [1, 0.1, 0.01],
    'kernel': ['rbf']
}
grid = GridSearchCV(SVC(), param_grid, refit=True, verbose=1, cv=5)
grid.fit(X_train, y_train)
print("Best Parameters:", grid.best_params_)
```

```python
scores = cross_val_score(grid.best_estimator_, X, y, cv=5)
print("Cross-validation scores:", scores)
print("Average accuracy:", scores.mean())

y_pred = grid.predict(X_test)
print("\nClassification Report:\n", classification_report(y_test, y_pred))
```