7/08/25

3. Study of Classifiers with respect to statistical Parameters

Aim : To evaluate and Compare Performance of classifiers with respect to statistical Parameters

Objectives :

- Load and Preprosses iris dataset
- Apply KNN, Decision tree and SVM classifiers
- Evaluate each model using accuracy, Precision and F1 score
- Compare the Performance of the classifiers using tabular format
- To draw Observations and Conclude which classifier performs best on dataset.

PseudoCode - KNN

1. Import KNeighbors classifier from sklearn
2. Import other required libraries
3. Load iris dataset
4. split the data into features (X) and labels (Y)
5. split data into training and testing
6. Initialize KNN classifier with K = 3
7. Fit the classifier on the training data
8. Predict labels for test data
9. Evaluate accuracy, Precision & F1 Score

Decision tree

1. Import decisiontree classifier from sklearn
2. Load iris dataset
3. Split the data int features (X) & labels (y)
4. split data int training & testing
5. Initialize decisiontree classifier
6. Fit classifier on training data
7. Predict labels for test data
8. Evaluate accuracy, Precision

SVM :

1. Import SVC from sklearn
2. Load iris dataset
3. split the data into features and labels
4. split data int training and testing
5. Initialize SVM classifier
6. Fit classifier on training data
7. Predict labels for test data
8. Evaluate accuracy, precision & f1score

Precision :

$$\text{Precision} = \frac{TP}{TP + FP}$$

High Precision means low false positive

Accuracy :

$$\text{Accuracy} = \frac{\text{No. of correct predictions}}{\text{total no of predictions}}$$

Comparision table

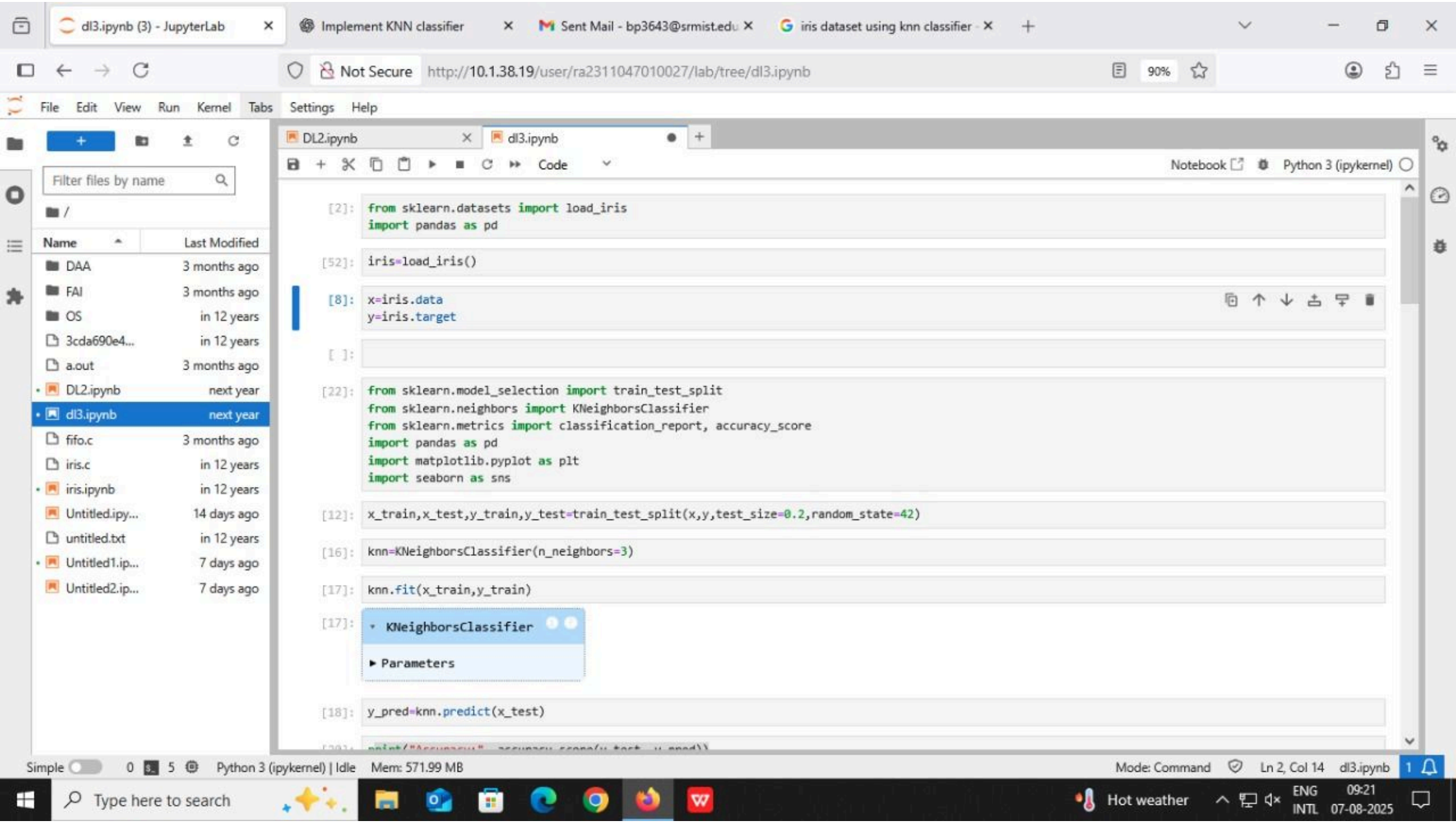
Classifier	Accuracy	Precision	Recall	F1-Score
KNN	0.97	0.96	0.96	0.96
Decision tree	0.93	0.92	0.92	0.92
SVM	1.00	1.00	1.00	1.00

Observation :

- SVM performed best across all metrics with perfect scores.
- KNN also gave high performance, it is more effective for simple datasets
- Decision tree has slightly lower metrics, indicating overfitting or sensitive to data variations.

Result :

Successfully evaluated and compared performance of all three classifiers with respect to statistical parameters.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[2]: from sklearn.datasets import load_iris
import pandas as pd
[52]: iris=load_iris()
[8]: x=iris.data
y=iris.target
[ ]:
[22]: from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import classification_report, accuracy_score
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
[12]: x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
[16]: knn=KNeighborsClassifier(n_neighbors=3)
[17]: knn.fit(x_train,y_train)
[17]: KNeighborsClassifier
Parameters
[18]: y_pred=knn.predict(x_test)
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[12]:
```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
```

[16]:
```
knn=KNeighborsClassifier(n_neighbors=3)
```

[17]:
```
knn.fit(x_train,y_train)
```

[17]:
```
KNeighborsClassifier
▸ Parameters
```

[18]:
```
y_pred=knn.predict(x_test)
```

[20]:
```
print("Accuracy:", accuracy_score(y_test, y_pred))
```

```
Accuracy: 1.0
```

[21]:
```
print("classification Report:",classification_report(y_test, y_pred))
```

```
classification Report:               precision    recall  f1-score   support

           0       1.00      1.00      1.00        10
           1       1.00      1.00      1.00         9
           2       1.00      1.00      1.00        11

    accuracy                           1.00        30
   macro avg       1.00      1.00      1.00        30
weighted avg       1.00      1.00      1.00        30
```

[24]:
```
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score,classification_report
```

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[24]:
```
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score,classification_report
```

[30]:
```
iris=load_iris()
x=iris.data
y=iris.target
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
```

[35]:
```
dtree=DecisionTreeClassifier()
```

[32]:
```
dtree.fit(x_train,y_train)
```

[32]:
```
DecisionTreeClassifier
▸ Parameters
```

[33]:
```
y_pred=knn.predict(x_test)
```

[36]:
```
print("Accuracy:", accuracy_score(y_test, y_pred))
```

```
Accuracy: 1.0
```

[38]:
```
print("classification Report:",classification_report(y_test, y_pred))
```

```
classification Report:              precision    recall  f1-score   support

           0       1.00      1.00      1.00        19
           1       1.00      1.00      1.00        13
           2       1.00      1.00      1.00        13

    accuracy                           1.00        45
   macro avg       1.00      1.00      1.00        45
```

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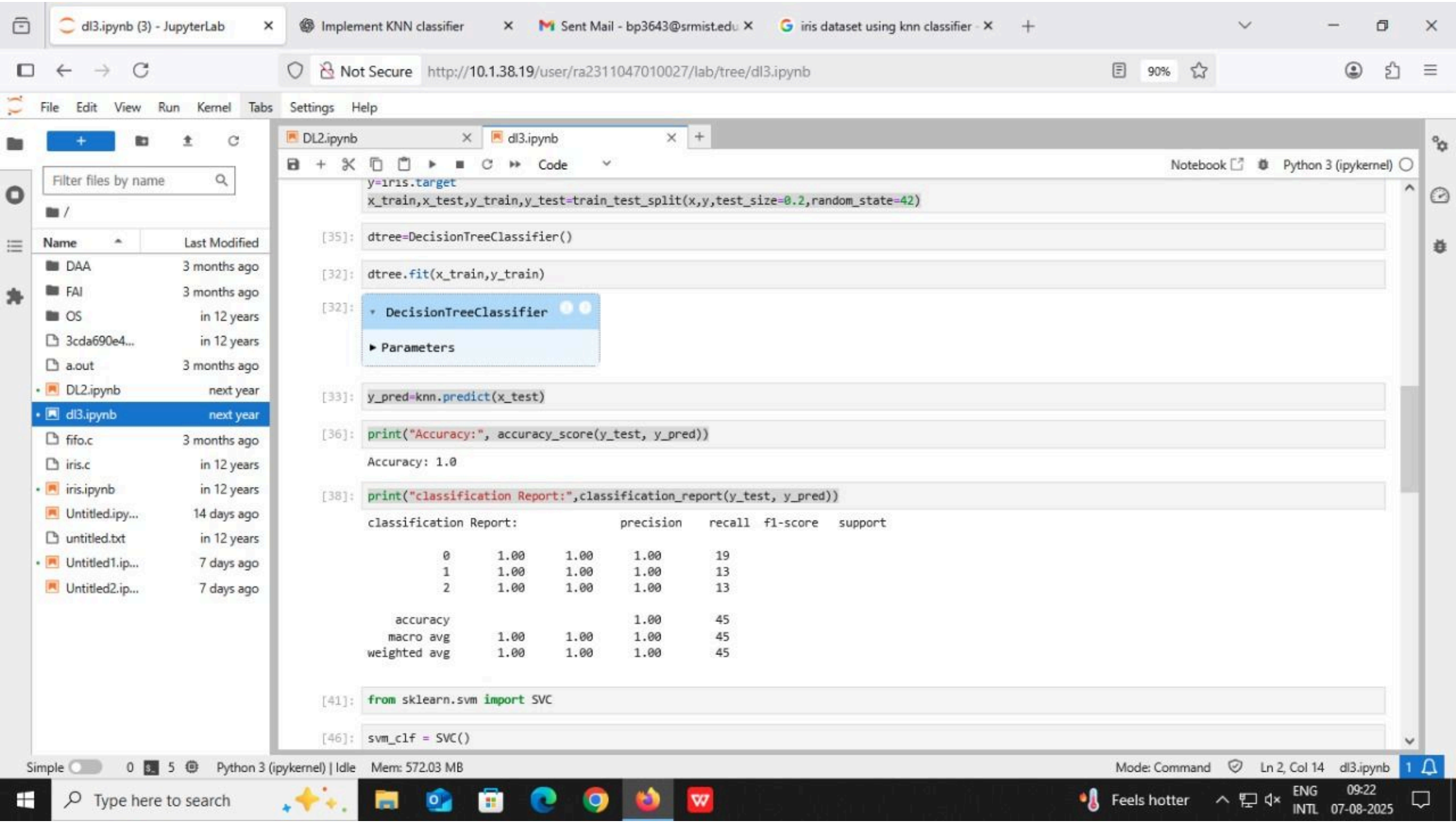
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y=iris.target
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
[35]: dtree=DecisionTreeClassifier()
[32]: dtree.fit(x_train,y_train)
[32]: DecisionTreeClassifier
Parameters
[33]: y_pred=knn.predict(x_test)
[36]: print("Accuracy:", accuracy_score(y_test, y_pred))
Accuracy: 1.0
[38]: print("classification Report:",classification_report(y_test, y_pred))
classification Report: precision recall f1-score support
0 1.00 1.00 1.00 19
1 1.00 1.00 1.00 13
2 1.00 1.00 1.00 13
accuracy 1.00 45
macro avg 1.00 1.00 1.00 45
weighted avg 1.00 1.00 1.00 45
[41]: from sklearn.svm import SVC
[46]: svm_clf = SVC()
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[41]:
```
from sklearn.svm import SVC
```

[46]:
```
svm_clf = SVC()
```

[43]:
```
iris=load_iris()
x=iris.data
y=iris.target
```

[44]:
```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)
```

[47]:
```
svm_clf.fit(x_train,y_train)
```

[47]:
```
SVC
▸ Parameters
```

[49]:
```
y_pred=svm_clf.predict(x_test)
```

[50]:
```
print("Accuracy:", accuracy_score(y_test, y_pred))
```

```
Accuracy: 1.0
```

[51]:
```
print("classification Report:",classification_report(y_test, y_pred))
```

```
classification Report:              precision    recall  f1-score   support

           0       1.00      1.00      1.00        10
           1       1.00      1.00      1.00         9
           2       1.00      1.00      1.00        11

    accuracy                           1.00        30
   macro avg       1.00      1.00      1.00        30
```

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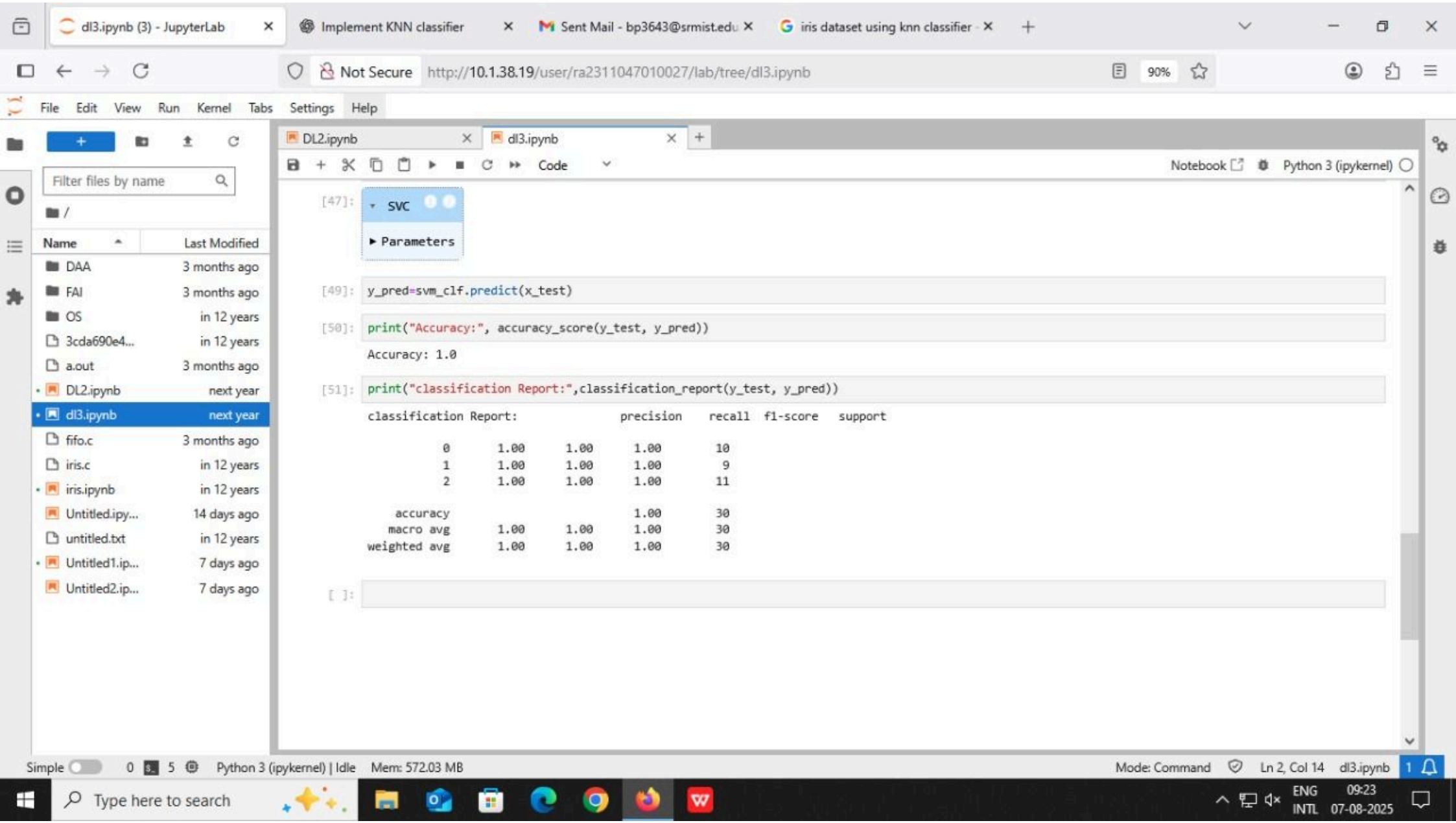
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Parameters
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classification Report: precision recall f1-score support
0 1.00 1.00 1.00 10
1 1.00 1.00 1.00 9
2 1.00 1.00 1.00 11
accuracy 1.00 30
macro avg 1.00 1.00 1.00 30
weighted avg 1.00 1.00 1.00 30
[ ]:
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