: RA2311047010016

S.No.	Date	Title	Signature
1	07.08.2025	Exploring the Deep learning platforms	
2.	07.08.2025	Implement a classifier using open source dataset	7/8/25
3.	14.08.2025	Study of classifiers with respect to Statistical parameters	14/8/25
4.	22.08.2025	To build and train a simple feed forward Network (~~FFNN~~) on MNIST dataset.	23/8/25
5.	22.8.25	Study different activation function used in NN	6/9/25
6.	9.9.25	Implement Gradient Descent & Backpropagation in ~~ANN~~ NN.	
7.	16.09.2025	Build a CNN model to classify Cat and dog image	23/9/25

07-08-2025

Exp: 2:- Implement a Classifier using open source dataset.

Aim:

To build a neural network classifier that accurately recognizes handwritten digits (0-9) from MNIST dataset.

Objective:

* Load and reprocess the MNIST dataset.
* Design and train a simple neural network classifier.
* Evaluate the model's accuracy on the test set.
* Understand the model's learning behaviour through loss and accuracy metrics.

pseudocode :

Sol :

* Start :

1. Import libraries (torch, torchvision, etc.)

2. Load MNIST dataset :

- Download training and test data.
- Normalize images (scale pixel values to [0, 1] or mean=0, std=1)
- Create DataLoader for batching

3) Define the neural network :

Input layer size = 28 * 28 (flattened image)

Hidden layers with activate functions (ReLU).

- Output layer size = 10 (for digits 0-9)

4.) Define loss function

5.) Train the model for N epochs

6.) Evaluate the model on test dataset:

- Calculate accuracy by comparing predictions with true labels.

7.) print final accuracy and loss

END.

Observations:

The loss decreases steadily over epochs indicating effective learning.

The model typically achieves around 95% test accuracy with this simple MLP architecture.

For better accuracy, you can explore deeper networks or convolutional neural networks (CNNs)

Training is fast due to small image size and simple network.

Result: Implemented a classifier using open source dataset.

Dataset Used:

* MNIST Dataset:

* Contains 70,000 grayscale images of handwritten digits (28×28 pixels).

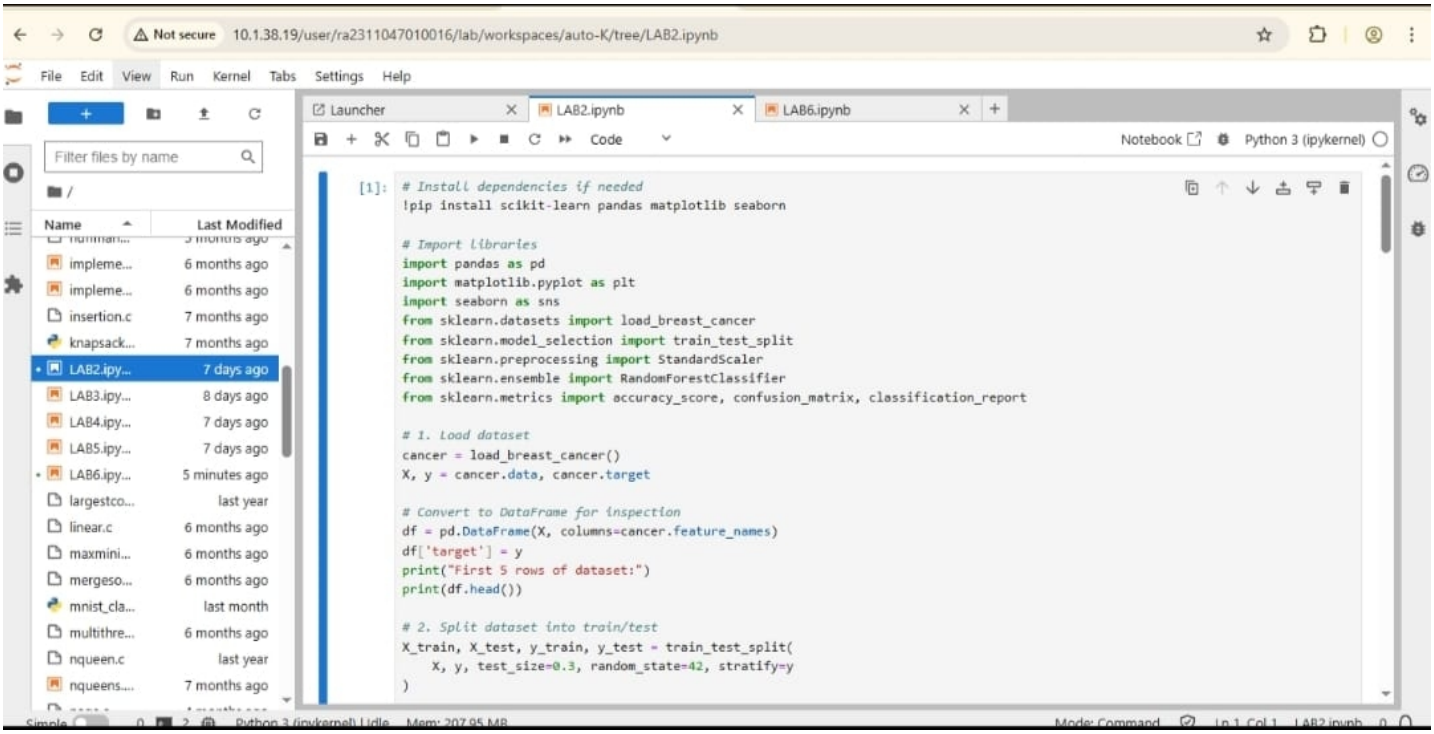
* Split into 60,000 training images and 10,000 test images.

* Labels correspond to digits 0 through 9.

Classifier Used:

* Fully connected Neural Network – MLP).

* Simple feedforward neural network with one or two hidden layers.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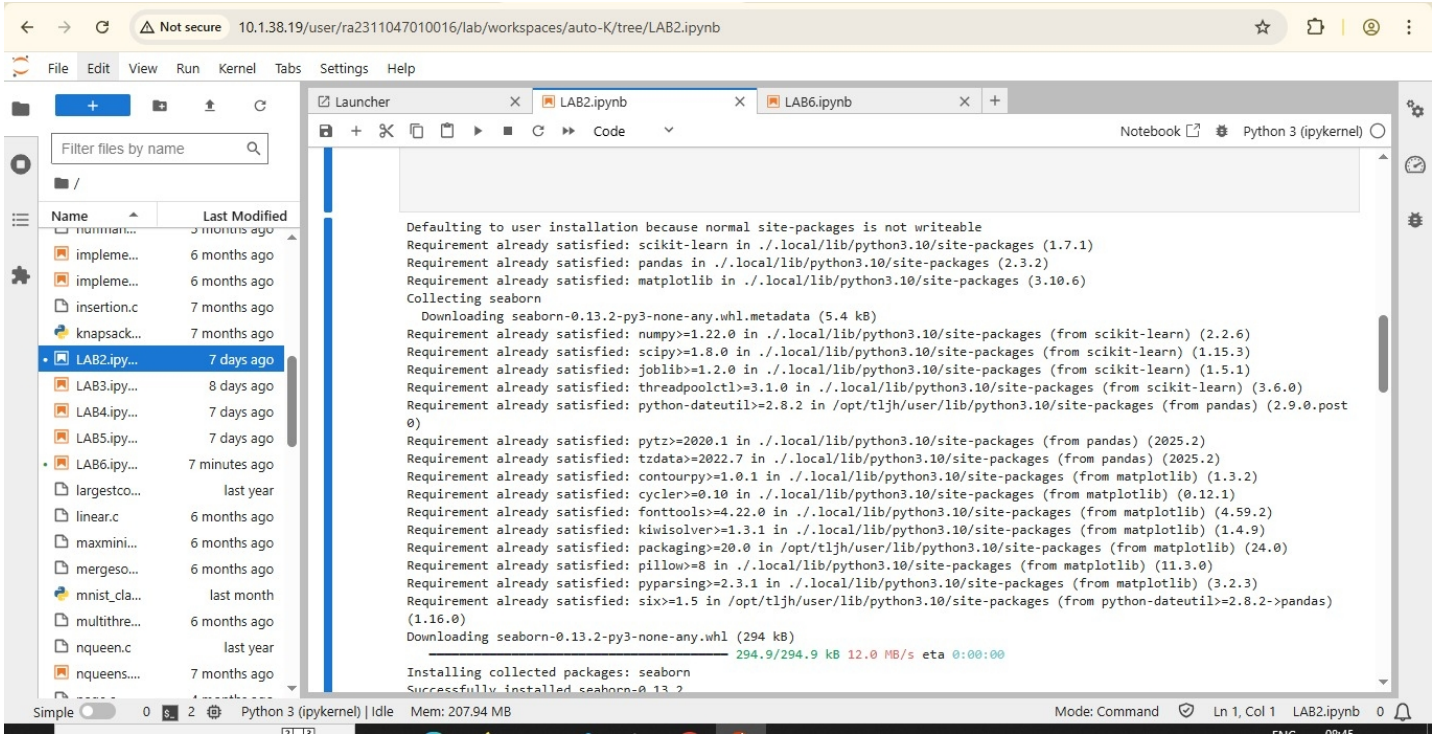
[1]:
Install dependencies if needed
!pip install scikit-learn pandas matplotlib seaborn
# Import libraries
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.datasets import load_breast_cancer
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report
# 1. Load dataset
cancer = load_breast_cancer()
X, y = cancer.data, cancer.target
# Convert to DataFrame for inspection
df = pd.DataFrame(X, columns=cancer.feature_names)
df['target'] = y
print("First 5 rows of dataset:")
print(df.head())
# 2. Split dataset into train/test
X_train, X_test, y_train, y_test = train_test_split(
X, y, test_size=0.3, random_state=42, stratify=y
)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Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: scikit-learn in ./.local/lib/python3.10/site-packages (1.7.1)
Requirement already satisfied: pandas in ./.local/lib/python3.10/site-packages (2.3.2)
Requirement already satisfied: matplotlib in ./.local/lib/python3.10/site-packages (3.10.6)
Collecting seaborn
Downloading seaborn-0.13.2-py3-none-any.whl.metadata (5.4 kB)
Requirement already satisfied: numpy>=1.22.0 in ./.local/lib/python3.10/site-packages (from scikit-learn) (2.2.6)
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Requirement already satisfied: joblib>=1.2.0 in ./.local/lib/python3.10/site-packages (from scikit-learn) (1.5.1)
Requirement already satisfied: threadpoolctl>=3.1.0 in ./.local/lib/python3.10/site-packages (from scikit-learn) (3.6.0)
Requirement already satisfied: python-dateutil>=2.8.2 in /opt/tljh/user/lib/python3.10/site-packages (from pandas) (2.9.0.post0)
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Requirement already satisfied: pillow>=8 in ./.local/lib/python3.10/site-packages (from matplotlib) (11.3.0)
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Requirement already satisfied: six>=1.5 in /opt/tljh/user/lib/python3.10/site-packages (from python-dateutil>=2.8.2->pandas) (1.16.0)
Downloading seaborn-0.13.2-py3-none-any.whl (294 kB)
294.9/294.9 kB 12.0 MB/s eta 0:00:00
Installing collected packages: seaborn
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Python 3 (ipykernel) | Idle
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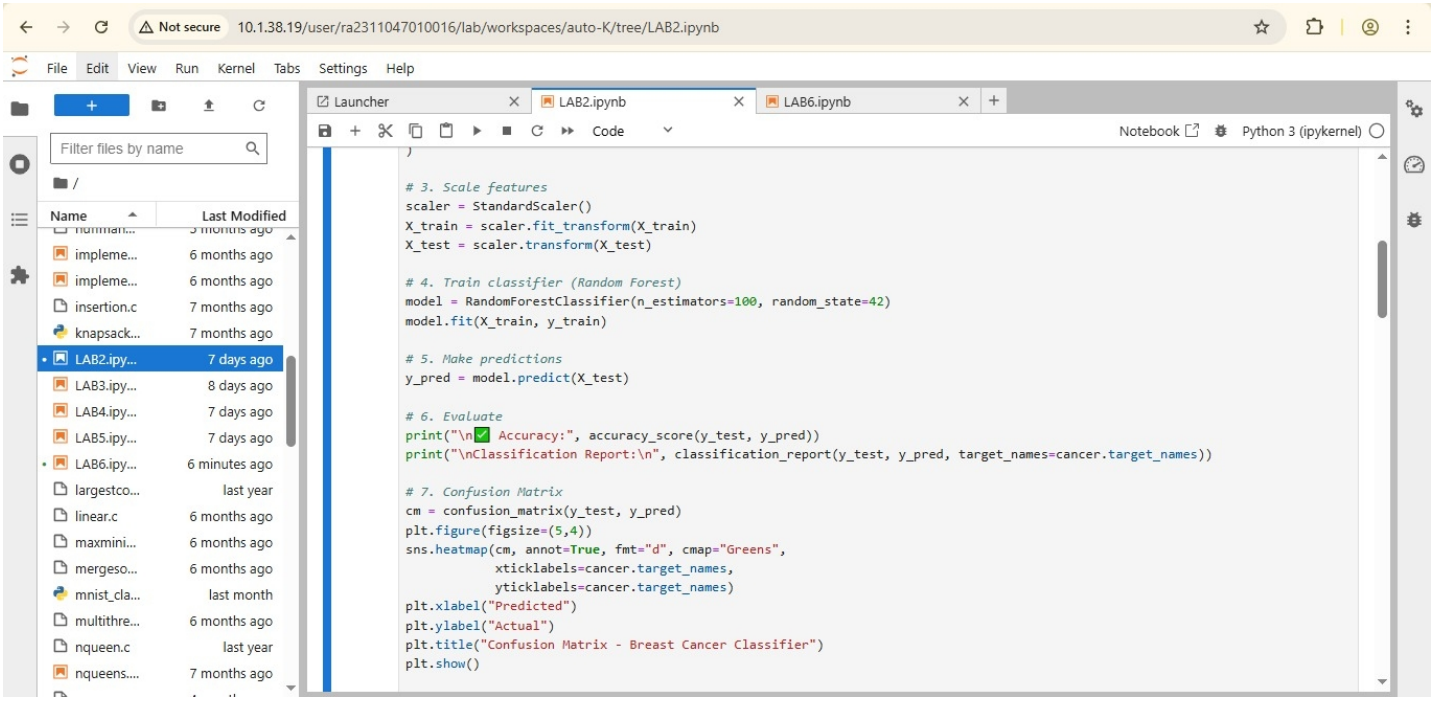
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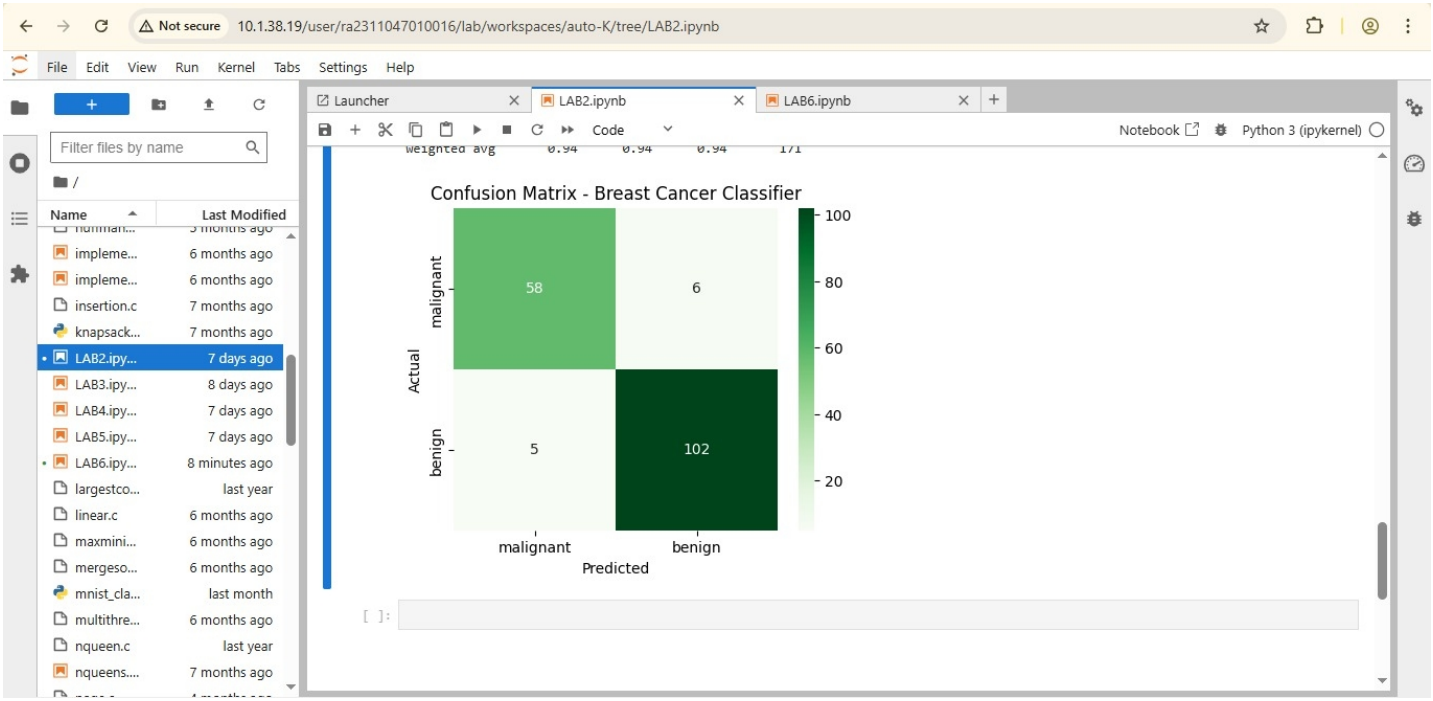
)
# 3. Scale features
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
# 4. Train classifier (Random Forest)
model = RandomForestClassifier(n_estimators=100, random_state=42)
model.fit(X_train, y_train)
# 5. Make predictions
y_pred = model.predict(X_test)
# 6. Evaluate
print("\n✅ Accuracy:", accuracy_score(y_test, y_pred))
print("\nClassification Report:\n", classification_report(y_test, y_pred, target_names=cancer.target_names))
# 7. Confusion Matrix
cm = confusion_matrix(y_test, y_pred)
plt.figure(figsize=(5,4))
sns.heatmap(cm, annot=True, fmt="d", cmap="Greens",
xticklabels=cancer.target_names,
yticklabels=cancer.target_names)
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.title("Confusion Matrix - Breast Cancer Classifier")
plt.show()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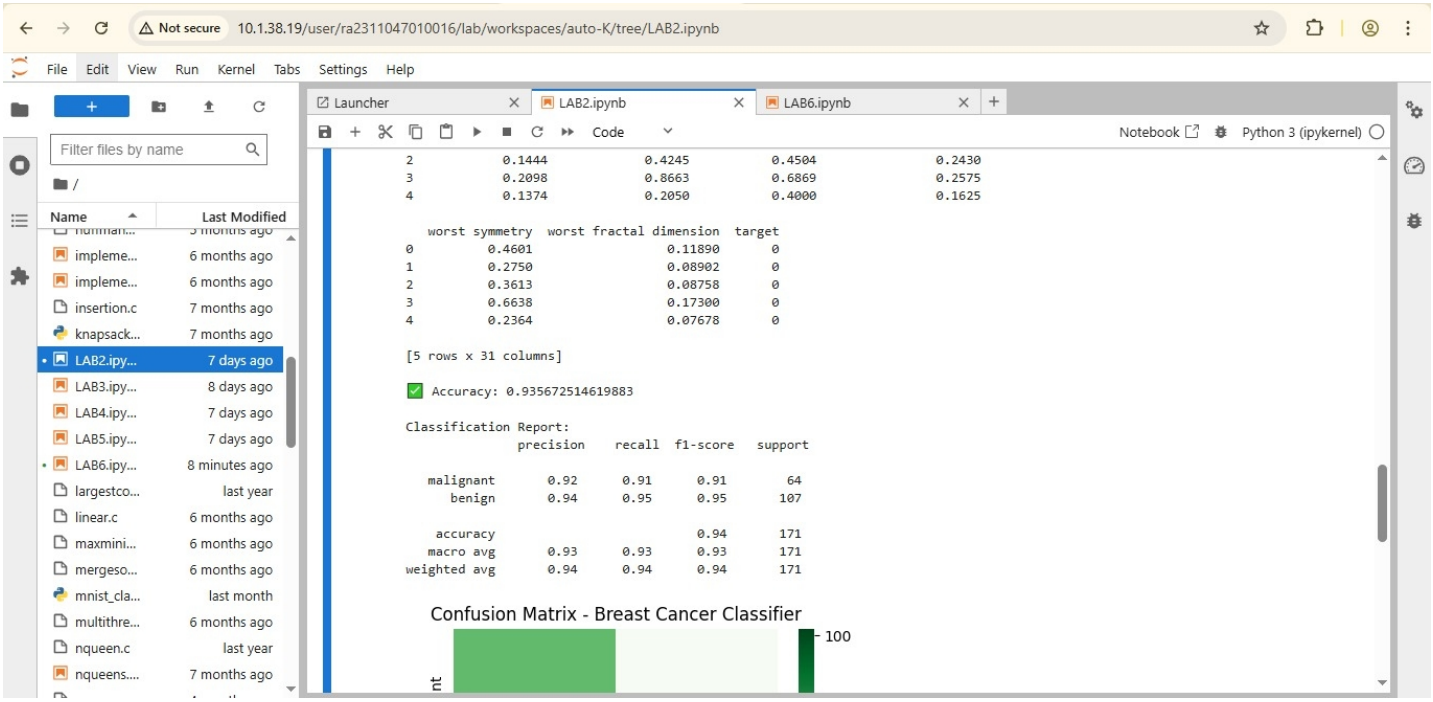
Confusion Matrix - Breast Cancer Classifier
58
6
5
102
malignant
benign
Actual
Predicted
100
80
60
40
20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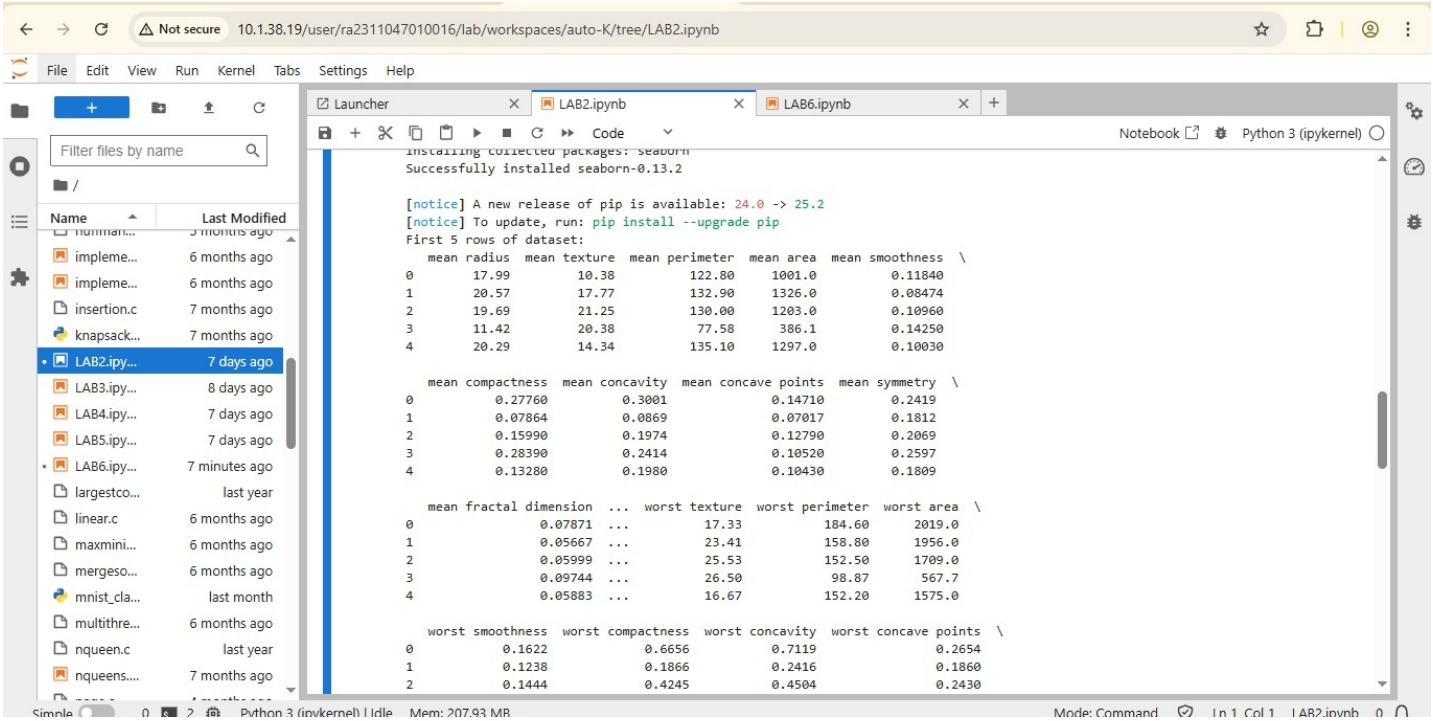
2 0.1444 0.4245 0.4504 0.2430
3 0.2098 0.8663 0.6869 0.2575
4 0.1374 0.2050 0.4000 0.1625
worst symmetry worst fractal dimension target
0 0.4601 0.11890 0
1 0.2750 0.08902 0
2 0.3613 0.08758 0
3 0.6638 0.17300 0
4 0.2364 0.07678 0
[5 rows x 31 columns]
Accuracy: 0.935672514619883
Classification Report:
precision recall f1-score support
malignant 0.92 0.91 0.91 64
benign 0.94 0.95 0.95 107
accuracy 0.94 171
macro avg 0.93 0.93 0.93 171
weighted avg 0.94 0.94 0.94 171
Confusion Matrix - Breast Cancer Classifier
100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Installing collected packages: seaborn
Successfully installed seaborn-0.13.2
[notice] A new release of pip is available: 24.0 -> 25.2
[notice] To update, run: pip install --upgrade pip
First 5 rows of dataset:
mean radius mean texture mean perimeter mean area mean smoothness \
0 17.99 10.38 122.80 1001.0 0.11840
1 20.57 17.77 132.90 1326.0 0.08474
2 19.69 21.25 130.00 1203.0 0.10960
3 11.42 20.38 77.58 386.1 0.14250
4 20.29 14.34 135.10 1297.0 0.10030
mean compactness mean concavity mean concave points mean symmetry \
0 0.27760 0.3001 0.14710 0.2419
1 0.07864 0.0869 0.07017 0.1812
2 0.15990 0.1974 0.12790 0.2069
3 0.28390 0.2414 0.10520 0.2597
4 0.13280 0.1980 0.10430 0.1809
mean fractal dimension ... worst texture worst perimeter worst area \
0 0.07871 ... 17.33 184.60 2019.0
1 0.05667 ... 23.41 158.80 1956.0
2 0.05999 ... 25.53 152.50 1709.0
3 0.09744 ... 26.50 98.87 567.7
4 0.05883 ... 16.67 152.20 1575.0
worst smoothness worst compactness worst concavity worst concave points \
0 0.1622 0.6656 0.7119 0.2654
1 0.1238 0.1866 0.2416 0.1860
2 0.1444 0.4245 0.4504 0.2430
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