DML MINI PROJECT

AIM: Handwritten digit recognition using mnist dataset

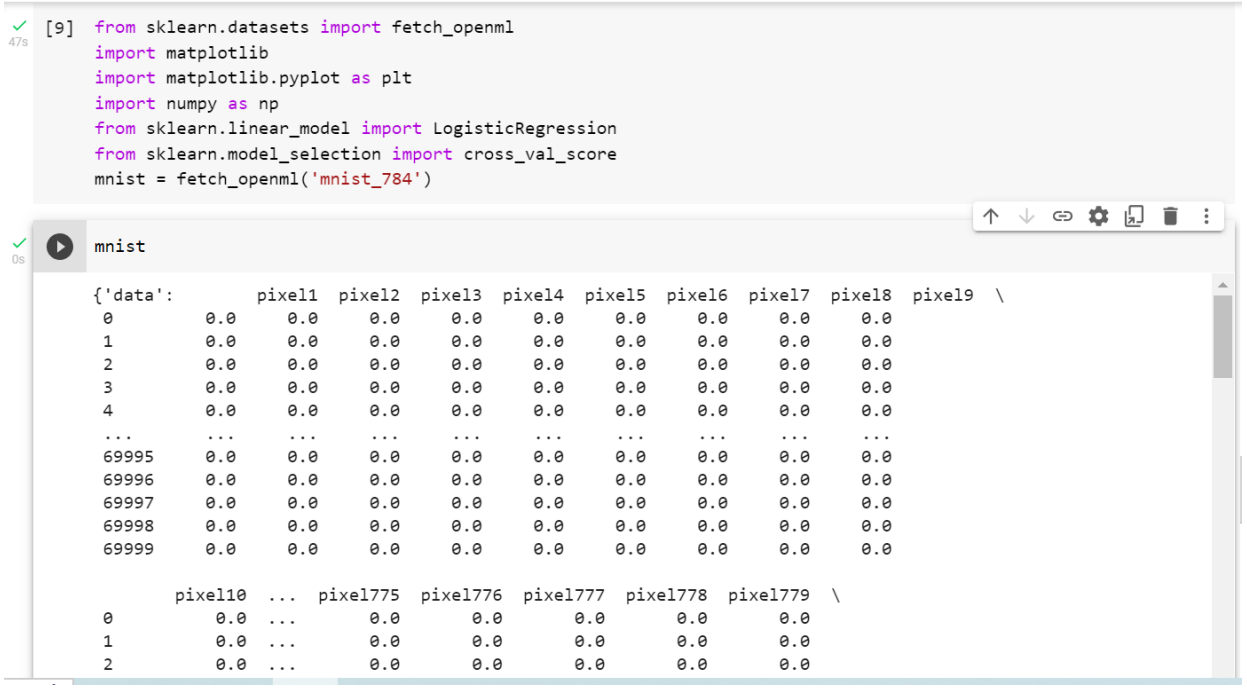
What is MNIST?

1. Set of 70,000 small images of digits handwritten by high school students and employees of the US causes Bureau.
2. All images are labeled with the respective digit they represent.
3. MNIST is the hello world of machine learning. Every time a data scientist or machine learning engineer makes a new algorithm for classification, they would always first check its performance on the MNIST dataset.
4. There are 70,000 images and each image has 28*28 = 784 features.
5. Each image is 28*28 pixels and each feature simply represents one-pixel intensity from 0 to 255. If the intensity is 0, it means that the pixel is white and if it is 255, it means it is black.

CODE:

```
from sklearn.datasets import fetch_openml
import matplotlib
import matplotlib.pyplot as plt
import numpy as np
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import cross_val_score
mnist = fetch_openml('mnist_784')
mnist
```

OUTPUT:



```
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    import matplotlib
    import matplotlib.pyplot as plt
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```

```
mnist
```

```
{'data':        pixel1  pixel2  pixel3  pixel4  pixel5  pixel6  pixel7  pixel8  pixel9  \
 0         0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 1         0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 2         0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 3         0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 4         0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 ...       ...     ...     ...     ...     ...     ...     ...     ...     ...
 69995     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 69996     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 69997     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 69998     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 69999     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0

        pixel10  ...  pixel775  pixel776  pixel777  pixel778  pixel779  \
 0          0.0  ...       0.0       0.0       0.0       0.0       0.0
 1          0.0  ...       0.0       0.0       0.0       0.0       0.0
 2          0.0  ...       0.0       0.0       0.0       0.0       0.0
```

CODE:

```
x, y = mnist['data'], mnist['target']
some_digit = x.to_numpy()[36001]
some_digit_image = some_digit.reshape(28, 28)  # let's reshape to plot it
plt.imshow(some_digit_image, cmap=matplotlib.cm.binary,
interpolation='nearest')
plt.axis("off")
plt.show()
```

OUTPUT:

CODE

```
x_train, x_test = x[:60000], x[6000:70000]
y_train, y_test = y[:60000], y[6000:70000]
shuffle_index = np.random.permutation(60000)
x_train, y_train = x_train.iloc[shuffle_index], y_train.iloc[shuffle_index]

# Creating a 2-detector
y_train = y_train.astype(np.int8)
y_test = y_test.astype(np.int8)
y_train_2 = (y_train == 2)
y_test_2 = (y_test == 2)
```

```
clf = LogisticRegression(tol=0.1)

clf.fit(x_train, y_train_2)
```

OUTPUT

```
LogisticRegression(tol=0.1)
```

CODE:

```
a = cross_val_score(clf, x_train, y_train_2, cv=3, scoring="accuracy")
print(a.mean())
```

In [15]:

OUTPUT: