

# Machine Learning

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## Task\_1

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### 1. 5 examples from the used mnist dataset :

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- Checking of random targets indices to know their values and Extracting their corresponding images from dataset.

```
# Extracting data and target variables
data, targets = mnist["data"], mnist["target"]    # data_shape : (70000, 784) &
targets_shape : (70000,)

# 5 examples from the mnist dataset

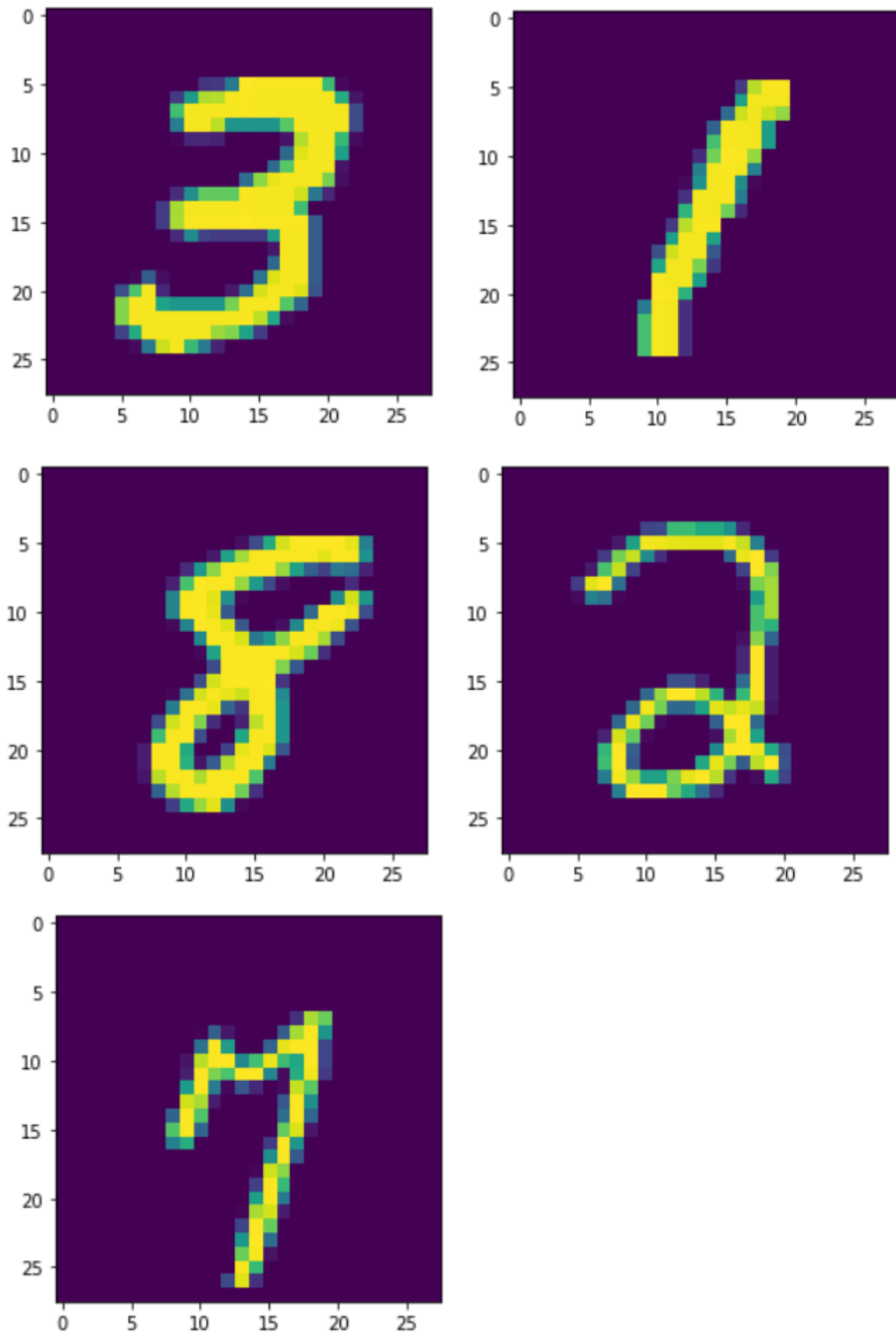
#targets[7]          # "3"
#targets [77]        # "1"
#targets [777]       # "8"
#targets[7776]       # "2"
#targets [6777]      # "7"

digits=[7,77,777,7776,6777]

for i in range(5):

    digit=data[digits[i]].reshape(28, 28)
    plt.imshow(digit)
    plt.show()
```

- Extracted images :
-



## 2. Findings of the requirements

- Binary classification using SGD classifier

```
# Testing the classifier
```

```
clf.predict(data_test)
```

```
array([False, False,  True, ..., False, False, False])
```

- Checking if these predictions are true

```
: # Testing the classifier
```

```
clf.predict(data_test)
```

```
print("index zero :",targets_test[0], " index 1 :",targets_test[1]," last index :",targets_test[13999])
```

```
index zero : 6   index 1 : 2   last index : 1
```

- The confusion matrix

```
: targets_train_pred = cross_val_predict(clf, data_train, targets_train_3, cv=3)
: confusion_matrix(targets_train_3, targets_train_pred)
```

```
: array([[49339,   951],
:        [ 1208,  4502]], dtype=int64)
```

- Multiclass classification prediction

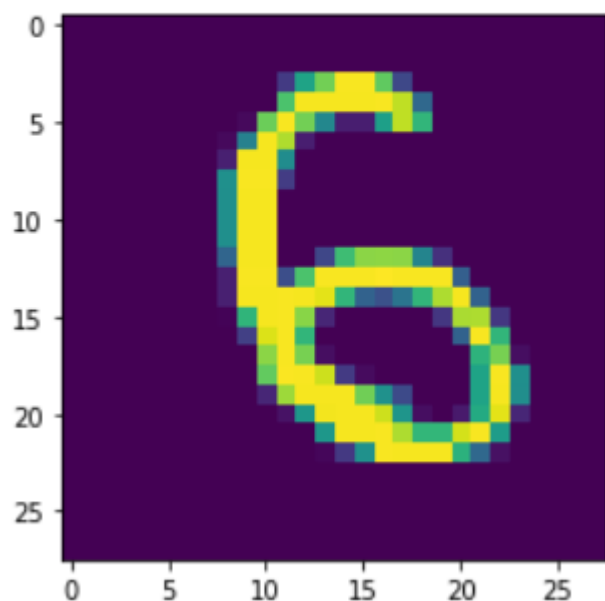
```
# Multiclass classification(classify the 10 digits)
clf.fit(data_train, targets_train)
clf.predict(data_test)
```

```
array(['6', '2', '3', ..., '4', '3', '1'], dtype='<U1')
```

- check prediction

```
print("index zero :",plt.imshow(data_test[0].reshape(28,28)))
```

index zero : AxesImage(54,36;334.8x217.44)



### 3. The output of the confusion matrix

```
TN=conf_matrix[0][0] # 49339
FP=conf_matrix[0][1] # 951
FN=conf_matrix[1][0] # 1208
TP=conf_matrix[1][1] # 4502
```

