What is Machine Learning (ML) :

Machine learning is a powerful approach that enables computers to learn from data and make predictions or decisions without being explicitly programmed.

In [ ]:

Types of Machine Learning

In classification, one major algorithm is missing, can you find it?

In [ ]:

What is Classification?

Classification is the process of categorizing or grouping data into distinct classes or categories based on certain features or attributes.

Think of it as teaching a computer to recognize patterns, and then the computer learns to assign new or unseen data points to predefined categories.

In [ ]:

Applications of Classification, why its important? :

Spam Detection: Automatically classifying emails as spam or not spam based on their content.

Image Recognition: Classifying images of objects, animals, or people in applications like self-driving cars or security systems.

Medical Diagnoses: Identifying whether a patient has a certain medical condition based on symptoms and test results.

In [ ]:

Basic steps in Machine Learning coding:

Loading Dataset

Data Splitting

Vizualizing Dataset

Model Selection & Training

Model Evaluation

Prediction / Classification

In [1]:
```
import matplotlib.pyplot as plt # for visualization
```

In [2]:
```
def plot_img(img, label): # to plot an image with its ground truth as title
    plt.matshow(img.reshape(8, 8), cmap='gray')
    plt.title(label)
    plt.axis('off')
    plt.show()
```

See description of other sklearn toy datasets here

In [3]:
```
# There are many built-in datasets in sklearn, eg - Iris, digits, breast_cancer etc
# Importing 'load_digits' function from 'datasets' module of 'sklearn'.

# Each datapoint is a 8x8 image of a digit.
# Classes: 10
# Samples per class : 180
# Samples total : 1797
# Dimensionality : 64

from sklearn.datasets import load_digits
```

In [4]:
```
# For training and testing a ML model we need to split the whole dataset into train
# It is done using 'train_test_split' function from 'model_selection' module of 'sk
```

```
from sklearn.model_selection import train_test_split
```

In [5]:
```
# Sklearn has different types of ML models in different modules, one such module is
# Importing 'KNeighborsClassifier' for K-Nearest Neighbours

from sklearn.neighbors import KNeighborsClassifier
```

Loading Dataset

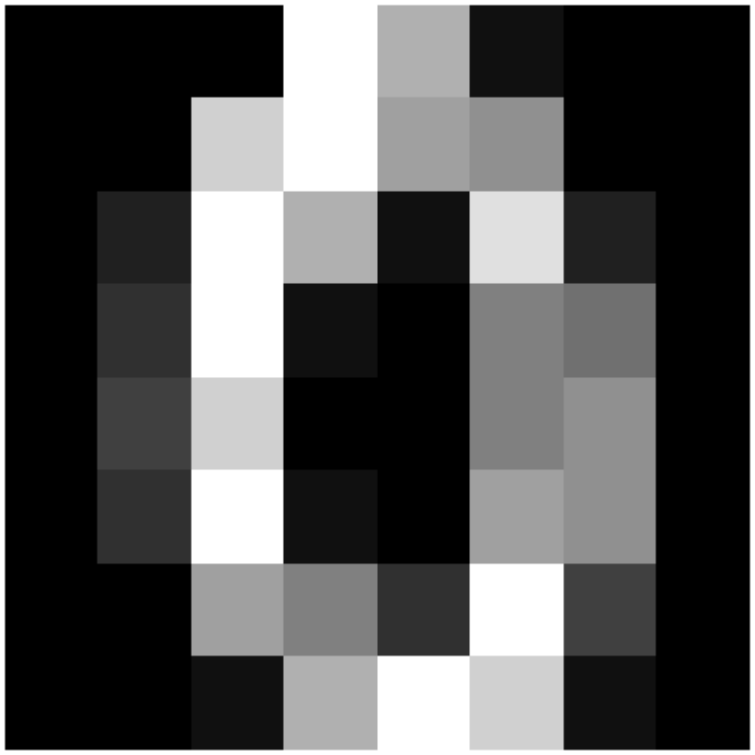
In [6]:
```
digits = load_digits()
features = digits.data # Different pixel values
targets = digits.target # Target values from 0 to 9
```

Data Splitting

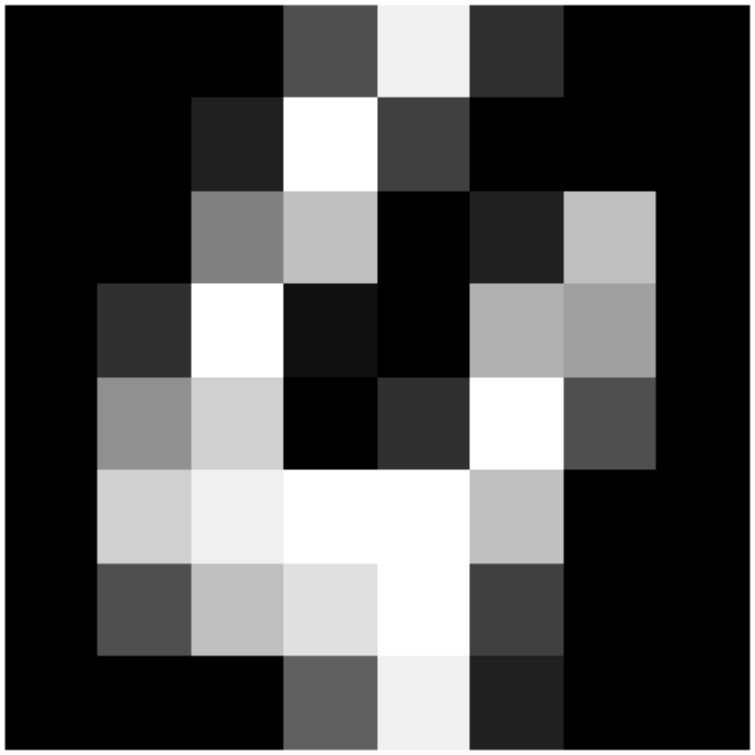
In [7]:
```
# Splitting the data into train and test sets
# test_size is the amount of dataset that is allocated as testing set from the whol
# 0.25 means 25% of the dataset is stored as testing set in X_test and their ground
# random_state is a seed value for reproducibility (for giving consistent result ev
# if there's no random_state given, you will get different dataset partiton, hence
X_train, X_test, y_train, y_test = train_test_split(features, targets, test_size=0.
```

Vizualizing Dataset

In [8]:
```
# Visualizing training set
i = 17
plot_img(X_train[i], y_train[i])
```



In [9]:
```
# Visualizing testing set
i = 24
plot_img(X_test[i], y_test[i])
```



Model Training

In [10]:
```
# Train the classifier, use 'n_neighbors' argument to give the number of nearest ne
knn = KNeighborsClassifier(n_neighbors=3)
knn.fit(X_train, y_train) # fitting knn ml model to our training set
```

Out[10]:
```
KNeighborsClassifier(n_neighbors=3)
```

Model Evaluation

In [11]:
```
acc = knn.score(X_test, y_test) # checking the accuracy of knn model on test set us
print(f"Accuracy: {round(acc * 100, 2)}%")
```

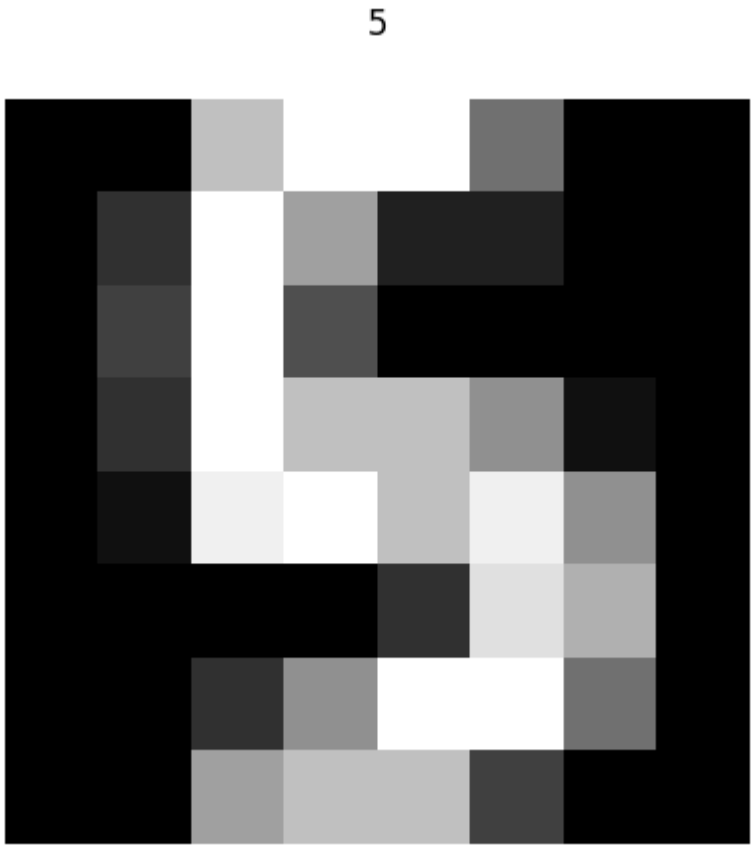
```
Accuracy: 97.78%
```

Classification

In [12]:
```
j = 12
test_img = X_test[j].reshape(1, -1)
y_pred = knn.predict(test_img) # Making prediction using 'predict' function
```

```
print(f"Classified as {y_pred[0]}")
plot_img(X_test[j], y_test[j])
```

```
Classified as 5
```



In [ ]: