Assignment 3

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(i) Download data

In [ ]:
```
import pandas as pd
from sklearn.preprocessing import OneHotEncoder
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.tree import DecisionTreeClassifier
import matplotlib.pyplot as plt
from google.colab import drive
```

In [ ]:
```
drive.mount('/content/drive')
BASE_PATH = '/content/drive/MyDrive/Colab_Notebooks/ML_DRIVE/Assign_3/dataset'
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
```

In [ ]:
```
dataset = pd.read_csv(f"{BASE_PATH}/train_and_test2.csv")
print("Dataset shape:", dataset.shape)
print("Dataset columns:", dataset.columns)
```

```
Dataset shape: (1309, 28)
Dataset columns: Index(['Passengerid', 'Age', 'Fare', 'Sex', 'sibsp', 'zer
o', 'zero.1',
       'zero.2', 'zero.3', 'zero.4', 'zero.5', 'zero.6', 'Parch', 'zero.7',
       'zero.8', 'zero.9', 'zero.10', 'zero.11', 'zero.12', 'zero.13',
       'zero.14', 'Pclass', 'zero.15', 'zero.16', 'Embarked', 'zero.17',
       'zero.18', '2urvived'],
      dtype='object')
```

In [ ]:
```
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1309 entries, 0 to 1308
Data columns (total 28 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   Passengerid  1309 non-null   int64
 1   Age          1309 non-null   float64
 2   Fare         1309 non-null   float64
 3   Sex          1309 non-null   int64
 4   sibsp        1309 non-null   int64
 5   zero         1309 non-null   int64
 6   zero.1       1309 non-null   int64
 7   zero.2       1309 non-null   int64
 8   zero.3       1309 non-null   int64
 9   zero.4       1309 non-null   int64
 10  zero.5       1309 non-null   int64
 11  zero.6       1309 non-null   int64
 12  Parch        1309 non-null   int64
 13  zero.7       1309 non-null   int64
 14  zero.8       1309 non-null   int64
 15  zero.9       1309 non-null   int64
 16  zero.10      1309 non-null   int64
 17  zero.11      1309 non-null   int64
 18  zero.12      1309 non-null   int64
 19  zero.13      1309 non-null   int64
 20  zero.14      1309 non-null   int64
 21  Pclass       1309 non-null   int64
 22  zero.15      1309 non-null   int64
 23  zero.16      1309 non-null   int64
 24  Embarked     1307 non-null   float64
 25  zero.17      1309 non-null   int64
 26  zero.18      1309 non-null   int64
 27  2urvived     1309 non-null   int64
dtypes: float64(3), int64(25)
memory usage: 286.5 KB
```

In [ ]:
```
cols_to_be_removed = ['Passengerid', 'zero', 'zero.1', 'zero.2', 'zero.3', 'ze
dataset = dataset.drop(cols_to_be_removed, axis=1)
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1309 entries, 0 to 1308
Data columns (total 8 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   Age       1309 non-null   float64
 1   Fare      1309 non-null   float64
 2   Sex       1309 non-null   int64
 3   sibsp     1309 non-null   int64
 4   Parch     1309 non-null   int64
 5   Pclass    1309 non-null   int64
 6   Embarked  1307 non-null   float64
 7   2urvived  1309 non-null   int64
dtypes: float64(3), int64(5)
memory usage: 81.9 KB
```

In [ ]:
```
dataset.shape
```

Out[ ]:
```
(1309, 8)
```

In [ ]:
```
dataset.head()
```

Out[ ]:

	Age	Fare	Sex	sibsp	Parch	Pclass	Embarked	2urvived
0	22.0	7.2500	0	1	0	3	2.0	0
1	38.0	71.2833	1	1	0	1	0.0	1
2	26.0	7.9250	1	0	0	3	2.0	1
3	35.0	53.1000	1	1	0	1	2.0	1
4	35.0	8.0500	0	0	0	3	2.0	0

In [ ]:
```
encoded_cols = ["Pclass", "Embarked"]
dataset = pd.get_dummies(dataset, columns=encoded_cols)
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1309 entries, 0 to 1308
Data columns (total 12 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Age           1309 non-null   float64
 1   Fare          1309 non-null   float64
 2   Sex           1309 non-null   int64  
 3   sibsp         1309 non-null   int64  
 4   Parch         1309 non-null   int64  
 5   2urvived      1309 non-null   int64  
 6   Pclass_1      1309 non-null   uint8  
 7   Pclass_2      1309 non-null   uint8  
 8   Pclass_3      1309 non-null   uint8  
 9   Embarked_0.0  1309 non-null   uint8  
 10  Embarked_1.0  1309 non-null   uint8  
 11  Embarked_2.0  1309 non-null   uint8  
dtypes: float64(2), int64(4), uint8(6)
memory usage: 69.2 KB
```

In [ ]:
```
X = dataset.drop('2urvived', axis=1)
y = dataset['2urvived']
```

In [ ]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y)
```

In [ ]:
```
print(f"Train Dataset Shape: X_train = {X_train.shape} y_train = {y_train.shape
```

```
Train Dataset Shape: X_train = (981, 11) y_train = (981,)
```

In [ ]:
```
print(f"Test Dataset Shape: X_test = {X_test.shape} y_test = {y_test.shape}")
```

```
Test Dataset Shape: X_test = (328, 11) y_test = (328,)
```

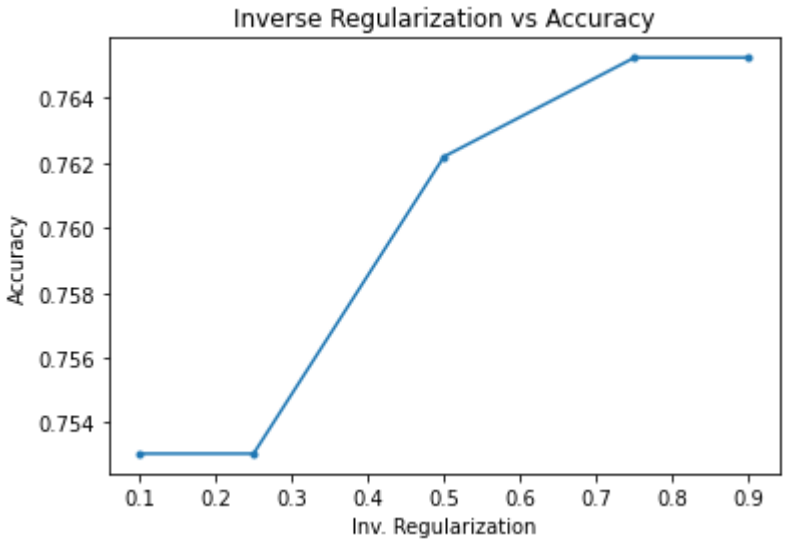
Task 2

In [ ]:
```
def train_model_with_inv_regu(X_train, y_train, X_test, y_test, C=1.0):
  lr = LogisticRegression(max_iter = 10000, C=C)
  lr.fit(X_train, y_train)
  return lr.score(X_test, y_test)
```

In [ ]:
```
inv_reg = [0.1, 0.25, 0.5, 0.75, 0.9]
accuracy = []

for ir in inv_reg:
  accuracy.append(train_model_with_inv_regu(X_train, y_train, X_test, y_test, i

plt.plot(inv_reg, accuracy, '.-')
plt.title("Inverse Regularization vs Accuracy")
plt.xlabel("Inv. Regularization")
plt.ylabel("Accuracy")
plt.show()
```



Task 3

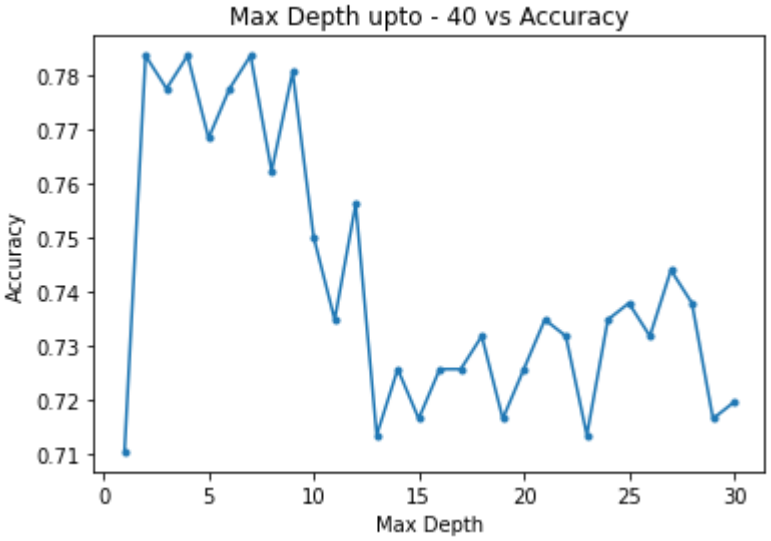
In [ ]:
```
def classifierHelper(
    X_train,
    y_train,
    X_test,
    y_test,
    max_depth
):

  max_depths = range(1, max_depth+1)
  accuracies = []

  for md in max_depths:
    classifier_model = DecisionTreeClassifier(max_depth=md).fit(X_train, y_trai
    accuracy = classifier_model.score(X_test, y_test)
    accuracies.append(accuracy)

  return [max_depths, accuracies]
```

In [ ]:
```
result = classifierHelper(X_train, y_train, X_test, y_test, 30)
plt.plot(result[0], result[1], ".-")
plt.title(f"Max Depth upto - {40} vs Accuracy")
plt.xlabel("Max Depth")
plt.ylabel("Accuracy")
plt.show()
```


Max Depth upto - 40 vs Accuracy
Accuracy
Max Depth
0.78
0.77
0.76
0.75
0.74
0.73
0.72
0.71
0
5
10
15
20
25
30