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Course and Section: CPE32S9
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Objectives

Part 1: Import the Libraries and Data
Part 2: Plot the Data
Part 3: Perform Simple Linear Regression on the SURVIVAL feature column (you can check the internet on how you can perform simple linear regression)

Train

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

```
train = "/content/titanic_train.csv"
TitanicTrain = pd.read_csv(train)
```

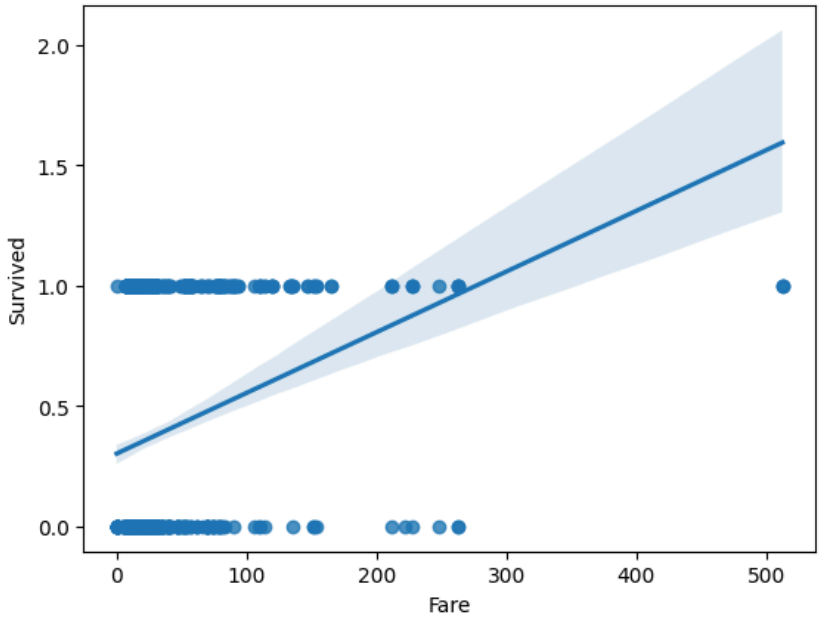
```
TitanicTrain.describe()
```

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

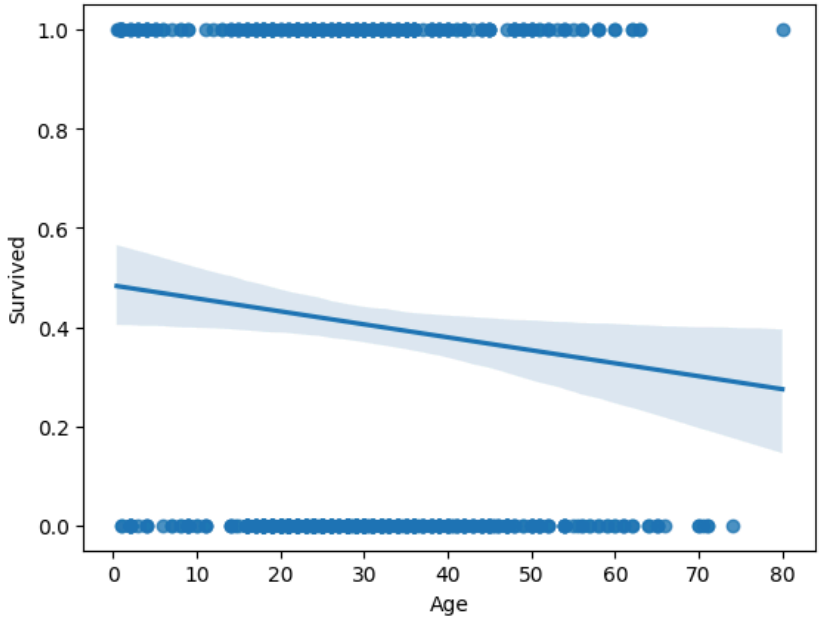
```
TitanicTrain.head()
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S

```
sns.regplot(x="Fare", y="Survived", data=TitanicTrain);
```




```
sns.regplot(x="Age", y="Survived", data=TitanicTrain);
```



Test

```
test = "/content/titanic_test.csv"
TitanicTest = pd.read_csv(test)
```

```
TitanicTest.describe()
```

	PassengerId	Pclass	Age	SibSp	Parch	Fare
count	418.000000	418.000000	332.000000	418.000000	418.000000	417.000000
mean	1100.500000	2.265550	30.272590	0.447368	0.392344	35.627188
std	120.810458	0.841838	14.181209	0.896760	0.981429	55.907576
min	892.000000	1.000000	0.170000	0.000000	0.000000	0.000000
25%	996.250000	1.000000	21.000000	0.000000	0.000000	7.895800
50%	1100.500000	3.000000	27.000000	0.000000	0.000000	14.454200
75%	1204.750000	3.000000	39.000000	1.000000	0.000000	31.500000
max	1309.000000	3.000000	76.000000	8.000000	9.000000	512.329200

```
TitanicTest.head()
```

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	892	3	Kelly, Mr. James	male	34.5	0	0	330911	7.8292	NaN	Q
1	893	3	Wilkes, Mrs. James (Ellen Needs)	female	47.0	1	0	363272	7.0000	NaN	S
2	894	2	Myles, Mr. Thomas Francis	male	62.0	0	0	240276	9.6875	NaN	Q
3	895	3	Wirz, Mr. Albert	male	27.0	0	0	315154	8.6625	NaN	S
4	896	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	female	22.0	1	1	3101298	12.2875	NaN	S

Part 2

```
#Code cell 1
#import pandas
import pandas as pd
path = "/content/titanic_train.csv"
training = pd.read_csv(path)
```

```
#Code cell 2
#verify the contents of the training dataframe using the pandas info() method.
#training.?
training.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   PassengerId  891 non-null    int64
 1   Survived     891 non-null    int64
 2   Pclass       891 non-null    int64
 3   Name         891 non-null    object
 4   Sex          891 non-null    object
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64
 7   Parch        891 non-null    int64
 8   Ticket       891 non-null    object
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object
 11  Embarked     889 non-null    object
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

Are there missing values in the data set?

- Yes, there are missing values in the dataset

```
#Code cell 3
#view the first few rows of the data
#
training.head(5)
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Far
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.250
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.283

Next steps: View recommended plots

```
#code cell 4
training["Sex"] = training["Sex"].apply(lambda toLabel: 0 if toLabel ==
'male' else 1)


#code cell 5
#view the first few rows of the data again
training.head(5)
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare
0	1	0	3	Braund, Mr. Owen Harris	0	22.0	1	0	A/5 21171	7.2500
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	1	38.0	1	0	PC 17599	71.2833

Next steps: View recommended plots

```
# Code cell 6
training["Age"].fillna(training["Age"].mean(), inplace=True)


#code cell 7
#verify that the missing values for the age variable have been eliminated.
training["Age"].head(10)
```

```
0    22.000000
1    38.000000
2    26.000000
3    35.000000
4    35.000000
5    29.699118
6    54.000000
7     2.000000
8    27.000000
9    14.000000
Name: Age, dtype: float64
```

```
#code cell 8
#create the array for the target values
y_target = training["Survived"].values
```

```
y_target
```

```
array([0, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 1,
       1, 1, 0, 1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 1,
       1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 1, 0, 0, 0, 1,
       1, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 0, 0,
       1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1, 1, 0, 0,
       0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0,
       0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 0, 1, 1, 1, 1, 0, 0,
       1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 1, 0,
       1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 1,
       0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 1, 0, 0,
       0, 0, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0,
       1, 0, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 1, 1,
       0, 1, 1, 1, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 1, 0, 1, 0, 1, 1, 1,
       1, 0, 0, 0, 1, 0, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0,
       0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 0, 0, 0,
       0, 1, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 1, 1, 1,
       1, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1,
       1, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0])
```

```
#code cell 9
columns = ["Fare", "Pclass", "Sex", "Age", "SibSp"]
#create the variable to hold the features that the classifier will use
X_input = training[list(columns)].values
X_input
```

```
array([[ 7.25      ,  3.        ,  0.        , 22.        ,  1.        ],
       [71.2833    ,  1.        ,  1.        , 38.        ,  1.        ],
       [ 7.925     ,  3.        ,  1.        , 26.        ,  0.        ],
       ...,
       [23.45      ,  3.        ,  1.        , 29.69911765,  1.        ],
       [30.        ,  1.        ,  0.        , 26.        ,  0.        ],
       [ 7.75      ,  3.        ,  0.        , 32.        ,  0.        ]])
```

```
#code cell 10
#import the tree module from the sklearn library
from sklearn import tree

#create clf_train as a decision tree classifier object
clf_train = tree.DecisionTreeClassifier(criterion="entropy", max_depth=3)

#train the model using the fit() method of the decision tree object.
#Supply the method with the input variable X_input and the target variable y_target
clf_train = clf_train.fit(X_input, y_target)
```

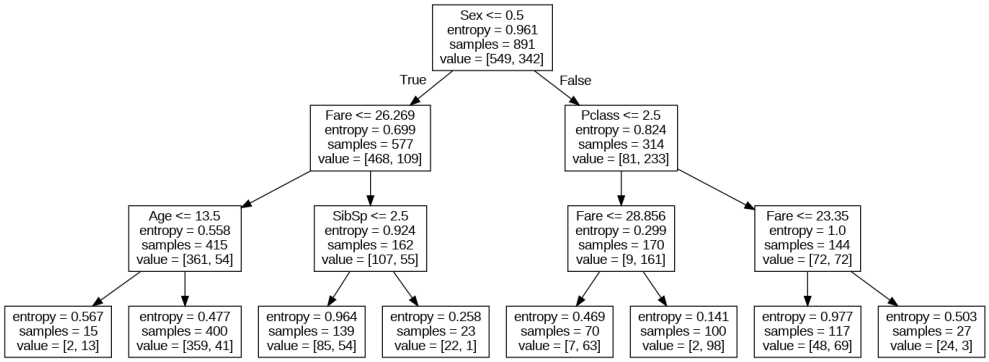
```
#code cell 11
clf_train.score(X_input,y_target)
```

```
0.8226711560044894
```

```
#code cell 12
from six import StringIO
with open("/content/titanic.dot", 'w') as f:
 f = tree.export_graphviz(clf_train, out_file=f, feature_names=columns)
```

```
#code cell 13
#run the Graphviz dot command to convert the .dot file to .png
!dot -Tpng /content/titanic.dot -o /content/titanic.png
```

```
#code cell 14
#import the Image module from the Ipython.display libary
from IPython.display import Image
#display the decison tree graphic
Image("/content/titanic.png")
```



What describes the group that had the most deaths by number? Which group had the most survivors?

- The group that had the most deaths by numbers are Male while the most survivors are Female

```
#code cell 15
#import the file into the 'testing' dataframe.
path = "/content/titanic_test.csv"
testing = pd.read_csv(path)
testing.info(5)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 11 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  418 non-null    int64  
 1   Pclass       418 non-null    int64  
 2   Name         418 non-null    object 
 3   Sex          418 non-null    object 
 4   Age          332 non-null    float64
 5   SibSp        418 non-null    int64  
 6   Parch        418 non-null    int64  
 7   Ticket       418 non-null    object 
 8   Fare         417 non-null    float64
 9   Cabin        91 non-null     object 
 10  Embarked     418 non-null    object 
dtypes: float64(2), int64(4), object(5)
memory usage: 36.0+ KB
```

How many records are in the data set?

- there are 418 records in the dataset

Which important variables(s) are missing values and how many are missing?

- The missing values of age are 86 and fare had 1 missing values

```
#code cell 16
#replace the Gender labels in the testing dataframe
# Hint: look at code cell 4
testing["Sex"] = testing["Sex"].apply(lambda toLabel: 0 if toLabel == 'male' else 1)
training.head(5)
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare
0	1	0	3	Braund, Mr. Owen Harris	0	22.0	1	0	A/5 21171	7.2500
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	1	38.0	1	0	PC 17599	71.2833

Next steps: View recommended plots

```
#code cell 17
#Use the fillna method of the testing dataframe column "Age"
#to replace missing values with the mean of the age values.
testing["Age"].fillna(testing["Age"].mean(), inplace=True)
testing["Fare"].fillna(testing["Fare"].mean(), inplace=True)
```

```
#code cell 18
#verify the data preparation steps. Enter and run both the info and head
#methods from here, by entering and running one and then the other.
testing.info()
testing.head(10)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 11 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  418 non-null    int64  
 1   Pclass       418 non-null    int64  
 2   Name         418 non-null    object 
 3   Sex          418 non-null    int64  
 4   Age          418 non-null    float64
 5   SibSp        418 non-null    int64  
 6   Parch        418 non-null    int64  
 7   Ticket       418 non-null    object 
 8   Fare         418 non-null    float64
 9   Cabin        91 non-null     object 
 10  Embarked     418 non-null    object 
dtypes: float64(2), int64(5), object(4)
memory usage: 36.0+ KB
```

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embar
0	892	3	Kelly, Mr. James	0	34.5	0	0	330911	7.8292	NaN	
1	893	3	Wilkes, Mrs. James (Ellen Needs)	1	47.0	1	0	363272	7.0000	NaN	
2	894	2	Myles, Mr. Thomas Francis	0	62.0	0	0	240276	9.6875	NaN	
3	895	3	Wirz, Mr. Albert	0	27.0	0	0	315154	8.6625	NaN	
			Hirvonen, Mrs.								

Next steps: View recommended plots

```
#code cell 19
#create the variable X_input to hold the features that the classifier will use
X_input = testing[list(columns)].values


#code cell 20
#apply the model to the testing data and store the result in a pandas datafrae.
#Use X_input as the argurment for the predict() method of the clf_train classifier object

target_labels = clf_train.predict(X_input)
#convert the target array into a pandas dataframe using the pd.DataFrame() method and target as argument

target_labels = pd.DataFrame({'Est_Survival':target_labels, 'Name':testing['Name']})
testing.head(20)
```

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cab
0	892	3	Kelly, Mr. James	0	34.50000	0	0	330911	7.8292	Na
1	893	3	Wilkes, Mrs. James (Ellen Needs)	1	47.00000	1	0	363272	7.0000	Na
2	894	2	Myles, Mr. Thomas Francis	0	62.00000	0	0	240276	9.6875	Na
3	895	3	Wirz, Mr. Albert	0	27.00000	0	0	315154	8.6625	Na
4	896	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	1	22.00000	1	1	3101298	12.2875	Na
5	897	3	Svensson, Mr. Johan Cervin	0	14.00000	0	0	7538	9.2250	Na
6	898	3	Connolly, Miss. Kate	1	30.00000	0	0	330972	7.6292	Na
7	899	2	Caldwell, Mr. Albert Francis	0	26.00000	1	1	248738	29.0000	Na
8	900	3	Abrahim, Mrs. Joseph (Sophie Halaut Easu)	1	18.00000	0	0	2657	7.2292	Na
9	901	3	Davies, Mr. John Samuel	0	21.00000	2	0	A/4 48871	24.1500	Na
10	902	3	Ilieff, Mr. Ylio	0	30.27259	0	0	349220	7.8958	Na

Next steps: View recommended plots

```
#code cell 21
#import the numpy library as np
import numpy as np
# Load data for all passengers in the variable all_data
path = "/content/titanic_train.csv"
all_data = pd.read_csv(path)
# Merging using the field Name as key, selects only the rows of the two datasets that refer to the same passenger
testing_results = pd.merge(target_labels, all_data[['Name','Survived']], on=['Name'])
# Compute the accuracy as a ratio of matching observations to total osbervations. Store this in in the variable acc.
acc = np.sum(testing_results['Est_Survival'] == testing_results['Survived']) /float(len(testing_results))
# Print the result
print(acc)
```

```
1.0
```

```
#code cell 22
#import the titanic_all.csv file into a dataframe called all_data. Specify the list of columns to import.
path = "/content/titanic_train.csv"
all_data = pd.read_csv(path, usecols=['Survived','Pclass','Sex','Age','SibSp','Fare'])
#View info for the new dataframe
all_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
```

```
Data columns (total 6 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   Survived  891 non-null    int64  
 1   Pclass    891 non-null    int64  
 2   Sex       891 non-null    object 
 3   Age       714 non-null    float64
 4   SibSp     891 non-null    int64  
 5   Fare      891 non-null    float64
dtypes: float64(2), int64(3), object(1)
memory usage: 41.9+ KB
```