Fall 2024: CS5720

Neural Networks & Deep Learning - ICP-3

1. Data Manipulation

In [1]:

```
# import necessary libraries for the assignment
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:

```
# read the data
df = pd.read_csv('data.csv')
```

In [3]:

```
# basic statistics about the data
df.describe()
```

Out[3]:

	Duration	Pulse	Maxpulse	Calories
count	169.000000	169.000000	169.000000	164.000000
mean	63.846154	107.461538	134.047337	375.790244
std	42.299949	14.510259	16.450434	266.379919
min	15.000000	80.000000	100.000000	50.300000
25%	45.000000	100.000000	124.000000	250.925000
50%	60.000000	105.000000	131.000000	318.600000
75%	60.000000	111.000000	141.000000	387.600000
max	300.000000	159.000000	184.000000	1860.400000

In [4]:

```
# checking if the null values
df.isnull().sum()
```

Out[4]:

```
Duration    0
Pulse       0
Maxpulse    0
Calories    5
dtype: int64
```

In [5]:

```
# view basic information about the featues
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 169 entries, 0 to 168
Data columns (total 4 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   Duration  169 non-null    int64  
 1   Pulse     169 non-null    int64  
 2   Maxpulse  169 non-null    int64  
 3   Calories  164 non-null    float64
dtypes: float64(1), int64(3)
memory usage: 5.4 KB
```

In [6]:

```
# replaced the null values in column calories with mean
# df['Calories'].fillna(df.Calories.mean(),inplace=True) # This method gives warning in
```

```
df['Calories'] = df['Calories'].fillna(df['Calories'].mean())
```

In [7]:

```
# checking the null values after replacing with mean
df.isnull().sum()
```

Out[7]:

```
Duration    0
Pulse       0
Maxpulse    0
Calories    0
dtype: int64
```

In [8]:

```
# the aggregate information with various funtions on columns Pulse and Maxpulse
df[['Pulse','Maxpulse']].agg(['min','max','count','mean'])
```

Out[8]:

	Pulse	Maxpulse
min	80.000000	100.000000
max	159.000000	184.000000
count	169.000000	169.000000
mean	107.461538	134.047337

In [9]:

```
# filter the dataframe to select the rows with calories between 500 and 1000
df.loc[(df.Calories >= 500) & (df.Calories <= 1000)]
```

Out[9]:

	Duration	Pulse	Maxpulse	Calories
51	80	123	146	643.1
62	160	109	135	853.0
65	180	90	130	800.4
66	150	105	135	873.4
67	150	107	130	816.0
72	90	100	127	700.0
73	150	97	127	953.2
75	90	98	125	563.2
78	120	100	130	500.4
83	120	100	130	500.0
90	180	101	127	600.1
99	90	93	124	604.1
101	90	90	110	500.0
102	90	90	100	500.0
103	90	90	100	500.4
106	180	90	120	800.3
108	90	90	120	500.3

In [10]:

```
# filter the dataframe to select the rows with calories values > 500 and pulse < 100
df.loc[(df.Calories > 500) & (df.Pulse <= 100)]
```

Out[10]:

	Duration	Pulse	Maxpulse	Calories
65	180	90	130	800.4
70	150	97	129	1115.0

72	90	100	127	700.0
73	150	97	127	953.2
75	90	98	125	563.2
78	120	100	130	500.4
79	270	100	131	1729.0
87	120	100	157	1000.1
99	90	93	124	604.1
103	90	90	100	500.4
106	180	90	120	800.3
108	90	90	120	500.3

In [11]:

```
# create a new 'modified_df' data frame that contains all the columns from df except "Ma
df_modified = df.drop('Maxpulse',axis = 1)
```

In [12]:

```
# view the head of new data frame
df_modified.head()
```

Out[12]:

	Duration	Pulse	Calories
0	60	110	409.1
1	60	117	479.0
2	60	103	340.0
3	45	109	282.4
4	45	117	406.0

In [13]:

```
# delete the maxpulse column from the main datafram
df.drop('Maxpulse',axis = 1,inplace=True)
df.head()
```

Out[13]:

	Duration	Pulse	Calories
0	60	110	409.1
1	60	117	479.0
2	60	103	340.0
3	45	109	282.4
4	45	117	406.0

In [14]:

```
# convert the datatype of column Calories to int datatype
df['Calories'] = df.Calories.astype(int)
```

In [15]:

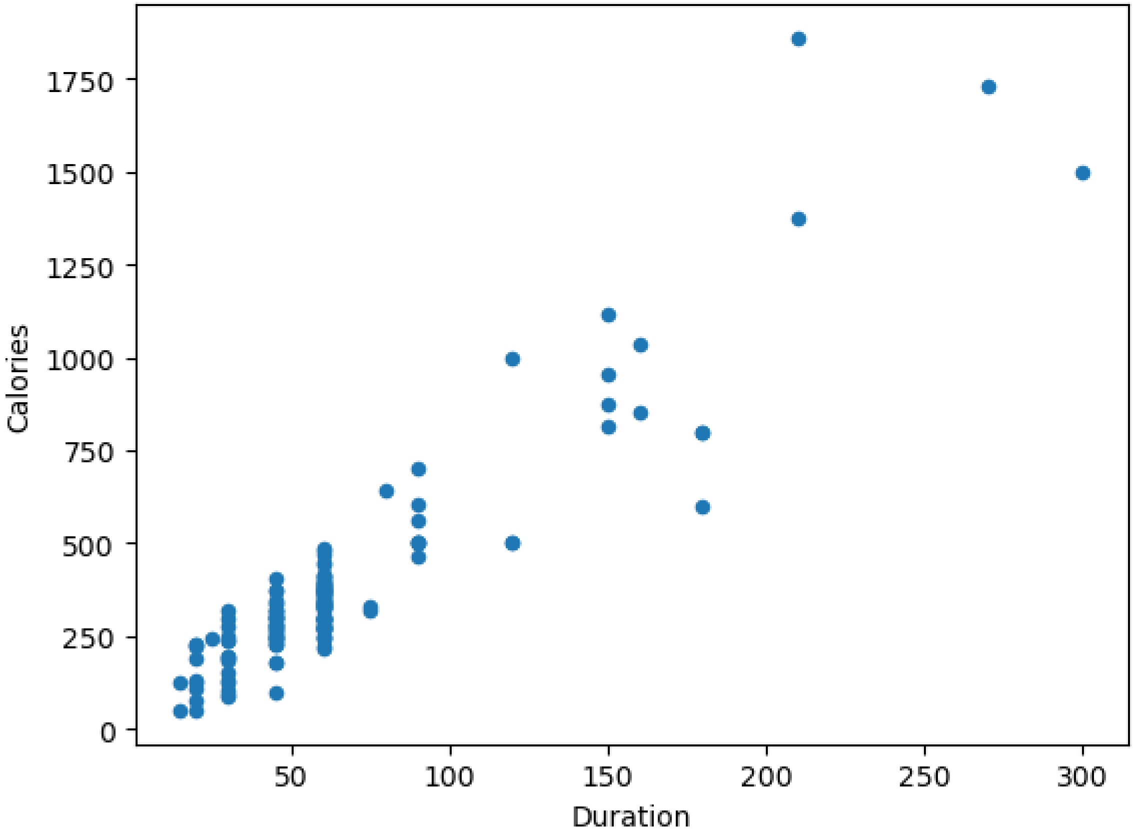
```
# display info to see the data type of the features
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 169 entries, 0 to 168
Data columns (total 3 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   Duration  169 non-null    int64
 1   Pulse     169 non-null    int64
 2   Calories  169 non-null    int32
```

```
dtypes: int32(1), int64(2)
memory usage: 3.4 KB
```

In [16]:

```
# Using pandas create a scatter plot for the two columns (Duration and Calories)
df.plot(x = 'Duration', y = 'Calories', kind = 'scatter')
plt.show()
```



2. Linear Regression

In [17]:

```
# read the dataset
salary_df = pd.read_csv('Salary_Data.csv')
```

In [18]:

```
# display basic information about the features
salary_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30 entries, 0 to 29
Data columns (total 2 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   YearsExperience  30 non-null     float64
 1   Salary           30 non-null     float64
dtypes: float64(2)
memory usage: 612.0 bytes
```

In [19]:

```
# import necessary libraries
from sklearn.model_selection import train_test_split
```

In [20]:

```
# arrange the data to numpy arrays
X = salary_df.iloc[:, :-1].values
y = salary_df.iloc[:, 1].values
```

In [21]:

```
X_Train, X_Test, Y_Train, Y_Test = train_test_split(X,y,random_state = 0,test_size= 0.35
```

In [22]:

```
# Fitting Linear Regression to the training set
```

```
from sklearn.linear_model import LinearRegression
regressor = LinearRegression()
regressor.fit(X_Train, Y_Train)
```

Out[22]:

```
□  LinearRegression  i  ?
LinearRegression()
```

In [23]:

```
# Predicting the Test set result

Y_Pred = regressor.predict(X_Test)
```

In [24]:

```
# calculate the Mean Squared Error(MSE)
from sklearn.metrics import mean_squared_error
```

In [25]:

```
mse = mean_squared_error(Y_Test,Y_Pred)
```

In [26]:

```
mse
```

Out[26]:

```
19421097.588238075
```

In [27]:

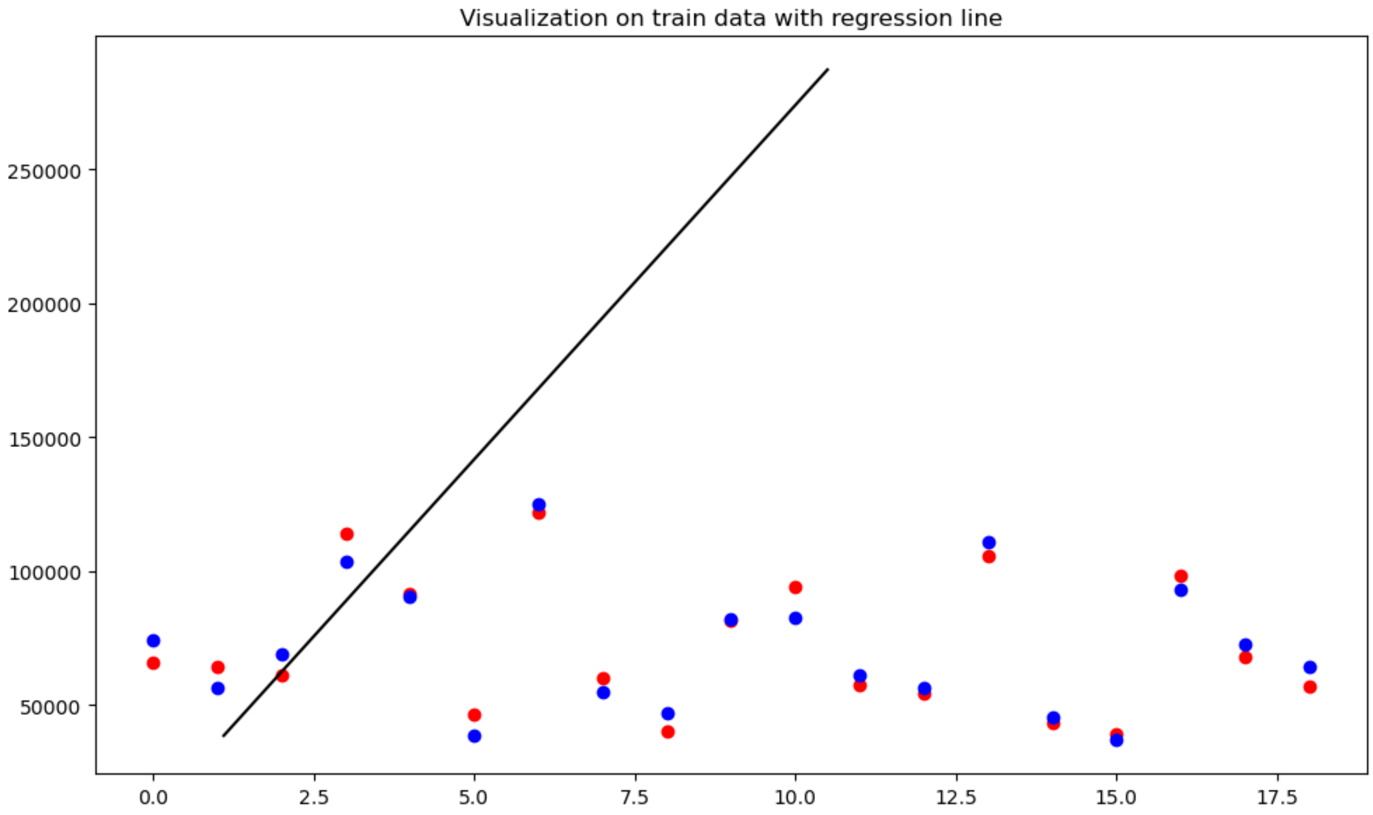
```
m = regressor.intercept_
c = regressor.coef_
```

In [28]:

```
# visulalize both train set results

x = np.arange(X_Train.shape[0])
y_train_pred = regressor.predict(X_Train)
plt.figure(figsize=(10,6))
plt.plot(X,m*X+c,c='black')
plt.scatter(x, Y_Train, color = 'r', linewidth=1)
plt.scatter(x,y_train_pred, color = 'b', linewidth=1)
plt.title("Visualization on train data with regression line")
plt.tight_layout()

plt.show()
```

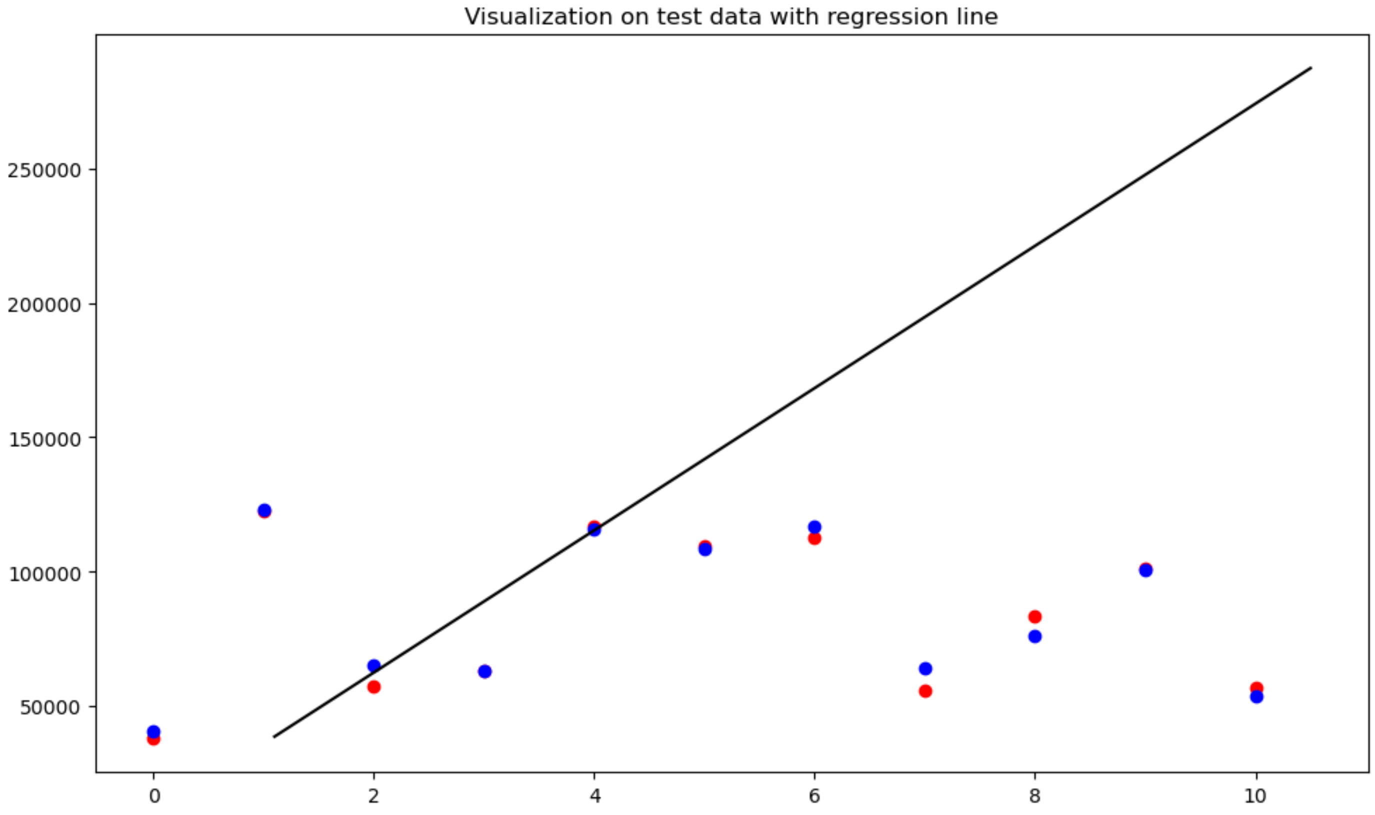


In [29]:

```
# visulalize both test set results

x = np.arange(X_Test.shape[0])
y_test_pred = regressor.predict(X_Test)
plt.figure(figsize=(10,6))
plt.plot(X,m*X+c,c='black')
plt.scatter(x, Y_Test, color = 'r', linewidth=1)
plt.scatter(x,y_test_pred, color = 'b', linewidth=1)
plt.title("Visualization on test data with regression line")
plt.tight_layout()

plt.show()
```



In [30]:

```
m # regressor intercept
```

Out[30]:

```
26469.683995470266
```

In [31]:

```
c # regressor coefficient
```

Out[31]:

```
array([9388.04802711])
```

ICP-3 Video URL:- https://drive.google.com/file/d/18deZ2uB1mj7PRsp6fLJHhs7ne-nCSP8J/view?usp=drive_link