# assignments-03

March 18, 2024

```
[5]: import pandas as pd
     import numpy as nm
     import matplotlib.pyplot as plt
     import seaborn as sns
     from sklearn.linear_model import LinearRegression
     from sklearn.model_selection import train_test_split
     from sklearn.ensemble import RandomForestRegressor
     lr = LinearRegression()
     rfr = RandomForestRegressor()
```

```
[6]: path = "https://raw.githubusercontent.com/ovibaridar/Data_sets/main/concrete.
      ↪csv"
```

```
[8]: data = pd.read_csv(path)
```

```
[9]: data.head(3)
```

```
[9]:    Cement (component 1)(kg in a m^3 mixture)  \
     0                                      540.0
     1                                      540.0
     2                                      332.5

        Blast Furnace Slag (component 2)(kg in a m^3 mixture)  \
     0                                                0.0
     1                                                0.0
     2                                              142.5

        Fly Ash (component 3)(kg in a m^3 mixture)  \
     0                                         0.0
     1                                         0.0
     2                                         0.0

        Water  (component 4)(kg in a m^3 mixture)  \
     0                                      162.0
     1                                      162.0
     2                                      228.0
```

```
   Superplasticizer (component 5)(kg in a m^3 mixture)  \
0                                                2.5
1                                                2.5
2                                                0.0

   Coarse Aggregate  (component 6)(kg in a m^3 mixture)  \
0                                             1040.0
1                                             1055.0
2                                              932.0

   Fine Aggregate (component 7)(kg in a m^3 mixture)  Age (day)  strength
0                                              676.0         28     79.99
1                                              676.0         28     61.89
2                                              594.0        270     40.27
```

[10]:

```
data.columns
```

[10]:

```
Index(['Cement (component 1)(kg in a m^3 mixture)',
       'Blast Furnace Slag (component 2)(kg in a m^3 mixture)',
       'Fly Ash (component 3)(kg in a m^3 mixture)',
       'Water  (component 4)(kg in a m^3 mixture)',
       'Superplasticizer (component 5)(kg in a m^3 mixture)',
       'Coarse Aggregate  (component 6)(kg in a m^3 mixture)',
       'Fine Aggregate (component 7)(kg in a m^3 mixture)', 'Age (day)',
       'strength'],
      dtype='object')
```

[13]:

```
#rename columns name
for col in data.columns:
    columns_name = ''
    for letter in col:
        if letter =='(':
            break
        columns_name = columns_name + letter
    data.rename(columns={col: columns_name}, inplace=True)
```

[14]:

```
data.head(3)
```

[14]:

```
   Cement   Blast Furnace Slag   Fly Ash    Water    Superplasticizer   \
0    540.0                  0.0       0.0    162.0                 2.5
1    540.0                  0.0       0.0    162.0                 2.5
2    332.5                142.5       0.0    228.0                 0.0

   Coarse Aggregate    Fine Aggregate   Age   strength
0              1040.0           676.0    28     79.99
1              1055.0           676.0    28     61.89
2               932.0           594.0   270     40.27
```

[15]:

```
data.isnull().sum()
```

[15]:

```
Cement                0
Blast Furnace Slag    0
Fly Ash               0
Water                 0
Superplasticizer      0
Coarse Aggregate      0
Fine Aggregate        0
Age                   0
strength              0
dtype: int64
```

[16]:

```
data.duplicated().sum()
```

[16]:

```
25
```

[17]:

```
data = data.drop_duplicates()
```

[18]:

```
data.duplicated().sum()
```

[18]:

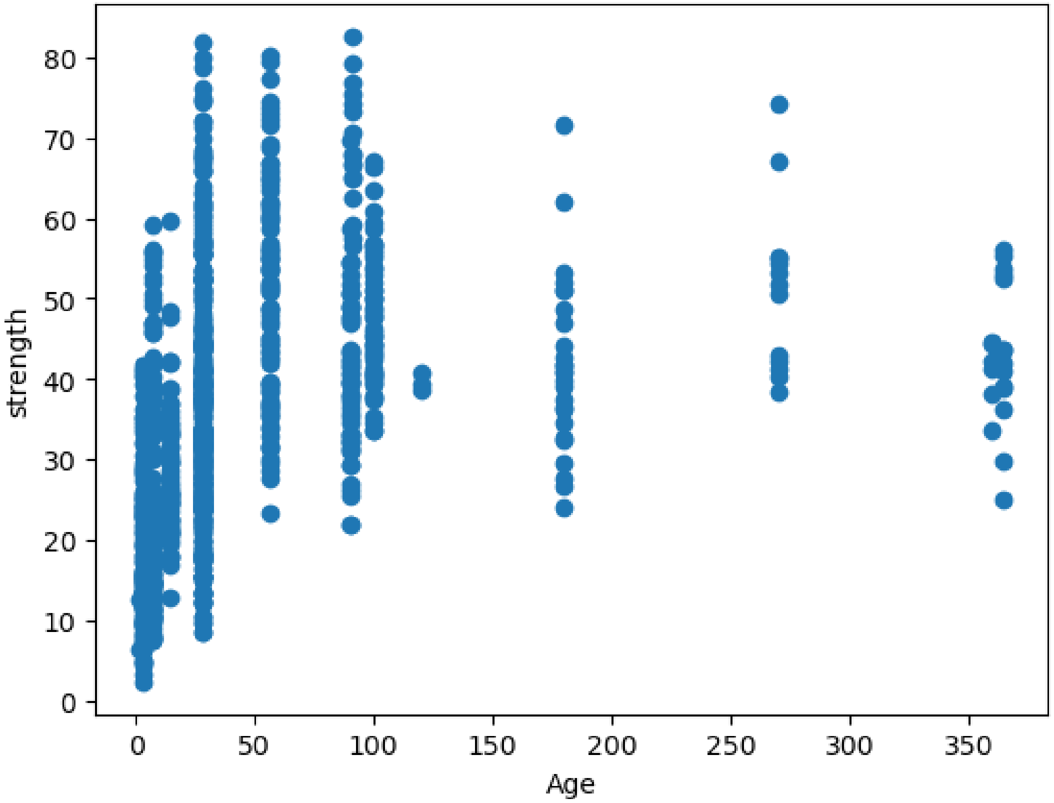
```
0
```

[26]:

```
plt.scatter(x = data["Age "] , y = data["strength"])
plt.xlabel("Age")
plt.ylabel("strength")
```

[26]:

```
Text(0, 0.5, 'strength')
```



[28]:
```
x = data.drop("strength" , axis=1)
y = data["strength"]
```

[29]:
```
print(x.shape)
print(y.shape)
```

```
(1005, 8)
(1005,)
```

[30]:
```
xtrain , xtest , ytrain , ytest  = train_test_split(x , y , random_state=41 ,␣
 ↪test_size=.30) #split
```

[32]:
```
print(xtrain.shape)
print(xtest.shape)
```

```
(703, 8)
(302, 8)
```

[33]:
```
lr.fit(xtrain , ytrain)
```

[33]:
```
LinearRegression()
```

[34]:

```
rfr.fit(xtrain , ytrain)
```

[34]:

```
RandomForestRegressor()
```

[35]:

```
print("LinearRegression train score = " , lr.score(xtrain , ytrain))
print("RandomForestRegressor train score = " , rfr.score(xtrain , ytrain))
```

```
LinearRegression train score =  0.6182820522999009
RandomForestRegressor train score =  0.9835274833510995
```

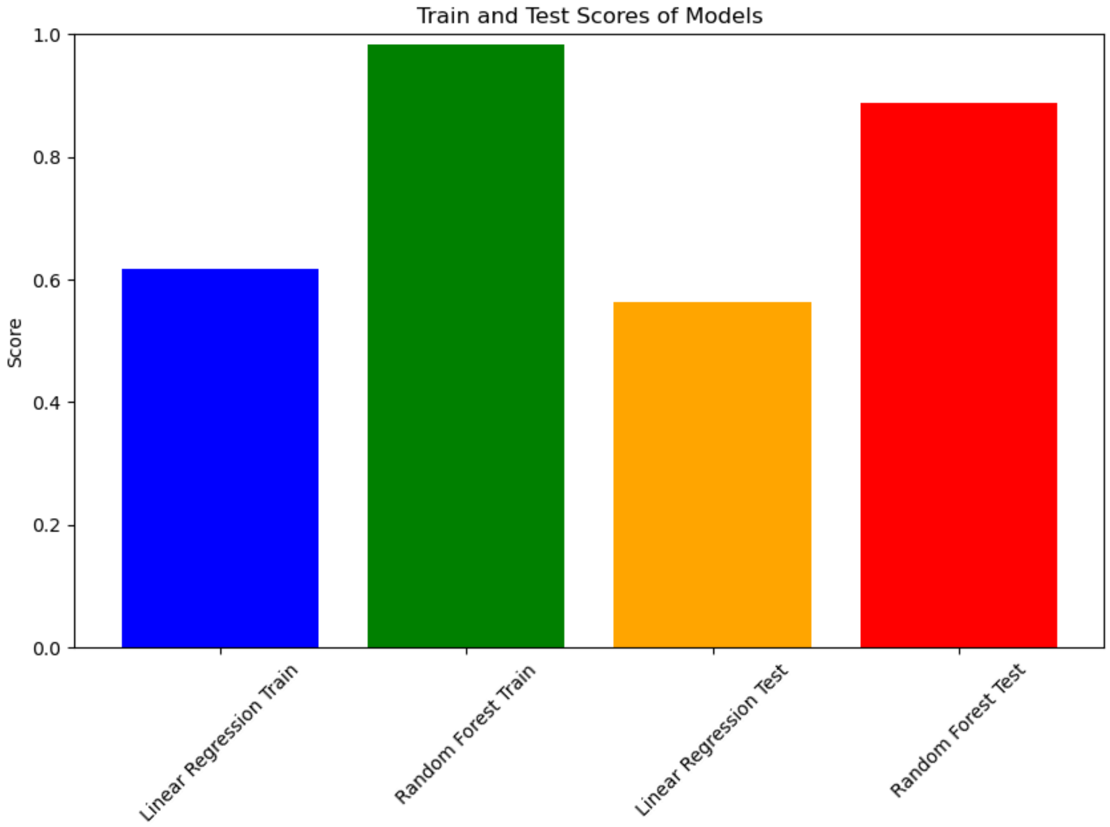
[36]:

```
print("LinearRegression test score = " , lr.score(xtest , ytest))
print("RandomForestRegressor test score = " , rfr.score(xtest , ytest))
```

```
LinearRegression test score =  0.5633190246815577
RandomForestRegressor test score =  0.8867570803943491
```

[38]:

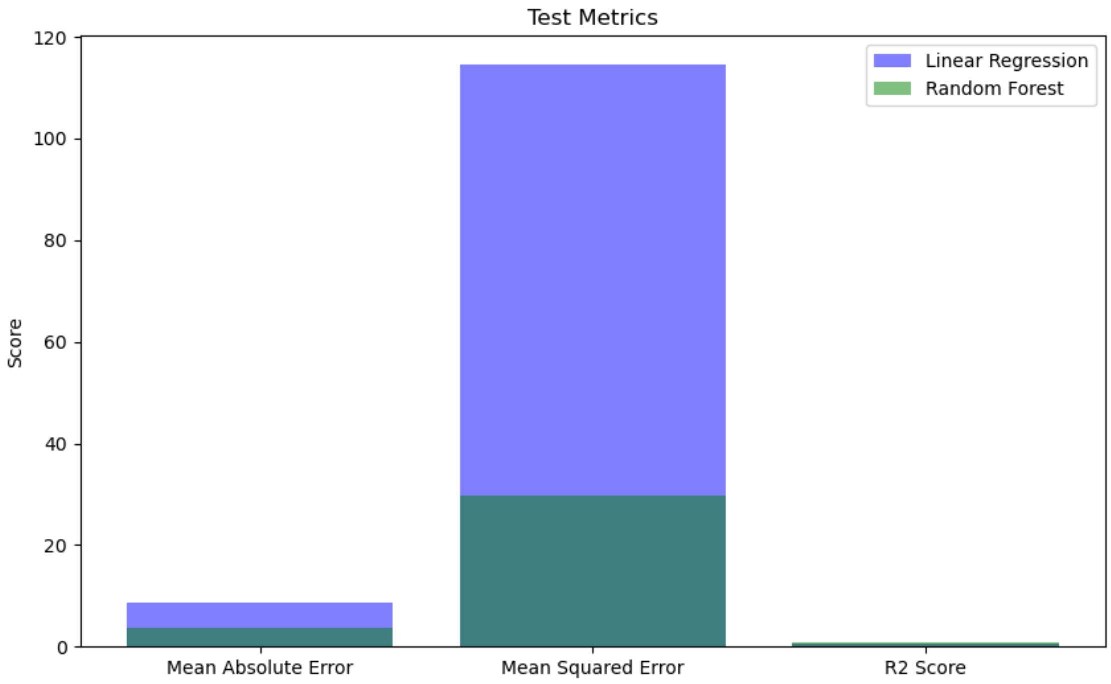
```
lr_train_score = lr.score(xtrain, ytrain)
rfr_train_score = rfr.score(xtrain, ytrain)
lr_test_score = lr.score(xtest, ytest)
rfr_test_score = rfr.score(xtest, ytest)

# Plotting
labels = ['Linear Regression Train', 'Random Forest Train', 'Linear Regression␣
 ↪Test', 'Random Forest Test']
scores = [lr_train_score, rfr_train_score, lr_test_score, rfr_test_score]

plt.figure(figsize=(10, 6))
plt.bar(labels, scores, color=['blue', 'green', 'orange', 'red'])
plt.title('Train and Test Scores of Models')
plt.ylabel('Score')
plt.ylim(0, 1)  # Limit y-axis from 0 to 1
plt.xticks(rotation=45)  # Rotate x-axis labels for better readability
plt.show()
```



[37]:
```
from sklearn.metrics import mean_absolute_error , mean_squared_error , r2_score
```

[39]:
```
lr_test_mae = mean_absolute_error(ytest, lr.predict(xtest))
lr_test_mse = mean_squared_error(ytest, lr.predict(xtest))
lr_test_r2 = r2_score(ytest, lr.predict(xtest))

rfr_test_mae = mean_absolute_error(ytest, rfr.predict(xtest))
rfr_test_mse = mean_squared_error(ytest, rfr.predict(xtest))
rfr_test_r2 = r2_score(ytest, rfr.predict(xtest))

# Plotting test metrics
metrics = ['Mean Absolute Error', 'Mean Squared Error', 'R2 Score']
lr_test_metrics = [lr_test_mae, lr_test_mse, lr_test_r2]
rfr_test_metrics = [rfr_test_mae, rfr_test_mse, rfr_test_r2]

plt.figure(figsize=(10, 6))

# Plotting for Linear Regression
plt.bar(metrics, lr_test_metrics, color='blue', alpha=0.5, label='Linear␣
↪Regression')
```

```
# Plotting for Random Forest
plt.bar(metrics, rfr_test_metrics, color='green', alpha=0.5, label='Random␣
 ↪Forest')

plt.title('Test Metrics')
plt.ylabel('Score')
plt.legend()
plt.show()
```



```
[ ]:
```