Fish weight prediction

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```
# import all libraries and dependencies for dataframe
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import statsmodels.api as sm

import warnings
warnings.filterwarnings('ignore')
```

Reading and Understanding the Data

```
# Reading the Fish CSV file
df_fish = pd.read_csv('/content/Fish.csv')
```

```
df_fish.head()
```

	Species	Weight	Length1	Length2	Length3	Height	Width
0	Bream	242.0	23.2	25.4	30.0	11.5200	4.0200
1	Bream	290.0	24.0	26.3	31.2	12.4800	4.3056
2	Bream	340.0	23.9	26.5	31.1	12.3778	4.6961
3	Bream	363.0	26.3	29.0	33.5	12.7300	4.4555
4	Bream	430.0	26.5	29.0	34.0	12.4440	5.1340

```
df_fish.shape
```

```
(159, 7)
```

```
# Information of the data set
df_fish.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 159 entries, 0 to 158
Data columns (total 7 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   Species  159 non-null    object 
 1   Weight   159 non-null    float64
 2   Length1  159 non-null    float64
 3   Length2  159 non-null    float64
 4   Length3  159 non-null    float64
 5   Height   159 non-null    float64
 6   Width    159 non-null    float64
dtypes: float64(6), object(1)
memory usage: 8.8+ KB
```

```
# description of the data
df_fish.describe().T
```

	count	mean	std	min	25%	50%	75%	max
Weight	159.0	398.326415	357.978317	0.0000	120.00000	273.0000	650.0000	1650.000
Length1	159.0	26.247170	9.996441	7.5000	19.05000	25.2000	32.7000	59.000
Length2	159.0	28.415723	10.716328	8.4000	21.00000	27.3000	35.5000	63.400
Length3	159.0	31.227044	11.610246	8.8000	23.15000	29.4000	39.6500	68.000
Height	159.0	8.970994	4.286208	1.7284	5.94480	7.7860	12.3659	18.957
Width	159.0	4.417486	1.685804	1.0476	3.38565	4.2485	5.5845	8.142

```
# Checking the null values
df_fish.isnull().sum()
```

```
Species    0
Weight     0
Length1    0
Length2    0
Length3    0
Height     0
Width      0
dtype: int64
```

There is no null value in fish dataset.

```
# checking for duplicates
df_fish.duplicated().sum()
```

```
0
```

There are no any duplicate values in the dataset

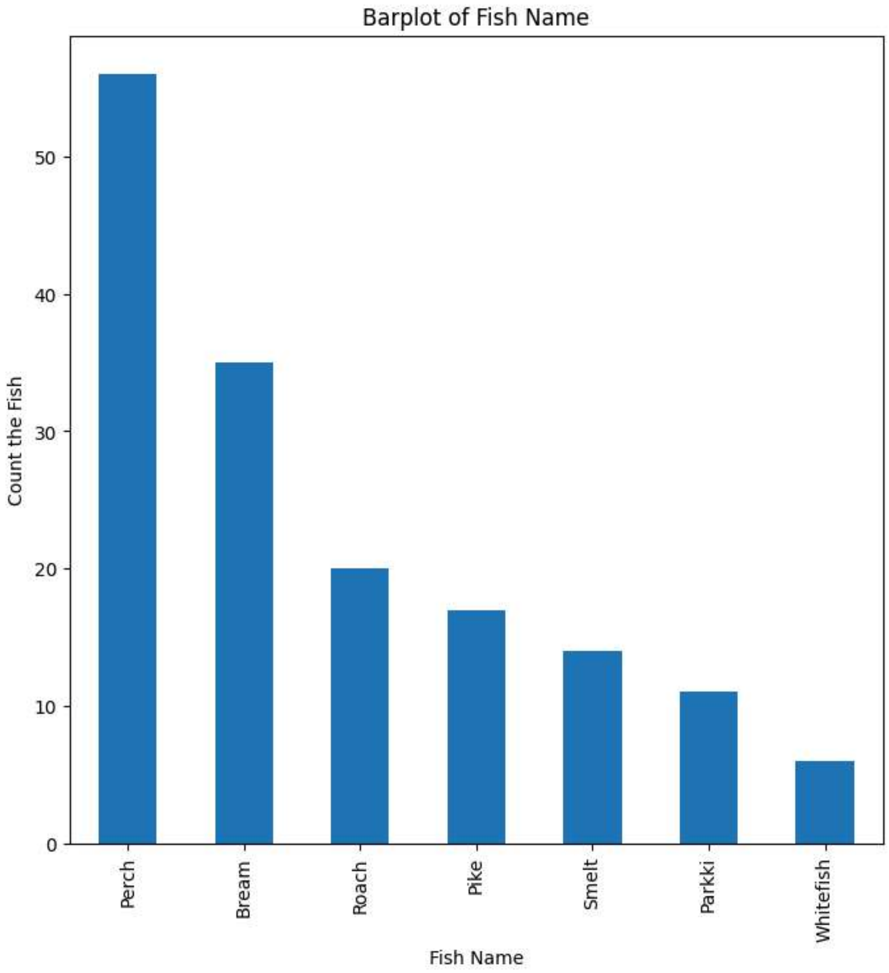
Visualization of The Data

```
# Counting the all 7 fish  individually in the data set
df_fish['Species'].value_counts()
```

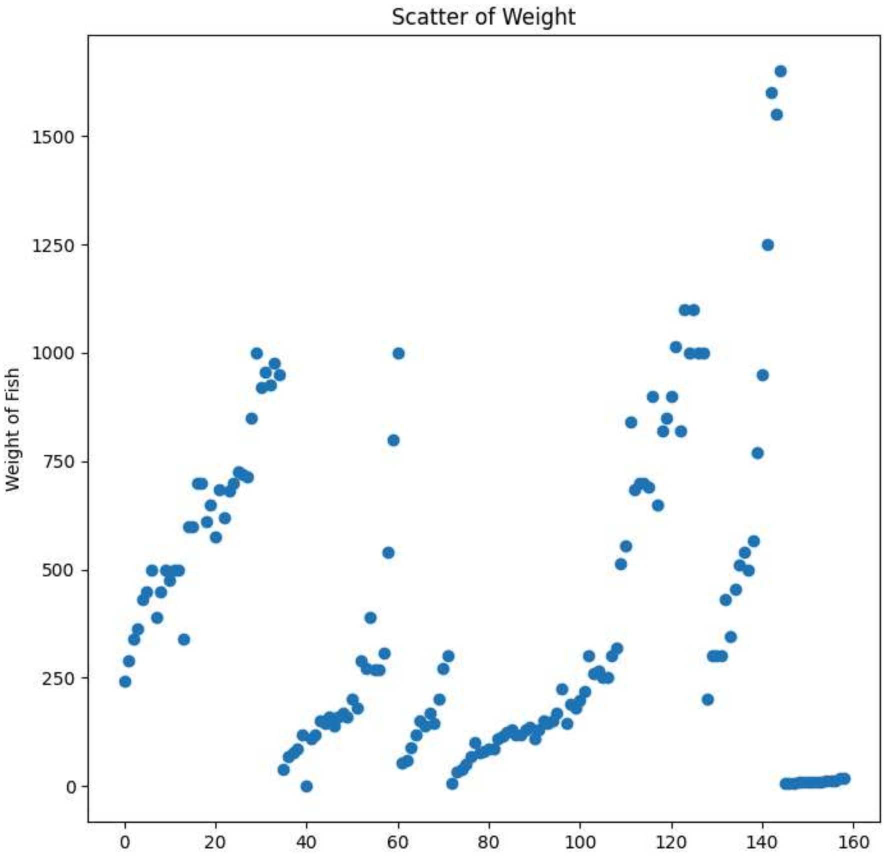
```
Perch        56
Bream        35
Roach        20
Pike         17
Smelt        14
Parkki       11
Whitefish     6
Name: Species, dtype: int64
```

Visualizing the different fish names available

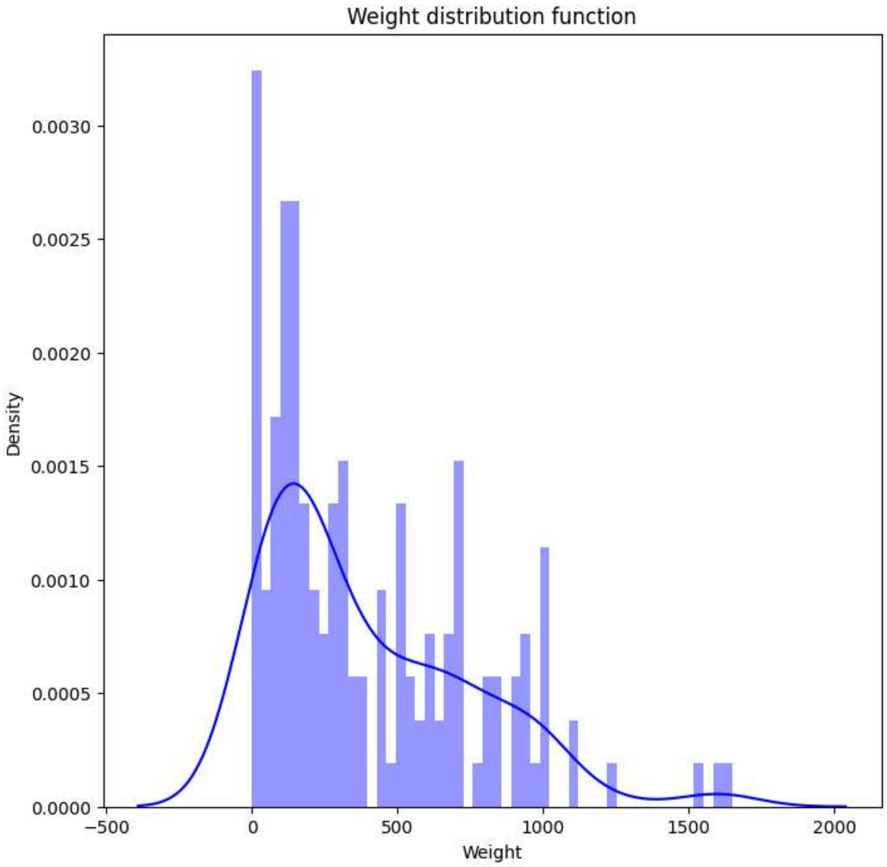
```
plt.figure(figsize = (8, 8))
ax = df_fish['Species'].value_counts().plot(kind = 'bar', stacked=True)
plt.title('Barplot of Fish Name')
plt.xlabel('Fish Name')
plt.ylabel('Count the Fish')
plt.show()
```



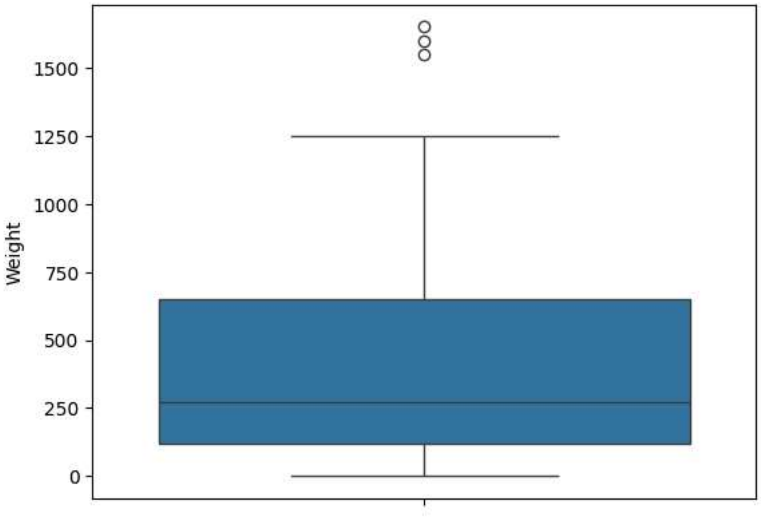
```
# Scatter plot of weight variable
plt.figure(figsize = (8, 8))
plt.scatter(x = np.arange(len(df_fish)), y = df_fish['Weight'])
plt.title('Scatter of Weight')
plt.ylabel('Weight of Fish')
plt.show()
```



```
# distribution plot of weight variable
plt.figure(figsize=(8,8))
sns.distplot(df_fish['Weight'], bins=50, kde=True, color = 'blue')
plt.title('Weight distribution function')
plt.show()
```

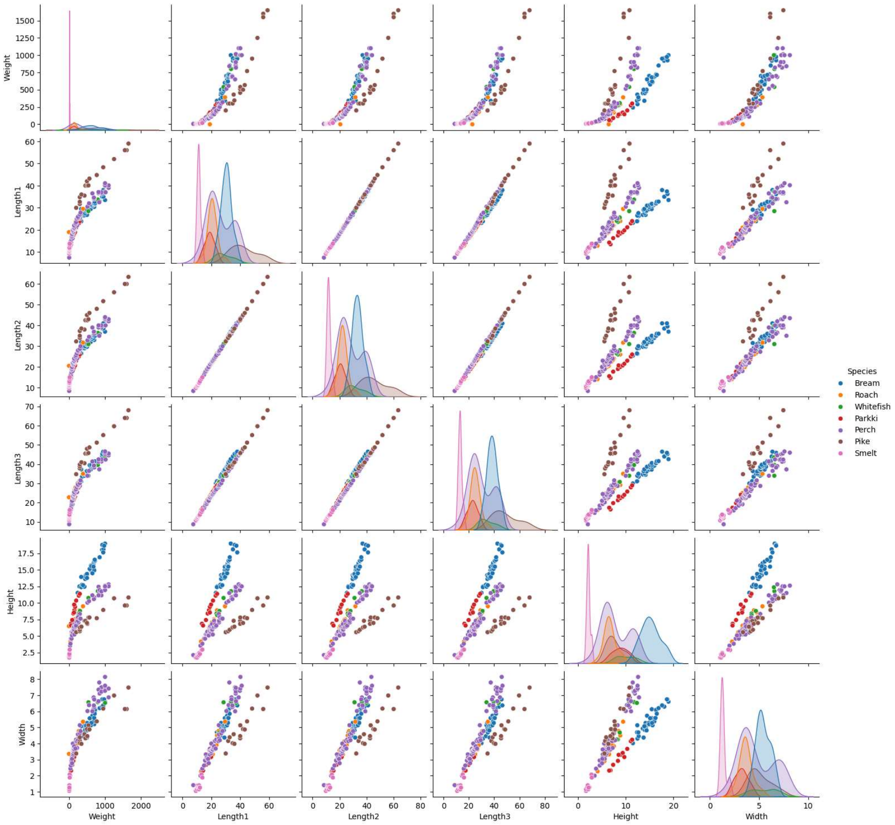


```
# Boxplot of weight varible
sns.boxplot(y = 'Weight', data = df_fish)
plt.show()
```



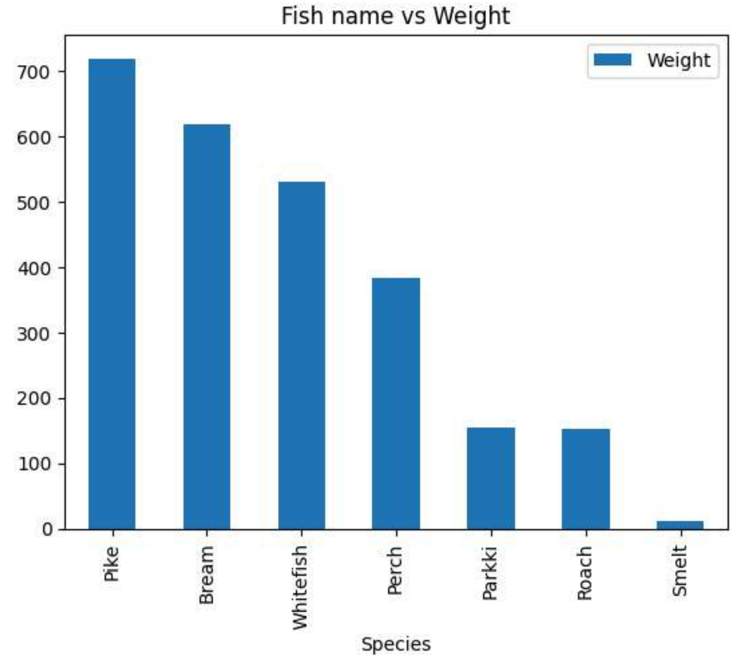
```
# Pairplot of dataset
plt.figure(figsize=(15, 15))
sns.pairplot(df_fish, hue="Species")
plt.show()
```

```
<Figure size 1500x1500 with 0 Axes>
```

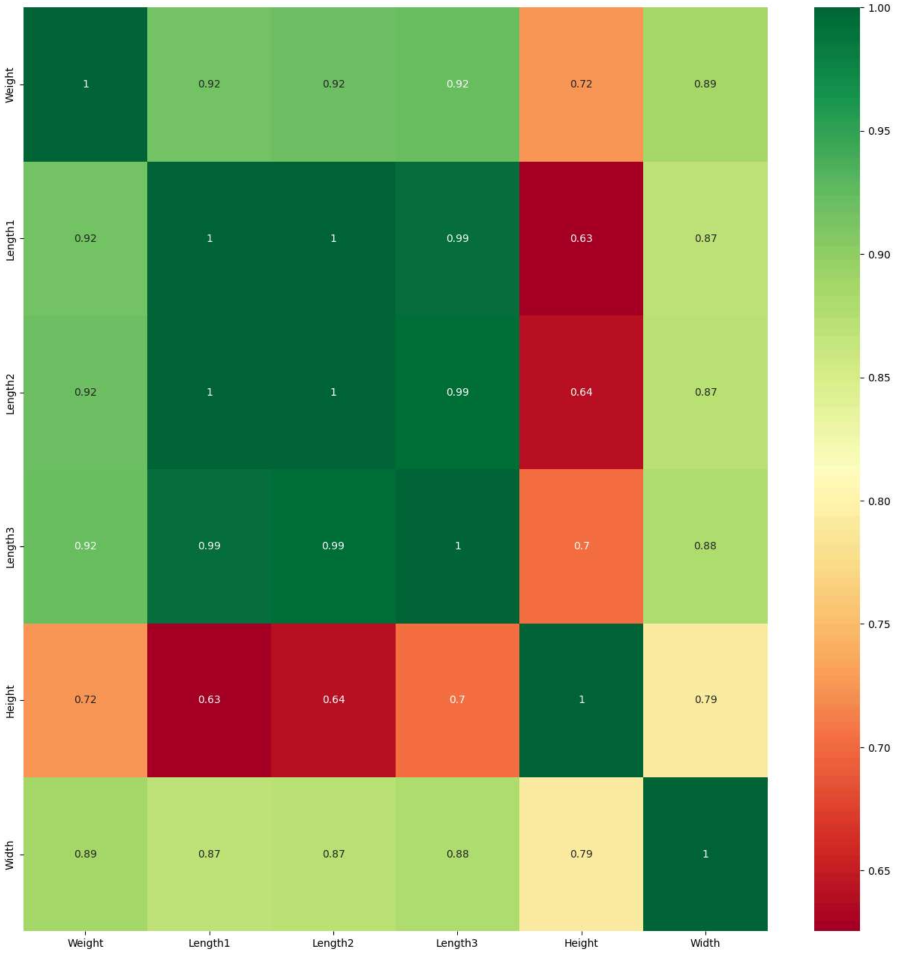

Weight
1500
1250
1000
750
500
250
0
Length1
60
50
40
30
20
10
Length2
60
50
40
30
20
10
Length3
70
60
50
40
30
20
10
Height
17.5
15.0
12.5
10.0
7.5
5.0
2.5
Width
8
7
6
5
4
3
2
1
0
1000
2000
Weight
0
20
40
60
Length1
0
20
40
60
80
Length2
0
20
40
60
80
Length3
0
10
20
Height
0
5
10
Width
Species
Bream
Roach
Whitefish
Parkki
Perch
Pike
Smelt

```
# The bar plot of fish and their corresponding mean weight
plt.figure(figsize=(10, 6))
df_fishx = pd.DataFrame(df_fish.groupby(['Species'])['Weight'].mean().sort_values(ascending = False))
df_fishx.plot.bar()
plt.title('Fish name vs Weight')
plt.show()
```

```
<Figure size 1000x600 with 0 Axes>
```



```
# Heat map of the data set
plt.figure(figsize = (16, 16))
sns.heatmap(df_fish.corr(), cmap="RdYlGn", annot=True)
plt.show()
```



Data Preprocessing

Encoding

```
#Encoding 'Species' column using One Hot Encoding

from sklearn.preprocessing import OneHotEncoder
my_encoder = OneHotEncoder()
x = df_fish[['Species']]

encoded_species = my_encoder.fit_transform(x).toarray()
encoded_species
```

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

```
df_fish[['Bream', 'Parkki', 'Perch', 'Pike', 'Roach', 'Smelt', 'Whitefish']] = encoded_species  #Here we should encode in alphabetical order
df_fish
```

	Species	Weight	Length1	Length2	Length3	Height	Width	Bream	Parkki	Perch	P:
0	Bream	242.0	23.2	25.4	30.0	11.5200	4.0200	1.0	0.0	0.0	
1	Bream	290.0	24.0	26.3	31.2	12.4800	4.3056	1.0	0.0	0.0	
2	Bream	340.0	23.9	26.5	31.1	12.3778	4.6961	1.0	0.0	0.0	
3	Bream	363.0	26.3	29.0	33.5	12.7300	4.4555	1.0	0.0	0.0	
4	Bream	430.0	26.5	29.0	34.0	12.4440	5.1340	1.0	0.0	0.0	
...	...	...	...	...	...	...	...	...	...	...	
154	Smelt	12.2	11.5	12.2	13.4	2.0904	1.3936	0.0	0.0	0.0	
155	Smelt	13.4	11.7	12.4	13.5	2.4300	1.2690	0.0	0.0	0.0	
156	Smelt	12.2	12.1	13.0	13.8	2.2770	1.2558	0.0	0.0	0.0	
157	Smelt	19.7	13.2	14.3	15.2	2.8728	2.0672	0.0	0.0	0.0	
158	Smelt	19.9	13.8	15.0	16.2	2.9322	1.8792	0.0	0.0	0.0	

159 rows × 14 columns

```
# Dropping Species column
df_fish.drop('Species', axis=1, inplace=True)
df_fish
```

	Weight	Length1	Length2	Length3	Height	Width	Bream	Parkki	Perch	Pike	Roacl
0	242.0	23.2	25.4	30.0	11.5200	4.0200	1.0	0.0	0.0	0.0	0.(
1	290.0	24.0	26.3	31.2	12.4800	4.3056	1.0	0.0	0.0	0.0	0.(
2	340.0	23.9	26.5	31.1	12.3778	4.6961	1.0	0.0	0.0	0.0	0.(
3	363.0	26.3	29.0	33.5	12.7300	4.4555	1.0	0.0	0.0	0.0	0.(
4	430.0	26.5	29.0	34.0	12.4440	5.1340	1.0	0.0	0.0	0.0	0.(
...	...	...	...	...	...	...	...	...	...	...	..
154	12.2	11.5	12.2	13.4	2.0904	1.3936	0.0	0.0	0.0	0.0	0.(
155	13.4	11.7	12.4	13.5	2.4300	1.2690	0.0	0.0	0.0	0.0	0.(
156	12.2	12.1	13.0	13.8	2.2770	1.2558	0.0	0.0	0.0	0.0	0.(
157	19.7	13.2	14.3	15.2	2.8728	2.0672	0.0	0.0	0.0	0.0	0.(
158	19.9	13.8	15.0	16.2	2.9322	1.8792	0.0	0.0	0.0	0.0	0.(

159 rows × 13 columns

Standardization

```
# standardization of the data set

num_cols = ['Length1', 'Length2', 'Length3', 'Height', 'Width']
df_fish_standard = df_fish[num_cols]

from sklearn.preprocessing import StandardScaler

scaler = StandardScaler()
scaled_data = scaler.fit_transform(df_fish_standard)
scaled_data
```

```
array([[-3.05788578e-01, -2.82303007e-01, -1.06020232e-01,
         5.96578670e-01, -2.36528948e-01],
       [-2.25507242e-01, -1.98053663e-01, -2.33668373e-03,
         8.21260549e-01, -6.65789457e-02],
       [-2.35542409e-01, -1.79331587e-01, -1.09769794e-02,
         7.97341291e-01,  1.65793169e-01],
       [ 5.30159764e-03,  5.46943678e-02,  1.96390116e-01,
         8.79771455e-01,  2.26210031e-02],
       [ 2.53719316e-02,  5.46943678e-02,  2.39591594e-01,
         8.12834979e-01,  4.26371272e-01],
       [ 5.54774324e-02,  1.20221635e-01,  3.00073664e-01,
         1.08395111e+00,  3.03431249e-01],
       [ 5.54774324e-02,  1.20221635e-01,  2.82793073e-01,
         1.21901769e+00,  5.12357880e-01],
       [ 1.35758768e-01,  1.48304750e-01,  3.25994551e-01,
         8.65728838e-01,  1.62163285e-01],
       [ 1.35758768e-01,  1.48304750e-01,  3.34634847e-01,
         1.17815367e+00,  2.53683979e-01],
       [ 2.26075271e-01,  2.13832017e-01,  4.29678099e-01,
         1.23004114e+00,  3.22473266e-01],
       [ 2.16040104e-01,  2.41915132e-01,  4.29678099e-01,
         1.23851352e+00,  4.08638393e-01],
       [ 2.46145605e-01,  2.41915132e-01,  4.29678099e-01,
         1.26393066e+00,  2.36308139e-01],
       [ 2.86286273e-01,  2.88720322e-01,  4.46958690e-01,
         1.12064915e+00, -2.94470124e-02],
       [ 3.26426940e-01,  3.35525513e-01,  5.24721351e-01,
         1.15662166e+00,  3.89953414e-01],
       [ 3.16391773e-01,  3.35525513e-01,  5.16081055e-01,
         1.40037809e+00,  4.48269591e-01],
       [ 3.16391773e-01,  3.35525513e-01,  5.16081055e-01,
         1.51356159e+00,  6.91769385e-01],
       [ 4.16743443e-01,  4.29135895e-01,  6.11124307e-01,
         1.37837799e+00,  5.16463815e-01],
       [ 4.16743443e-01,  4.29135895e-01,  6.28404899e-01,
         1.39653978e+00,  4.64157774e-01],
       [ 4.66919278e-01,  4.75941086e-01,  6.37045194e-01,
         1.55920010e+00,  4.26252259e-01],
       [ 4.76954445e-01,  4.75941086e-01,  6.45685490e-01,
         1.28789673e+00,  7.79600689e-01],
       [ 5.07059946e-01,  5.22746277e-01,  7.14807855e-01,
         1.44112509e+00,  6.85521223e-01],
       [ 5.17095113e-01,  5.22746277e-01,  6.88886968e-01,
         1.64359623e+00,  5.67044173e-01],
       [ 5.27130280e-01,  5.69551468e-01,  7.32088446e-01,
         1.53338508e+00,  5.13309981e-01],
       [ 5.57235780e-01,  6.16356659e-01,  8.09851107e-01,
         1.52072332e+00,  1.01941109e+00],
       [ 5.67270947e-01,  6.16356659e-01,  8.01210812e-01,
         1.70138160e+00,  6.97124952e-01],
       [ 5.57235780e-01,  6.16356659e-01,  8.35771994e-01,
         1.72934981e+00,  9.73353212e-01],
       [ 5.77306114e-01,  6.16356659e-01,  8.09851107e-01,
         1.72977109e+00,  9.95251532e-01],
       [ 6.47552283e-01,  7.09967041e-01,  8.87613768e-01,
         1.76609466e+00,  8.53328999e-01],
       [ 6.57587450e-01,  7.09967041e-01,  8.96254064e-01,
         1.85329931e+00,  1.05975637e+00],
```

```
scaled_features = pd.DataFrame(data=scaled_data, columns=num_cols) #Dataframe of scaled numerical columns
scaled_features
```

	Length1	Length2	Length3	Height	Width
0	-0.305789	-0.282303	-0.106020	0.596579	-0.236529
1	-0.225507	-0.198054	-0.002337	0.821261	-0.066579
2	-0.235542	-0.179332	-0.010977	0.797341	0.165793
3	0.005302	0.054694	0.196390	0.879771	0.022621
4	0.025372	0.054694	0.239592	0.812835	0.426371
...	...	...	...	...	...
154	-1.479903	-1.517960	-1.540309	-1.610359	-1.799403
155	-1.459833	-1.499238	-1.531669	-1.530878	-1.873547
156	-1.419692	-1.443072	-1.505748	-1.566687	-1.881402
157	-1.309305	-1.321378	-1.384784	-1.427243	-1.398568
158	-1.249094	-1.255851	-1.298381	-1.413341	-1.510440

159 rows × 5 columns

```
# Drop the numerical colums before scaling
modified_df_fish = df_fish.drop(num_cols, axis = 1)
modified_df_fish
```

	Weight	Bream	Parkki	Perch	Pike	Roach	Smelt	Whitefish
0	242.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
1	290.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2	340.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
3	363.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
4	430.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
...	...	...	...	...	...	...	...	...
154	12.2	0.0	0.0	0.0	0.0	0.0	1.0	0.0
155	13.4	0.0	0.0	0.0	0.0	0.0	1.0	0.0
156	12.2	0.0	0.0	0.0	0.0	0.0	1.0	0.0
157	19.7	0.0	0.0	0.0	0.0	0.0	1.0	0.0
158	19.9	0.0	0.0	0.0	0.0	0.0	1.0	0.0

159 rows × 8 columns

```
# Concatinate the scaled features
final_df_fish = pd.concat([scaled_features, modified_df_fish], axis=1)
final_df_fish
```

	Length1	Length2	Length3	Height	Width	Weight	Bream	Parkki	Perch	Pil
0	-0.305789	-0.282303	-0.106020	0.596579	-0.236529	242.0	1.0	0.0	0.0	0
1	-0.225507	-0.198054	-0.002337	0.821261	-0.066579	290.0	1.0	0.0	0.0	0
2	-0.235542	-0.179332	-0.010977	0.797341	0.165793	340.0	1.0	0.0	0.0	0
3	0.005302	0.054694	0.196390	0.879771	0.022621	363.0	1.0	0.0	0.0	0
4	0.025372	0.054694	0.239592	0.812835	0.426371	430.0	1.0	0.0	0.0	0
...	...	...	...	...	...	...	...	...	...	
154	-1.479903	-1.517960	-1.540309	-1.610359	-1.799403	12.2	0.0	0.0	0.0	0
155	-1.459833	-1.499238	-1.531669	-1.530878	-1.873547	13.4	0.0	0.0	0.0	0
156	-1.419692	-1.443072	-1.505748	-1.566687	-1.881402	12.2	0.0	0.0	0.0	0
157	-1.309305	-1.321378	-1.384784	-1.427243	-1.398568	19.7	0.0	0.0	0.0	0
158	-1.249094	-1.255851	-1.298381	-1.413341	-1.510440	19.9	0.0	0.0	0.0	0

159 rows × 13 columns