Experiment 1 - Operations in Pandas and Numpy

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1 Experiment Details

1.1 Submitted By

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1.2 Import Libraries

```python
import pandas as pd
import numpy as np
```

1.3 Operations in `Pandas`

Importing a `.csv` file into a pandas dataframe

```python
data = pd.read_csv(r'data/iris_csv.csv')
data
```

```
[ ]:      sepallength  sepalwidth  petallength  petalwidth            class
     0            5.1         3.5          1.4         0.2      Iris-setosa
     1            4.9         3.0          1.4         0.2      Iris-setosa
     2            4.7         3.2          1.3         0.2      Iris-setosa
     3            4.6         3.1          1.5         0.2      Iris-setosa
     4            5.0         3.6          1.4         0.2      Iris-setosa
     ..           ...         ...          ...         ...              ...
     145          6.7         3.0          5.2         2.3   Iris-virginica
     146          6.3         2.5          5.0         1.9   Iris-virginica
     147          6.5         3.0          5.2         2.0   Iris-virginica
     148          6.2         3.4          5.4         2.3   Iris-virginica
     149          5.9         3.0          5.1         1.8   Iris-virginica

     [150 rows x 5 columns]
```

```python
data.columns
```

```
[ ]: Index(['sepallength', 'sepalwidth', 'petallength', 'petalwidth', 'class'],
     dtype='object')
```

Get **n** random samples from the dataset

```
[ ]: data.sample(10)
```

```
[ ]:      sepallength  sepalwidth  petallength  petalwidth            class
     13           4.3         3.0          1.1         0.1      Iris-setosa
     82           5.8         2.7          3.9         1.2  Iris-versicolor
     84           5.4         3.0          4.5         1.5  Iris-versicolor
     121          5.6         2.8          4.9         2.0   Iris-virginica
     22           4.6         3.6          1.0         0.2      Iris-setosa
     60           5.0         2.0          3.5         1.0  Iris-versicolor
     15           5.7         4.4          1.5         0.4      Iris-setosa
     59           5.2         2.7          3.9         1.4  Iris-versicolor
     91           6.1         3.0          4.6         1.4  Iris-versicolor
     115          6.4         3.2          5.3         2.3   Iris-virginica
```

```
[ ]: data.shape
```

```
[ ]: (150, 5)
```

```
[ ]: data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   sepallength  150 non-null    float64
 1   sepalwidth   150 non-null    float64
 2   petallength  150 non-null    float64
 3   petalwidth   150 non-null    float64
 4   class        150 non-null    object
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

```
[ ]: data.describe()
```

```
[ ]:        sepallength  sepalwidth  petallength  petalwidth
     count   150.000000  150.000000   150.000000  150.000000
     mean      5.843333    3.054000     3.758667    1.198667
     std       0.828066    0.433594     1.764420    0.763161
     min       4.300000    2.000000     1.000000    0.100000
     25%       5.100000    2.800000     1.600000    0.300000
     50%       5.800000    3.000000     4.350000    1.300000
     75%       6.400000    3.300000     5.100000    1.800000
     max       7.900000    4.400000     6.900000    2.500000
```

```
[ ]: data[:21]
```

```
[ ]:        sepallength  sepalwidth  petallength  petalwidth         class
      0            5.1         3.5          1.4         0.2  Iris-setosa
      1            4.9         3.0          1.4         0.2  Iris-setosa
      2            4.7         3.2          1.3         0.2  Iris-setosa
      3            4.6         3.1          1.5         0.2  Iris-setosa
      4            5.0         3.6          1.4         0.2  Iris-setosa
      5            5.4         3.9          1.7         0.4  Iris-setosa
      6            4.6         3.4          1.4         0.3  Iris-setosa
      7            5.0         3.4          1.5         0.2  Iris-setosa
      8            4.4         2.9          1.4         0.2  Iris-setosa
      9            4.9         3.1          1.5         0.1  Iris-setosa
      10           5.4         3.7          1.5         0.2  Iris-setosa
      11           4.8         3.4          1.6         0.2  Iris-setosa
      12           4.8         3.0          1.4         0.1  Iris-setosa
      13           4.3         3.0          1.1         0.1  Iris-setosa
      14           5.8         4.0          1.2         0.2  Iris-setosa
      15           5.7         4.4          1.5         0.4  Iris-setosa
      16           5.4         3.9          1.3         0.4  Iris-setosa
      17           5.1         3.5          1.4         0.3  Iris-setosa
      18           5.7         3.8          1.7         0.3  Iris-setosa
      19           5.1         3.8          1.5         0.3  Iris-setosa
      20           5.4         3.4          1.7         0.2  Iris-setosa
```

```
[ ]: data[10:-1]
```

```
[ ]:        sepallength  sepalwidth  petallength  petalwidth           class
      10           5.4         3.7          1.5         0.2     Iris-setosa
      11           4.8         3.4          1.6         0.2     Iris-setosa
      12           4.8         3.0          1.4         0.1     Iris-setosa
      13           4.3         3.0          1.1         0.1     Iris-setosa
      14           5.8         4.0          1.2         0.2     Iris-setosa
      ..           ...         ...          ...         ...             ...
      144          6.7         3.3          5.7         2.5  Iris-virginica
      145          6.7         3.0          5.2         2.3  Iris-virginica
      146          6.3         2.5          5.0         1.9  Iris-virginica
      147          6.5         3.0          5.2         2.0  Iris-virginica
      148          6.2         3.4          5.4         2.3  Iris-virginica

      [139 rows x 5 columns]
```

```
[ ]: data[:]
```

```
[ ]:        sepallength  sepalwidth  petallength  petalwidth           class
      0            5.1         3.5          1.4         0.2     Iris-setosa
      1            4.9         3.0          1.4         0.2     Iris-setosa
      2            4.7         3.2          1.3         0.2     Iris-setosa
      3            4.6         3.1          1.5         0.2     Iris-setosa
```

```
4           5.0           3.6           1.4           0.2      Iris-setosa
..          ...           ...           ...           ...           ...
144         6.7           3.3           5.7           2.5  Iris-virginica
145         6.7           3.0           5.2           2.3  Iris-virginica
146         6.3           2.5           5.0           1.9  Iris-virginica
147         6.5           3.0           5.2           2.0  Iris-virginica
148         6.2           3.4           5.4           2.3  Iris-virginica

[149 rows x 5 columns]
```

```python
[ ]: sepalData = data[
         ['sepallength', 'sepalwidth']
     ]

     sepalData.head(10)
```

```
[ ]:    sepallength  sepalwidth
     0          5.1         3.5
     1          4.9         3.0
     2          4.7         3.2
     3          4.6         3.1
     4          5.0         3.6
     5          5.4         3.9
     6          4.6         3.4
     7          5.0         3.4
     8          4.4         2.9
     9          4.9         3.1
```

```python
[ ]: data.iloc[110]
```

```
[ ]: sepallength              6.5
     sepalwidth               3.2
     petallength              5.1
     petalwidth               2.0
     class          Iris-virginica
     Name: 110, dtype: object
```

```python
[ ]: classVirginica = data.loc[data['class'] == 'Iris-virginica']
```

```
[ ]:      sepallength  sepalwidth  petallength  petalwidth           class
     100          6.3         3.3          6.0         2.5  Iris-virginica
     101          5.8         2.7          5.1         1.9  Iris-virginica
     102          7.1         3.0          5.9         2.1  Iris-virginica
     103          6.3         2.9          5.6         1.8  Iris-virginica
     104          6.5         3.0          5.8         2.2  Iris-virginica
     105          7.6         3.0          6.6         2.1  Iris-virginica
     106          4.9         2.5          4.5         1.7  Iris-virginica
```

```
107        7.3        2.9        6.3        1.8   Iris-virginica
108        6.7        2.5        5.8        1.8   Iris-virginica
109        7.2        3.6        6.1        2.5   Iris-virginica
110        6.5        3.2        5.1        2.0   Iris-virginica
111        6.4        2.7        5.3        1.9   Iris-virginica
112        6.8        3.0        5.5        2.1   Iris-virginica
113        5.7        2.5        5.0        2.0   Iris-virginica
114        5.8        2.8        5.1        2.4   Iris-virginica
115        6.4        3.2        5.3        2.3   Iris-virginica
116        6.5        3.0        5.5        1.8   Iris-virginica
117        7.7        3.8        6.7        2.2   Iris-virginica
118        7.7        2.6        6.9        2.3   Iris-virginica
119        6.0        2.2        5.0        1.5   Iris-virginica
120        6.9        3.2        5.7        2.3   Iris-virginica
121        5.6        2.8        4.9        2.0   Iris-virginica
122        7.7        2.8        6.7        2.0   Iris-virginica
123        6.3        2.7        4.9        1.8   Iris-virginica
124        6.7        3.3        5.7        2.1   Iris-virginica
125        7.2        3.2        6.0        1.8   Iris-virginica
126        6.2        2.8        4.8        1.8   Iris-virginica
127        6.1        3.0        4.9        1.8   Iris-virginica
128        6.4        2.8        5.6        2.1   Iris-virginica
129        7.2        3.0        5.8        1.6   Iris-virginica
130        7.4        2.8        6.1        1.9   Iris-virginica
131        7.9        3.8        6.4        2.0   Iris-virginica
132        6.4        2.8        5.6        2.2   Iris-virginica
133        6.3        2.8        5.1        1.5   Iris-virginica
134        6.1        2.6        5.6        1.4   Iris-virginica
135        7.7        3.0        6.1        2.3   Iris-virginica
136        6.3        3.4        5.6        2.4   Iris-virginica
137        6.4        3.1        5.5        1.8   Iris-virginica
138        6.0        3.0        4.8        1.8   Iris-virginica
139        6.9        3.1        5.4        2.1   Iris-virginica
140        6.7        3.1        5.6        2.4   Iris-virginica
141        6.9        3.1        5.1        2.3   Iris-virginica
142        5.8        2.7        5.1        1.9   Iris-virginica
143        6.8        3.2        5.9        2.3   Iris-virginica
144        6.7        3.3        5.7        2.5   Iris-virginica
145        6.7        3.0        5.2        2.3   Iris-virginica
146        6.3        2.5        5.0        1.9   Iris-virginica
147        6.5        3.0        5.2        2.0   Iris-virginica
148        6.2        3.4        5.4        2.3   Iris-virginica
149        5.9        3.0        5.1        1.8   Iris-virginica
```

```python
data['class'].value_counts()
```

```
[ ]: Iris-setosa        50
     Iris-versicolor    50
     Iris-virginica     50
     Name: class, dtype: int64
```

```
[ ]: data[:16].style
```

```
[ ]: <pandas.io.formats.style.Styler at 0x7fdf2a3a10f0>
```

```
[ ]: data.corr(method='pearson')
```

```
/tmp/ipykernel_13216/2721894934.py:1: FutureWarning: The default value of
numeric_only in DataFrame.corr is deprecated. In a future version, it will
default to False. Select only valid columns or specify the value of numeric_only
to silence this warning.
  data.corr(method='pearson')
```

```
[ ]:              sepallength  sepalwidth  petallength  petalwidth
     sepallength     1.000000   -0.109369     0.871754    0.817954
     sepalwidth     -0.109369    1.000000    -0.420516   -0.356544
     petallength     0.871754   -0.420516     1.000000    0.962757
     petalwidth      0.817954   -0.356544     0.962757    1.000000
```

```
[ ]: import seaborn as sns

     g = sns.pairplot(data, hue='class')
```
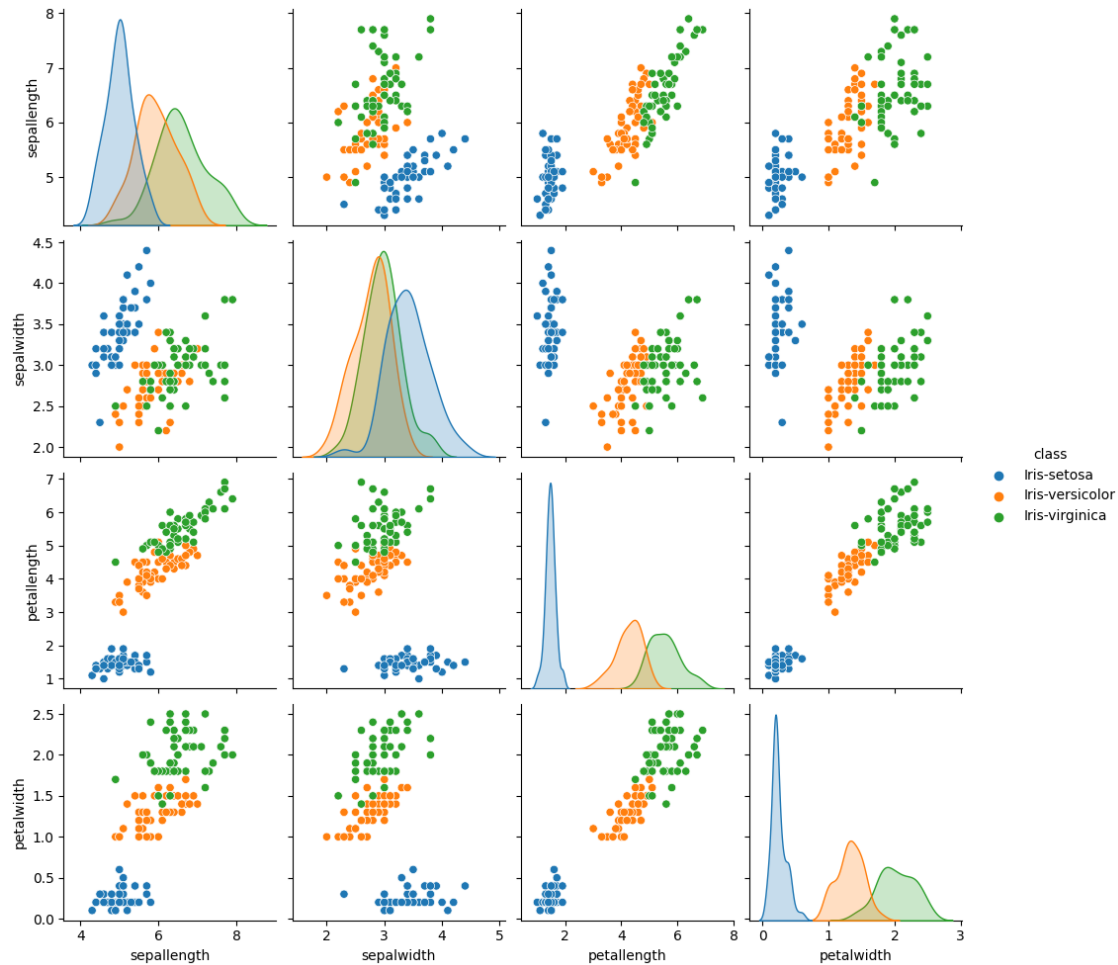
1.4 Operations in `Numpy`

```python
import numpy as np
from sklearn.datasets import load_iris

# Load iris dataset
iris = load_iris()
X = iris.data
```

```
/home/volt/.local/lib/python3.10/site-packages/scipy/__init__.py:146:
UserWarning: A NumPy version >=1.16.5 and <1.23.0 is required for this version
of SciPy (detected version 1.24.3
   warnings.warn(f"A NumPy version >={np_minversion} and <{np_maxversion}"
```

```python
# Mean of each feature
print("Mean of each feature:", np.mean(X, axis=0))
```

```python
# Standard deviation of each feature
print("Standard deviation of each feature:", np.std(X, axis=0))

# Maximum value of each feature
print("Maximum value of each feature:", np.max(X, axis=0))

# Minimum value of each feature
print("Minimum value of each feature:", np.min(X, axis=0))
```

```
Mean of each feature: [5.84333333 3.05733333 3.758      1.19933333]
Standard deviation of each feature: [0.82530129 0.43441097 1.75940407
0.75969263]
Maximum value of each feature: [7.9 4.4 6.9 2.5]
Minimum value of each feature: [4.3 2.  1.  0.1]
```

```python
# Reshape array
X_reshaped = X.reshape(-1, 2, 2)
print("Reshaped array:", X_reshaped)

# Transpose array
X_transposed = np.transpose(X)
print("Transposed array:", X_transposed)

# Create array with all zeros
X_zeros = np.zeros((3, 5))
print("Array with all zeros:\n", X_zeros)

# Create array with all ones
X_ones = np.ones((2, 4))
print("Array with all ones:\n", X_ones)
```

```
Reshaped array: [[[5.1 3.5]
  [1.4 0.2]]

 [[4.9 3. ]
  [1.4 0.2]]

 [[4.7 3.2]
  [1.3 0.2]]

 [[4.6 3.1]
  [1.5 0.2]]

 [[5.  3.6]
  [1.4 0.2]]

 [[5.4 3.9]
  [1.7 0.4]]
```

```
[[4.6 3.4]
 [1.4 0.3]]

[[5.  3.4]
 [1.5 0.2]]

[[4.4 2.9]
 [1.4 0.2]]

[[4.9 3.1]
 [1.5 0.1]]

[[5.4 3.7]
 [1.5 0.2]]

[[4.8 3.4]
 [1.6 0.2]]

[[4.8 3. ]
 [1.4 0.1]]

[[4.3 3. ]
 [1.1 0.1]]

[[5.8 4. ]
 [1.2 0.2]]

[[5.7 4.4]
 [1.5 0.4]]

[[5.4 3.9]
 [1.3 0.4]]

[[5.1 3.5]
 [1.4 0.3]]

[[5.7 3.8]
 [1.7 0.3]]

[[5.1 3.8]
 [1.5 0.3]]

[[5.4 3.4]
 [1.7 0.2]]

[[5.1 3.7]
 [1.5 0.4]]
```

```
[[4.6 3.6]
 [1.  0.2]]

[[5.1 3.3]
 [1.7 0.5]]

[[4.8 3.4]
 [1.9 0.2]]

[[5.  3. ]
 [1.6 0.2]]

[[5.  3.4]
 [1.6 0.4]]

[[5.2 3.5]
 [1.5 0.2]]

[[5.2 3.4]
 [1.4 0.2]]

[[4.7 3.2]
 [1.6 0.2]]

[[4.8 3.1]
 [1.6 0.2]]

[[5.4 3.4]
 [1.5 0.4]]

[[5.2 4.1]
 [1.5 0.1]]

[[5.5 4.2]
 [1.4 0.2]]

[[4.9 3.1]
 [1.5 0.2]]

[[5.  3.2]
 [1.2 0.2]]

[[5.5 3.5]
 [1.3 0.2]]

[[4.9 3.6]
 [1.4 0.1]]
```

```
[[4.4 3. ]
 [1.3 0.2]]

[[5.1 3.4]
 [1.5 0.2]]

[[5.  3.5]
 [1.3 0.3]]

[[4.5 2.3]
 [1.3 0.3]]

[[4.4 3.2]
 [1.3 0.2]]

[[5.  3.5]
 [1.6 0.6]]

[[5.1 3.8]
 [1.9 0.4]]

[[4.8 3. ]
 [1.4 0.3]]

[[5.1 3.8]
 [1.6 0.2]]

[[4.6 3.2]
 [1.4 0.2]]

[[5.3 3.7]
 [1.5 0.2]]

[[5.  3.3]
 [1.4 0.2]]

[[7.  3.2]
 [4.7 1.4]]

[[6.4 3.2]
 [4.5 1.5]]

[[6.9 3.1]
 [4.9 1.5]]

[[5.5 2.3]
 [4.  1.3]]
```

```
[[6.5 2.8]
 [4.6 1.5]]

[[5.7 2.8]
 [4.5 1.3]]

[[6.3 3.3]
 [4.7 1.6]]

[[4.9 2.4]
 [3.3 1. ]]

[[6.6 2.9]
 [4.6 1.3]]

[[5.2 2.7]
 [3.9 1.4]]

[[5.  2. ]
 [3.5 1. ]]

[[5.9 3. ]
 [4.2 1.5]]

[[6.  2.2]
 [4.  1. ]]

[[6.1 2.9]
 [4.7 1.4]]

[[5.6 2.9]
 [3.6 1.3]]

[[6.7 3.1]
 [4.4 1.4]]

[[5.6 3. ]
 [4.5 1.5]]

[[5.8 2.7]
 [4.1 1. ]]

[[6.2 2.2]
 [4.5 1.5]]

[[5.6 2.5]
 [3.9 1.1]]
```

```
[[5.9 3.2]
 [4.8 1.8]]

[[6.1 2.8]
 [4.  1.3]]

[[6.3 2.5]
 [4.9 1.5]]

[[6.1 2.8]
 [4.7 1.2]]

[[6.4 2.9]
 [4.3 1.3]]

[[6.6 3. ]
 [4.4 1.4]]

[[6.8 2.8]
 [4.8 1.4]]

[[6.7 3. ]
 [5.  1.7]]

[[6.  2.9]
 [4.5 1.5]]

[[5.7 2.6]
 [3.5 1. ]]

[[5.5 2.4]
 [3.8 1.1]]

[[5.5 2.4]
 [3.7 1. ]]

[[5.8 2.7]
 [3.9 1.2]]

[[6.  2.7]
 [5.1 1.6]]

[[5.4 3. ]
 [4.5 1.5]]

[[6.  3.4]
 [4.5 1.6]]
```

```
[[6.7 3.1]
 [4.7 1.5]]

[[6.3 2.3]
 [4.4 1.3]]

[[5.6 3. ]
 [4.1 1.3]]

[[5.5 2.5]
 [4.  1.3]]

[[5.5 2.6]
 [4.4 1.2]]

[[6.1 3. ]
 [4.6 1.4]]

[[5.8 2.6]
 [4.  1.2]]

[[5.  2.3]
 [3.3 1. ]]

[[5.6 2.7]
 [4.2 1.3]]

[[5.7 3. ]
 [4.2 1.2]]

[[5.7 2.9]
 [4.2 1.3]]

[[6.2 2.9]
 [4.3 1.3]]

[[5.1 2.5]
 [3.  1.1]]

[[5.7 2.8]
 [4.1 1.3]]

[[6.3 3.3]
 [6.  2.5]]

[[5.8 2.7]
 [5.1 1.9]]
```

```
[[7.1 3. ]
 [5.9 2.1]]

[[6.3 2.9]
 [5.6 1.8]]

[[6.5 3. ]
 [5.8 2.2]]

[[7.6 3. ]
 [6.6 2.1]]

[[4.9 2.5]
 [4.5 1.7]]

[[7.3 2.9]
 [6.3 1.8]]

[[6.7 2.5]
 [5.8 1.8]]

[[7.2 3.6]
 [6.1 2.5]]

[[6.5 3.2]
 [5.1 2. ]]

[[6.4 2.7]
 [5.3 1.9]]

[[6.8 3. ]
 [5.5 2.1]]

[[5.7 2.5]
 [5.  2. ]]

[[5.8 2.8]
 [5.1 2.4]]

[[6.4 3.2]
 [5.3 2.3]]

[[6.5 3. ]
 [5.5 1.8]]

[[7.7 3.8]
 [6.7 2.2]]
```

```
[[7.7 2.6]
 [6.9 2.3]]

[[6.  2.2]
 [5.  1.5]]

[[6.9 3.2]
 [5.7 2.3]]

[[5.6 2.8]
 [4.9 2. ]]

[[7.7 2.8]
 [6.7 2. ]]

[[6.3 2.7]
 [4.9 1.8]]

[[6.7 3.3]
 [5.7 2.1]]

[[7.2 3.2]
 [6.  1.8]]

[[6.2 2.8]
 [4.8 1.8]]

[[6.1 3. ]
 [4.9 1.8]]

[[6.4 2.8]
 [5.6 2.1]]

[[7.2 3. ]
 [5.8 1.6]]

[[7.4 2.8]
 [6.1 1.9]]

[[7.9 3.8]
 [6.4 2. ]]

[[6.4 2.8]
 [5.6 2.2]]

[[6.3 2.8]
 [5.1 1.5]]
```

```
[[6.1 2.6]
 [5.6 1.4]]

[[7.7 3. ]
 [6.1 2.3]]

[[6.3 3.4]
 [5.6 2.4]]

[[6.4 3.1]
 [5.5 1.8]]

[[6.  3. ]
 [4.8 1.8]]

[[6.9 3.1]
 [5.4 2.1]]

[[6.7 3.1]
 [5.6 2.4]]

[[6.9 3.1]
 [5.1 2.3]]

[[5.8 2.7]
 [5.1 1.9]]

[[6.8 3.2]
 [5.9 2.3]]

[[6.7 3.3]
 [5.7 2.5]]

[[6.7 3. ]
 [5.2 2.3]]

[[6.3 2.5]
 [5.  1.9]]

[[6.5 3. ]
 [5.2 2. ]]

[[6.2 3.4]
 [5.4 2.3]]

[[5.9 3. ]
 [5.1 1.8]]]
```

```
Transposed array: [[5.1 4.9 4.7 4.6 5.  5.4 4.6 5.  4.4 4.9 5.4 4.8 4.8 4.3 5.8
5.7 5.4 5.1
  5.7 5.1 5.4 5.1 4.6 5.1 4.8 5.  5.  5.2 5.2 4.7 4.8 5.4 5.2 5.5 4.9 5.
  5.5 4.9 4.4 5.1 5.  4.5 4.4 5.  5.1 4.8 5.1 4.6 5.3 5.  7.  6.4 6.9 5.5
  6.5 5.7 6.3 4.9 6.6 5.2 5.  5.9 6.  6.1 5.6 6.7 5.6 5.8 6.2 5.6 5.9 6.1
  6.3 6.1 6.4 6.6 6.8 6.7 6.  5.7 5.5 5.5 5.8 6.  5.4 6.  6.7 6.3 5.6 5.5
  5.5 6.1 5.8 5.  5.6 5.7 5.7 6.2 5.1 5.7 6.3 5.8 7.1 6.3 6.5 7.6 4.9 7.3
  6.7 7.2 6.5 6.4 6.8 5.7 5.8 6.4 6.5 7.7 7.7 6.  6.9 5.6 7.7 6.3 6.7 7.2
  6.2 6.1 6.4 7.2 7.4 7.9 6.4 6.3 6.1 7.7 6.3 6.4 6.  6.9 6.7 6.9 5.8 6.8
  6.7 6.7 6.3 6.5 6.2 5.9]
 [3.5 3.  3.2 3.1 3.6 3.9 3.4 3.4 2.9 3.1 3.7 3.4 3.  3.  4.  4.4 3.9 3.5
  3.8 3.8 3.4 3.7 3.6 3.3 3.4 3.  3.4 3.5 3.4 3.2 3.1 3.4 4.1 4.2 3.1 3.2
  3.5 3.6 3.  3.4 3.5 2.3 3.2 3.5 3.8 3.  3.8 3.2 3.7 3.3 3.2 3.2 3.1 2.3
  2.8 2.8 3.3 2.4 2.9 2.7 2.  3.  2.2 2.9 2.9 3.1 3.  2.7 2.2 2.5 3.2 2.8
  2.5 2.8 2.9 3.  2.8 3.  2.9 2.6 2.4 2.4 2.7 2.7 3.  3.4 3.1 2.3 3.  2.5
  2.6 3.  2.6 2.3 2.7 3.  2.9 2.9 2.5 2.8 3.3 2.7 3.  2.9 3.  3.  2.5 2.9
  2.5 3.6 3.2 2.7 3.  2.5 2.8 3.2 3.  3.8 2.6 2.2 3.2 2.8 2.8 2.7 3.3 3.2
  2.8 3.  2.8 3.  2.8 3.8 2.8 2.8 2.6 3.  3.4 3.1 3.  3.1 3.1 3.1 2.7 3.2
  3.3 3.  2.5 3.  3.4 3. ]
 [1.4 1.4 1.3 1.5 1.4 1.7 1.4 1.5 1.4 1.5 1.5 1.6 1.4 1.1 1.2 1.5 1.3 1.4
  1.7 1.5 1.7 1.5 1.  1.7 1.9 1.6 1.6 1.5 1.4 1.6 1.6 1.5 1.5 1.4 1.5 1.2
  1.3 1.4 1.3 1.5 1.3 1.3 1.3 1.6 1.9 1.4 1.6 1.4 1.5 1.4 4.7 4.5 4.9 4.
  4.6 4.5 4.7 3.3 4.6 3.9 3.5 4.2 4.  4.7 3.6 4.4 4.5 4.1 4.5 3.9 4.8 4.
  4.9 4.7 4.3 4.4 4.8 5.  4.5 3.5 3.8 3.7 3.9 5.1 4.5 4.5 4.7 4.4 4.1 4.
  4.4 4.6 4.  3.3 4.2 4.2 4.2 4.3 3.  4.1 6.  5.1 5.9 5.6 5.8 6.6 4.5 6.3
  5.8 6.1 5.1 5.3 5.5 5.  5.1 5.3 5.5 6.7 6.9 5.  5.7 4.9 6.7 4.9 5.7 6.
  4.8 4.9 5.6 5.8 6.1 6.4 5.6 5.1 5.6 6.1 5.6 5.5 4.8 5.4 5.6 5.1 5.1 5.9
  5.7 5.2 5.  5.2 5.4 5.1]
 [0.2 0.2 0.2 0.2 0.2 0.4 0.3 0.2 0.2 0.1 0.2 0.2 0.1 0.1 0.2 0.4 0.4 0.3
  0.3 0.3 0.2 0.4 0.2 0.5 0.2 0.2 0.4 0.2 0.2 0.2 0.2 0.4 0.1 0.2 0.2 0.2
  0.2 0.1 0.2 0.2 0.3 0.3 0.2 0.6 0.4 0.3 0.2 0.2 0.2 0.2 1.4 1.5 1.5 1.3
  1.5 1.3 1.6 1.  1.3 1.4 1.  1.5 1.  1.4 1.3 1.4 1.5 1.  1.5 1.1 1.8 1.3
  1.5 1.2 1.3 1.4 1.4 1.7 1.5 1.  1.1 1.  1.2 1.6 1.5 1.6 1.5 1.3 1.3 1.3
  1.2 1.4 1.2 1.  1.3 1.2 1.3 1.3 1.1 1.3 2.5 1.9 2.1 1.8 2.2 2.1 1.7 1.8
  1.8 2.5 2.  1.9 2.1 2.  2.4 2.3 1.8 2.2 2.3 1.5 2.3 2.  2.  1.8 2.1 1.8
  1.8 1.8 2.1 1.6 1.9 2.  2.2 1.5 1.4 2.3 2.4 1.8 1.8 2.1 2.4 2.3 1.9 2.3
  2.5 2.3 1.9 2.  2.3 1.8]]
Array with all zeros:
 [[0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]
 [0. 0. 0. 0. 0.]]
Array with all ones:
 [[1. 1. 1. 1.]
 [1. 1. 1. 1.]]
```

```
[ ]: # Multiply two arrays element-wise
     X1 = np.array([[1, 2], [3, 4]])
```

```python
X2 = np.array([[5, 6], [7, 8]])
X_product = np.multiply(X1, X2)
print("Element-wise product:\n", X_product)

# Dot product of two arrays
X_dot = np.dot(X1, X2)
print("Dot product:\n", X_dot)

# Inverse of a matrix
X_inv = np.linalg.inv(X1)
print("Inverse of matrix:\n", X_inv)
```

```
Element-wise product:
 [[ 5 12]
 [21 32]]
Dot product:
 [[19 22]
 [43 50]]
Inverse of matrix:
 [[-2.   1. ]
 [ 1.5 -0.5]]
```