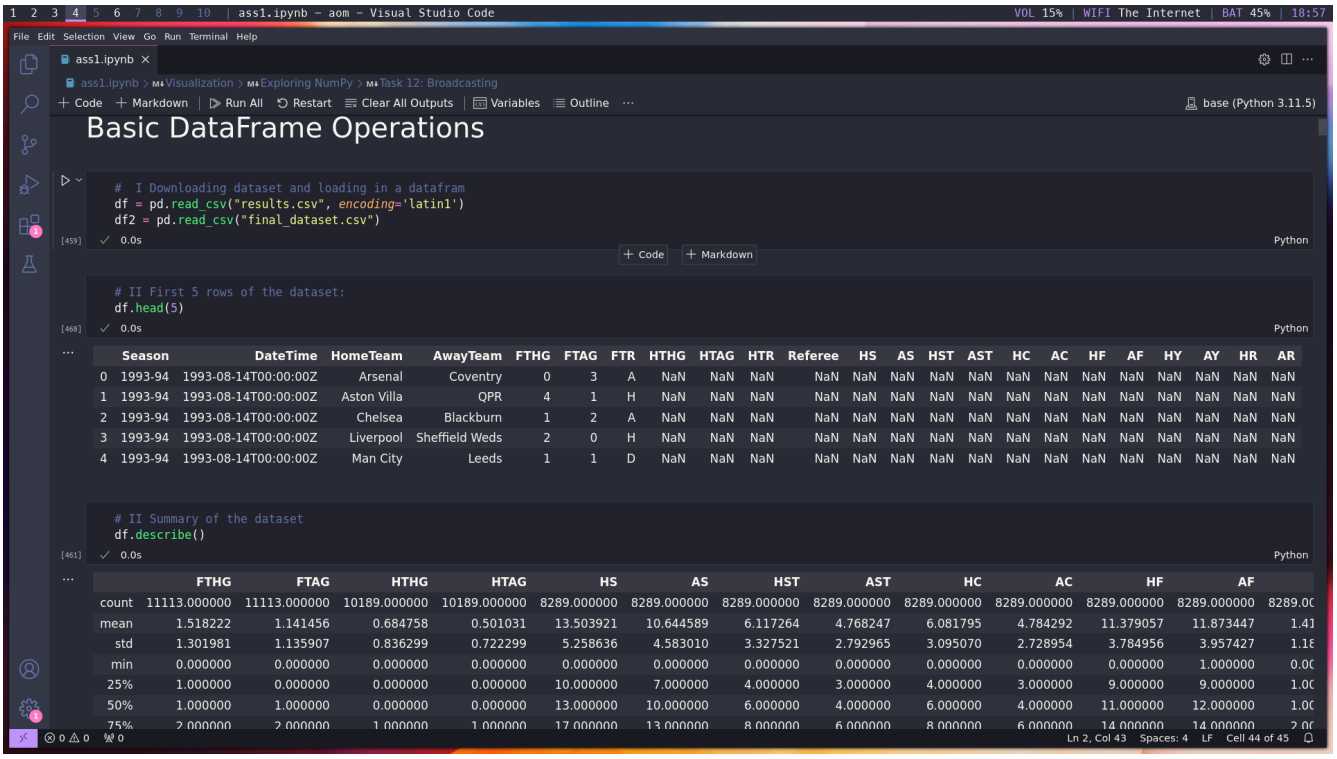
Assignment – 1

Rahul Sharma, 500091839, R2142210619, B.Tech. CSE AIML Batch-2 NH



Basic DataFrame Operations

```
#  I Downloading dataset and loading in a datafram
df = pd.read_csv("results.csv", encoding='latin1')
df2 = pd.read_csv("final_dataset.csv")
```

[459] ✓ 0.0s — Python

```
# II First 5 rows of the dataset:
df.head(5)
```

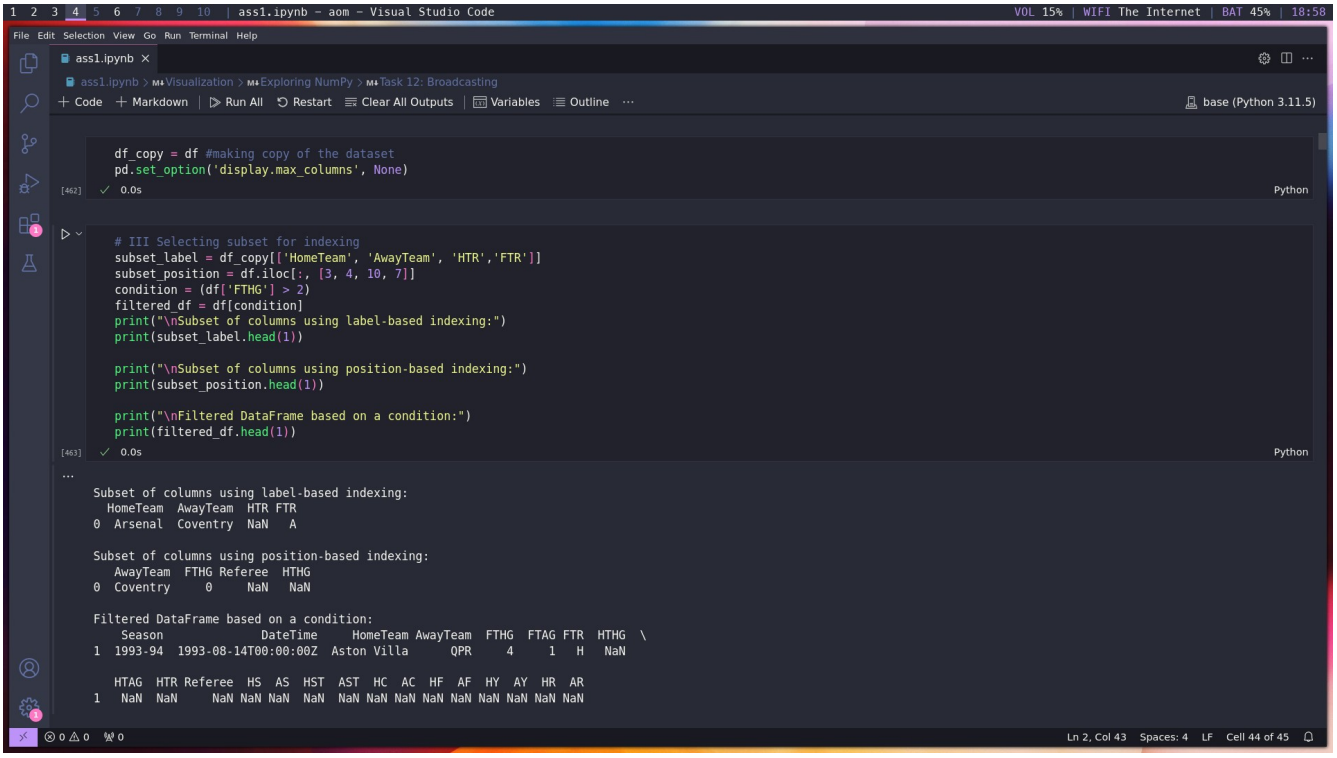
[468] ✓ 0.0s — Python

	Season	DateTime	HomeTeam	AwayTeam	FTHG	FTAG	FTR	HTHG	HTAG	HTR	Referee	HS	AS	HST	AST	HC	AC	HF	AF	HY	AY	HR	AR
0	1993-94	1993-08-14T00:00:00Z	Arsenal	Coventry	0	3	A	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
1	1993-94	1993-08-14T00:00:00Z	Aston Villa	QPR	4	1	H	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2	1993-94	1993-08-14T00:00:00Z	Chelsea	Blackburn	1	2	A	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
3	1993-94	1993-08-14T00:00:00Z	Liverpool	Sheffield Weds	2	0	H	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
4	1993-94	1993-08-14T00:00:00Z	Man City	Leeds	1	1	D	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

```
# II Summary of the dataset
df.describe()
```

[461] ✓ 0.0s — Python

	FTHG	FTAG	HTHG	HTAG	HS	AS	HST	AST	HC	AC	HF	AF	
count	11113.000000	11113.000000	10189.000000	10189.000000	8289.000000	8289.000000	8289.000000	8289.000000	8289.000000	8289.000000	8289.000000	8289.000000	8289.0(
mean	1.518222	1.141456	0.684758	0.501031	13.503921	10.644589	6.117264	4.768247	6.081795	4.784292	11.379057	11.873447	1.41
std	1.301981	1.135907	0.836299	0.722299	5.258636	4.583010	3.327521	2.792965	3.095070	2.728954	3.784956	3.957427	1.18
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.0(
25%	1.000000	0.000000	0.000000	0.000000	10.000000	7.000000	4.000000	3.000000	4.000000	3.000000	9.000000	9.000000	1.0(
50%	1.000000	1.000000	0.000000	0.000000	13.000000	10.000000	6.000000	4.000000	6.000000	4.000000	11.000000	12.000000	1.0(
75%	2.000000	2.000000	1.000000	1.000000	17.000000	13.000000	8.000000	6.000000	8.000000	6.000000	14.000000	14.000000	2.0(



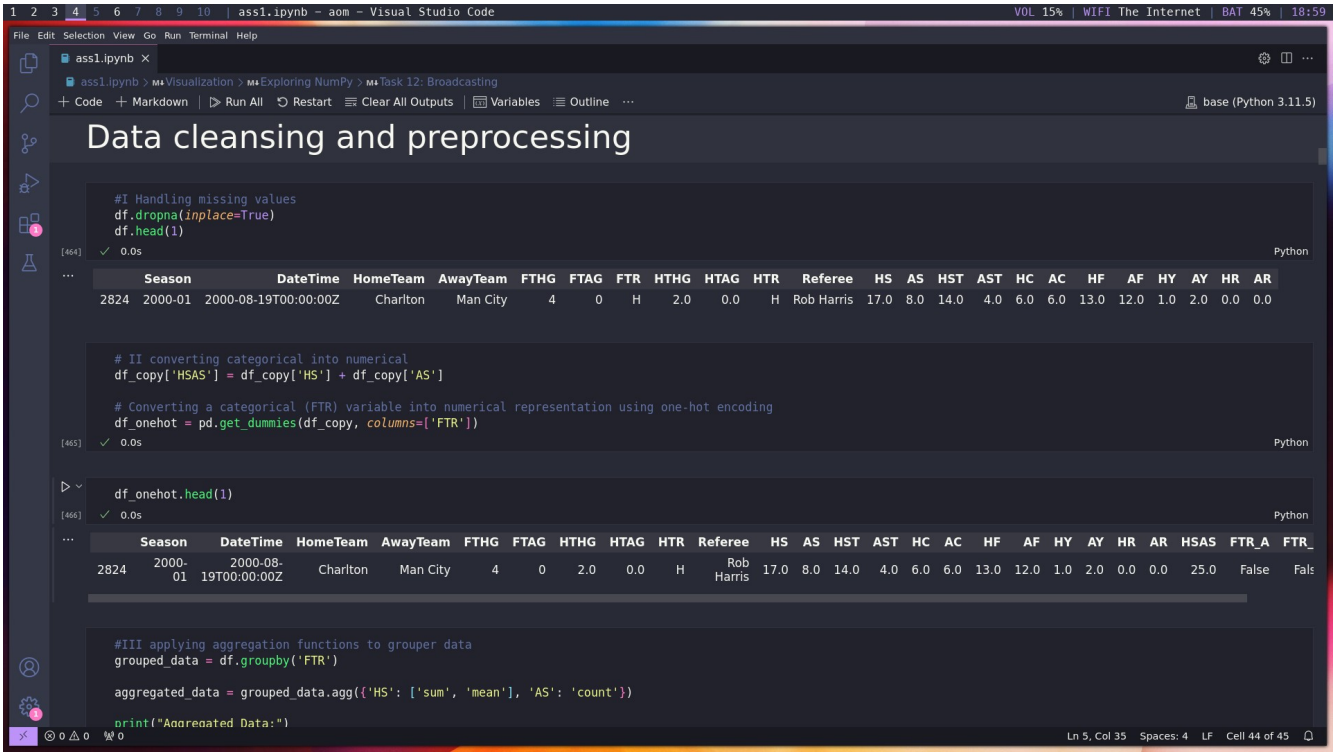
```
df_copy = df #making copy of the dataset
pd.set_option('display.max_columns', None)
```

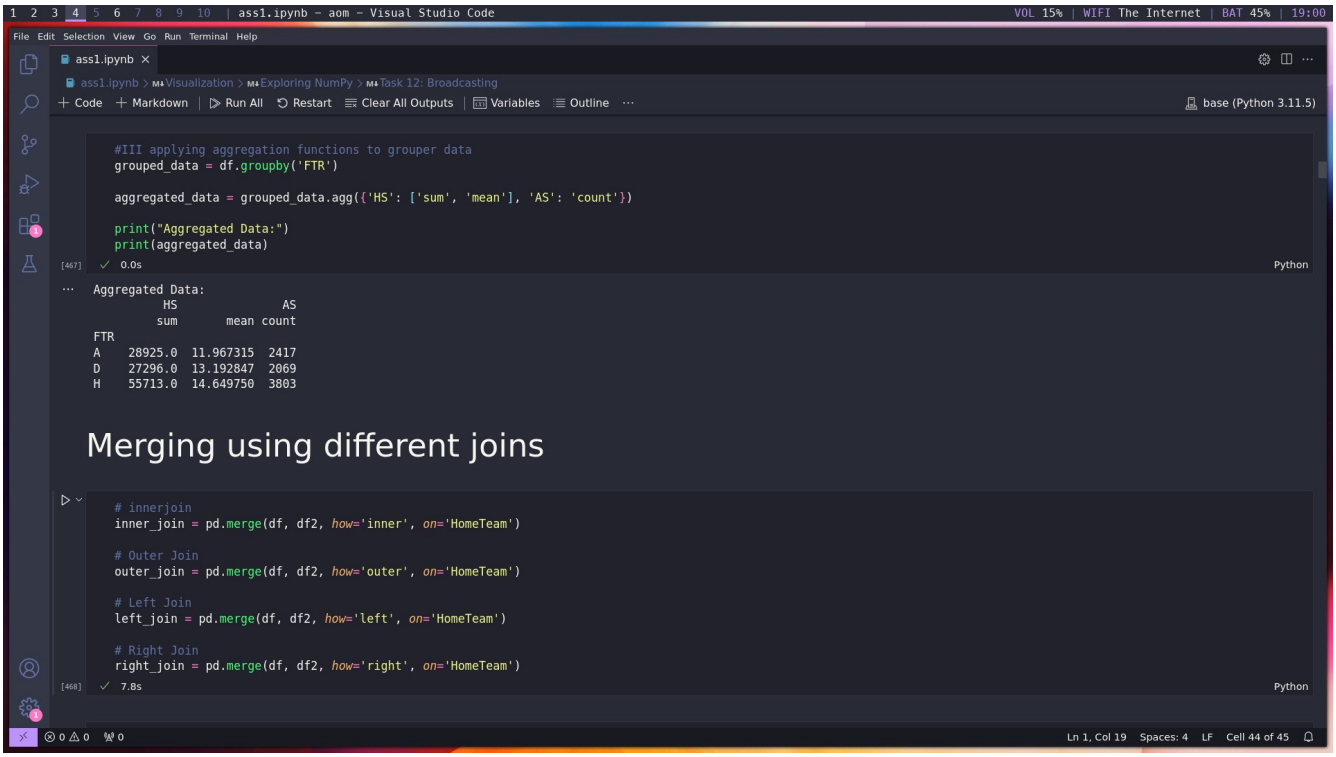
[462] ✓ 0.0s — Python

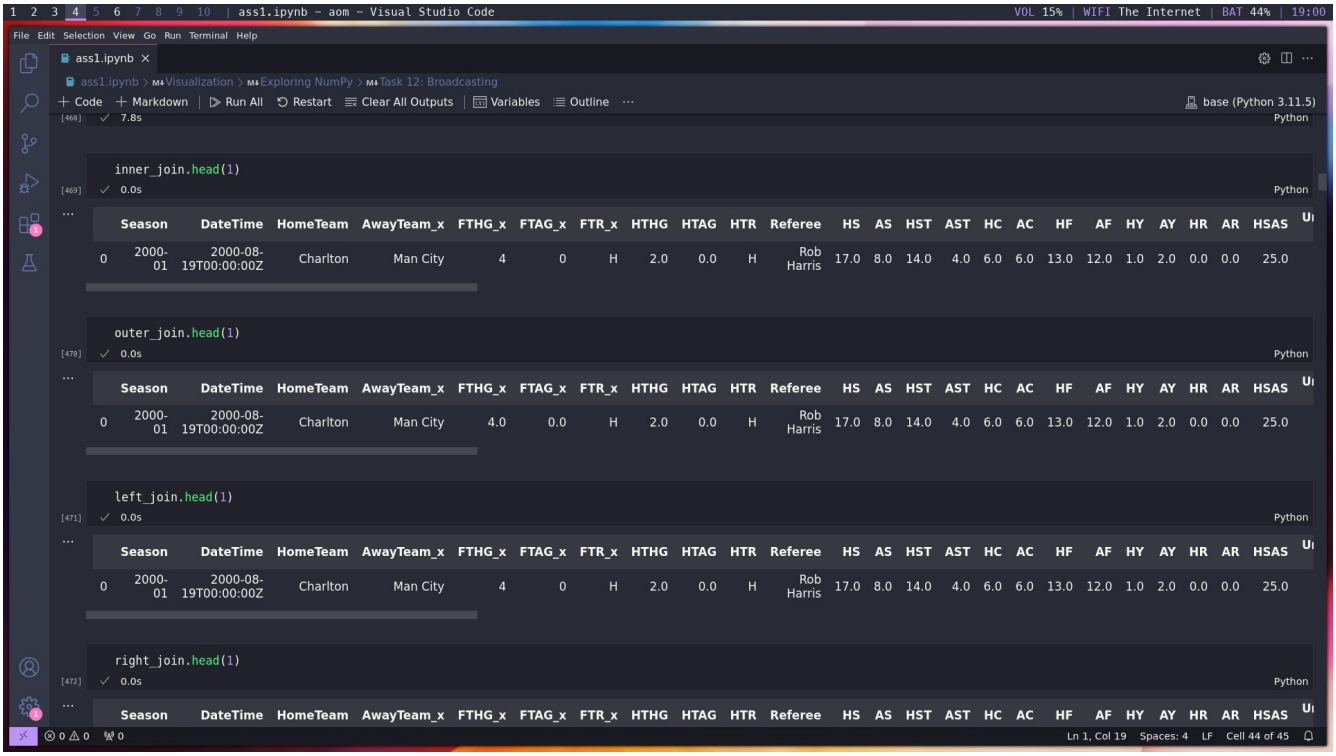
```
# III Selecting subset for indexing
subset_label = df_copy[['HomeTeam', 'AwayTeam', 'HTR','FTR']]
subset_position = df.iloc[:, [3, 4, 10, 7]]
condition = (df['FTHG'] > 2)
filtered_df = df[condition]
print("\nSubset of columns using label-based indexing:")
print(subset_label.head(1))

print("\nSubset of columns using position-based indexing:")
print(subset_position.head(1))

print("\nFiltered DataFrame based on a condition:")
print(filtered_df.head(1))
```

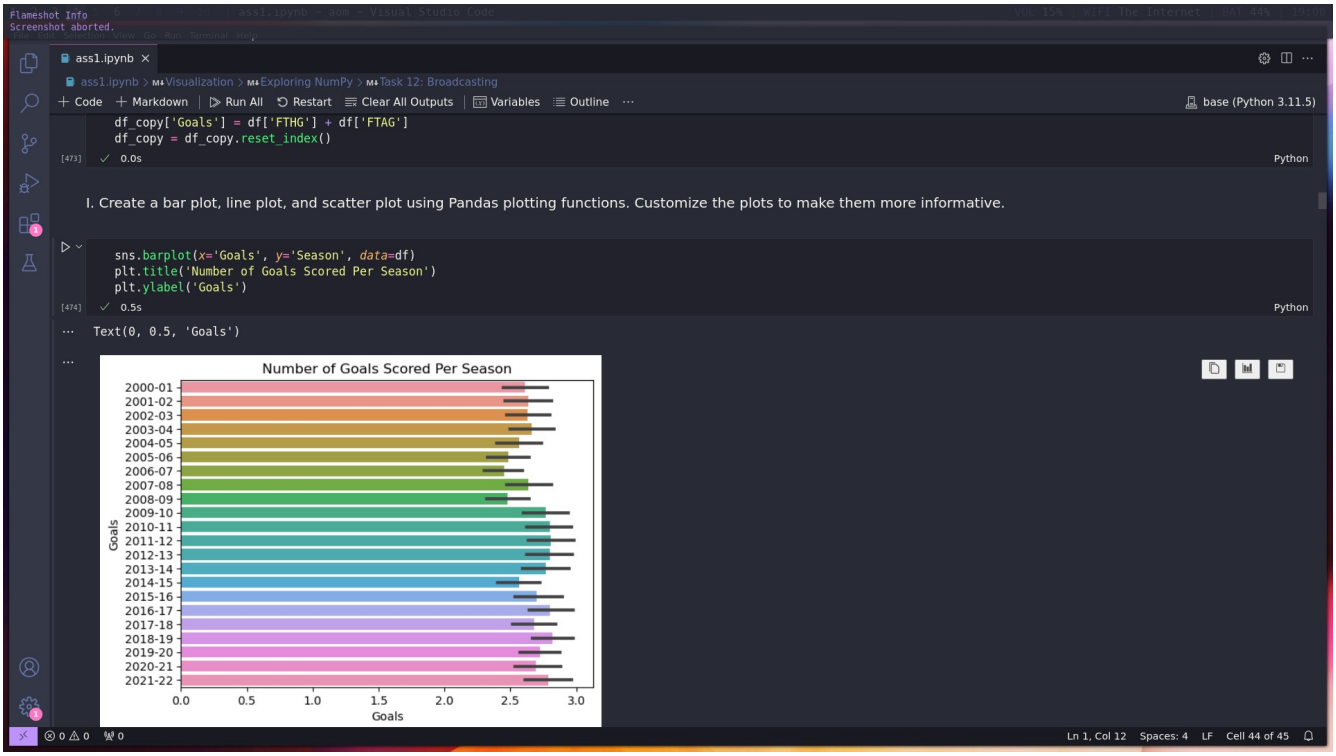
[463] ✓ 0.0s — Python

```
Subset of columns using label-based indexing:
  HomeTeam  AwayTeam  HTR FTR
0  Arsenal  Coventry  NaN   A

Subset of columns using position-based indexing:
   AwayTeam  FTHG Referee  HTHG
0  Coventry     0     NaN   NaN

Filtered DataFrame based on a condition:
    Season             DateTime     HomeTeam AwayTeam  FTHG  FTAG FTR  HTHG  \
1  1993-94  1993-08-14T00:00:00Z  Aston Villa      QPR     4     1   H   NaN

   HTAG  HTR Referee  HS  AS  HST  AST  HC  AC  HF  AF  HY  AY  HR  AR
1   NaN  NaN     NaN NaN NaN  NaN  NaN NaN NaN NaN NaN NaN NaN NaN NaN
```

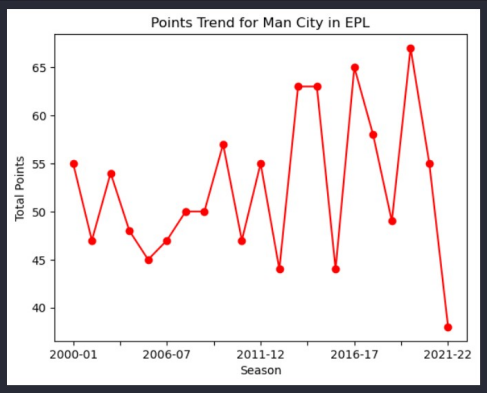

ass1.ipynb – aom – Visual Studio Code
File Edit Selection View Go Run Terminal Help
ass1.ipynb
Code Markdown Run All Restart Clear All Outputs Variables Outline
base (Python 3.11.5)
Data cleansing and preprocessing
#I Handling missing values
df.dropna(inplace=True)
df.head(1)
0.0s
Python
Season DateTime HomeTeam AwayTeam FTHG FTAG FTR HTHG HTAG HTR Referee HS AS HST AST HC AC HF AF HY AY HR AR
2824 2000-01 2000-08-19T00:00:00Z Charlton Man City 4 0 H 2.0 0.0 H Rob Harris 17.0 8.0 14.0 4.0 6.0 6.0 13.0 12.0 1.0 2.0 0.0 0.0
II converting categorical into numerical
df_copy['HSAS'] = df_copy['HS'] + df_copy['AS']
# Converting a categorical (FTR) variable into numerical representation using one-hot encoding
df_onehot = pd.get_dummies(df_copy, columns=['FTR'])
0.0s
Python
df_onehot.head(1)
0.0s
Python
Season DateTime HomeTeam AwayTeam FTHG FTAG HTHG HTAG HTR Referee HS AS HST AST HC AC HF AF HY AY HR AR HSAS FTR_A FTR_
2824 2000-01 2000-08-19T00:00:00Z Charlton Man City 4 0 2.0 0.0 H Rob Harris 17.0 8.0 14.0 4.0 6.0 6.0 13.0 12.0 1.0 2.0 0.0 0.0 25.0 False Fals
#III applying aggregation functions to grouper data
grouped_data = df.groupby('FTR')
aggregated_data = grouped_data.agg({'HS': ['sum', 'mean'], 'AS': 'count'})
print("Aggregated Data:")
Ln 5, Col 35 Spaces: 4 LF Cell 44 of 45


ass1.ipynb – aom – Visual Studio Code
File Edit Selection View Go Run Terminal Help
ass1.ipynb
Code Markdown Run All Restart Clear All Outputs Variables Outline
base (Python 3.11.5)
#III applying aggregation functions to grouper data
grouped_data = df.groupby('FTR')
aggregated_data = grouped_data.agg({'HS': ['sum', 'mean'], 'AS': 'count'})
print("Aggregated Data:")
print(aggregated_data)
0.0s
Python
Aggregated Data:
HS AS
sum mean count
FTR
A 28925.0 11.967315 2417
D 27296.0 13.192847 2069
H 55713.0 14.649750 3803
Merging using different joins
# innerjoin
inner_join = pd.merge(df, df2, how='inner', on='HomeTeam')
# Outer Join
outer_join = pd.merge(df, df2, how='outer', on='HomeTeam')
# Left Join
left_join = pd.merge(df, df2, how='left', on='HomeTeam')
# Right Join
right_join = pd.merge(df, df2, how='right', on='HomeTeam')
7.8s
Python
Ln 1, Col 19 Spaces: 4 LF Cell 44 of 45

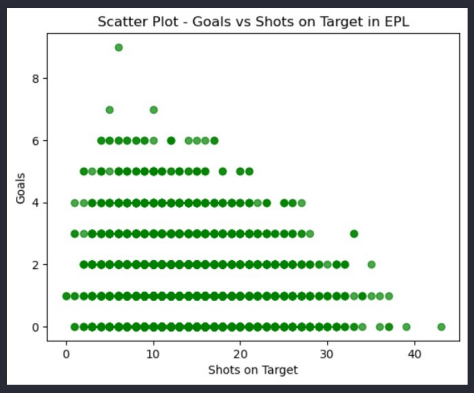

ass1.ipynb – aom – Visual Studio Code
File Edit Selection View Go Run Terminal Help
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
Code Markdown Run All Restart Clear All Outputs Variables Outline
base (Python 3.11.5)
[468] 7.8s Python
inner_join.head(1)
[469] 0.0s Python
Season DateTime HomeTeam AwayTeam_x FTHG_x FTAG_x FTR_x HTHG HTAG HTR Referee HS AS HST AST HC AC HF AF HY AY HR AR HSAS
0 2000-01 2000-08-19T00:00:00Z Charlton Man City 4 0 H 2.0 0.0 H Rob Harris 17.0 8.0 14.0 4.0 6.0 6.0 13.0 12.0 1.0 2.0 0.0 0.0 25.0
outer_join.head(1)
[470] 0.0s Python
Season DateTime HomeTeam AwayTeam_x FTHG_x FTAG_x FTR_x HTHG HTAG HTR Referee HS AS HST AST HC AC HF AF HY AY HR AR HSAS
0 2000-01 2000-08-19T00:00:00Z Charlton Man City 4.0 0.0 H 2.0 0.0 H Rob Harris 17.0 8.0 14.0 4.0 6.0 6.0 13.0 12.0 1.0 2.0 0.0 0.0 25.0
left_join.head(1)
[471] 0.0s Python
Season DateTime HomeTeam AwayTeam_x FTHG_x FTAG_x FTR_x HTHG HTAG HTR Referee HS AS HST AST HC AC HF AF HY AY HR AR HSAS
0 2000-01 2000-08-19T00:00:00Z Charlton Man City 4 0 H 2.0 0.0 H Rob Harris 17.0 8.0 14.0 4.0 6.0 6.0 13.0 12.0 1.0 2.0 0.0 0.0 25.0
right_join.head(1)
[472] 0.0s Python
Season DateTime HomeTeam AwayTeam_x FTHG_x FTAG_x FTR_x HTHG HTAG HTR Referee HS AS HST AST HC AC HF AF HY AY HR AR HSAS
Ln 1, Col 19 Spaces: 4 LF Cell 44 of 45


Flameshot Info
Screenshot aborted.
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
Code Markdown Run All Restart Clear All Outputs Variables Outline
base (Python 3.11.5)
df_copy['Goals'] = df['FTHG'] + df['FTAG']
df_copy = df_copy.reset_index()
[473] 0.0s Python
I. Create a bar plot, line plot, and scatter plot using Pandas plotting functions. Customize the plots to make them more informative.
sns.barplot(x='Goals', y='Season', data=df)
plt.title('Number of Goals Scored Per Season')
plt.ylabel('Goals')
[474] 0.5s Python
Text(0, 0.5, 'Goals')
Number of Goals Scored Per Season
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18
2018-19
2019-20
2020-21
2021-22
Goals
0.0 0.5 1.0 1.5 2.0 2.5 3.0
Goals
Ln 1, Col 12 Spaces: 4 LF Cell 44 of 45

```
selected_team = 'Man City'
team_points_trend = df[df['AwayTeam'] == selected_team].groupby('Season')['Goals'].sum()
team_points_trend.plot(kind='line', marker='o', linestyle='-', color='red')
plt.title(f'Points Trend for {selected_team} in EPL')
plt.xlabel('Season')
plt.ylabel('Total Points')
plt.show()
```




```
plt.scatter(df['HS'], df['FTAG'], color='green', alpha=0.7)
plt.title('Scatter Plot - Goals vs Shots on Target in EPL')
plt.xlabel('Shots on Target')
plt.ylabel('Goals')
plt.show()
```



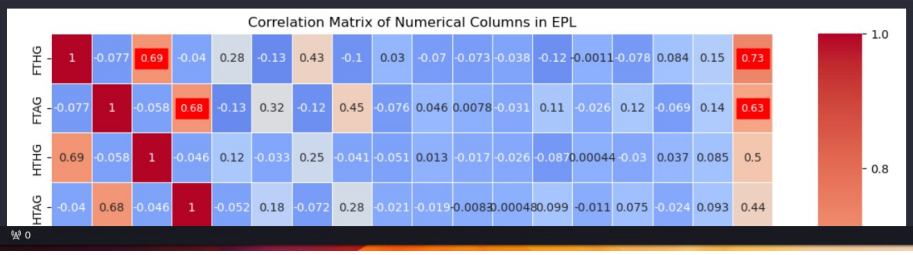
II. Visualize the correlation matrix of numerical columns. Highlight highly correlated features.

ass1.ipynb - aom - Visual Studio Code

II. Visualize the correlation matrix of numerical columns. Highlight highly correlated features.

```
numerical_columns = df.select_dtypes(include=['float64', 'int64']).columns
correlation_matrix = df[numerical_columns].corr()

plt.figure(figsize=(14, 14))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', linewidths=.5)

threshold = 0.6
plt.title('Correlation Matrix of Numerical Columns in EPL')
plt.xlabel('Features')
plt.ylabel('Features')

for i in range(len(correlation_matrix.columns)):
    for j in range(i, len(correlation_matrix.columns)):
        if abs(correlation_matrix.iloc[i, j]) > threshold and i != j:
            plt.text(j + 0.5, i + 0.5, f'{correlation_matrix.iloc[i, j]:.2f}', color='white',
                     ha='center', va='center', fontsize=9, bbox=dict(facecolor='red', edgecolor='red'))

plt.show()
```

[477] ✓ 0.6s Python



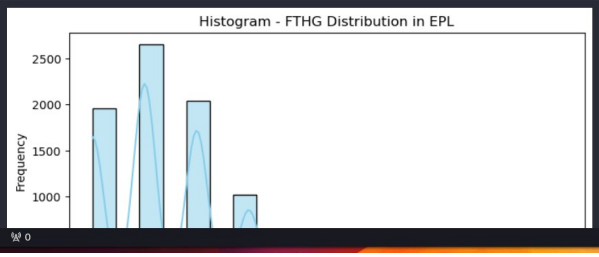
Ln 11, Col 1 Spaces: 4 LF Cell 44 of 45

ass1.ipynb - aom - Visual Studio Code

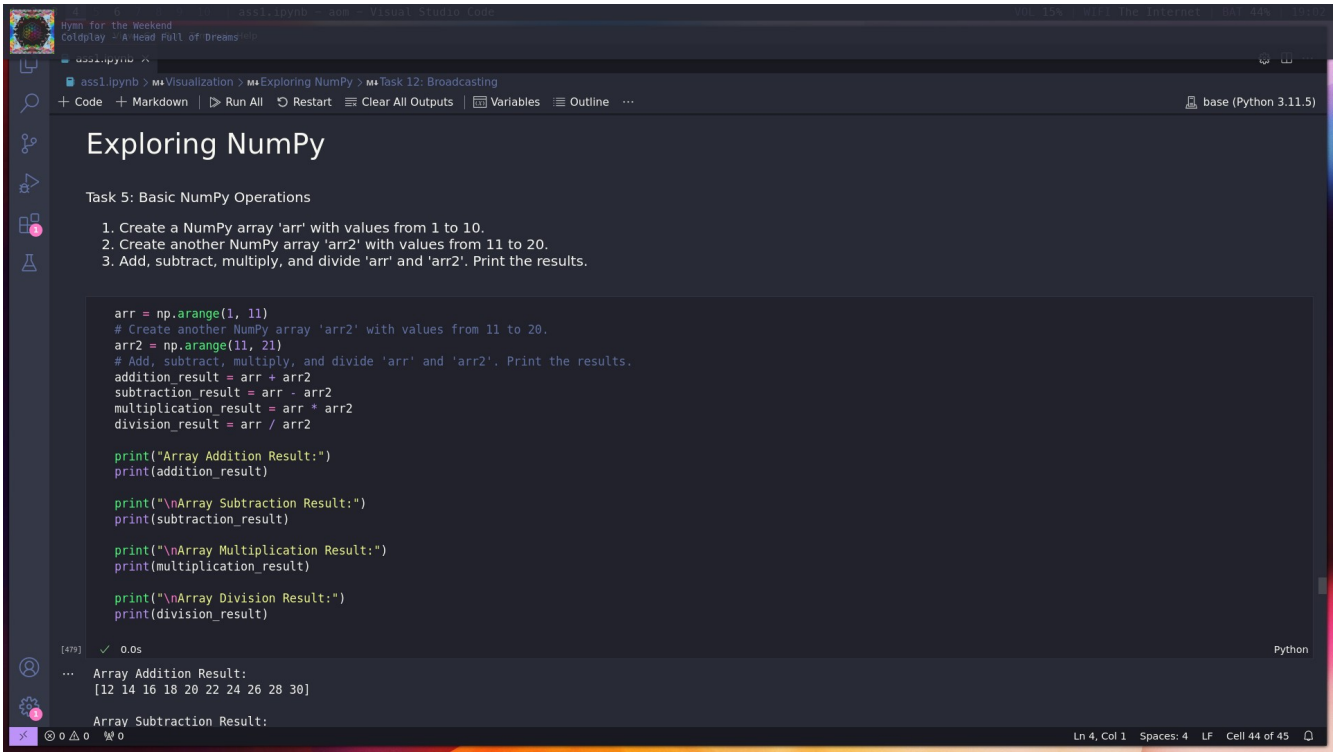
III. Create histograms and box plots for numerical columns. Analyze the distribution and presence of outliers

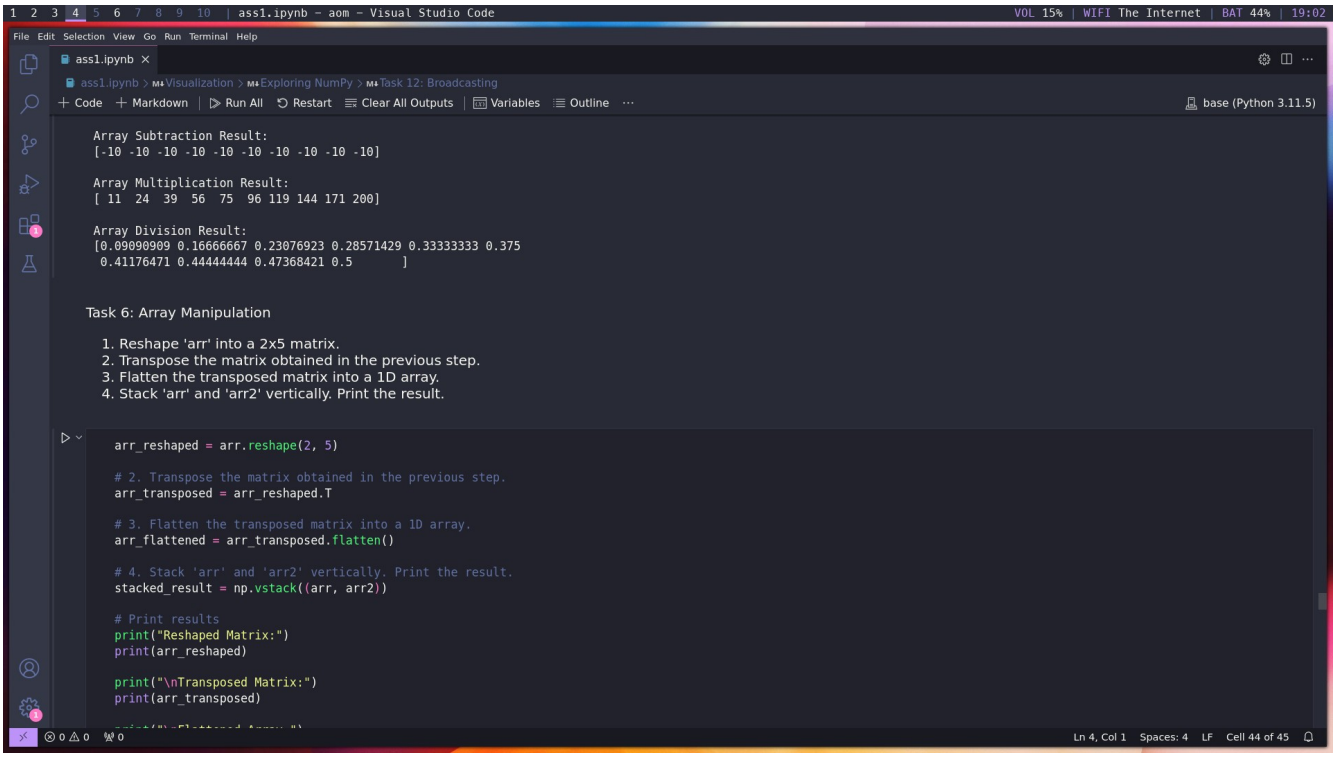
```
numerical_columns = df.select_dtypes(include=['float64', 'int64']).columns

# Create histograms for numerical columns
for column in numerical_columns:
    plt.figure(figsize=(8, 4))
    sns.histplot(df[column], bins=20, kde=True, color='skyblue')
    plt.title(f'Histogram - {column} Distribution in EPL')
    plt.xlabel(column)
    plt.ylabel('Frequency')
    plt.show()

# Create box plots for numerical columns
for column in numerical_columns:
    plt.figure(figsize=(8, 4))
    sns.boxplot(x=df[column], color='lightgreen')
    plt.title(f'Box Plot - {column} Distribution and Outliers in EPL')
    plt.xlabel(column)
    plt.show()
```

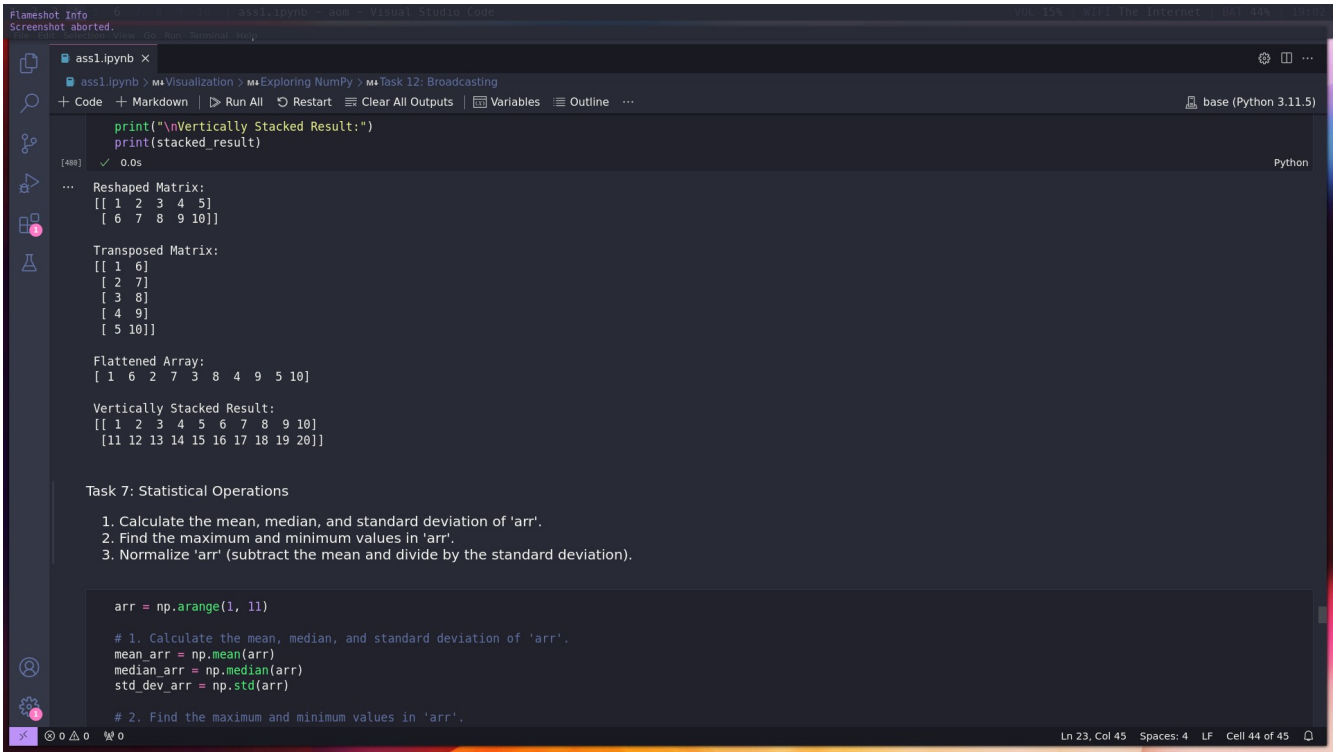
[478] ✓ 4.1s Python

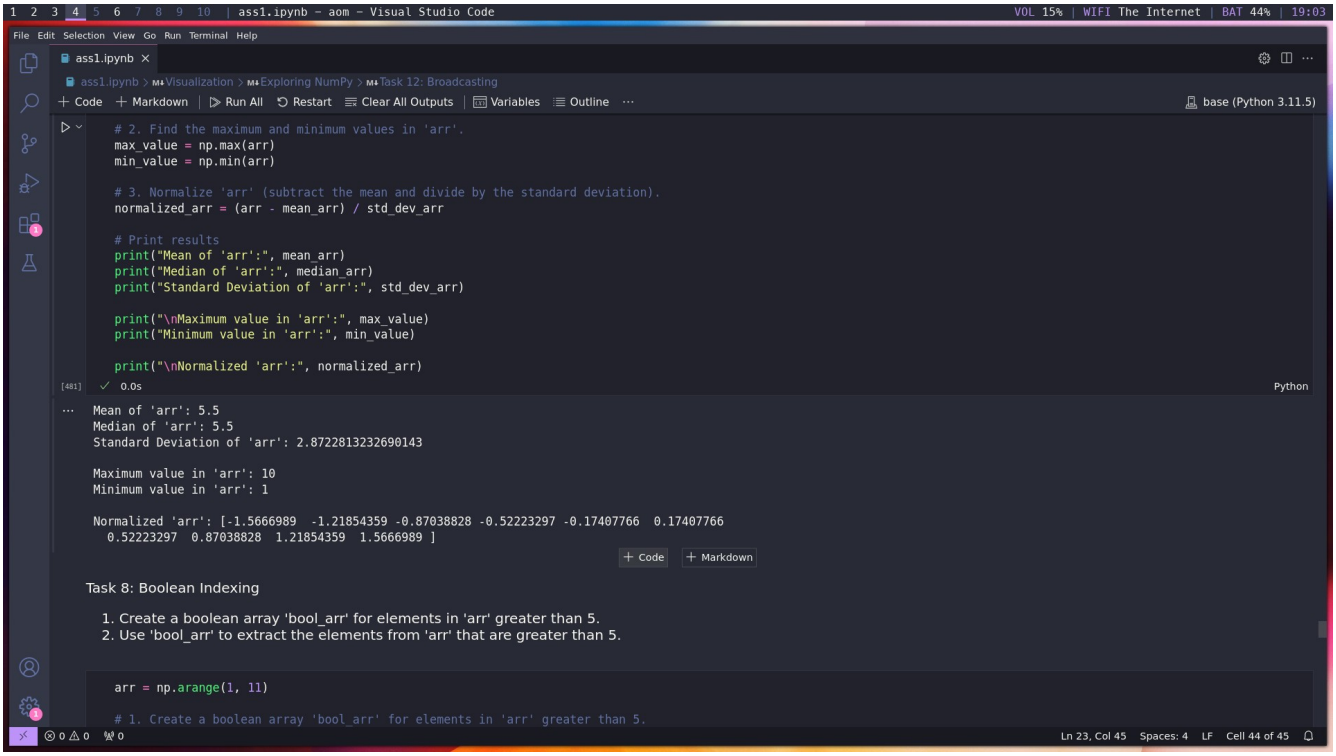


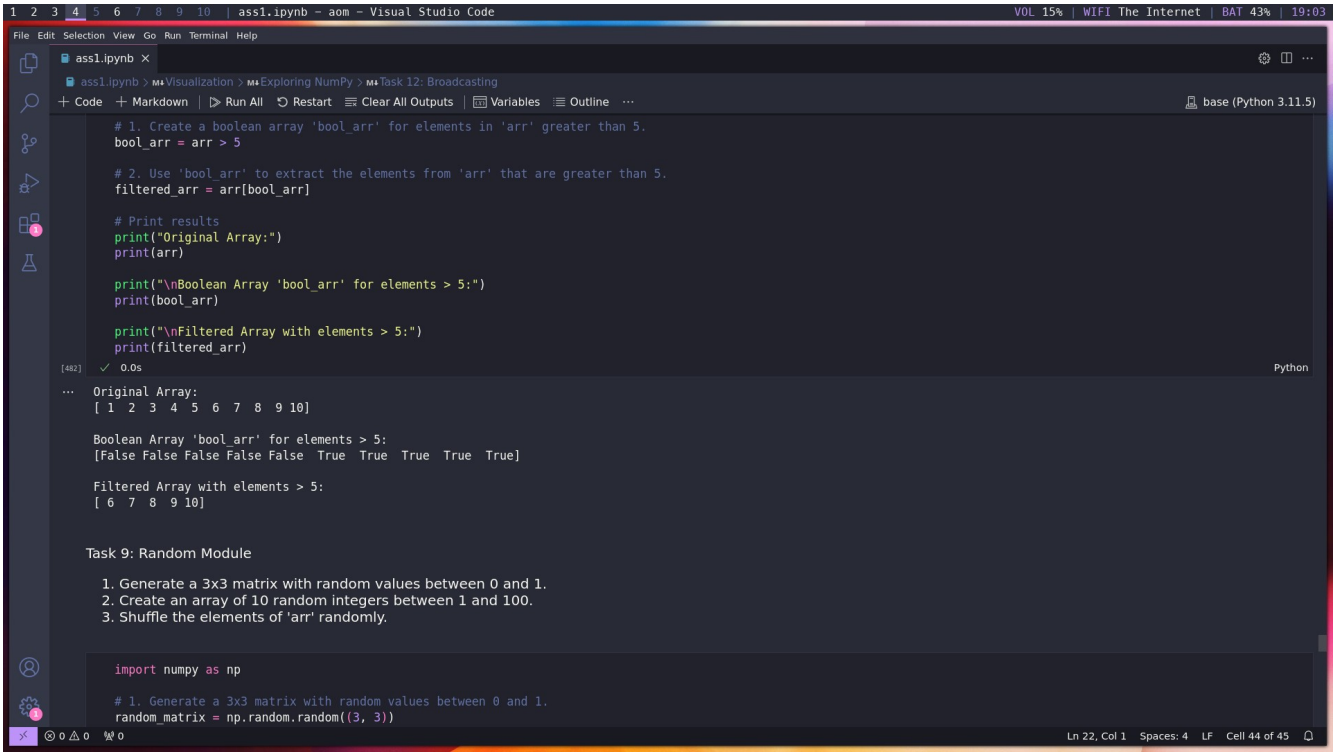
Ln 11, Col 1 Spaces: 4 LF Cell 44 of 45

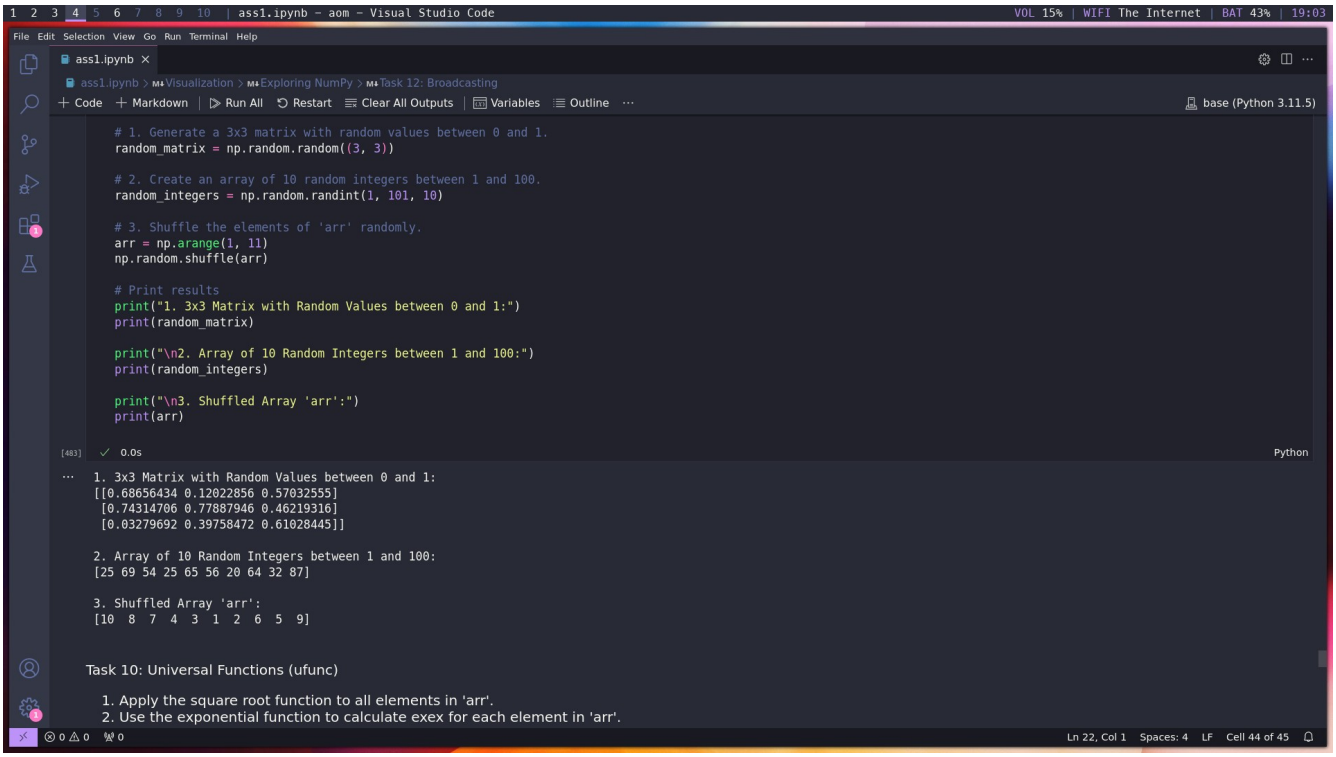

Hymn for the Weekend
Coldplay - A Head Full of Dreams
ass1.ipynb - aom - Visual Studio Code
VOL 15% | WIFI The Internet | BAT 44% | 19:02
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
+ Code + Markdown | Run All | Restart | Clear All Outputs | Variables | Outline ...
base (Python 3.11.5)
Exploring NumPy
Task 5: Basic NumPy Operations
1. Create a NumPy array 'arr' with values from 1 to 10.
2. Create another NumPy array 'arr2' with values from 11 to 20.
3. Add, subtract, multiply, and divide 'arr' and 'arr2'. Print the results.
arr = np.arange(1, 11)
# Create another NumPy array 'arr2' with values from 11 to 20.
arr2 = np.arange(11, 21)
# Add, subtract, multiply, and divide 'arr' and 'arr2'. Print the results.
addition_result = arr + arr2
subtraction_result = arr - arr2
multiplication_result = arr * arr2
division_result = arr / arr2
print("Array Addition Result:")
print(addition_result)
print("\nArray Subtraction Result:")
print(subtraction_result)
print("\nArray Multiplication Result:")
print(multiplication_result)
print("\nArray Division Result:")
print(division_result)
[479] 0.0s
Python
... Array Addition Result:
[12 14 16 18 20 22 24 26 28 30]
Array Subtraction Result:
Ln 4, Col 1 Spaces: 4 LF Cell 44 of 45

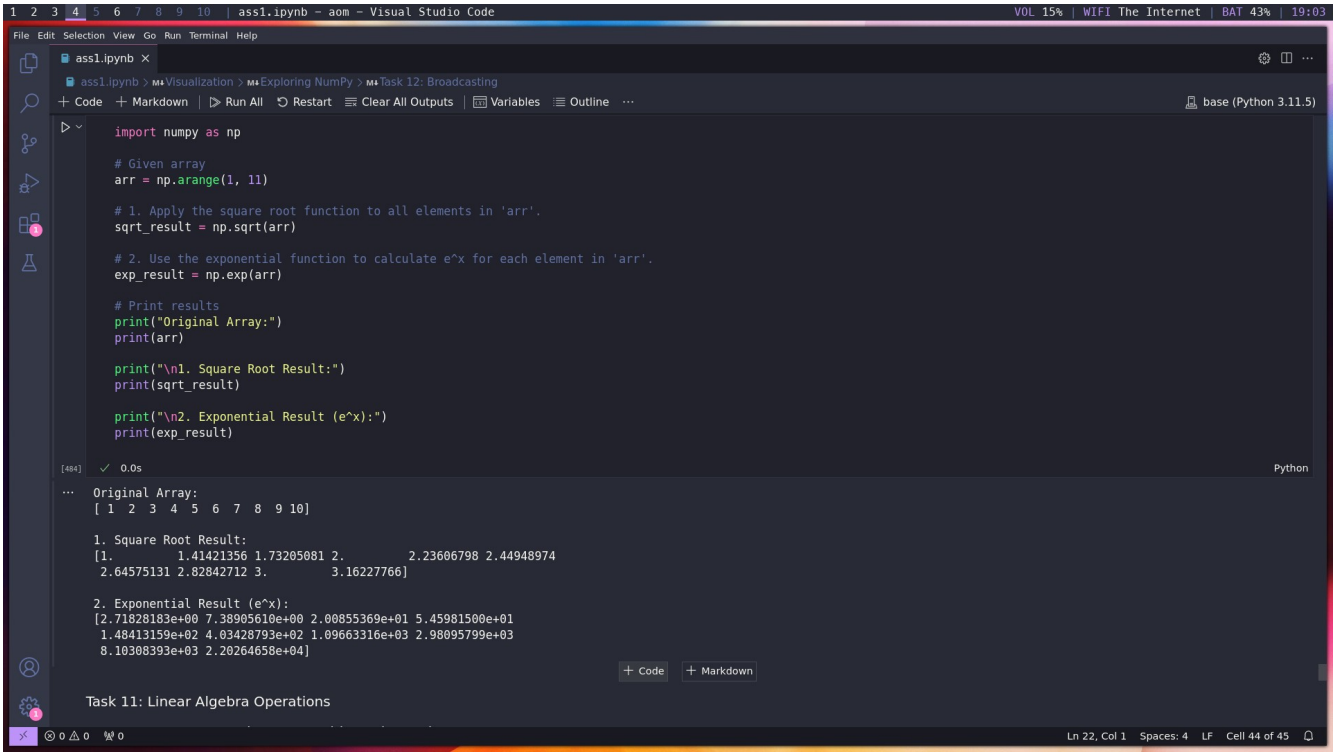

1 2 3 4 5 6 7 8 9 10 | ass1.ipynb - aom - Visual Studio Code
VOL 15% | WIFI The Internet | BAT 44% | 19:02
File Edit Selection View Go Run Terminal Help
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
+ Code + Markdown | Run All | Restart | Clear All Outputs | Variables | Outline ...
base (Python 3.11.5)
Array Subtraction Result:
[-10 -10 -10 -10 -10 -10 -10 -10 -10 -10]
Array Multiplication Result:
[11 24 39 56 75 96 119 144 171 200]
Array Division Result:
[0.09090909 0.16666667 0.23076923 0.28571429 0.33333333 0.375
0.41176471 0.44444444 0.47368421 0.5]
Task 6: Array Manipulation
1. Reshape 'arr' into a 2x5 matrix.
2. Transpose the matrix obtained in the previous step.
3. Flatten the transposed matrix into a 1D array.
4. Stack 'arr' and 'arr2' vertically. Print the result.
arr_reshaped = arr.reshape(2, 5)
# 2. Transpose the matrix obtained in the previous step.
arr_transposed = arr_reshaped.T
# 3. Flatten the transposed matrix into a 1D array.
arr_flattened = arr_transposed.flatten()
# 4. Stack 'arr' and 'arr2' vertically. Print the result.
stacked_result = np.vstack((arr, arr2))
# Print results
print("Reshaped Matrix:")
print(arr_reshaped)
print("\nTransposed Matrix:")
print(arr_transposed)
Ln 4, Col 1 Spaces: 4 LF Cell 44 of 45

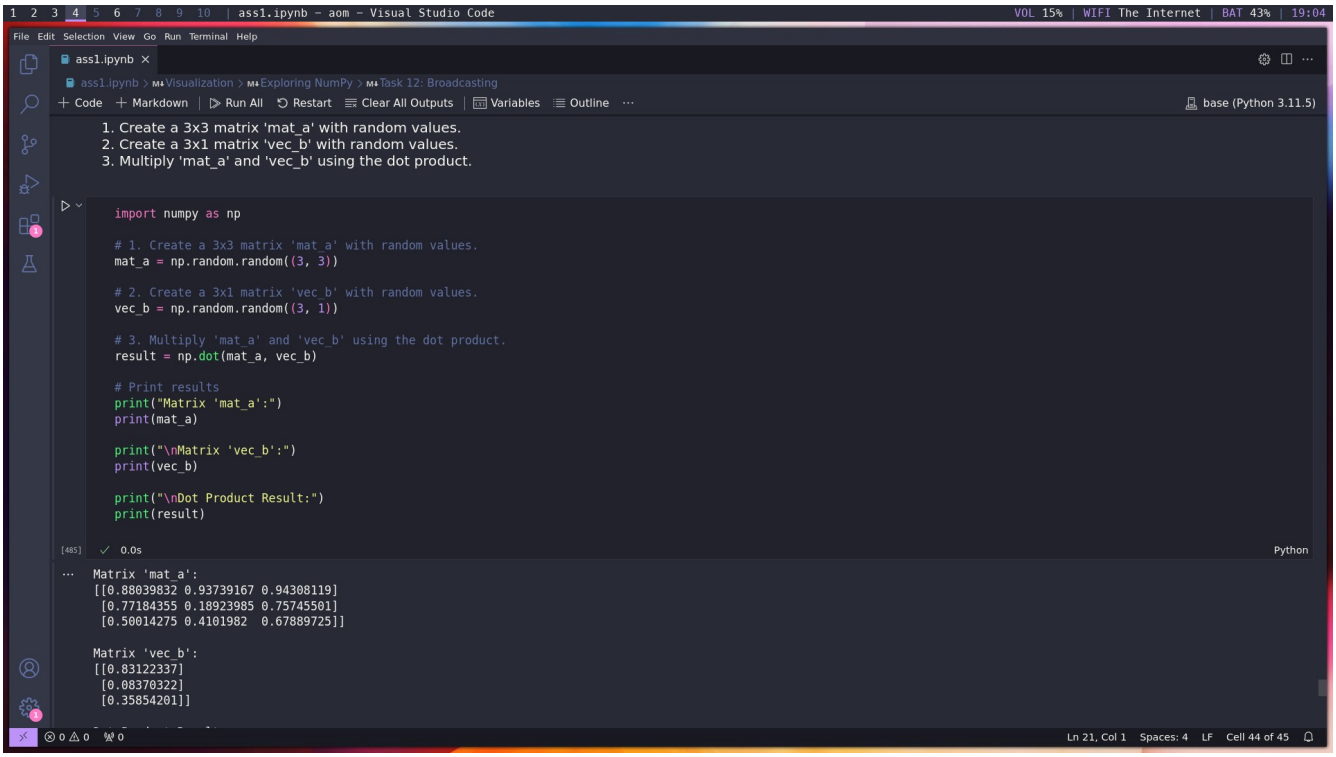

Flameshot Info
Screenshot aborted.
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
Code
Markdown
Run All
Restart
Clear All Outputs
Variables
Outline
base (Python 3.11.5)
print("\nVertically Stacked Result:")
print(stacked_result)
[480]
0.0s
Python
Reshaped Matrix:
[[1 2 3 4 5]
[6 7 8 9 10]]
Transposed Matrix:
[[1 6]
[2 7]
[3 8]
[4 9]
[5 10]]
Flattened Array:
[1 6 2 7 3 8 4 9 5 10]
Vertically Stacked Result:
[[1 2 3 4 5 6 7 8 9 10]
[11 12 13 14 15 16 17 18 19 20]]
Task 7: Statistical Operations
1. Calculate the mean, median, and standard deviation of 'arr'.
2. Find the maximum and minimum values in 'arr'.
3. Normalize 'arr' (subtract the mean and divide by the standard deviation).
arr = np.arange(1, 11)
# 1. Calculate the mean, median, and standard deviation of 'arr'.
mean_arr = np.mean(arr)
median_arr = np.median(arr)
std_dev_arr = np.std(arr)
# 2. Find the maximum and minimum values in 'arr'.
Ln 23, Col 45
Spaces: 4
LF
Cell 44 of 45

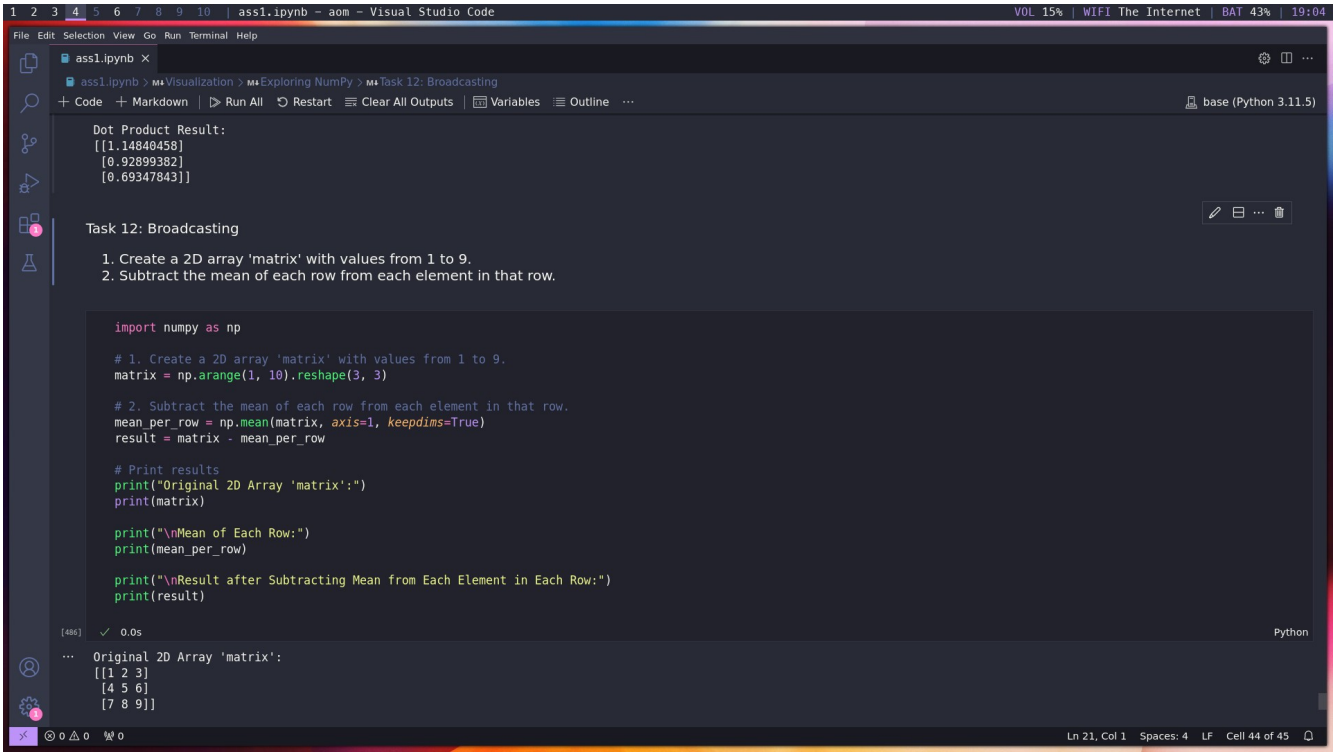

ass1.ipynb - aom - Visual Studio Code
File Edit Selection View Go Run Terminal Help
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
Code
Markdown
Run All
Restart
Clear All Outputs
Variables
Outline
base (Python 3.11.5)
# 2. Find the maximum and minimum values in 'arr'.
max_value = np.max(arr)
min_value = np.min(arr)
# 3. Normalize 'arr' (subtract the mean and divide by the standard deviation).
normalized_arr = (arr - mean_arr) / std_dev_arr
# Print results
print("Mean of 'arr':", mean_arr)
print("Median of 'arr':", median_arr)
print("Standard Deviation of 'arr':", std_dev_arr)
print("\nMaximum value in 'arr':", max_value)
print("Minimum value in 'arr':", min_value)
print("\nNormalized 'arr':", normalized_arr)
[481]
0.0s
Python
Mean of 'arr': 5.5
Median of 'arr': 5.5
Standard Deviation of 'arr': 2.8722813232690143
Maximum value in 'arr': 10
Minimum value in 'arr': 1
Normalized 'arr': [-1.5666989 -1.21854359 -0.87038828 -0.52223297 -0.17407766 0.17407766
0.52223297 0.87038828 1.21854359 1.5666989]
Code
Markdown
Task 8: Boolean Indexing
1. Create a boolean array 'bool_arr' for elements in 'arr' greater than 5.
2. Use 'bool_arr' to extract the elements from 'arr' that are greater than 5.
arr = np.arange(1, 11)
# 1. Create a boolean array 'bool_arr' for elements in 'arr' greater than 5.
Ln 23, Col 45
Spaces: 4
LF
Cell 44 of 45

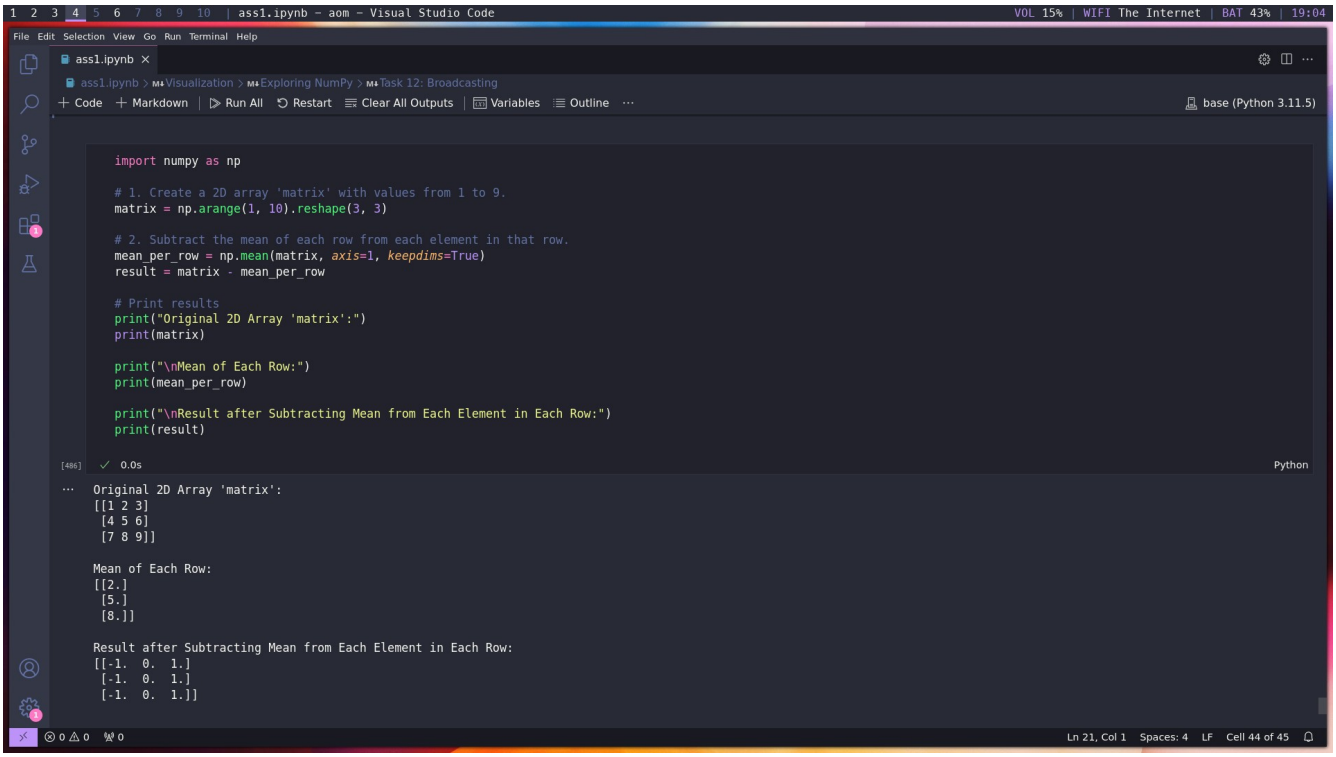

1 2 3 4 5 6 7 8 9 10 | ass1.ipynb - aom - Visual Studio Code
VOL 15% | WIFI The Internet | BAT 43% | 19:03
File Edit Selection View Go Run Terminal Help
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
Code Markdown Run All Restart Clear All Outputs Variables Outline
base (Python 3.11.5)
# 1. Create a boolean array 'bool_arr' for elements in 'arr' greater than 5.
bool_arr = arr > 5
# 2. Use 'bool_arr' to extract the elements from 'arr' that are greater than 5.
filtered_arr = arr[bool_arr]
# Print results
print("Original Array:")
print(arr)
print("\nBoolean Array 'bool_arr' for elements > 5:")
print(bool_arr)
print("\nFiltered Array with elements > 5:")
print(filtered_arr)
[482] 0.0s
Python
Original Array:
[1 2 3 4 5 6 7 8 9 10]
Boolean Array 'bool_arr' for elements > 5:
[False False False False False True True True True True]
Filtered Array with elements > 5:
[6 7 8 9 10]
Task 9: Random Module
1. Generate a 3x3 matrix with random values between 0 and 1.
2. Create an array of 10 random integers between 1 and 100.
3. Shuffle the elements of 'arr' randomly.
import numpy as np
# 1. Generate a 3x3 matrix with random values between 0 and 1.
random_matrix = np.random.random((3, 3))
Ln 22, Col 1 Spaces: 4 LF Cell 44 of 45


1 2 3 4 5 6 7 8 9 10 | ass1.ipynb - aom - Visual Studio Code
VOL 15% | WIFI The Internet | BAT 43% | 19:03
File Edit Selection View Go Run Terminal Help
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
Code Markdown Run All Restart Clear All Outputs Variables Outline
base (Python 3.11.5)
# 1. Generate a 3x3 matrix with random values between 0 and 1.
random_matrix = np.random.random((3, 3))
# 2. Create an array of 10 random integers between 1 and 100.
random_integers = np.random.randint(1, 101, 10)
# 3. Shuffle the elements of 'arr' randomly.
arr = np.arange(1, 11)
np.random.shuffle(arr)
# Print results
print("1. 3x3 Matrix with Random Values between 0 and 1:")
print(random_matrix)
print("\n2. Array of 10 Random Integers between 1 and 100:")
print(random_integers)
print("\n3. Shuffled Array 'arr':")
print(arr)
[483] 0.0s
Python
1. 3x3 Matrix with Random Values between 0 and 1:
[[0.68656434 0.12022856 0.57032555]
[0.74314706 0.77887946 0.46219316]
[0.03279692 0.39758472 0.61028445]]
2. Array of 10 Random Integers between 1 and 100:
[25 69 54 25 65 56 20 64 32 87]
3. Shuffled Array 'arr':
[10 8 7 4 3 1 2 6 5 9]
Task 10: Universal Functions (ufunc)
1. Apply the square root function to all elements in 'arr'.
2. Use the exponential function to calculate exex for each element in 'arr'.
Ln 22, Col 1 Spaces: 4 LF Cell 44 of 45


ass1.ipynb - aom - Visual Studio Code
File Edit Selection View Go Run Terminal Help
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
Code Markdown Run All Restart Clear All Outputs Variables Outline
base (Python 3.11.5)
import numpy as np
# Given array
arr = np.arange(1, 11)
# 1. Apply the square root function to all elements in 'arr'.
sqrt_result = np.sqrt(arr)
# 2. Use the exponential function to calculate e^x for each element in 'arr'.
exp_result = np.exp(arr)
# Print results
print("Original Array:")
print(arr)
print("\n1. Square Root Result:")
print(sqrt_result)
print("\n2. Exponential Result (e^x):")
print(exp_result)
[484] 0.0s
Python
Original Array:
[1 2 3 4 5 6 7 8 9 10]
1. Square Root Result:
[1. 1.41421356 1.73205081 2. 2.23606798 2.44948974
2.64575131 2.82842712 3. 3.16227766]
2. Exponential Result (e^x):
[2.71828183e+00 7.38905610e+00 2.00855369e+01 5.45981500e+01
1.48413159e+02 4.03428793e+02 1.09663316e+03 2.98095799e+03
8.10308393e+03 2.20264658e+04]
Code Markdown
Task 11: Linear Algebra Operations
Ln 22, Col 1 Spaces: 4 LF Cell 44 of 45


ass1.ipynb - aom - Visual Studio Code
File Edit Selection View Go Run Terminal Help
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
Code Markdown Run All Restart Clear All Outputs Variables Outline
base (Python 3.11.5)
1. Create a 3x3 matrix 'mat_a' with random values.
2. Create a 3x1 matrix 'vec_b' with random values.
3. Multiply 'mat_a' and 'vec_b' using the dot product.
import numpy as np
# 1. Create a 3x3 matrix 'mat_a' with random values.
mat_a = np.random.random((3, 3))
# 2. Create a 3x1 matrix 'vec_b' with random values.
vec_b = np.random.random((3, 1))
# 3. Multiply 'mat_a' and 'vec_b' using the dot product.
result = np.dot(mat_a, vec_b)
# Print results
print("Matrix 'mat_a':")
print(mat_a)
print("\nMatrix 'vec_b':")
print(vec_b)
print("\nDot Product Result:")
print(result)
[485] 0.0s
Python
Matrix 'mat_a':
[[0.88039832 0.93739167 0.94308119]
[0.77184355 0.18923985 0.75745501]
[0.50014275 0.4101982 0.67889725]]
Matrix 'vec_b':
[[0.83122337]
[0.08370322]
[0.35854201]]
Ln 21, Col 1 Spaces: 4 LF Cell 44 of 45


1 2 3 4 5 6 7 8 9 10 | ass1.ipynb - aom - Visual Studio Code
VOL 15% | WIFI The Internet | BAT 43% | 19:04
File Edit Selection View Go Run Terminal Help
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
+ Code + Markdown | Run All Restart Clear All Outputs | Variables Outline ...
base (Python 3.11.5)
Dot Product Result:
[[1.14840458]
[0.92899382]
[0.69347843]]
Task 12: Broadcasting
1. Create a 2D array 'matrix' with values from 1 to 9.
2. Subtract the mean of each row from each element in that row.
import numpy as np
# 1. Create a 2D array 'matrix' with values from 1 to 9.
matrix = np.arange(1, 10).reshape(3, 3)
# 2. Subtract the mean of each row from each element in that row.
mean_per_row = np.mean(matrix, axis=1, keepdims=True)
result = matrix - mean_per_row
# Print results
print("Original 2D Array 'matrix':")
print(matrix)
print("\nMean of Each Row:")
print(mean_per_row)
print("\nResult after Subtracting Mean from Each Element in Each Row:")
print(result)
[486] 0.0s
Python
Original 2D Array 'matrix':
[[1 2 3]
[4 5 6]
[7 8 9]]
0 0 0
Ln 21, Col 1 Spaces: 4 LF Cell 44 of 45


1 2 3 4 5 6 7 8 9 10 | ass1.ipynb - aom - Visual Studio Code
VOL 15% | WIFI The Internet | BAT 43% | 19:04
File Edit Selection View Go Run Terminal Help
ass1.ipynb
ass1.ipynb > Visualization > Exploring NumPy > Task 12: Broadcasting
+ Code + Markdown | Run All Restart Clear All Outputs | Variables Outline ...
base (Python 3.11.5)
import numpy as np
# 1. Create a 2D array 'matrix' with values from 1 to 9.
matrix = np.arange(1, 10).reshape(3, 3)
# 2. Subtract the mean of each row from each element in that row.
mean_per_row = np.mean(matrix, axis=1, keepdims=True)
result = matrix - mean_per_row
# Print results
print("Original 2D Array 'matrix':")
print(matrix)
print("\nMean of Each Row:")
print(mean_per_row)
print("\nResult after Subtracting Mean from Each Element in Each Row:")
print(result)
[486] 0.0s
Python
Original 2D Array 'matrix':
[[1 2 3]
[4 5 6]
[7 8 9]]
Mean of Each Row:
[[2.]
[5.]
[8.]]
Result after Subtracting Mean from Each Element in Each Row:
[[-1. 0. 1.]
[-1. 0. 1.]
[-1. 0. 1.]]
0 0 0
Ln 21, Col 1 Spaces: 4 LF Cell 44 of 45