Department of Engineering Sciences and Technology,

Second Year Btech in Computer Science

Project Based Learning-Python

Assignment - 10

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Problem statement : **Write a program to create two NumPy arrays and perform element-wise addition, subtraction, multiplication, and division. Use universal functions to compute square root, logarithm, and exponential of array elements.**

Pre-requisites:Knowledge of NumPy for array manipulations.

Understanding of universal functions (`ufuncs`) like `sqrt`, `log`, and `exp`.

Installed NumPy library (`pip install numpy`).

Code:

```
# Import NumPy library

import numpy as np



# Create two NumPy arrays

array1 = np.array([1, 4, 9, 16, 25])

array2 = np.array([5, 10, 15, 20, 25])



print("Array 1:")
```

```
print(array1)


print("\nArray 2:")
print(array2)


# Perform element-wise operations
addition = np.add(array1, array2)
subtraction = np.subtract(array1, array2)
multiplication = np.multiply(array1, array2)
division = np.divide(array1, array2)


print("\nElement-wise Addition:")
print(addition)


print("\nElement-wise Subtraction:")
print(subtraction)


print("\nElement-wise Multiplication:")
print(multiplication)


print("\nElement-wise Division:")
print(division)


# Universal functions
sqrt_array1 = np.sqrt(array1)
log_array1 = np.log(array1)  # Natural logarithm (base e)
exp_array1 = np.exp(array1)


print("\nSquare Root of Array 1:")
print(sqrt_array1)
```

```
print("\nNatural Logarithm (ln) of Array 1:")

print(log_array1)


print("\nExponential (e^x) of Array 1:")

print(exp_array1)
```

Explanation :

Creating Arrays:

- `np.array([1, 4, 9, 16, 25])`: Creates a NumPy array with specific values for `array1`.
- `np.array([5, 10, 15, 20, 25])`: Creates another NumPy array for `array2`.

Element-wise Operations:

- `np.add`, `np.subtract`, `np.multiply`, `np.divide`: Perform addition, subtraction, multiplication, and division element by element.

Universal Functions:

- `np.sqrt`: Computes the square root of each element in the array.
- `np.log`: Calculates the natural logarithm (base e) of each element.
- `np.exp`: Computes the exponential function exe^xex for each element.

Output:

```
Array 1:
[ 1  4  9 16 25]

Array 2:
[ 5 10 15 20 25]

Element-wise Addition:
[ 6 14 24 36 50]

Element-wise Subtraction:
[ -4  -6  -6  -4   0]

Element-wise Multiplication:
[  5  40 135 320 625]

Element-wise Division:
[0.2 0.4 0.6 0.8 1. ]

Square Root of Array 1:
[1. 2. 3. 4. 5.]

Natural Logarithm (ln) of Array 1:
[0.         1.38629436 2.19722458 2.77258872 3.21887582]

Exponential (e^x) of Array 1:
[2.71828183e+00 5.45981500e+01 8.10308393e+03 8.88611052e+06
 7.20048993e+10]
```

Output Explained:

Element-wise Operations:

- Each operation is performed index-by-index between `array1` and `array2`.

Square Root:

- Computes the square root of each element in `array1`.

Logarithm:

- Calculates ln(x)\ln(x)ln(x) (natural logarithm) for each element in `array1`.

Exponential:

- Computes exe^xex for each element in `array1`, resulting in very large values for larger elements.