Ex.No-1 NUMPY

AIM:

To calculate the values for the mathematical formulas using NumPy library

INTEGRATED DEVELOPMENT ENVIRONMENT (IDE) REQUIRED:

JUPYTER NOTEBOOK

REQUIRED LIBRARIES FOR PYTHON:

Numpy

PROCEDURE:

A) Euclidean distance

The mathematical formula for calculating the Euclidean distance between 2 points in 2D space:

$$d(p,q) = \sqrt[2]{(q_1-p_1)^2 + (q_2-p_2)^2}$$

B) Dot Product

$$u = \begin{bmatrix} 5 \\ 12 \end{bmatrix}, \quad v = \begin{bmatrix} 8 \\ 6 \end{bmatrix}$$

Dot product is
$$u \cdot v = u_1 imes v_1 + u_2 imes v_2$$

$$= 5 imes 8 + 12 imes 6$$

$$= 112$$

C) Solving a System of Linear Equations

A system of linear equations can be represented in matrix form as AX=B, where A is the matrix of coefficients, X is the column vector of variables, and B is the column vector of solutions. To solve for \mathbf{X} , we can use: $X=A^{-1}$ B assuming A is invertible.

PROGRAM:

A) Calculating the Euclidean Distance Between Two Points

importnumpy as np

defeuclidean_distance(p, q):

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returnnp.sqrt(np.sum((q - p) ** 2))

# Example usage

p = np.array([1, 2])

q = np.array([4, 6])

distance = euclidean_distance(p, q)

print("Output for Calculating the Euclidean Distance Between Two Points is: ",distance)

B) Calculating the Dot Product of Two Vectors
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importnumpy as np

A = np.array([1, 3, -5])

B = np.array([4, -2, -1])

 $dot_product = np.dot(A, B)$

print("Output for dot product of two vectors A and B is ",dot_product)

C) Solving a System of Linear Equations

importnumpy as np

Coefficients matrix A and result vector b

A = np.array([[3, 1], [1, 2]])

b = np.array([9, 8])

Solve for x

x = np.linalg.solve(A, b)

print("Output solution of System of Linear Equations is ",x)

Output:

A)Output for Calculating the Euclidean Distance between Two Points is: 5.0. Exercise 2-B)Output for dot product of two vectors A and B is 3

C)Output solution of System of Linear Equations is [2. 3.]

Result:

The programs were run successfully