# Bahria University,

## Karachi Campus



LAB EXPERIMENT NO.

**\_06\_**

LIST OF TASKS

|  |  |
| --- | --- |
| **TASK NO** | **OBJECTIVE** |
| 01 | Write a python program implementing the newton’s difference formula that considers the following data points, and   * 1. Find the value of y at x = 301   2. Find the value of y at any given user input  |  |  |  |  |  | | --- | --- | --- | --- | --- | | x | 300 | 304 | 305 | 307 | | y | 2.4771 | 2.4829 | 2.4843 | 2.4871 | |
| 02 | Write a Python program that implements Newton's difference formula, reads the CSV file 'salary\_data,' and considers 'years of experience' as x and 'salary' as y. Then, upon user input for a specific number of years of experience, it provides an output of the salary they would receive. |

Submitted On:

Date: 25/10/2024

**Task No 01:**

Write a python program implementing the newton’s difference formula that considers the following data points, and

* 1. Find the value of y at x = 301
  2. Find the value of y at any given user input

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | 300 | 304 | 305 | 307 |
| y | 2.4771 | 2.4829 | 2.4843 | 2.4871 |

**Solution:**

def divided\_difference(x, y):

    n = len(y)

    diff\_table = [[0] \* n for \_ in range(n)]

    for i in range(n):

        diff\_table[i][0] = y[i]

    for j in range(1, n):

        for i in range(n - j):

            diff\_table[i][j] = (diff\_table[i + 1][j - 1] - diff\_table[i][j - 1]) / (x[i + j] - x[i])

    return diff\_table

def newtons\_interpolation(x, y, value):

    n = len(x)

    diff\_table = divided\_difference(x, y)

    result = diff\_table[0][0]

    product\_term = 1

    for i in range(1, n):

        product\_term \*= (value - x[i - 1])

        result += diff\_table[0][i] \* product\_term

    return result

x\_values = [300, 304, 305, 307]

y\_values = [2.4771, 2.4829, 2.4843, 2.4871]

# a. Find the value of y at x = 301

y\_at\_301 = newtons\_interpolation(x\_values, y\_values, 301)

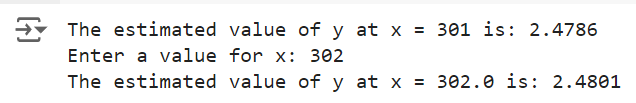
print(f"The estimated value of y at x = 301 is: {y\_at\_301:.4f}")

user\_input = float(input("Enter a value for x: "))

y\_at\_user\_input = newtons\_interpolation(x\_values, y\_values, user\_input)

print(f"The estimated value of y at x = {user\_input} is: {y\_at\_user\_input:.4f}")

**Output:**

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**Task No 02:** Write a Python program that implements Newton's difference formula, reads the CSV file 'salary\_data,' and considers 'years of experience' as x and 'salary' as y. Then, upon user input for a specific number of years of experience, it provides an output of the salary they would receive.

**Solution:**

def divided\_diff\_table(x, y, n):

    table = [[0 for \_ in range(n)] for \_ in range(n)]

    for i in range(n):

        table[i][0] = y[i]

    for j in range(1, n):

        for i in range(n - j):

            table[i][j] = (table[i+1][j-1] - table[i][j-1]) / (x[i+j] - x[i])

    return table

def newton\_interpolation(x, y, value):

    n = len(x)

    table = divided\_diff\_table(x, y, n)

    result = table[0][0]

    product\_term = 1

    for i in range(1, n):

        product\_term \*= (value - x[i-1])

        result += product\_term \* table[0][i]

    return result

x = [1, 2, 3, 4, 5]

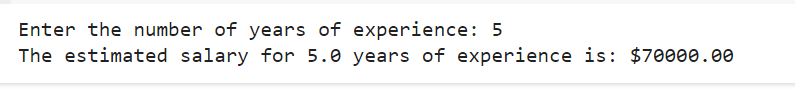
y = [45000, 50000, 60000, 65000, 70000]

years\_of\_experience = float(input("Enter the number of years of experience: "))

estimated\_salary = newton\_interpolation(x, y, years\_of\_experience)

print(f"The estimated salary for {years\_of\_experience} years of experience is: ${estimated\_salary:.2f}")

**Output:**

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