Linear Interpolation

# Abstract

The purpose of this exercise is to calculate the linear interpolation of a variable within an array. The assignment stated that we need to fill in the blanks of the array with the calculated output of rainfall.

# Problem Statement

We are demonstrating the use of variables within python to calculate an outcome based upon a linear interpolation of a point within a list also known as an array. The following variables are needed to calculate the outcome are xp, fp, and i. A table with variables and formulas are listed below.

Table : Variables used with use cases.

|  |  |
| --- | --- |
| Variable | Use Case |
| xp | First Array (hours) |
| fp | Second Array for rainfall in (inches) |
| i | Location Index with-in the for loop |

# Methodology

Using Python to process the problem with the included numpy library were used to handle all calculations needed. A for loop allowed us to loop through each number within the assignment filling the holes in the table of expected rainfall.

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Interpolation

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EGN3214 - Assignment 2

Variables:

xp = list of rain fall in hours

fp = list of rain fall in inches

i = throw away variable for hours

plural = logic for hours or hour depending on the amout of time entered

'''

import numpy as np

xp = [0, 1, 2, 5, 7, 8, 10, 12, 15]

fp = [0, 0.4, 0.6, 1.3, 2.1, 2.9, 3.4, 3.7, 3.9]

while True:

question = input('Enter Time in hours (M)anually or use (A)ssignment Times (M or A)? ').upper()

if question == 'A':

for i in range(1,16):

if i > 1:

plural = 'hours'

else:

plural = 'hour'

print(f'The rain fall for {i} {plural} is {np.interp(i, xp, fp):.2f} inches.')

break

if question == 'M':

i = float(input('Enter Time in hours (number can be a float) '))

if i > 1:

plural = 'hours'

else:

plural = 'hour'

print(f'The rain fall for {i} {plural} is {np.interp(i, xp, fp):.2f} inches.')

break

# Solution

Using the information given within the Assignment the calculated values are provided below in the table indicated by bold red text. When the code is executed for the first time you are asked if you want to run Assignment Problem or Manually enter your own input to be calculated using ‘M’ or ‘A’. Note for when running a manual value, it can be indicated by either an integer or a float number.

Table : Calculated Output for Rain Fall in Inches.

|  |  |
| --- | --- |
| **Rain Fall in Hours (xp)** | **Rain Fall in Inches (fp)** |
| 0 | 0 |
| 1 | 0.40 |
| 2 | 0.60 |
| **3** | **0.83** |
| **4** | **1.07** |
| 5 | 1.30 |
| **6** | **1.70** |
| 7 | 2.10 |
| 8 | 2.90 |
| **9** | **3.15** |
| 10 | 3.40 |
| **11** | **3.55** |
| 12 | 3.70 |
| **13** | **3.77** |
| **14** | **3.83** |
| 15 | 3.90 |

The way the function works is by checking to see if the Rain Fall in Hours variable is greater than the next variable with-in the array. If it is greater than the next variable, then it calculates the Rain Fall in Inches by knowing the index of where the variable is within relation to the known variables.

# Conclusion

By calculating the missing variable in Rain Fall in Hours it allows us to see how linear interpolation works when interpolating the missing variables. Thus, allowing us to find unknowns based on known variables.