

Problem-Based Learning

Python 3

Lecture: 05-for (2)

Online Python

- <https://www.programiz.com/python-programming/online-compiler/>

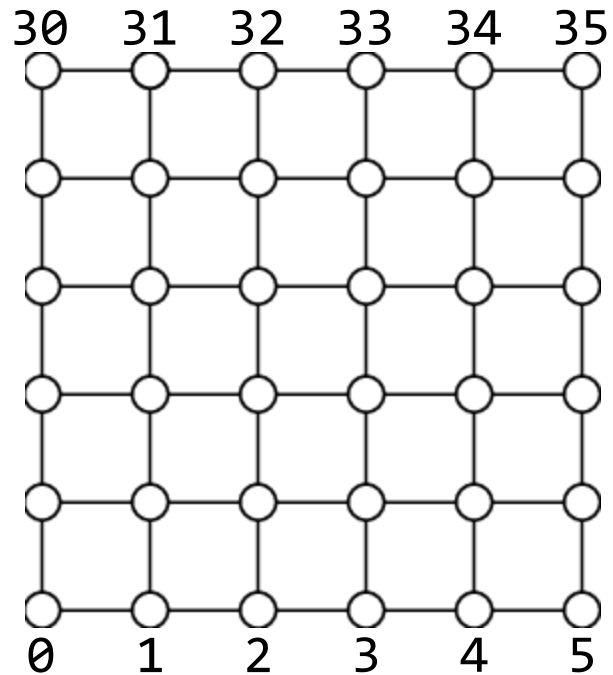
Lecture Notes

- <https://web.phy.ntnu.edu.tw/~hongyi/?url=notes>



Problem

使用for、if、print



$0 \rightarrow (0, 0)$
 $1 \rightarrow (1, 0)$
 $2 \rightarrow (2, 0)$

$33 \rightarrow (3, 5)$
 $34 \rightarrow (4, 5)$
 $35 \rightarrow (5, 5)$

I	(x,y)	+x	+y
0	(0,0)	1	6
1	(1,0)	2	7
2	(2,0)	3	8
33	(3,5)	34	3
34	(4,5)	35	4
35	(5,5)	30	5

建立Table和使用者輸入

- `import numpy as np`
- `i_x = np.zeros(36, dtype=int)`
- `i_y = np.zeros(36, dtype=int)`
- `i_px = np.zeros(36, dtype=int)`
- `i_py = np.zeros(36, dtype=int)`
- `For y in range(6):`
 - `for x in range(6):`
 - `i =`
 - `i_x[i] = x`
 - `i_y[i] = y`
 - `:`
- `while True:`
 - `C = input("Enter 0-35 or 'done' to finish? ")`
 - `if C.lower() == "done":`
 - `break`
 - `try:`
 - `i = int(C)`
 - `print(i, i_x[i], i_y[i], i_px[i], i_py[i])`
 - `except:`
 - `print("Not a number!")`

矩陣

- Write a program to use **for loop** to calculate the multiplication of two matrices:

$$\begin{pmatrix} 0.1 & 0.2 & 0.3 \\ 0.2 & 0.3 & 0.4 \\ 0.3 & 0.4 & 0.5 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{pmatrix}$$

矩陣 matrix

- 3 維矩陣有 9 個變數

$$\mathbf{a} = \begin{pmatrix} a_{00} & a_{01} & a_{02} \\ a_{10} & a_{11} & a_{12} \\ a_{20} & a_{21} & a_{22} \end{pmatrix}$$

- Python把 3 維矩陣看成 3 個向量組成

$$\mathbf{a} = \begin{pmatrix} \vec{a}_0 \\ \vec{a}_1 \\ \vec{a}_2 \end{pmatrix}, \quad \begin{aligned} \vec{a}_0 &= (a_{00} & a_{01} & a_{02}) \\ \vec{a}_1 &= (a_{10} & a_{11} & a_{12}) \\ \vec{a}_2 &= (a_{20} & a_{21} & a_{22}) \end{aligned}$$

- `import numpy as np`
 - `a = np.array([[1,2,3], [4,5,6], [7,8,9]])`
 - `print(a)`
 - `print(a[1][2])`
- $a[i][j]$
-

矩陣向量內積 matrix dot vector

- `import numpy as np`
 - `a = np.array([[1,2,3], [4,5,6], [7,8,9]])`
 - `b = np.array([0.3,0.5,0.7])`
 - `c = np.zeros(3)`
 - `for i in range(3):`
 - `sum = 0`
 - `for j in range(3):`
 - `sum = sum + a[i][j] * b[j]`
 - `c[i] = sum`
 - `print(c)`
- [1.8 7.5 16.8]

矩陣相加 matrix addition

- `import numpy as np`
 - `a = np.array([[1,2,3], [4,5,6], [7,8,9]])`
 - `b = np.array([[0.3,0.5,0.7], [0.1,0.2,0.3], [0.2,0.3,0.4]])`
 - `c = np.zeros((3,3))`
 - `for i in range(3):`
 - `for j in range(3):`
 - `c[i][j] = a[i][j] + b[i][j]`
 - `print(c)`
- `[[1.3 2.5 3.7]`
 - `[4.1 5.2 6.3]`
 - `[7.2 8.3 9.4]]`

術語

電腦：

- 陣列(array)

人：

- 向量(vector)
- 矩陣(matrix)
- 張量(tensor)

Problem

- Write a program to use **for loop** to calculate the multiplication of two matrices:

$$\begin{pmatrix} 0.1 & 0.2 & 0.3 \\ 0.2 & 0.3 & 0.4 \\ 0.3 & 0.4 & 0.5 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{pmatrix}$$

Solution

- `import numpy as np`
- `a = np.array([[0.1,0.2,0.3], [0.2,0.3,0.4], [0.3,0.4,0.5]])`
- `b = np.array([[1,2,3], [2,3,4], [3,4,5]])`
- `c = np.zeros((3,3))`
- `for i in range(3):`
 - `for j in range (3):`
 - `s = 0`
 - `for k in range (3):`
 - `s = s + a[i][k] * b[k][j]`
 - `c[i][j] = s`
 - `print(c)`