

Problem-Based Learning

Python 3

Lecture: 12-function (2)

Online Python

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

Lecture Notes

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



矩陣(Numpy) 、串列(List) 、表格(Pandas)

- 串列List

```
[[96, 65, 73], [88, 76, 82], [92, 84, 89]]
```

- 矩陣Numpy array

```
[[96 65 73]  
 [88 76 82]  
 [92 84 89]]
```

- 表格Pandas DataFrame

	A	B	C ← columns
a	96	65	73
b	88	76	82
c	92	84	89

↑
index

Problem

- 自製function
- 傳入list，傳出min

- `def min(a):`

-

- `return min`

- `a = [6, 2, 4, 3, 8, 9]`

- `print(min(a))`

- 自製function

- 傳入list，傳出max

- `def max(a):`

-

- `return max`

- `a = [6, 2, 4, 3, 8, 9]`

- `print(max(a))`

Solution

- `def min(a):`
- `min = 9999`
- `for i in range(len(a)):`
- `if a[i] < min:`
- `min = a[i]`
- `return min`

- `a = [6, 2, 4, 3, 8, 9]`
- `print(min(a))`

- `def max(a):`
- `max = -9999`
- `for i in range(len(a)):`
- `if a[i] > max:`
- `max = a[i]`
- `return max`

- `a = [6, 2, 4, 3, 8, 9]`
- `print(max(a))`

Problem

- 自製function
- 傳入list，傳出mean

- `def mean(a):`

-

- `return mean`

- `a = [6, 2, 4, 3, 8, 9]`

- `print(mean(a))`

- 自製function

- 傳入list和mean，傳出standard deviation

- `def sd(a, mean):`

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- `return sd`

- `a = [6, 2, 4, 3, 8, 9]`

- `print(sd(a))`

Solution

- `def mean(a):`
- `mean = 0`
- `for i in range(len(a)):`
- `mean = mean + a[i]`
- `mean = mean / len(a)`
- `return mean`

- `a = [6, 2, 4, 3, 8, 9]`
- `print(mean(a))`

- `def sd(a, mean):`
- `sd = 0`
- `for i in range(len(a)):`
- `sd = sd + (mean - a[i])**2`
- `sd = np.sqrt(sd / (len(a) - 1))`
- `return sd`

- `a = [6, 2, 4, 3, 8, 9]`
- `print(sd(a))`

Problem

- 五個學生國英數成績如下：
- 計算各科的平均值和標準差，並附加到原表格。

	國文	英文	數學
學生1	96	65	73
學生2	88	76	82
學生3	92	84	89
學生4	82	73	64
學生5	70	83	68

- 使用Pandas
- 使用自製的function來計算平均成績和標準差
- 使用`iloc[:,i].to_list()`來取得特定欄位的串列

Solution

- `import pandas as pd`
- `a = [[96, 65, 73],
[88, 76, 82],
[92, 84, 89],
[82, 73, 64],
[70, 83, 68]]`
- `ind = ["學生1", "學生2", "學生3", "學生4", "學生5"]`
- `col = ["國文", "英文", "數學"]`
- `d = pd.DataFrame(a, index=ind, columns=col)`
- `print(d)`

Solution

- `a2 = np.zeros(3)`
- `a3 = np.zeros(3)`
- `for i in range(d.shape[1]):`
 - `b = d.iloc[:,i].to_list()`
 - `a2[i] = mean(b)`
 - `a3[i] = sd(b, a2[i])`
- `d.loc['平均'] = a2`
- `d.loc['標準差'] = a3`
- `print(d)`