

**LAPORAN UJIAN TENGAH SEMESTER
KECERDASAN BUATAN**



Disusun Oleh :

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**Program Studi D4 Manajemen Informatika
Program Vokasi
Universitas Negeri Surabaya
2022**

- **Single Neuron**

Source Code :

```
1  # Program Single Neuron,
2  # 1. Input layer feature 10
3  # 2. Neuron 1
4
5  # inisialisasi numpy
6  import numpy as np
7
8  # inisialisasi variable
9  inputs = [2, 5.5, 9, 4, 1, 6.5, 3, 7, 2.5, 6]
10
11 # inisialisasi bobot variable
12 weights = [-3.3, 4.2, 1.8, 3.8, -4.3, -0.3, 0.9, 1.9, 2.1, 2.8]
13
14 # inisialisasi bias
15 bias = 7
16
17 # penghitungan output = (input*weight)+bias
18 output = np.dot(weights, inputs) + bias
19
20 # cetak output
21 print(output)
```

>>>
86.69999999999999

Penjelasan step by step:

- Memanggil library Numpy yang telah diinstall, untuk memproses komputasi numeric / angka.

```
# inisialisasi numpy
import numpy as np
```

- Mengset nilai dari variabel inputs, weight, dan juga bias. Dengan ketentuan jumlah tiap input layer 10 dengan 1 neuron. Kita bisa memanfaatkan numeric generator di internet.

```
# inisialisasi variable
inputs = [2, 5.5, 9, 4, 1, 6.5, 3, 7, 2.5, 6]

# inisialisasi bobot variable
weights = [-3.3, 4.2, 1.8, 3.8, -4.3, -0.3, 0.9, 1.9, 2.1, 2.8]

# inisialisasi bias
bias = 7
```

- Melakukan penghitungan untuk mendapatkan output. Dengan rumus $(inputs * weights) + bias$.

```
# penghitungan output = (input*weight)+bias
output = np.dot(weights, inputs) + bias
```

Perhitungan dot product.

$$\begin{array}{cc}
 \text{weights} & \text{inputs} \\
 10 * 1 & 1 * 10
 \end{array}$$

$$\begin{bmatrix} 4.2 \\ 1.8 \\ 3.8 \\ -4.3 \\ -0.3 \\ 0.9 \\ 1.9 \\ 2.1 \\ 2.8 \end{bmatrix} * [2, 5.5, 9, 4, 1, 6.5, 3, 7, 2.5, 6] = 79.699$$

Kemudian akan ditambahkan dengan bias.

$$\begin{array}{cc}
 \text{np.dot} & \text{bias} \\
 \uparrow & \uparrow \\
 79.699 + 7 = 86.699
 \end{array}$$

- Mencetak output.

```
# cetak output
print(output)
```

```
>>>
86.69999999999999
```

- **Multi Neuron**

Source Code :

```
1  # Program Multi Neuron
2  # 1. Input layer feature 10
3  # 2. Neuron 5
4
5  # inisialisasi numpy
6  import numpy as np
7
8  # inisialisasi variable
9  inputs = [2, 5.5, 9, 4, 1, 6.5, 3, 7, 2.5, 6]
10
11 # inisialisasi bobot variable
12 weights = [[-3.3, 4.2, 1.8, 3.8, -4.3, -0.3, 0.9, 1.9, 2.1, 2.8],
13            [4, 3.6, 4.4, -3.3, -1.8, -2.1, 1.1, 2.2, -3.9, 3.4],
14            [1, -0.8, 3, 1.5, 1.2, -1.9, -2.7, 4, 0.2, 2.3],
15            [2.1, -2.6, 3.9, 4.6, 0.3, -3.5, 2.2, -4.8, 4, 2.3],
16            [4.1, -2.2, 0.7, 1.7, 2, 0.2, 4.6, 2.6, -2.3, 3]]
17
18 # inisialisasi bias
19 bias = [7, 3, 0.5, 1.5, 4.5]
20
21 # penghitungan output = (input*weight)+bias
22 output = np.dot(weights, inputs) + bias
23
24 # cetak output
25 print(output)
>>>
[86.7  71.1  54.15 19.25 61.25]
```

Penjelasan step by step:

- Memanggil library Numpy yang telah diinstall, untuk memproses komputasi numeric / angka.

```
# inisialisasi numpy
import numpy as np
```

- Mengset nilai dari variabel inputs, weight, dan juga bias. Dengan ketentuan jumlah tiap input layer 10 dengan 5 neuron.

```
# inisialisasi variable
inputs = [2, 5.5, 9, 4, 1, 6.5, 3, 7, 2.5, 6]

# inisialisasi bobot variable
weights = [[-3.3, 4.2, 1.8, 3.8, -4.3, -0.3, 0.9, 1.9, 2.1, 2.8],
           [4, 3.6, 4.4, -3.3, -1.8, -2.1, 1.1, 2.2, -3.9, 3.4],
           [1, -0.8, 3, 1.5, 1.2, -1.9, -2.7, 4, 0.2, 2.3],
           [2.1, -2.6, 3.9, 4.6, 0.3, -3.5, 2.2, -4.8, 4, 2.3],
           [4.1, -2.2, 0.7, 1.7, 2, 0.2, 4.6, 2.6, -2.3, 3]]

# inisialisasi bias
bias = [7, 3, 0.5, 1.5, 4.5]
```

- Melakukan penghitungan untuk mendapatkan output. Dengan rumus $(inputs * weights) + bias$.

```
# penghitungan output = (input*weight)+bias
output = np.dot(weights, inputs) + bias
```

Perhitungan dot product.

$$\begin{bmatrix} -3.3 & 4.2 & 1.8 & 3.8 & -4.3 & -0.3 & 0.9 & 1.9 & 2.1 & 2.8 \\ 4 & 3.6 & 4.4 & -3.3 & -1.8 & -2.1 & 1.1 & 2.2 & -3.9 & 3.4 \\ 1 & -0.8 & 3 & 1.5 & 1.2 & -1.9 & -2.7 & 4 & 0.2 & 2.3 \\ 2.1 & -2.6 & 3.9 & 4.6 & 0.3 & -3.5 & 2.2 & -4.8 & 4 & 2.3 \\ 4.1 & -2.2 & 0.7 & 1.7 & 2 & 0.2 & 4.6 & 2.6 & -2.3 & 3 \end{bmatrix} * [2 \ 5.5 \ 9 \ 4 \ 1 \ 6.5 \ 3 \ 7 \ 2.5 \ 6]$$

$$\begin{bmatrix} (2 * -3.3) (5.5 * 4.2) (9 * 1.8) (4 * 3.8) (1 * -4.3) (6.5 * -0.3) (3 * 0.9) (7 * 1.9) (2.5 * 2.1) (6 * 2.8) \\ (2 * 4) (5.5 * 3.6) (9 * 4.4) (4 * -3.3) (1 * -1.8) (6.5 * -2.1) (3 * 1.1) (7 * 2.2) (2.5 * -3.9) (6 * 3.4) \\ (2 * 1) (5.5 * -0.8) (9 * 3) (4 * 1.5) (1 * 1.2) (6.5 * -1.9) (3 * -2.7) (7 * 4) (2.5 * 0.2) (6 * 2.3) \\ (2 * 2.1) (5.5 * -2.6) (9 * 3.9) (4 * 4.6) (1 * 0.3) (6.5 * -3.5) (3 * 2.2) (7 * -4.8) (2.5 * 4) (6 * 2.3) \\ (2 * 4.1) (5.5 * -2.2) (9 * 0.7) (4 * 1.7) (1 * 2) (6.5 * 0.2) (3 * 4.6) (7 * 2.6) (2.5 * -2.3) (6 * 3) \end{bmatrix}$$

→ Neuron 1
 → Neuron 2
 → Neuron 3
 → Neuron 4
 → Neuron 5

$$[79.7 \ 68.1 \ 53.65 \ 17.75 \ 56.75]$$

Kemudian akan ditambahkan dengan bias.

$$[79.7 \ 68.1 \ 53.65 \ 17.75 \ 56.75] + [7 \ 3 \ 0.5 \ 1.5 \ 4.5]$$

$$= [86.7 \ 71.1 \ 54.15 \ 19.25 \ 61.25]$$

- Mencetak output.

```
# cetak output
print(output)
```

```
>>>
[86.7  71.1  54.15 19.25 61.25]
```

- **Multi Neuron Batch Input**

Source Code :

```
1  # Program Multi Neuron Batch Input
2  # 1. Input layer feature 10
3  # 2. Per batch nya 6 input
4  # 3. Neuron 5
5
6  # inisialisasi numpy
7  import numpy as np
8
9  # inisialisasi variable
10 inputs = [[-2, 5.5, 9, 4, 1, 6.5, -3, 7, 2.5, 6],
11           [1.6, -1.7, 2.3, -0.2, 3.7, 3.3, -3.7, -3.3, 0.5, 4],
12           [4.6, -2.6, 1.3, 1, -2.7, 0.5, 3.2, 4.2, -3.4, 4.7],
13           [2.3, -4.1, -3.4, 1, 0.2, -4.5, 5, 1.4, 4, 36],
14           [-1.3, 2, -5, 4.3, 4.5, 3.6, -0.6, -0.8, 0.5, 3.5],
15           [1.2, 0.7, -4.6, -4.5, 2.2, -2.2, 3, 4.3, -1.5, 4]]
16
17 # inisialisasi bobot variable
18 weights = [[-3.3, 4.2, 1.8, 3.8, -4.3, -0.3, 0.9, 1.9, 2.1, 2.8],
19            [4, 3.6, 4.4, -3.3, -1.8, -2.1, 1.1, 2.2, -3.9, 3.4],
20            [1, -0.8, 3, 1.5, 1.2, -1.9, -2.7, 4, 0.2, 2.3],
21            [2.1, -2.6, 3.9, 4.6, 0.3, -3.5, 2.2, -4.8, 4, 2.3],
22            [4.1, -2.2, 0.7, 1.7, 2, 0.2, 4.6, 2.6, -2.3, 3]]
23
24 # inisialisasi bias
25 bias = [7, 3, 0.5, 1.5, 4.5]
26
27 # penghitungan output
28 output = np.dot(inputs, np.array(weights).T) + bias
29
30 # cetak output
31 print(output)
32
33 >>>
34 [[ 94.5   48.5   66.35  -2.35  17.25]
35  [-16.29   0.79  14.32  25.79   9.38]
36  [ 15.38  60.27  26.68   9.12  73.95]
37  [ 96.72 103.65  81.87 127.22 147.21]
38  [ 15.39 -39.32  -5.82  -4.83  12.81]
39  [ -9.28  37.8   5.41 -38.92  41.4  ]]
```

Penjelasan step by step:

- Memanggil library Numpy yang telah diinstall, untuk memproses komputasi numeric / angka.

```
# inisialisasi numpy
import numpy as np
```

- Mengset nilai dari variabel inputs, weight, dan juga bias. Dengan ketentuan per batch 6 input dan tiap input – batch layer 10 jadi inputs = 6 * 10 dan 5 neuron.

```
# inisialisasi variable
inputs = [[-2, 5.5, 9, 4, 1, 6.5, -3, 7, 2.5, 6],
          [1.6, -1.7, 2.3, -0.2, 3.7, 3.3, -3.7, -3.3, 0.5, 4],
          [4.6, -2.6, 1.3, 1, -2.7, 0.5, 3.2, 4.2, -3.4, 4.7],
          [2.3, -4.1, -3.4, 1, 0.2, -4.5, 5, 1.4, 4, 36],
          [-1.3, 2, -5, 4.3, 4.5, 3.6, -0.6, -0.8, 0.5, 3.5],
          [1.2, 0.7, -4.6, -4.5, 2.2, -2.2, 3, 4.3, -1.5, 4]]

# inisialisasi bobot variable
weights = [[-3.3, 4.2, 1.8, 3.8, -4.3, -0.3, 0.9, 1.9, 2.1, 2.8],
           [4, 3.6, 4.4, -3.3, -1.8, -2.1, 1.1, 2.2, -3.9, 3.4],
           [1, -0.8, 3, 1.5, 1.2, -1.9, -2.7, 4, 0.2, 2.3],
           [2.1, -2.6, 3.9, 4.6, 0.3, -3.5, 2.2, -4.8, 4, 2.3],
           [4.1, -2.2, 0.7, 1.7, 2, 0.2, 4.6, 2.6, -2.3, 3]]

# inisialisasi bias
bias = [7, 3, 0.5, 1.5, 4.5]
```

- Melakukan penghitungan untuk mendapatkan output. Dengan rumus :

```
# penghitungan output
output = np.dot(inputs, np.array(weights).T) + bias
```

Perhitungan dot product.

$$\begin{matrix} \text{[weights]}^T \\ 10 \times 5 \end{matrix} \quad \begin{matrix} \text{Input - batch} \\ 6 \times 10 \end{matrix}$$

$$\begin{bmatrix} -3.3 & 4 & 1 & 2.1 & 4.1 \\ 4.2 & 3.6 & -0.8 & -2.6 & -2.2 \\ 1.8 & 4.4 & 3 & 3.9 & 0.7 \\ 3.8 & -3.3 & 1.5 & 4.6 & 1.7 \\ -4.3 & -1.8 & 1.2 & 0.3 & 2 \\ -0.3 & -2.1 & -1.9 & -3.5 & 0.2 \\ 0.9 & 1.1 & -2.7 & 2.2 & 4.6 \\ 1.9 & 2.2 & 4 & 4.8 & 2.6 \\ 2.1 & -3.9 & 0.2 & 4 & -2.3 \\ 2.8 & 3.4 & 2.3 & 2.3 & 3 \end{bmatrix} \cdot \begin{bmatrix} -2 & 5.5 & 9 & 4 & 1 & 6.5 & -3 & 7 & 2.5 & 6 \\ 1.6 & -1.7 & 2.3 & -0.2 & 3.7 & 3.3 & -3.7 & -3.3 & 0.5 & 4 \\ 4.6 & -2.6 & 1.3 & 1 & -2.7 & 0.5 & 3.2 & 4.2 & -3.4 & 4.7 \\ 2.3 & -4.1 & -3.4 & 1 & 0.2 & -4.5 & 5 & 1.4 & 4 & 36 \\ -1.3 & 2 & -5 & 4.3 & 4.5 & 3.6 & -0.6 & -0.8 & 0.5 & 3.5 \\ 1.2 & 0.7 & -4.6 & -4.5 & 2.2 & -2.2 & 3 & 4.3 & -1.5 & 4 \end{bmatrix} = \begin{bmatrix} 87.5 & 45.5 & 65.85 & -3.85 & 12.75 \\ -23.29 & -2.21 & 13.82 & 24.29 & 4.88 \\ 8.38 & 57.27 & 26.18 & 7.62 & 69.45 \\ 89.72 & 100.65 & 81.37 & 125.72 & 142.71 \\ 8.39 & -42.32 & -6.32 & -6.33 & 8.31 \\ -16.28 & 34.8 & 4.91 & -40.42 & 36.9 \end{bmatrix}$$

Kemudian akan ditambahkan dengan bias.

$$\begin{bmatrix} 87.5 & 45.5 & 65.85 & -3.85 & 12.75 \\ -23.29 & -2.21 & 13.82 & 24.29 & 4.88 \\ 8.38 & 57.27 & 26.18 & 7.62 & 69.45 \\ 89.72 & 100.65 & 81.37 & 125.72 & 142.71 \\ 8.39 & -42.32 & -6.32 & -6.33 & 8.31 \\ -16.28 & 34.8 & 4.91 & -40.42 & 36.9 \end{bmatrix} + [7, 3, 0.5, 1.5, 4.5] = \begin{bmatrix} 94.5 & 48.5 & 66.35 & -2.35 & 17.25 \\ -16.29 & 0.79 & 14.32 & 25.79 & 9.38 \\ 15.38 & 60.27 & 26.68 & 9.12 & 73.95 \\ 96.72 & 103.65 & 81.87 & 127.22 & 147.21 \\ 15.39 & -39.32 & -5.82 & -4.83 & 12.81 \\ -9.28 & 37.8 & 5.41 & -38.92 & 41.4 \end{bmatrix}$$

- Mencetak output.

```
# cetak output  
print(output)
```

```
>>>
```

```
[[ 94.5   48.5   66.35  -2.35   17.25]  
 [-16.29   0.79   14.32   25.79    9.38]  
 [ 15.38  60.27  26.68    9.12   73.95]  
 [ 96.72 103.65  81.87 127.22 147.21]  
 [ 15.39 -39.32  -5.82  -4.83   12.81]  
 [ -9.28  37.8    5.41 -38.92  41.4  ]]
```