**Lembar Jawaban Kalkulasi Neural Network**

**Pada lembar jawaban ini, kamu dapat menuliskan cara mengkalkulasikan nilai-nilai yang diminta pada arsitektur neural network sesuai soal, ya, semangat!😄**

Pertama, masukkan dulu nilai initial value dan randomnya ya …

**Initial Value**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x1** | **x2** | **x3** | **α** | **Threshold** | **Yd,6** |
| 0.7 | 0.8 | 0.9 | 0.1 | -1 | 0 |

**Initial Random**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **W14** | **W15** | **W24** | **W25** | **W34** | **W35** | **W46** | **W56** | **θ4** | **θ5** | **θ6** |
| 0.5 | 0.6 | 0.3 | 1.1 | -1.0 | 0.1 | -1.1 | -0.7 | 0.2 | 0.3 | 0.4 |

Jika sudah selesai, kita akan masuk ke langkah-langkah kalkulasi, sebagai berikut:

**Forward Pass**

Forward Pass merupakan hasil dari langkah 1 pada proses kalkulasi di challenge deck. Oleh karena itu kamu tuliskan langkah kalkulasi yang kamu lakukan untuk mencari nilai-nilai di bawah ini, ya🙌

**Langkah 1: Menghitung output Neuron 4 (y4), Neuron 5 (y5), Neuron 6 (y6), dan Error menggunakan sigmoid function**

|  |  |
| --- | --- |
| Y4 | = sigmoid( x1 \* W14 + x2 \* W24 + x3 \* W34 – Threshold \* θ4 ) |
|  | = 1 / (1 + e^(-( 0.7 \* 0.5 + 0.8 \* 0.3 + 0.9 \* (-1.0) - (-1) \* 0.2))) **=>** 1 / (1 + e^(-(-0.11))) |
|  | = 0.4727 |
| Y5 | = sigmoid( x1 \* W15 + x2 \* W25 + x3 \* W35 – Threshold \* θ5 ) |
|  | = 1 / (1 + e^(-( 0.7 \* 0.6 + 0.8 \* 1.1 + 0.9 \* 0.1 - (-1) \* 0.3 ))) **=>** 1 / (1 + e^(-1.69)) |
|  | = 0.8442 |
| Y6 | = sigmoid( Y4 \* W46 + Y5 \* W56 – Threshold \* θ6 ) |
|  | = 1 / (1 + e^(-( 0.4727 \* (-1.1) + 0.8442 \* (-0.7) - (-1) \* 0.4 ))) **=>** 1 / (1 + e^(-(-0.71091))) |
|  | = 0.3297 |
| e | = Yd,6 – Y6 |
|  | = 0 - 0.3297 |
|  | = - 0.3297 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |
| --- | --- | --- | --- |
| **Y4** | **Y5** | **Y6** | **e** |
| **0.4727** | **0.8442** | **0.3297** | **- 0.3297** |

**Backward Pass**

Sementara itu, nilai-nilai dari backward pass didapatkan dengan menjalankan langkah 2, 3, dan 4. Jangan lupa tuliskan proses dan hasil kalkulasinya pada tempat yang telah disediakan di bawah, ya👍

**Langkah 2: Hitung error gradient untuk Neuron 6 di Output Layer dan weight corrections**

|  |  |
| --- | --- |
| δ6 | = Y6 ( 1 - Y6 ) e |
|  | = 0.3297 \* (1 - 0.3297) \* (0 - 0.3297) |
|  | = -0.0236 |
| ∇46 | = α \* Y4 \* δ6 |
|  | = 0.1 \* 0.4727 \* (-0.0236) |
|  | = -0.0011 |
| ∇56 | = α \* Y5 \* δ6 |
|  | = 0.1 \* 0.8442 \* (-0.0236) |
|  | = -0.0020 |
| ∇θ6 | = α \* Threshold \* δ6 |
|  | = 0.1 \* (-1) \* (-0.0236) |
|  | = 0.0024 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |
| --- | --- | --- | --- |
| **δ6** | **∇46** | **∇56** | **∇θ6** |
| **-0.0236** | **-0.0011** | **-0.0020** | **0.0024** |

**Langkah 3: Hitung error gradients untuk Neuron 4 dan Neuron 5 di Middle Layer/Hidden Layer**

|  |  |
| --- | --- |
| δ4 | = Y4 \* (1-Y4) \* δ6 \* W46 |
|  | = 0.4727 \* (1 - 0.4727) \* (-0.0236) \* (-1.1) |
|  | = 0.0062 |
| δ5 | = Y5 \* (1-Y5 ) \* δ6 \* W56 |
|  | = 0.8442 \* (1 - 0.8442) \* (-0.0236) \* (-0.7) |
|  | = 0.0046 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |
| --- | --- |
| **δ4** | **δ5** |
| **0.0062** | **0.0046** |

**Langkah 4: Hitung weight corrections**

|  |  |
| --- | --- |
| ∇w14 | = α \* x1 \* δ4 |
|  | = 0.1 \* 0.7 \* 0.0062 |
|  | = 0.000434 |
| ∇w24 | = α \* x2 \* δ4 |
|  | = 0.1 \* 0.8 \* 0.0062 |
|  | = 0.000496 |
| ∇w34 | = α \* x3 \* δ4 |
|  | = 0.1 \* 0.9 \* 0.0062 |
|  | = 0.000558 |
| ∇θ4 | = α \* Threshold \* δ4 |
|  | = 0.1 \* (-1) \* 0.0062 |
|  | = -0.00062 |
| ∇w15 | = α \* x1 \* δ5 |
|  | = 0.1 \* 0.7 \* 0.0046 |
|  | = 0.000322 |
| ∇w25 | = α \* x2 \* δ5 |
|  | = 0.1 \* 0.8 \* 0.0046 |
|  | = 0.000368 |
| ∇w35 | = α \* x3 \* δ5 |
|  | = 0.1 \* 0.9 \* 0.0046 |
|  | = 0.000414 |
| ∇θ5 | = α \* Threshold \* δ5 |
|  | = 0.1 \* (-1) \* 0.0046 |
|  | = -0.00046 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **∇w14** | **∇w24** | **∇w34** | **∇θ4** | **∇w15** | **∇w25** | **∇w35** | **∇θ5** |
| **0.000434** | **0.000496** | **0.000558** | **-0.00062** | **0.000322** | **0.000368** | **0.000414** | **-0.00046** |

**Backward Pass**

Last but not least, adalah nilai-nilai dari updated weight didapatkan dengan menjalankan langkah nomor 5. Seperti biasa, tuliskan proses dan hasil kalkulasinya pada tempat yang telah disediakan di bawah, ya👌

**Langkah 5: Hitung semua weights dan theta pada arsitektur yang telah diperbarui**

|  |  |
| --- | --- |
| w14 | = W14 + ∇w14 |
|  | = 0.5 + 0.000434 |
|  | = 0.500434 |
| w15 | = W15 + ∇w15 |
|  | = 0.6 + 0.000322 |
|  | = 0.600322 |
| w24 | = W16 + ∇w16 |
|  | = 0.3 + 0.000496 |
|  | = 0.300496 |
| w25 | = W25 + ∇w25 |
|  | = 1.1 + 0.000368 |
|  | = 1.100368 |
| w34 | = W34 + ∇w34 |
|  | = -1.0 + 0.000558 |
|  | = -0.999442 |
| w35 | = W35 + ∇w35 |
|  | = 0.1 + 0.000414 |
|  | = 0.100414 |
| θ4 | = θ4 + ∇ θ4 |
|  | = 0.2 - 0.00062 |
|  | = 0.19938 |
| θ5 | = θ5 + ∇ θ5 |
|  | = 0.3 - 0.00046 |
|  | = 0.29954 |
| θ6 | = θ6 + ∇ θ6 |
|  | = 0.4 + 0.0024 |
|  | = 0.4024 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **w14** | **w15** | **w24** | **w25** | **w34** | **w35** | **θ3** | **θ4** | **θ5** |
| **0.500434** | **0.600322** | **0.300496** | **1.100368** | **-0.999442** | **0.100414** | **0.19938** | **0.29954** | **0.4024** |

**Hore, kamu sudah menyelesaikan satu dari tiga proyek challenge, semoga mendapatkan hasil yang maksimal dan selamat bersenang-senang~**