**Lembar Jawaban Kalkulasi Neural Network**

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

Pertama, masukkan dulu nilai initial value dan initial 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** ) |
| --- | --- |
|  | = Sigmoid((0.7 \* 0.5) + (0.8 \* 0.3) + (0.9 \* -1.0) + (-1 \* 0.2)) |
|  | = 0.37519 |
| Y5 | = Sigmoid (**x1 \* W15** + **x2 \* W25** + **x3 \* W35** + **Threshold \* θ5** ) |
|  | = Sigmoid ((0.7 \* 0.6) + (0.8 \* 1.1) + (0.9 \* 0.1) + (-1 \* 0.3)) |
|  | = 0.74838 |
| Y6 | = Sigmoid (**Y4 \* W46** + **Y5 \* W56** + **Threshold \* θ6** ) |
|  | = Sigmoid ( 0.37519 \* -1.1 + 0.74838 \* -0.7 + -1 \* 0.4 ) |
|  | = 0.20807 |
| e | = **Yd,6** - **Y6** |
|  | = 0 - 0.20807 |
|  | = -0.20807 |

Lalu isi rangkuman hasilnya di tabel ini ya …

| **Y4** | **Y5** | **Y6** | **e** |
| --- | --- | --- | --- |
| 0.37519 | 0.74838 | 0.20807 | -0.20807 |

**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** |
| --- | --- |
|  | = 0.20807 \* ( 1 - 0.20807 ) \* -0.20807 |
|  | = -0.034285 |
| ∇46 | = **α \*** δ6 **\*** **Y4** |
|  | = 0.1 \* -0.034285 \* 0.37519 |
|  | = -0.001286 |
| ∇56 | = **α \*** δ6 **\*** **Y5** |
|  | = 0.1 \* -0.034285 \* 0.74838 |
|  | = -0.002565 |
| ∇θ6 | = **α \*** δ6 **\* Threshold** |
|  | = 0.1 \* -0.034285 \* -1 |
|  | = 0.003428 |

Lalu isi rangkuman hasilnya di tabel ini ya …

| **δ6** | **∇46** | **∇56** | **∇θ6** |
| --- | --- | --- | --- |
| -0.034285 | -0.001286 | -0.002565 | 0.003428 |

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

| δ4 | = **Y4 \* ( 1 - Y4 )** \* **W46** \* **δ6** |
| --- | --- |
|  | = 0.37519 \* (1 - 0.37519) \* -1.1 \* -0.034285 |
|  | = 0.008840 |
| δ5 | = **Y5 \* ( 1 - Y5 )** \* **W56** \* **δ6** |
|  | = 0.74838 \* ( 1- 0.74838) \* -0.7 \* -0.034285 |
|  | = 0.004519 |

Lalu isi rangkuman hasilnya di tabel ini ya …

| **δ4** | **δ5** |
| --- | --- |
| 0.008840 | 0.004519 |

**Langkah 4: Hitung weight corrections**

| ∇w14 | = **α \* δ4**  **\* x1** |
| --- | --- |
|  | = 0.1 \* 0.008840 \* 0.7 |
|  | = 0.0006188 |
| ∇w24 | = **α \* δ4** **\*** **x2** |
|  | = 0.1 \* 0.008840 \* 0.8 |
|  | = 0.0007072 |
| ∇w34 | = **α \* δ4** **\* x3** |
|  | = 0.1 \* 0.008840 \* 0.9 |
|  | = 0.0007956 |
| ∇θ4 | = **α \* δ4** **\* Threshold** |
|  | = 0.1 \* 0.008840 \* -1 |
|  | = -0.000884 |
| ∇w15 | = **α \* δ5**  **\* x1** |
|  | = 0.1 \* 0.004519 \* 0.7 |
|  | =0.0003163 |
| ∇w25 | = **α \* δ5** **\*** **x2** |
|  | = 0.1 \* 0.004519 \* 0.8 |
|  | = 0.0003615 |
| ∇w35 | = **α \* δ5** **\* x3** |
|  | = 0.1 \* 0.004519 \* 0.9 |
|  | = 0.0004067 |
| ∇θ5 | = **α \* δ5** **\* Threshold** |
|  | = 0.1 \* 0.004519 \* -1 |
|  | = -0.0004519 |

Lalu isi rangkuman hasilnya di tabel ini ya …

| **∇w14** | **∇w24** | **∇w34** | **∇θ4** | **∇w15** | **∇w25** | **∇w35** | **∇θ5** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0.0006188 | 0.0007072 | 0.0007956 | -0.000884 | 0.0003163 | 0.0003615 | 0.0004067 | -0.0004519 |

**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 + 0.0006188 |
|  | = 0.5006188 |
| w15 | = **w15 + ∇w15** |
|  | = 0.6 + 0.0003163 |
|  | = 0.6003163 |
| w24 | = **w24 + ∇w24** |
|  | = 0.3 + 0.0007072 |
|  | = 0.3007072 |
| w25 | = **w25 + ∇w25** |
|  | = 1.1 + 0.0003615 |
|  | = 1.1003615 |
| w34 | = **w34 + ∇w34** |
|  | = -1.0 + 0.0007956 |
|  | = -0.9992044 |
| w35 | = **w35  + ∇w35** |
|  | = 0.1 + 0.0004067 |
|  | = 0.1004067 |
| θ4 | = **θ4 + ∇θ4** |
|  | = 0.2 -0.000884 |
|  | = 0.199116 |
| θ5 | = **θ5 + ∇θ5** |
|  | = -0.7 -0.0004519 |
|  | = -0.7004519 |
| θ6 | = **θ6 + ∇θ6** |
|  | = 0.4 + 0.003428 |
|  | = 0.403428 |

Lalu isi rangkuman hasilnya di tabel ini ya …

| **w14** | **w15** | **w24** | **w25** | **w34** | **w35** | **θ4** | **θ5** | **θ6** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.5006188 | 0.6003163 | 0.3007072 | 1.1003615 | -0.9992044 | 0.1004067 | 0.199116 | -0.7004519 | 0.403428 |

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