**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** |
| -0.9 | -0.6 | -1.4 | 0.4 | -0.2 | 0.3 | -1.9 | 0.6 | 0.2 | 0.8 | 0.6 |

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** - **θ4** ) |
|  | = 1/ [1 + e^-( (0.7 \* -0.9) +( 0.8\*-1.4) + (0.9\*-0.2) – (-1\*0.2) ] |
|  | = 0.2 |
| Y5 | = sigmoid(**x1**. **W15** + **x2**. **W25** + **x3**. **W35** - **θ5** ) |
|  | = 1/ [1 + e^-( (0.7 \* -0.6) +( 0.8\*-0.4) + (0.9\*-0.3) – (-1\*0.8) ] |
|  | = 0.58 |
| Y6 | = sigmoid(**Y4**. **W46** + **Y5**. **W56** - **θ6** ) |
|  | = 1/ [1 + e^-( (0.2 \* -1.9) +( 0.58\*-0.6) – (-1\*0.6) ] |
|  | = 0.64 |
| e | = **Yd,6 - Y6** |
|  | = 0 – 0.64 |
|  | = -0.64 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |
| --- | --- | --- | --- |
| **Y4** | **Y5** | **Y6** | **e** |
| **0.2** | **0.58** | **0.64** | **-0.64** |

**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** |
|  | = **0.64 \* (1 - 0.64) \* (-0.64)** |
|  | = -0.147 |
| ∇46 | = **α \* Y4 \* δ6** |
|  | = 0.1 \* **0.2 \*** -0.147 |
|  | = -0.0029 |
| ∇56 | = **α \* Y5 \* δ6** |
|  | = 0.1 \* **0.58 \*** -0.147 |
|  | = -0.0085 |
| ∇θ6 | = **α \* (-1)\* δ6** |
|  | =0.1 \* -1 \* -0.147 |
|  | = 0.0147 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |
| --- | --- | --- | --- |
| **δ6** | **∇46** | **∇56** | **∇θ6** |
| -0.147 | -0.0029 | -0.0085 | 0.0147 |

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

|  |  |
| --- | --- |
| δ4 | = **Y4** (1- **Y4** ) \* **δ6** \* **W46** |
|  | = **0.2 \* ( 1 - 0.2) \* -0.147 \* -1.9** |
|  | = **0.044** |
| δ5 | = **Y5** (1- **Y5** ) \* **δ6** \* **W56** |
|  | = **0.58 \* (1-0.58) \* -0.147 \* 0.6** |
|  | = **-0.021** |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |
| --- | --- |
| **δ4** | **δ5** |
| **0.044** | **-0.021** |

**Langkah 4: Hitung weight corrections**

|  |  |
| --- | --- |
| ∇w14 | = **α \* x1** \* δ4 |
|  | = 0.1 \* 0.7 \* **0.044** |
|  | = 0.00308 |
| ∇w24 | = **α \* x2** \* δ4 |
|  | = 0.1 \* 0.8 \* **0.044** |
|  | = 0.00352 |
| ∇w34 | = **α \* x3**\* δ4 |
|  | = 0.1 \* 0.9 \* **0.044** |
|  | = 0.00396 |
| ∇θ4 | = **α \* (-1) \*** δ4 |
|  | = 0.1 \* (-1) \* **0.044** |
|  | = -0.0044 |
| ∇w15 | = **α \* x1** \* δ5 |
|  | = 0.1 \* 0.7 \* **-0.021** |
|  | = -0.0014 |
| ∇w25 | = **α \* x2** \* δ5 |
|  | = 0.1 \* 0.8 \* **-0.021** |
|  | = -0.0016 |
| ∇w35 | = **α \* x3** \* δ5 |
|  | = 0.1 \* 0.9 \* **-0.021** |
|  | = -0.0018 |
| ∇θ5 | = **α \* (-1) \*** δ5 |
|  | = 0.1 \* (-1) \* **-0.021** |
|  | = 0.0021 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **∇w14** | **∇w24** | **∇w34** | **∇θ4** | **∇w15** | **∇w25** | **∇w35** | **∇θ5** |
| 0.00308 | 0.00352 | 0.00396 | -0.0044 | -0.0014 | -0.0016 | -0.0018 | 0.0021 |

**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** |
|  | = -0.9 + 0.00308 |
|  | = -0.896 |
| w15 | = w15 + **∇w15** |
|  | = -0.6 + (-0.0014) |
|  | = -0.6014 |
| w24 | = w24 + **∇w24** |
|  | = -1.4 + 0.00352 |
|  | = -1.396 |
| w25 | = w25 + **∇w25** |
|  | = 0.4 + (-0.0016) |
|  | = 0.398 |
| w34 | = w34 + **∇w34** |
|  | = -0.2 + 0.00396 |
|  | = -0.196 |
| w35 | = w35 + **∇w35** |
|  | = 0.3 + (-0.0018) |
|  | = 0.2982 |
| θ4 | = θ4 + **∇θ4** |
|  | = 0.2 + (-0.0044) |
|  | = 0.1956 |
| θ5 | = θ5 + **∇θ5** |
|  | = 0.8 + 0.0021 |
|  | = 0.8021 |
| θ6 | = θ6 + **∇θ6** |
|  | = 0.6 + 0.0147 |
|  | = 0.6147 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **w14** | **w15** | **w24** | **w25** | **w34** | **w35** | **Θ4** | **Θ5** | **Θ6** |
| -0.896 | -0.6014 | -1.396 | 0.398 | -0.196 | 0.2982 | 0.1956 | 0.8021 | 0.6147 |

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