**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 (𝑋1𝑊14 + 𝑋2𝑊24 + 𝑋3𝑊34 − θ4) |
|  | = |
|  | = 0.377 |
| Y5 | = 𝑆𝑖𝑔𝑚𝑜𝑖𝑑 (𝑋1𝑊15 + 𝑋2𝑊25 + 𝑋3𝑊35 − θ5) |
|  | = |
|  | = 0.748 |
| Y6 | = 𝑆𝑖𝑔𝑚𝑜𝑖𝑑 (𝑌4𝑊46 + 𝑌5𝑊56 − θ6) |
|  | = |
|  | = 0.207 |
| e | = 𝑌𝑑,6 − 𝑌6 |
|  | = 0 – 0.207 |
|  | = -0.207 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |
| --- | --- | --- | --- |
| **Y4** | **Y5** | **Y6** | **e** |
| **0.377** | **0.748** | **0.207** | **-0.207** |

**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 |
|  | = 0.207 (1 – 0.207) (-0.207) |
|  | = -0.0339 |
| ∇46 | = ∝ × 𝑌4 × 𝛿6 |
|  | = 0.1 (0.377) (-0.0339) |
|  | = -0.0012 |
| ∇56 | = ∝ × 𝑌5 × 𝛿6 |
|  | = 0.1 (0.748) (-0.0339) |
|  | = -0.0025 |
| ∇θ6 | = ∝ × (−1) × 𝛿6 |
|  | = 0.1 (-1) (-0.0339) |
|  | = 0.00339 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |
| --- | --- | --- | --- |
| **δ6** | **∇46** | **∇56** | **∇θ6** |
| **-0.0339** | **-0.0012** | **-0.0025** | **0.00339** |

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

|  |  |
| --- | --- |
| δ4 | = 𝑌4 (1 − 𝑌4 ) 𝛿6 × 𝑊46 |
|  | = 0.377 (1 − 0.377) (−0.0339) (−1.1) |
|  | = 0.0087 |
| δ5 | = 𝑌5 (1 − 𝑌5 ) 𝛿6 × 𝑊56 |
|  | = 0.748 (1 − 0.748) (−0.0339) (−0.7) |
|  | = 0.0044 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |
| --- | --- |
| **δ4** | **δ5** |
| **0.0087** | **0.0044** |

**Langkah 4: Hitung weight corrections**

|  |  |
| --- | --- |
| ∇w14 | = ∝ × 𝑋1 × 𝛿4 |
|  | = 0.1 (0.7) (0.0087) |
|  | = 0.000609 |
| ∇w24 | = ∝ × 𝑋2 × 𝛿4 |
|  | = 0.1 (0.8) (0.0087) |
|  | = 0.000696 |
| ∇w34 | = ∝ × 𝑋4 × 𝛿4 |
|  | = 0.1 (0.9) (0.0087) |
|  | = 0.000783 |
| ∇θ4 | = ∝ × (−1) × 𝛿4 |
|  | = 0.1 (−1) (0.0087) |
|  | = -0.00087 |
| ∇w15 | = ∝ × 𝑋1 × 𝛿5 |
|  | = 0.1 (0.7) (0.0044) |
|  | = 0.000308 |
| ∇w25 | = ∝ × 𝑋2 × 𝛿5 |
|  | = 0.1 (0.8) (0.0044) |
|  | = 0.000352 |
| ∇w35 | = ∝ × 𝑋3 × 𝛿5 |
|  | = 0.1 (0.9) (0.0044) |
|  | = 0.000396 |
| ∇θ5 | = ∝ × (−1) × 𝛿5 |
|  | = 0.1 (−1) (0.0044) |
|  | = -0.00044 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **∇w14** | **∇w24** | **∇w34** | **∇θ4** | **∇w15** | **∇w25** | **∇w35** | **∇θ5** |
| 0.000609 | 0.000696 | 0.000783 | -0.00087 | 0.000308 | 0.000352 | 0.000396 | -0.00044 |

**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 + Δ𝑊14 |
|  | = 0.5 + 0.000609 |
|  | = 0.500609 |
| w15 | = 𝑊15 + Δ𝑊15 |
|  | = 0.6 + 0.000308 |
|  | = 0.600308 |
| w24 | = 𝑊24 + Δ𝑊24 |
|  | = 0.3 + 0.000696 |
|  | = 0.300696 |
| w25 | = 𝑊25 + Δ𝑊25 |
|  | = 1.1 + 0.000352 |
|  | = 1.100352 |
| w34 | = 𝑊34 + Δ𝑊34 |
|  | = −1.0 + 0.000783 |
|  | = -0.999217 |
| w35 | = 𝑊35 + ΔW35 |
|  | = 0.1 + 0.000396 |
|  | = 0.100396 |
| θ4 | = 𝜃4 + Δ𝜃4 |
|  | = 0.2 + (−0.00087) |
|  | = 0.19913 |
| θ5 | = 𝜃5 + Δ𝜃5 |
|  | = 0.3 + (−0.00044) |
|  | = 0.29956 |
| θ6 | = 𝜃6 + Δ𝜃6 |
|  | = 0.4 + 0.00339 |
|  | = 0.40339 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **w14** | **w15** | **w24** | **w25** | **w34** | **w35** | **θ3** | **θ4** | **θ5** |
| 0.500609 | 0.600308 | 0.300696 | 1.10035 2 | - 0.999217 | 0.100396 | 0.19913 | 0.29956 | 0.40339 |

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