**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** |  | **-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 | **= x1\*w14 + x2\*w24 + x3\*w34 + Threshold\*theta4** |
|  | **= (0.7 \*0.5) + (0.8 \* 0.3) + (0.9 \* -1.0) + (-1 \* 0.2) = -0.51** |
|  | **= sigmoid = 1 / (1 + e­-x) = 1 / (1 + 2.718281828459045-(-0.51))**  **= 0.37519352553157076** |
| Y5 | = **x1\*w15 + x2\*w25 + x3\*w35 + Threshold\*theta5** |
|  | =  **(0.7 \*0.6) + (0.8 \* 1.1) + (0.9 \* 0.1) + (-1 \* 0.3) = 1.09** |
|  | = **sigmoid = 1 / (1 + e­-x) = 1 / (1 + 2.718281828459045-(1.09))**  **= 0.7483817216070642** |
| Y6 | = **Y4\*w46 + Y5\*w56 + Threshold\*theta6** |
|  | = **(0.37519352553157076 \*-1.1) + (0.7483817216070642 \* -0.7) + (-1 \* 0.4) = -1.3365800832096728** |
|  | = **sigmoid = 1 / (1 + e­-x) = 1 / (1 + 2.718281828459045-(-1.3365800832096728))**  **= 0.2080730252065704** |
| e | = **Yd,6 - Y6 = 0 - 0.2080730252065704** |
|  | = **-0.2080730252065704** |
|  | = |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |
| --- | --- | --- | --- |
| **Y4** | **Y5** | **Y6** | **e** |
| **0.37519352553157076** | **0.7483817216070642** | **0.2080730252065704** | **-0.2080730252065704** |

**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)\*error** |
|  | **=** 0.2080730252065704 \* (1-0.2080730252065704) \* - **0.2080730252065704** |
|  | = **-0.03428599040302067** |
| ∇46 | = alpha \* y4 \* δ6 |
|  | = **0.1 \* 0.37519352553157076 \* -0.03428599040302067** |
|  | = - 0.0012863881615650925 |
| ∇56 | = alpha \* y5 \* δ6 |
|  | = **0.1 \* 0.7483817216070642**  **\* -0.03428599040302067** |
|  | = **-0.0025659008524815887** |
| ∇θ6 | **= alpha \* theta6 \* δ6** |
|  | = **0.1 \* 0.2080730252065704 \* -0.03428599040302067** |
|  | = **-0.000713398974535995** |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |
| --- | --- | --- | --- |
| **δ6** | **∇46** | **∇56** | **∇θ6** |
| **-0.03428599040302067** | **- 0.0012863881615650925** | **-0.0025659008524815887** | **-0.000713398974535995** |

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

|  |  |
| --- | --- |
| δ4 | = Y4\*(1-Y4) \*δ6\_­ \* W46 |
|  | = **0.37519352553157076\*(1-0.37519352553157076) \* -0.03428599040302067 \* -1.1** |
|  | = 0.008841180172279505 |
| δ5 | = Y5\*(1-Y5) \*δ6\_­ \* W56 |
|  | = 0.7483817216070642 (1-0.7483817216070642) \* -0.03428599040302067 \* -0.7 |
|  | = 0.004519392885198686 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |
| --- | --- |
| **δ4** | **δ5** |
| 0.008841180172279505 | 0.004519392885198686 |

**Langkah 4: Hitung weight corrections**

|  |  |
| --- | --- |
| ∇w14 | =alpha \* x1 \* δ4 |
|  | = 0.1 \* 0.7 \* 0.008841180172279505 |
|  | = 0.0006188826120595653 |
| ∇w24 | = alpha \* x2 \* δ4 |
|  | = 0.1 \* 0.8 \* 0.008841180172279505 |
|  | = 0.0007072944137823606 |
| ∇w34 | = alpha \* x3 \* δ4 |
|  | = 0.1 \* 0.9 \* 0.008841180172279505 |
|  | = 0.0007957062155051556 |
| ∇θ4 | = alpha \* threshold \* δ4 |
|  | = 0.1 \* -1 \* 0.008841180172279505 |
|  | = -0.0008841180172279505 |
| ∇w15 | = alpha \* x1 \* δ5 |
|  | = 0.1 \* 0.7 \* 0.004519392885198686 |
|  | = 0.00031635750196390796 |
| ∇w25 | = alpha \* x2 \* δ5 |
|  | = 0.1 \* 0.8\* 0.004519392885198686 |
|  | = 0.00036155143081589494 |
| ∇w35 | = alpha \* x3 \* δ5 |
|  | =0.1 \* 0.9 \* 0.004519392885198686 |
|  | = 0.00040674535966788176 |
| ∇θ5 | = alpha \* threshold \* δ5 |
|  | = 0.1 \* -1 \* 0.004519392885198686 |
|  | = -0.0004519392885198686 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **∇w14** | **∇w24** | **∇w34** | **∇θ4** | **∇w15** | **∇w25** | **∇w35** | **∇θ5** |
| 0.0006188826120595653 | 0.0007072944137823606 | 0.0007957062155051556 | -0.0008841180172279505 | 0.00031635750196390796 | 0.00036155143081589494 | 0.00040674535966788176 | -0.0004519392885198686 |

**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 + 0.0006188826120595653 |
|  | = 0.5006188826120596 |
| w15 | = w15 + ∇w15 |
|  | = 0.6 + 0.00031635750196390796 |
|  | = 0.6003163575019639 |
| w24 | = w24 + ∇w24 |
|  | = 0.3 + 0.0007072944137823606 |
|  | = 0.30070729441378236 |
| w25 | = w25 + ∇w25 |
|  | = 1.1 + 0.00036155143081589494 |
|  | = 1.100361551430816 |
| w34 | = w34 + ∇w34 |
|  | = -1.0 + 0.0007957062155051556 |
|  | = -0.9992042937844948 |
| w35 | = w35 + ∇w35 |
|  | = 0.1 + 0.00040674535966788176 |
|  | = 0.10040674535966788 |
| θ4 | = θ4 + ∇θ4 |
|  | = 0.2 + ( -0.0008841180172279505) |
|  | = 0.19911588198277205 |
| θ5 | = θ5 + ∇θ5 |
|  | = 0.3 + (-0.0004519392885198686) |
|  | = 0.2995480607114801 |
| θ6 | = θ6 + ∇θ6 |
|  | = **0.4** + (**-0.000713398974535995)** |
|  | = 0.39928660102546404 |

Lalu isi rangkuman hasilnya di tabel ini ya …

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **w14** | **w15** | **w24** | **w25** | **w34** | **w35** | **θ4** | **θ5** | **θ6** |
| 0.5006188826120596 | 0.6003163575019639 | 0.30070729441378236 | 1.100361551430816 | -0.9992042937844948 | 0.10040674535966788 | 0.19911588198277205 | 0.2995480607114801 | 0.39928660102546404 |

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