**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 | = 1 / (1 + EXP(-((X1 x W14) + (X2 x W24) + (X3 x W34) + threshold x θ4)) |
| --- | --- |
|  | = 1 / (1 + EXP(-((0.7 x 0.5) + (0.8 x 0.3) + (0.9 x -1) + (-1 x 0.2))) |
|  | = 0.3752 |
| Y5 | = 1 / (1 + EXP(-((X1 x W15) + (X2 x W25) + (X3 x W35) + threshold x θ5)) |
|  | = 1 / (1 + EXP(-((0.7 x 0.6) + (0.8 x 1.1) + (0.9 x 0.1) + (-1 x 0.3))) |
|  | = 0.7484 |
| Y6 | = 1 / (1 + EXP(-((Y4 x W46) + (Y5 x W56) + threshold x θ6)) |
|  | = 1 / (1 + EXP(-((0.3752 x -1.1) + (0.7484\*-0.7) -1 x 0.4) |
|  | = 0.3690 |
| e | = Yd,6 - Y6 |
|  | = 0 - 0.3690 |
|  | = -0.3690 |

Lalu isi rangkuman hasilnya di tabel ini ya …

| **Y4** | **Y5** | **Y6** | **e** |
| --- | --- | --- | --- |
| **0.3752** | **0.7484** | **0.3690** | **-0.3690** |

**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 | = e x (1 – e) x (0 – Y6) |
| --- | --- |
|  | = 0.3690 x (1 - 0.3690) x -0.3690 |
|  | = -0.0859 |
| ∇46 | = α x Y4 x δ6 |
|  | = 0.1 x 0.3752 x -0.0859 |
|  | = -0.0032 |
| ∇56 | = α x Y5 x δ6 |
|  | = 0.1 x 0.7484 x -0.0859 |
|  | = -0.0064 |
| ∇θ6 | = α x threshold x e |
|  | = 0.1 x (-1) x (-0.0859) |
|  | = 0.0086 |

Lalu isi rangkuman hasilnya di tabel ini ya …

| **δ6** | **∇46** | **∇56** | **∇θ6** |
| --- | --- | --- | --- |
| **-0.0859** | **-0.0032** | **-0.0064** | **0.0086** |

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

| δ4 | = Y4 x (1-Y4) x δ6 x W46 |
| --- | --- |
|  | = 0.3752 x (1 - 0.3752) x (-0.0859) x (-1.1) |
|  | = 0.0222 |
| δ5 | = Y5 x (1-Y5) x δ6 x W56 |
|  | = 0.7484 x (1 - 0.7484) x (-0.0859) x (-0,7) |
|  | = 0.0113 |

Lalu isi rangkuman hasilnya di tabel ini ya …

| **δ4** | **δ5** |
| --- | --- |
| **0.0222** | **0.0113** |

**Langkah 4: Hitung weight corrections**

| ∇w14 | = α x X1 x δ4 |
| --- | --- |
|  | = 0.1 x 0.7 x 0.0222 |
|  | = 0.0016 |
| ∇w24 | = α x X2 x δ4 |
|  | = 0.1 x 0.8 x 0.0222 |
|  | = 0.0018 |
| ∇w34 | = α x X3 x δ4 |
|  | = 0.1 x 0.9 x 0.0222 |
|  | = 0.0020 |
| ∇θ4 | = α x 1 x δ4 |
|  | = 0.1 x (-1) x 0.0222 |
|  | = -0.0022 |
| ∇w15 | = α x X1 x δ5 |
|  | = 0.1 x 0.7 x 0.0113 |
|  | = 0.0008 |
| ∇w25 | = α x X2 x δ5 |
|  | = 0.1 x 0.8 x 0.0113 |
|  | = 0.0009 |
| ∇w35 | = α x X3 x δ5 |
|  | = 0.1 x 0.9 x 0.0113 |
|  | = 0.0010 |
| ∇θ5 | = α x 1 x δ5 |
|  | = 0.1 x 1 x 0.0113 |
|  | = -0.0011 |

Lalu isi rangkuman hasilnya di tabel ini ya …

| **∇w14** | **∇w24** | **∇w34** | **∇θ4** | **∇w15** | **∇w25** | **∇w35** | **∇θ5** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **0.0016** | **0.0018** | **0.0020** | **-0.0022** | **0.0008** | **0.0009** | **0.0010** | **-0.0011** |

**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 + 0.0016 |
|  | = 0.5016 |
| w15 | = w15 + ∇w15 |
|  | = 0.6 + 0.0008 |
|  | = 0.6008 |
| w24 | = w24 + ∇w24 |
|  | = 0.3 + 0.0018 |
|  | = 0.3018 |
| w25 | = w25 + ∇w25 |
|  | = 1.1 + 0.0009 |
|  | = 1.1009 |
| w34 | = w34 + ∇w34 |
|  | = -1 + 0.0020 |
|  | = -0.9980 |
| w35 | = w35 + ∇w35 |
|  | = 0.1 + 0,0010 |
|  | = 0.1010 |
| θ4 | = θ4 +**∇θ4** |
|  | = 0.2 + (-0.0022) |
|  | = 0.1978 |
| θ5 | = θ5 +**∇θ5** |
|  | = 0.3 + -0.011 |
|  | = 0.2989 |
| θ6 | = θ6 +**∇θ6** |
|  | = 0.4 + 0.0086 |
|  | = 0.4086 |

Lalu isi rangkuman hasilnya di tabel ini ya …

| **w14** | **w15** | **w24** | **w25** | **w34** | **w35** | **θ4** | **θ5** | **θ6** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0.5016** | **0.6008** | **0.3018** | **1.1009** | **-0.9980** | **0.1010** | **0.1978** | **0.2989** | **0.4086** |

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