### **Understanding the Computations in a Deep Neural Network**

Let’s look at the computations inside a DNN

1. Consider the same DNN drawn in the previous section
2. The preactivation outputs for the first layer a11, a12 a13, are calculated using simple Matrix-vector multiplication

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | w111 | w112 | w113 |  |  |  | x1 |  |
| W1= | w121 | w122 | w123 | X= | x2 |
|  | w131 | w132 | w133 |  | x3 |

1. Here, the preactivation values are as follows
   1. These values are just the individual rows of the dot-product between W1 and X plus the bias vector
   2. Thus W1X = a1 is given by

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | a11 |  |
| a1 = | a12 |
|  | a13 |

* 1. Here, W1∊ℝ3x3, X∊ℝ3x1, and W1X∊ℝ3x1

1. The activation values are as follows
   1. They are simply the result on applying the activation function (in this case: sigmoid) on the preactivated values