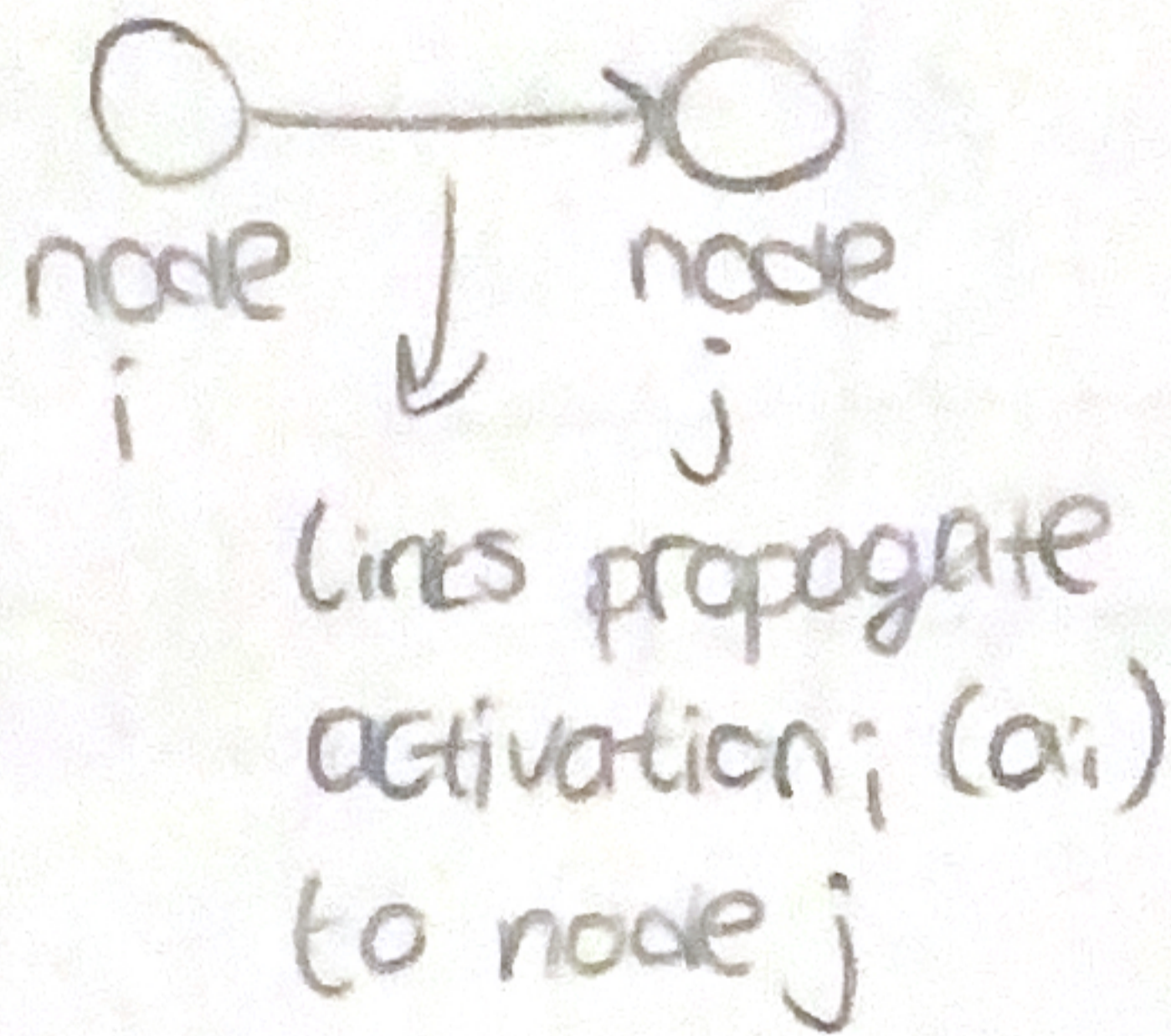
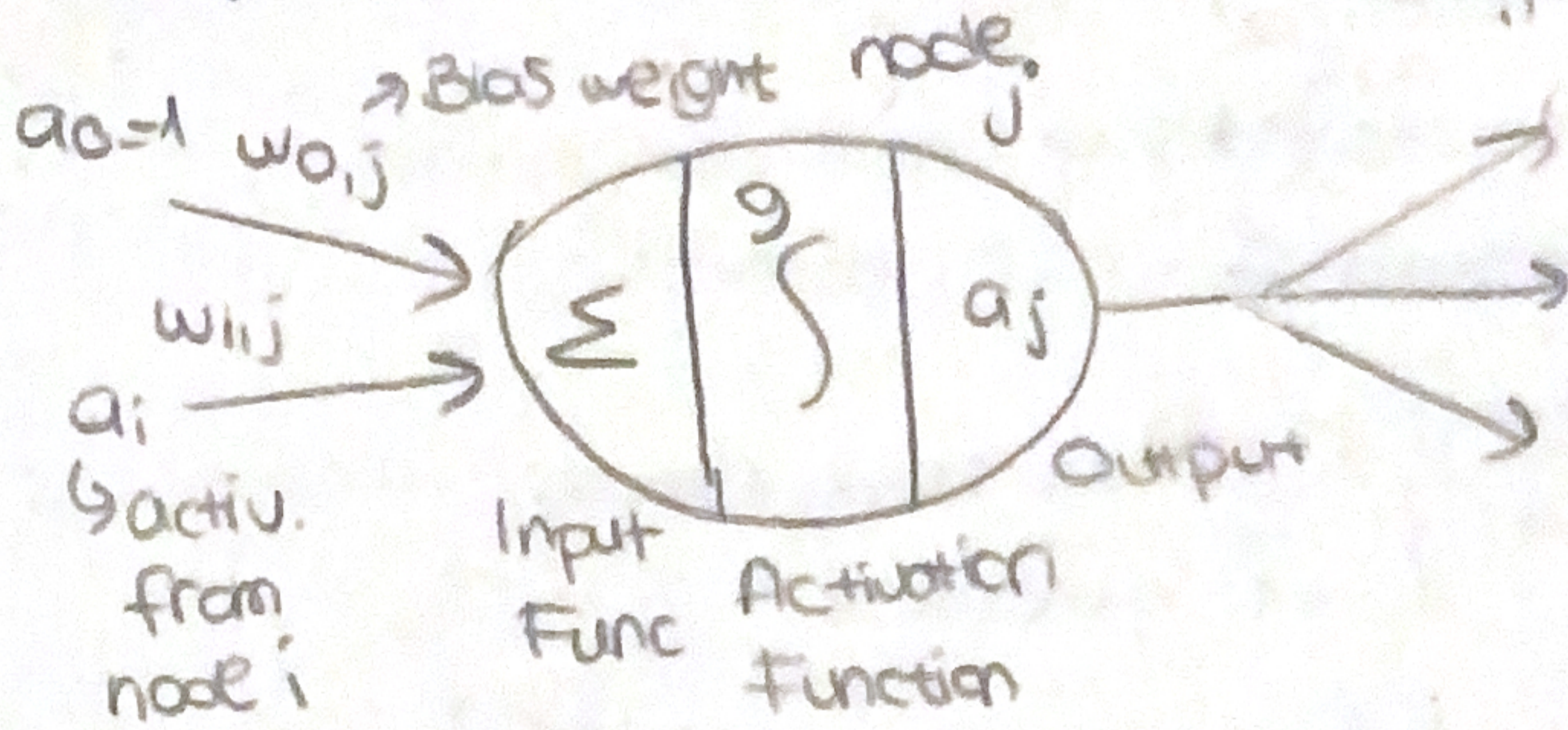


# Neural Networks



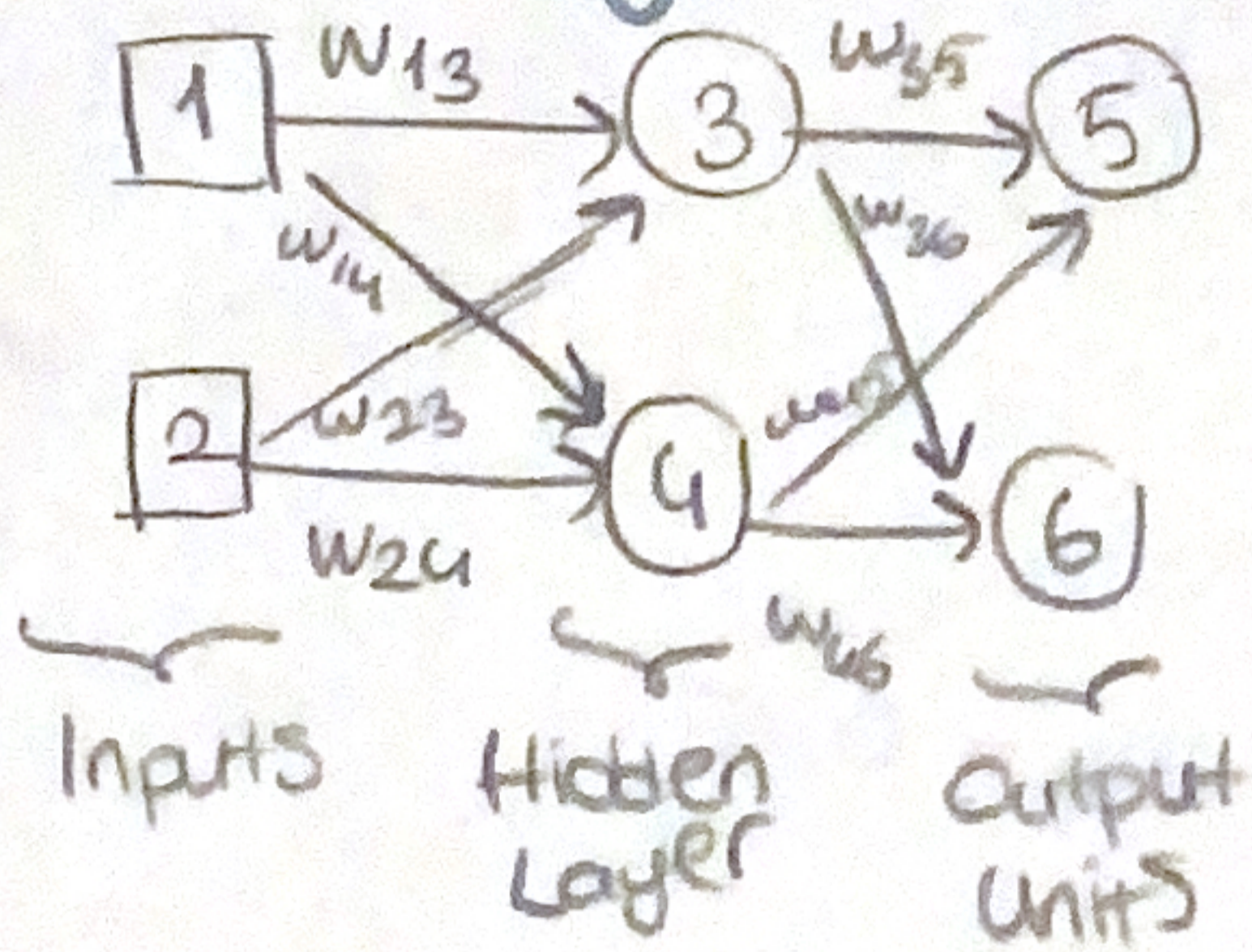
$w_{ij}$ : weight of line  $i, j$   
 $a_0$ : dummy (bias)  
 $w_{0,j}$ : weight of bias

$$in_j = \sum_{i=0}^n w_{i,j} a_i \rightarrow \text{weighted sum of unit } j\text{'s inputs}$$

apply activation

$$a_j = g(in_j) = g\left(\sum_{i=0}^n w_{i,j} a_i\right)$$

## Multi-layer Feed Forward Neural Network



$$\begin{aligned}
 a_5 &= g(w_{0,5} + w_{3,5}a_3 + w_{4,5}a_4) \\
 &= g(w_{0,5} + w_{3,5}(g(w_{1,3}a_1 + w_{2,3}a_2 + w_{0,3})) \\
 &\quad w_{4,5}(g(w_{1,4}a_1 + w_{2,4}a_2 + w_{0,4})))
 \end{aligned}$$

replace with inputs  $x_1, x_2$