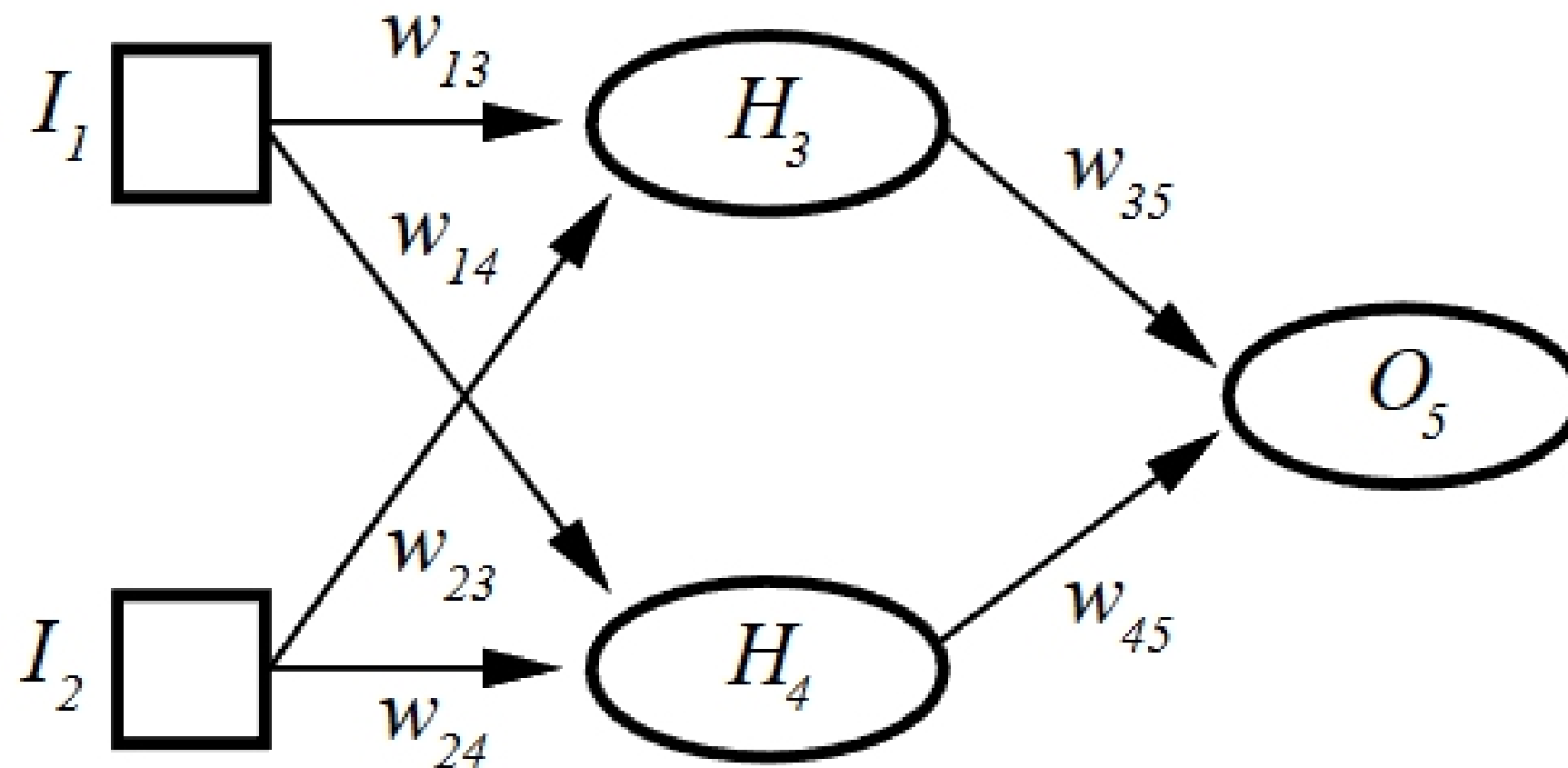


Artificial Intelligence

Learning and Neural Networks

**Readings: Chapter 19 & 20.5 of
Russell & Norvig**

Example: A Feed-forward Network



$$\begin{aligned} a_5 &= g_5(W_{3,5}a_3 + W_{4,5}a_4) \\ &= g_5(W_{3,5}g_3(W_{1,3}a_1 + W_{2,3}a_2) + W_{4,5}g_4(W_{1,4}a_1 + W_{2,4}a_2)) \end{aligned}$$

where a_i is the output and g_i is the activation function of node i .

Computing with NNs

- Different functions are implemented by different network topologies and unit weights.
- The lure of NNs is that a network need not be explicitly programmed to compute a certain function f .
- Given enough nodes and links, a NN can *learn* the function by itself.
- It does so by looking at a training set of *input/output pairs* for f and modifying its topology and weights so that its own input/output behavior agrees with the training pairs.
- In other words, NNs learn by *induction*, too.