Exercise 1:

This week our research group is still busy with the task of deciding whether a patient should be admitted to the hospital. However, based on the findings of the last weeks, it is questioned whether a linear classifier can actually adequately separate the patients into two groups.

1) **Explain why neural networks (NNs) can be useful in such a situation and how they relate to the concept of representation learning.**

Now that we know why NNs can be useful, researcher Holger wonders how such an NN actually works. Researcher Stefanie states that an *input layer*, *neurons, hidden layers* and an *output layer* are the central components of a NN.
(Tip: A small sketch of an NN might be helpful for the next tasks)

2) **Let's start with the input layer. Explain its role in the network and how it interacts with subsequent components.**

After the input layer, an arbitrary number of so-called hidden layers follows. Each of these layers consists of an arbitrary number of neurons.

3) **Explain why these layers are considered to be "hidden".**

4) **Each neuron in a hidden layer performs a 2-step computation. Explain what these two steps are and where the so-called *weights* come into play here.**

The last component of an NN is the so-called output layer, which again consists of a number of neurons.

5) **Explain how the number of neurons and the activation function, which is used in these/this neuron(s) of the output layer, relate to the respective ML problem. For example, consider how the assumed distribution of the target variable in a classification/regression problem affects the choice of function and the number of neurons.**