I) Backpropagation for the Logistic Regression

Let's consider the following neural network:

A) Warm-up questions and definitions

- What is a neuron?
- How many parameters does this model have?
- How do we learn the parameters?
- What is a model?
- How to predict?

B) Forward propagation

The Optimization Loop:

1.
2.
   i)
   ii)
   iii)
II) Backpropagation for a one-hidden layer network

We now add a hidden layer to our network. Here is how it looks like:

A) Warm-up questions and definitions

- Notations

- How many parameters? Shape of each weight matrix / bias vector?

- How many derivatives to calculate?
B) Forward propagation

C) Backward propagation

III) Backpropagation for deep networks

\[
\frac{\partial L}{\partial z^{[1]}} = \frac{\partial L}{\partial a^{[2]}} \frac{\partial a^{[2]}}{\partial z^{[2]}} \frac{\partial z^{[2]}}{\partial a^{[1]}} \frac{\partial a^{[1]}}{\partial z^{[1]}} = \frac{\partial L}{\partial a^{[1]}} \frac{\partial a^{[1]}}{\partial z^{[1]}}
\]
Additional notes & Conclusion:

Method: Multi-layer backpropagation

1.
2.