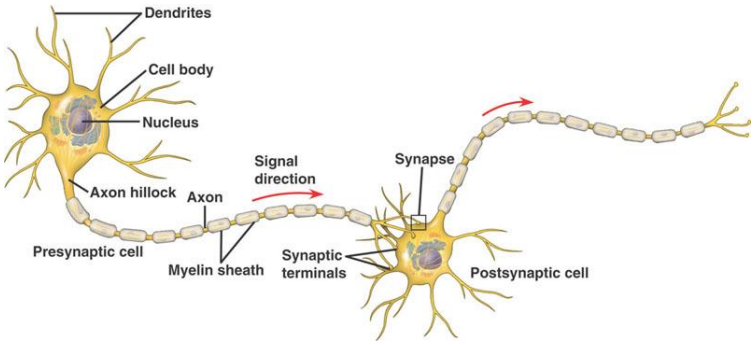
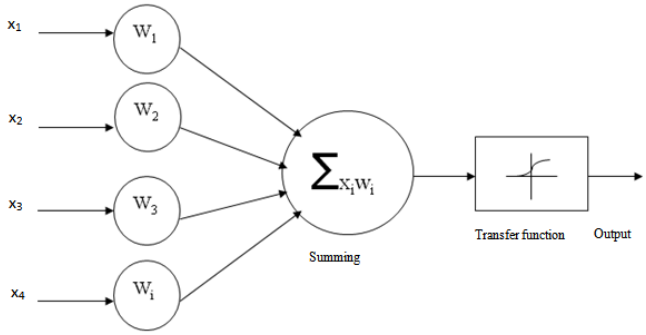
MT Summer Term 2021 Ex7: SMT – NMT Intuitions

1. What is cool and what is not so cool about PB-SMT?

2. In your own words, please describe how a biological neuron cell works and how an artificial neuron (AN) is loosely modelled on a biological neuron:

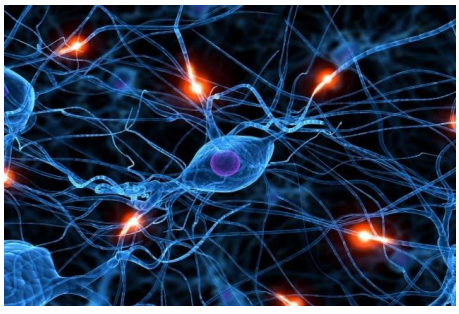


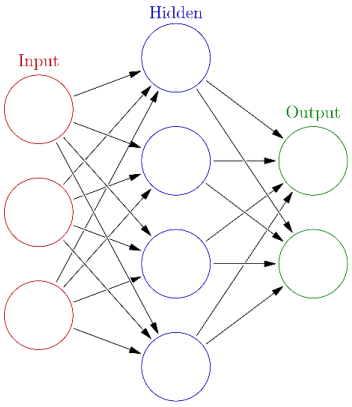


3. What are the parameters of the artificial neuron in (2) above?

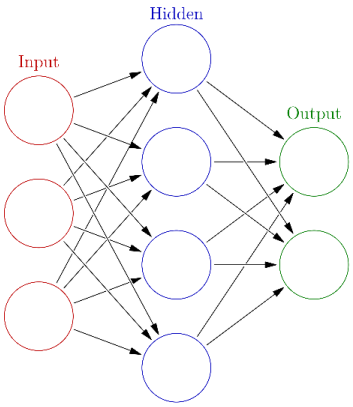
4. Mathematically, what is the function computed by the AN in (2) above?

5. In terms of a high level metaphor, how does learning happen in biological neural networks and in artificial neural networks (ANNs)?

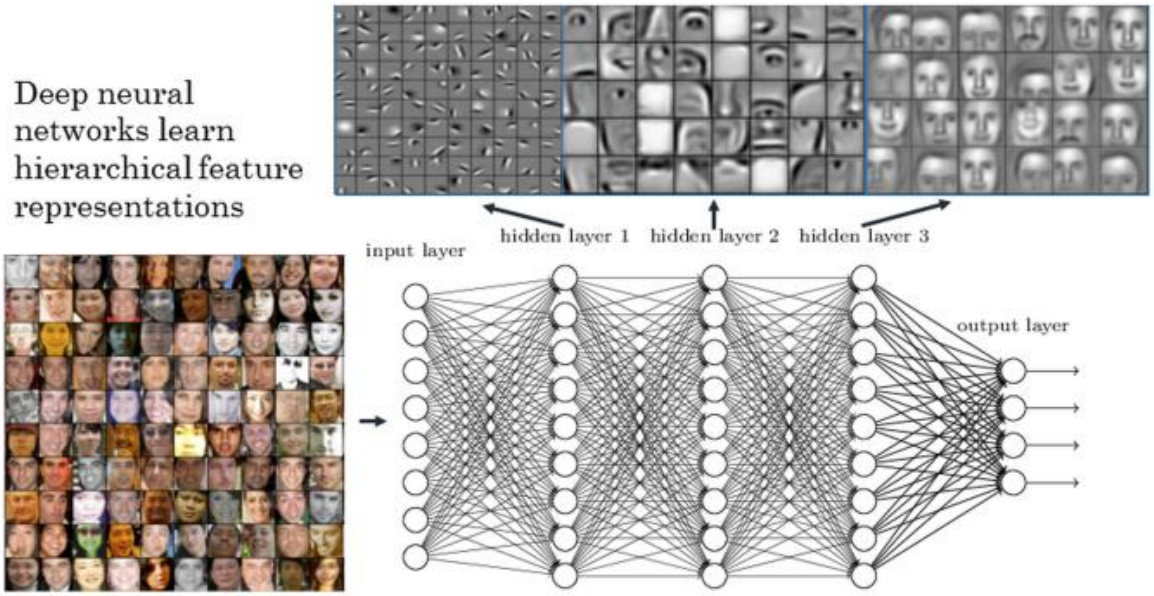




6. What is function composition? In your own words, how does the ANN below learn the composition $f(g(x))$ of two functions f and g? In the picture below, where is f, and where is g?



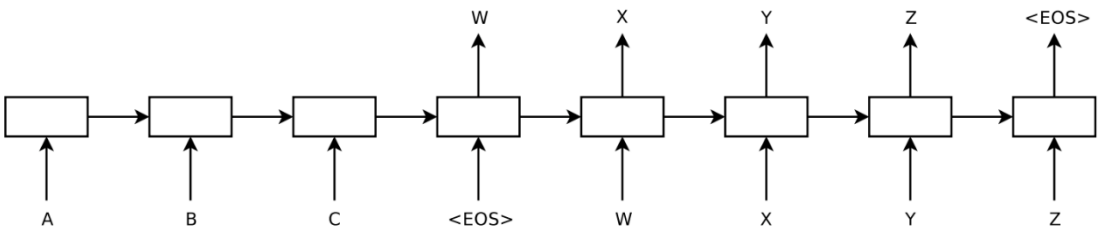
7. In your own words please describe what is “feature and representation learning” by an ANN and how is this different from feature engineering in classical supervised machine learning:



8. Please list some major ANN architectures.

9. In your own words, please describe how the below is a neural MT model:

$$p(t|s) = p(y_1 \cdots y_m | x_1 \cdots x_n) = \prod_{i=1}^{m} p(y_i | y_1 \cdots y_{i-1}, x_1 \cdots x_n)$$

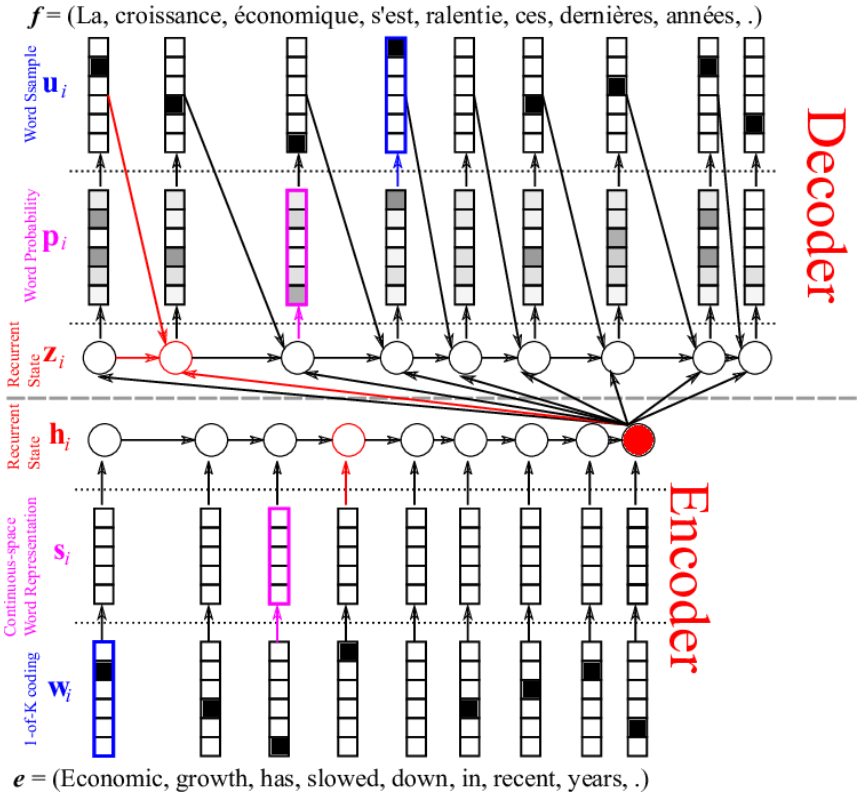


Sutskever et al. 2014

In you description, please refer to sequence to sequence, encoder-decoder models. What licences the equation above?

10. What are hot-one encodings?

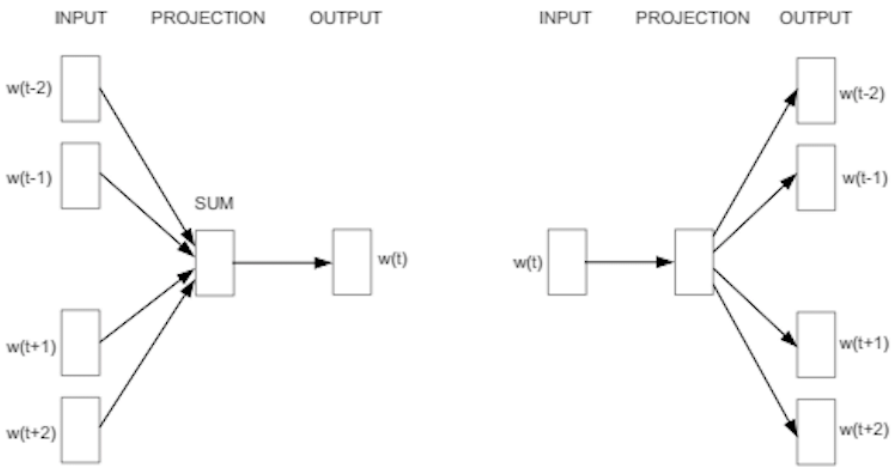
11. In your own words, please describe the following NMT architecture: where are hot-one encodings, the word embeddings, where are the contextualised embeddings, where are the hidden states, where is the context vector linking encoder and decoder



12. What are word embeddings?

13. What is the basic intuition that word embeddings are based on and that they try to capture: think about the distributional hypothesis/distributional semantics.

14. Which of the two diagrams below correspond to skip-gram and which to CBOW:



15. What are “contextualised embeddings”? Please refer to the picture in (11) above.