# The Attention Mechanism – Review

D. Gueorguiev 1/7/2023

## Introductory Notes

The attention mechanism is a part of a neural architecture that enables dynamically to select relevant features in the input data which in NLP is typically a sequence of textual elements. The idea behind attention is to compute a weight distribution on the input sequence, assigning higher values to more relevant elements.

## Appendix

### Probability Density Estimation

### Bi-directional Neural Networks

*Problem Statement*

Consider a (time) sequence of input data vectors

and a sequence of corresponding output data vectors

with neighboring data-pairs in time being statistically independent. Given time sequences and as training data, the aim is to learn the rules to predict output data given the input data. Inputs and outputs, can, in general, be continuous and/or categorical variables. When the outputs are continuous, we have *regression problem* at hand and when they are categorical (class labels), the problem is known as a *classification problem*. In general we talk about *prediction problem* which includes regression and classification.

1. *Unimodal Regression*

With unimodal regression or function approximation, the components of the output vectors are continuous variables. The network parameters are estimated to maximize some predefined objective criterion e.g. maximize the likelihood of the output data. When the distribution of the errors between the desired and the estimated output vectors is assumed to be Gaussian with zero mean and a fixed global data-dependent variance, the likelihood criterion reduces to the Euclidean distance measure between the desired and the estimated output vectors or the *mean-squared-error criterion*, which has to be minimized during training.

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