

How to build complex neural network for text classification

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The great advantage of artificial neural network models is that they can be generalized well and they are perfect for answering high-level questions such as natural language processing ones. The models could be further fine-tuned with their parameters and they could be adapted to solve specific problems. In addition, the methodology is constantly evolving, allowing model assembling to take advantage of combining the capabilities of individual components.

In this work, we present our results on a classification problem related to a real natural language processing problem. The specific task was to automatically classify emails received from users of the service management system of the University of Debrecen for faster processing. The database of the system contains messages written in Hungarian and the textual content with their related labels can be downloaded from the system.

Instead of traditional filter-based approaches, we have considered advanced artificial intelligence applications based on deep learning to solve the task. As methodological novelty, we have developed an algorithm capable of constructing a complex neural network, which, as described above, is able to integrate the individual models recommended in this domain into a complex network providing higher accuracy. We have limited the randomness of the search by a set of rules corresponding to the nature of the natural text as the input data domain.

We have carried out the quantitative evaluation of our dynamic architecture based solution according to the requirements of the field for the preparation of the test data and the selection of the performance measures. Namely, our database containing approximately 30,000 emails was divided into a training (80%) and test (20%) subset, and accuracy was measured by Accuracy combining the sensitivity and specificity of the system. The optimized complex neural network found by our algorithm achieved a classification accuracy of 90%. This result is higher than the 87% of a state-of-the-art neural network architecture [1] recommended for a similar task.

References

[1] Liu, G. and Guo, J. (2019). Bidirectional LSTM with attention mechanism and convolutional layer for text classification. *Neurocomputing*, 337, pp.325-338.