

Application of Machine Learning for Sequential Data

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Nowadays artificial neural networks (ANN) gain an increasing interest after periods of disappointments and several cycles of hype. They are being used in ordinary real life applications, dealing with various types of problems such as natural language processing, handwriting recognition and loans applications. Every year new forms of ANNs applications are being brought into practice. There is still a potential to discover new applications based on ANNs, especially when combined with interesting data. Good assembly of ANNs can produce new insights into data. A neural network can give us a different point of view on the data by discovering new information and relations within data.

In our study we are focusing on using ANNs with data from online news portals sequentially storing web behavior of their visitors. Our goal is to find out whether we can find such architecture of an ANN, which will be able to learn a vector representation of raw input data. Vector representation would allow us to easily compare requests and would hopefully lead to uncovering hidden relations between users and news articles. Adjusted data in a new form will enable us to effectively employ machine learning tasks on the data. This transformation from raw data input to new representation is called feature learning.

Feature learning is a good choice, when we possess a big amount of data from real-word and we want to transfer it to mathematically and computationally convenient form to process in machine learning methods [1]. Feature learning can be divided into two categories:

- Supervised feature learning – features are learnt from labeled data with help from a teacher, who corrects the algorithm, in case of failure.
- Unsupervised feature learning – features are learnt from unlabeled data without any help of teacher. Algorithm learns itself.

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These two categories can be combined into a single category called semi-supervised learning. Many machine-learning researchers have found that unlabeled data, when used in conjunction with a small amount of labeled data, can produce considerable improvement in learning accuracy [1].

Semi-supervised learning is often being compared to the way how children learn. For example, when children are learning about animals, they receive information from looking at pictures (this is unsupervised learning), but sometimes a parent sits with her child and points at animals and says “Dog” (this is supervised learning). Most of the time, a child learns in an unsupervised manner. However, when they get the “meaning” information from parents, they combine it with all previously obtained information. Some researchers say that semi-supervised learning can be a connection between machine learning and human learning [3]

In our study, feature learning with techniques of semi-supervised learning will be the cornerstone for the designed ANN. Choice of a suitable ANN architecture is a difficult task and requires many observations and practice implementations. Our designed ANNs may not produce wanted results even though of there is a hope to discover something new and gain a new knowledge about the data.

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References

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