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Deep learning classification for large behavioral data

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Deep learning has demonstrated significant performance improvements over traditional state-of-the-art classification techniques in knowledge discovery fields such as computer vision and natural language processing. Moreover, the representation-learning nature of the deep learning architecture enables intuitive interpretation of these complex models. The predictive analysis of very high-dimensional human behavioral data (originating from contexts such as e-commerce) could highly benefit from a complex classification model on the one hand and from an intuitive insight in the many fine-grained features on the other hand. The research question we investigate is whether and how deep learning classification can extend its superior results to this omnipresent type of big data. We present the following three contributions. First and foremost, the results of applying deep learning on large, sparse behavioral data sets demonstrate as good as or better results compared to shallow classifiers. We find significant performance improvements over linear support vector machines, logistic regression with stochastic gradient descent and a relational classifier. Moreover, we shed light on hyper-parameter values to facilitate the adoption of deep learning techniques in practice. The results demonstrate that an unsupervised pre-training step does not improve classification performance and that a tanh non-linearity achieves the best predictive performance. Lastly, we entangle the meaning of the neurons in a manner that is intuitive for researchers and practitioners, and show that the separate neurons identify more nuances in the many fine-grained features compared to the shallow classifiers.

Biography

Sofie De Cnudde is currently finishing her PhD at the University of Antwerp in Belgium. Her PhD analyses and compares the performance of wide and deep classification techniques on large and sparse human behavioral data. She has given tutorials on the use of deep learning for large-scale classification and has currently finished a research stay at an e-commerce company in London. Her work has been published in Expert Systems with Applications, Decision Support Systems and has been presented at conferences such as IFORS.

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