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Guoqiang Zhong, Li-Na Wang, Xiao Ling, Junyu Dong

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An Overview on Data Representation Learning: From Traditional Feature Learning to Recent Deep Learning

Guoqiang Zhong*, Li-Na Wang, Xiao Ling, Junyu Dong
Department of Computer Science and Technology
Ocean University of China
238 Songling Road, Qingdao 266100, China
* Corresponding author. Email: gqzhong@ouc.edu.cn

Abstract: Since about 100 years ago, to learn the intrinsic structure of data, many representation learning approaches have been proposed, either linear or nonlinear, either supervised or unsupervised, either “shallow” or “deep”. Particularly, deep architectures are widely applied for representation learning in recent years, and have delivered top results in many tasks, such as image classification, object detection and speech recognition. In this paper, we review the development of data representation learning methods. Specifically, we investigate both traditional feature learning algorithms and state-of-the-art deep learning models. The history of data representation learning is introduced, while available online resources (e.g., courses, tutorials and books) and toolboxes are provided. At the end, we give a few remarks on the development of data representation learning and suggest some interesting research directions in this area.

Key words: Representation learning; Feature learning; Deep learning.