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Deep network based on stacked orthogonal convex incremental ELM autoencoders. (English)

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Summary: Extreme learning machine (ELM) as an emerging technology has recently attracted many researchers' interest due to its fast learning speed and state-of-the-art generalization ability in the implementation. Meanwhile, the incremental extreme learning machine (I-ELM) based on incremental learning algorithm was proposed which outperforms many popular learning algorithms. However, the incremental algorithms with ELM do not recalculate the output weights of all the existing nodes when a new node is added and cannot obtain the least-squares solution of output weight vectors. In this paper, we propose orthogonal convex incremental learning machine (OCI-ELM) with Gram-Schmidt orthogonalization method and Barron's convex optimization learning method to solve the nonconvex optimization problem and least-squares solution problem, and then we give the rigorous proofs in theory. Moreover, in this paper, we propose a deep architecture based on stacked OCI-ELM autoencoders according to stacked generalization philosophy for solving large and complex data problems. The experimental results verified with both UCI datasets and large datasets demonstrate that the deep network based on stacked OCI-ELM autoencoders (DOC-IELM-AEs) outperforms the other methods mentioned in the paper with better performance on regression and classification problems.

MSC:

68T05 Learning and adaptive systems in artificial intelligence
62J05 Linear regression; mixed models

Software:

darch

Full Text: DOI

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