Paperwork on Degree Project: Machine Learning Based Fault Prediction for Real-time Scheduling on Shop-floor

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Stacked Auto-encoders

Overview

A stacked auto-encoder is a neural network consisting of multiple layers of sparse auto-encoders in which the outputs of each layer is wired to the inputs of the successive layer. Stacked autoencoders take advantage of the greedy layerwise approach for pretraining a deep network by training each layer in turn. To do this, first train the first layer on raw input to obtain parameters of weights and biases. Use the first layer to transform the raw input into a vector consisting of activation of the hidden units. Train the second layer on this vector to obtain parameters of weights and biases.Repeat for subsequent layers, using the output of each layer as input for the subsequent layer.
This method trains the parameters of each layer individually while freezing parameters for the remainder of the model. To produce better results, after this phase of training is complete, fine-tuning using back propagation can be used to improve the results by tuning the parameters of all layers are changed at the same time.
Dal Xi Wu et al. constructed a stacked denoising auto-encoder architecture with adaptive learning rate for action recognition based on skeleton features and found their results with better robustness and accuracy than that of classic machine learning models including SVM, REFTrees, Linear Regression, RBF Network and Deep Belief Network(Applied Mechanics and Materials)[1]. Heung-Il Suk et al. used stacked auto-encoders for diagnosis of Alzheimer's disease and its prodromal stage mild cognitive impairment(Brain Structure and Function)[2]. Earnest Paul Ijjina and Krishna Mohan C built a stacked auto-encoder for human actions classification using pose based features(Pattern Recognition Letters)[3].

Algorithm Details

Overall, medium computation time, require large amount of training data. Capable of learning complex patterns. Step 1:
...
Step n: equations

References

[1] Hassan K Khalil. *Nonlinear systems*. Prentice Hall, Upper Saddle river, 3. edition, 2002. ISBN 0-13-067389-7.

[2] Tobias Oetiker, Hubert Partl, Irene Hyna, and Elisabeth Schlegl. *The Not So Short Introduction to LaTeX 2ε*. Oetiker, OETIKER+PARTNER AG, Aarweg 15, 4600 Olten, Switzerland, 2008. http://www.ctan.org/info/lshort/.

[3] Shankar Sastry. *Nonlinear systems: analysis, stability, and control*, volume 10. Springer, New York, N.Y., 1999. ISBN 0-387-98513-1.