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SPEAKER

Kirandeep Kour
MPI Magdeburg

TITLE

Tensor Methods for Machine Learning

ABSTRACT

An increasing amount of data collected are high-dimensional and efficient learning algorithms must utilize the tensorial structure as much as possible. The ever-present curse of dimensionality for high dimensional data and the loss of structure when vectorizing the data motivates the use of tailored low-rank tensor methods. Also, some real-world applications (medical data) and scientific experiments generates small amount of these tensorial data. There is a well-known machine learning Kernel Method known as Support Vector Machine (SVM) has proven to work better for small amount of data. We are working in the direction of extending SVMs to tensor structure or in general to kernel methods.
In order to elaborate tensorial structure, we propose a new tensor decomposition method, namely “Tensor Train Canonical Polyadic (TTCP) decomposition. And we call corresponding kernel method TT-MMK (Tensor Train- Multi-way Multi Kernel). This low-rank tensorial kernel method provides state-of-the-art and benchmarked other methods.
In computation of TT-MMK, the low-rank tensor decomposition has been fixed and LIBSVM library was used to obtain the best hyper-parameter of SVM model. Further in research, we uses TTCP-update as the regularization term along with SVMs objective function. This leads us to also look at another most important direction of Machine learning, that is “Optimization”. Solving SVMs optimization problem has been a richer topic in literature and so far there are very few good methods, and these methods also fails to generalize to nonlinearity and noisy model. To solve this issue, we propose “SimulUp-TT-MMK” method for a regularized low-rank tensorial SVM model.
Although, Kernel methods are more robust and explainable, still there is a big leap for extending it to Neural Network framework. We also propose a Neural Support Tensor Structure, in which SimulUp-TT-MMK model is used as a prior in transfer learning. This is being layered by a black-box on top, which includes multiple kernel learning approach.

Tuesday, August 24, 2021 at 2 pm

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