

Master thesis project

IT (Computational science & Engineering, Mathematics)

Advisor: Prof. Ivan Oseledets

Digital data compression of video (and beyond) using Wavelet Tensor Train decomposition

Prerequisites.

Linear algebra, Python, some experience with video / data analysis is a plus

Background.

Digital data are becoming more and more high-dimensional. This project focuses on video compression, but the results are potentially applicable to arrays coming from 3D TV applications. The goal is to try to bring a new mathematical tool to a real encoder.

Problem description.

There are numerous compression algorithms for video. One of the important steps in a video compression (and in the image compression as well) is the continuous transformation of the video sequence using certain sets of predefined transforms (filters). One of the possibilities is to use wavelets. The problem is that those filters are fixed once-and-for-all, and can not adapt to the particular data. An approach, named Wavelet Tensor Train (WTT) overcoming this issue was recently proposed: at the compression stage a set of filters is computed adaptively. There is a long way to go to the actual product, but preliminary experiments confirm that the method is quite effective. The coder will be implemented in the Python ecosystem

Tasks.

1. Get familiar with the mathematics behind WTT
2. Get familiar with video formats / processing tools in Python
3. Construct a prototype of the compression software

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