

Tensor networks and efficient descriptions of classical data

Wednesday 21 September 2022 15:15 (15 minutes)

We investigate the potential of tensor network based machine learning methods to scale to large image and text data sets. For that, we study how the mutual information between a subregion and its complement scales with the subsystem size L , similarly to how it is done in quantum many-body physics. We find that for text, the mutual information scales as a power law L with a close to volume law exponent, indicating that text cannot be efficiently described by 1D tensor networks. For images, the scaling is close to an area law, hinting at 2D tensor networks such as PEPS could have an adequate expressibility. For the numerical analysis, we introduce a mutual information estimator based on autoregressive networks, and we also use convolutional neural networks in a neural estimator method.

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Session Classification: Understanding Machine Learning

Track Classification: Understanding Machine Learning