

Matrix Element Regression with Deep Neural Networks – breaking the CPU barrier

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The Matrix Element Method (MEM) is a powerful method to extract information from measured events at collider experiments. Compared to multivariate techniques built on large sets of experimental data, the MEM does not rely on an examples-based learning phase but directly exploits our knowledge of the physics processes. This comes at a price, both in term of complexity and computing time since the required multi-dimensional integral of a rapidly varying function needs to be evaluated for every event and physics process considered. This can be mitigated by optimizing the integration, as is done in the MoMEMta package, but the computing time remains a concern, and often makes the use of the MEM in full-scale analysis unpractical or impossible. We investigate in this paper the use of a Deep Neural Network (DNN) built by regression of the MEM integral as an ansatz for analysis, especially in the search for new physics.

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