HAMLET
How to Apply Machine Learning to Experimental & Theoretical PHYSICS
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Transforming the Bootstrap: Using Transformers to Compute Scattering Amplitudes in Planar N = 4 Super Yang-Mills Theory

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We pursue the use of deep learning methods to improve state-of-the-art computations in theoretical high-energy physics. Planar N = 4 Super Yang-Mills theory is a close cousin to the theory that describes Higgs boson production at the Large Hadron Collider; its scattering amplitudes are large mathematical expressions containing integer coefficients. In this paper, we apply Transformers to predict these coefficients. The problem can be formulated in a language-like representation amenable to standard cross-entropy training objectives. We design two related experiments and show that the model achieves high accuracy (> 98%) on both tasks. Our work shows that Transformers can be applied successfully to problems in theoretical physics that require exact solutions. (Based on arXiv:2405.06107 [cs.LG])

Primary authors: CAI, Tianji; CHARTON, François; CRANMER, Kyle; DIXON, Lance J.; MERZ, Garrett W.; NOLTE, Niklas; Dr WILHELM, Matthias (NBI)

Presenter: Dr WILHELM, Matthias (NBI)

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