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Optimizing the Constrained Conformal Bootstrap VIJAY NARAYAN, JASON PARISI, Yale University — Conformal field theories (CFT) are a class of quantum field theories that are invariant under conformal transformations, a natural extension of scale invariance. They are widely studied because of their potential to describe critical systems such as the 3D Ising model, strongly-coupled interactions in extensions to the Standard Model, and quantum gravity via the AdS/CFT correspondence. In the conformal bootstrap program, much of the progress made in constraining CFTs uses crossing symmetry and unitarity to numerically evaluate upper bounds on operator scaling dimensions. A recent proposal suggests that approximate solutions to local CFT data (operator dimensions, spins, and Operator Product Expansion coefficients) could instead be obtained by truncating an infinite sum rule of conformal blocks and taking derivatives to form a set of linear equations and unknowns. We present an in-depth study of this direct solutions method through its application to CFTs of known solutions (4D free scalar theory, 2D Ising model).

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