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Linked cluster expansion method for the SU(3) spin models

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An $SU(3)$ spin model is often used in the literature as a first step to deal with QCD at finite chemical potential. It approximates full lattice QCD in the strong coupling and large fermion-mass limit. We describe a series expansion method called Linked Cluster Expansion (LCE), and how to apply it to the spin model. The results are series of several couplings, which we analyze by generalized Padé approximants, called Partial Differential Approximants (PDAs). This method allows complex multi-critical behavior of quark matter to be investigated. We compare our results with those from complex Langevin and flux representation. We also indicate a couple of open problems.

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