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Towards locating the (real) critical end point

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Lattice simulations and functional approaches established that QCD has no phase transition at small baryon chemical potential. However, second order phase transitions are expected at the conjectured critical endpoint at larger chemical potential and in the chiral limit at vanishing chemical potential.

These phase transitions leave an imprint as Lee-Yang edge singularities and can be found at high temperatures $T > T_c$ for complex magnetisation and complex chemical potential. For an increasing real part of the chemical potential, the edge singularity moves towards the real μ_B-axis, potentially allowing for an extrapolation to the critical endpoint.

As a precursor for a quantitative study in QCD we discuss the impact of fluctuations in a simple low energy effective theory, the non-linear sigma model. We show that in this model the location of the phase transition can accurately be determined by tracking the Lee-Yang singularities in the complex plane. We close by discussing the remaining task of extending this computation to full QCD.

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