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Title:	Finding qcd critical point with quantum machine learning
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Abstract:	The quarks and gluons that are typically bound to nucleons can travel freely in a state called Quark-Gluon Plasma (QGP) when temperatures and densities are incredibly high. Droplets of QGP may now be generated experimentally utilising heavy-ion collisions at Brookhaven National Laboratory's Relativistic Heavy Ion Collider (RHIC) and CERN's Large Hadron Collider (LHC). When the net-baryon density is zero, we have a smooth crossover between the bounded nu- clear matter and the unbounded QGP, according to the first-principles of quantum chromo- dynamics (QCD) calculations, and is also compatible with the experimental observations. At enormous baryon densities, one of the fundamental concerns in the subject is whether QCD shows a first-order phase transition or not. So, the critical point is when the smooth crossover ends and the first order phase transition begins. The ramifications of the presence of a critical point on the QCD phase diagram are detailed in this thesis. In the first half of my study, I built a family of state equations that matched lattice computations at low baryon density and included a critical point in the suitable uni- versality class. The equation of state I created is then used to investigate a probable critical point signature that can be observed experimentally at RHIC. In the second half of my study, using the EoS data for the heavy-ion collision, I made a fully quantum classifier to classify the transition order, whether it's a zero-order phase transition, hinting at a smooth crossover or a first-order phase transition. I compared it with many well known classical classification algorithms.
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