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Density of observables from local derivatives

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The extraction of interesting physics from lattice data is dependent on how precisely the expectation values of observables can be obtained.
I will in this talk present a method to utilize the smoothness of observables to improve the level of precision by calculating how the volume contracts or expands as the observable changes.
To do this, we will derive a formula to calculate the local change to the log of any density of states for smooth real observables. Using this in Monte-Carlo simulations, we can from the obtained density of states calculate the expectation value of observables with a precision often better than standard sampling. The method can be applied to previously generated configurations, as long as the analysis uses the same action used to generate the configurations. We show that for observables such as Wilson line correlators, errors are reduced by up to 4 times at large complex time, which is the part which is most crucial to improve, due to the exponential decay of the correlator.

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