

MASTER'S THESIS

Quasi-Monte Carlo methods for bootstrap

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Quasi-Monte Carlo Methods For Bootstrap

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Abstract

An important part of bootstrap is the construction of the bootstrap resamples by Monte-Carlo resampling. In this thesis, we explore the use of quasi-Monte Carlo resampling to generate the bootstrap resamples. Although quasi-Monte Carlo methods are generally more efficient than Monte Carlo, their performance is known to deteriorate as the dimension increases. By randomizing the quasi-Monte Carlo methods, we remove the bias and lower the discrepancy of the original point set. This improvement is especially apparent in high dimensions. For measuring the uniformity of the resampling points in the ordinary bootstrap, we construct a new type of discrepancy, which is the discrete version of the common \mathcal{L}_2 -star discrepancy. We also construct a discrepancy to measure the quality of weights used in the Bayesian bootstrap. Finally, quasi-Monte Carlo resampling is applied to three examples, including bias reduction, ratio of mean and correlation coefficient, to show the effectiveness of this new resampling method.

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