

Multilevel Control Functional



Invited Speaker

Zhuo Sun

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Finance and Economics*

Date: Mar 31, 2026 (Tue)

Time: 14:00 (HKT)

Zoom Meeting: 801 137 0362

Biography

孙卓，上海财经大学统计与数据科学学院常任轨助理教授，英国帝国理工学院访问学者。曾就职于华为技术有限公司，研究方向为大模型训练和模型压缩。博士毕业于英国伦敦大学学院。研究获ICLR 2026口头报告、UAI 2023口头报告、美国统计学会贝叶斯学部最佳学生论文奖、伦敦大学学院杰出青年学者奖、华为技术创新与突破奖等。主要研究方向是概率机器学习、蒙特卡洛方法等。个人主页：<https://jz-fun.github.io>

Abstract

Control variates are variance reduction techniques for Monte Carlo estimators. They play a critical role in improving Monte Carlo estimators in scientific and machine learning applications that involve computationally expensive integrals. We introduce multilevel control functionals (MLCFs), a novel and widely applicable extension of control variates that combines non-parametric Stein-based control variates with multi-fidelity methods. We show that when the integrand and the density are smooth, and when the dimensionality is not very high, MLCFs enjoy a faster convergence rate. We provide both theoretical analysis and empirical assessments on differential equation examples, including Bayesian inference for ecological models, to demonstrate the effectiveness of our proposed approach. Furthermore, we extend MLCFs for variational inference, and demonstrate improved performance empirically through Bayesian neural network examples.