

STOCHASTIC GRADIENTS: FROM SINGLE SAMPLE PATHS TO CONDITIONAL MONTE CARLO TO MACHINE LEARNING

Michael C. Fu

Robert H. Smith Business School
Institute for Systems Research
University of Maryland
College Park, MD 20742, USA

ABSTRACT

The speaker will make a humble attempt to convey one perspective of his journey through nearly four decades of simulation methodology research focused on stochastic gradient estimation and simulation optimization, highlighting technical advances and some real-world success stories (mainly of others) and illustrating several techniques using simple examples, sprinkled in with personal anecdotes, some historical context, and random ramblings. Perhaps by the end of the talk, with the guidance of the audience, potential future sample paths can be envisioned or reimagined.

AUTHOR BIOGRAPHY

MICHAEL FU holds the Smith Chair of Management Science in the Decision, Operations and Information Technologies department of the Robert H. Smith School of Business, with a joint appointment in the Institute for Systems Research and an affiliate appointment in the Department of Electrical & Computer Engineering (both in the Clark School of Engineering), all at the University of Maryland. He received degrees in math and EECS from MIT in 1985 and a Ph.D. in applied math from Harvard in 1989. His research interests include stochastic gradient estimation, simulation optimization, and applied probability. He is the co-author of the books, *Conditional Monte Carlo: Gradient Estimation and Optimization Applications*, which received the INFORMS Simulation Society's 1998 Outstanding Publication Award, and *Simulation-Based Algorithms for Markov Decision Processes*, and editor/co-editor of four volumes: *Perspectives in Operations Research*, *Advances in Mathematical Finance*, *Encyclopedia of Operations Research and Management Science* (3rd edition), and *Handbook of Simulation Optimization*. He served as Program Chair for the 2011 Winter Simulation Conference, as the Operations Research Program Director at the National Science Foundation from 2010 to 2012 and in 2015, on the INFORMS Board of Directors from 2017-2018, and as General Co-Chair for the 2020 INFORMS National Meeting. Recent awards include the INFORMS Simulation Society's Distinguished Service Award (2019) and the INFORMS Saul Gass Expository Writing Award (2021). He is a Fellow of IEEE and INFORMS.