Industrial and Systems Engineering Seminar

Creating Unbiased Monte Carlo Schemes from Biased Ones: Theory and Applications

Wednesday, April 30

3:15 PM – Refreshments before the Seminar

3:30 PM – Graduate Seminar

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In many Monte Carlo settings, one wishes to compute the expectation of a random object which cannot be generated in finite time. In such settings, it is often the case that one can instead compute approximations to the random object, where the computer time required to generate the approximation is increasing in the equality of the approximation. An example of such a problem context is that of stochastic differential equations (SDEs), where the approximation is typically obtained via an appropriate discretization of the equation. Of course, when such approximations are used, the resulting estimators are generally biased. We show that in the presence of an appropriate coupling of the sequence of approximations, one can create new estimators that are unbiased. These new unbiased estimators often enjoy much better rates of convergence than do the underlying biased schemes. Furthermore, because the expectation can then be computed by averaging independent unbiased samples, the wide range of output analysis methods available in the presence of conventional Monte Carlo are applicable. In the SDE setting, such unbiased schemes are closely related to multi-level Monte Carlo. We discuss this new class of unbiased estimators in the SDE setting, that of Markov chain Monte Carlo, and several other problem contexts.

Bio: Peter W. Glynn is the current Chair of the Department of Management Science and Engineering at Stanford University. He received his Ph.D in Operations Research from Stanford University in 1982. He then joined the faculty of the University of Wisconsin at Madison, where he held a joint appointment between the Industrial Engineering Department and Mathematics Research Center, and courtesy appointment in Computer Science and Mathematics. In 1987, he returned to Stanford, where he joined the Department of Operations Research. He is now the Thomas Ford Professor of Engineering in the Department of Management Science and Engineering, and also holds a courtesy appointment in the Department of Electrical Engineering. From 1999 to 2005, he served as Deputy Chair of the Department of Management Science and Engineering, and was Director of Stanford's Institute for Computational and Mathematical Engineering from 2006 until 2010. He is a Fellow of INFORMS Applied Probability Society in 2009, and was the co-winner of the John von Neumann Theory Prize from INFORMS in 2010. In 2012, he was elected to the National Academy of Engineering. His research interest lie in simulation, computational probability, queueing theory, statistical inference for stochastic processes, and stochastic modeling.