The University of Chicago

Departments of Computer Science,
Mathematics, and Statistics

Scientific and Statistical Computing Seminar

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Time Stepping and Numerical Sensitivity Analysis for SDE

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133 Eckhart Hall, 5734 S. University Avenue.

ABSTRACT

This talk discusses some computational issues related to stochastic differential equations (SDEs). A specific error measure is necessary to design and compare computational methods for SDEs. We discuss the *microscopic total variation*, which measures the L^1 error in the joint PDF of all the time step values. This is a path measure (unlike weak error) and independent of a coupling (unlike strong error). We also consider the *coupling distance* between the exact and approximate joint PDFs. This is closer to strong error in spirit and in results, but also allows methods with no natural coupling.

Suppose $\Omega(\theta)$ is a smooth domain that depends on parameters θ. Let X_t satisfy an SDE and let $f(\theta) = E\left[V(X_\tau)\right]$, where τ_θ is the hitting time of $\partial\Omega$. We discuss a good Monte Carlo estimator of $\nabla_\theta f(\theta)$. This is used in stochastic optimization for computing optimal stopping rules. We present computational experiments that show that an affine invariant (in θ space) version of Robbins Munro can be more effective than the original method or some other variants.

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