Class notes: Monte Carlo methods
Project ideas
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1. Finance application

    (a) Monte Carlo option valuation and/or risk estimation using the hierarchical method of Giles for SDE models

    - Acta Numerica article of Michael Giles

    (b) Stochastic optimization of Bayesian investment strategies with estimated covariance matrices.

    - Thesis of Yuan Yuan (recent Courant PhD)
    - Papers of Petter Kolm and Gordon Ritter

2. Samplers

    (a) Ensemble sampler with PCN proposal

    - Goodman and Weare paper on ensemble sampling
    - Papers by Hairer and Stewart on PCN (Preconditioned Crank Nicholson) sampler

    (b) Hamiltonian sampling for surfaces

    - Arxiv paper of Zappa, Holmes-Cerfon, Goodman
    - Paper of Tony Lelivre, Mathias Rousset, Gabriel Stoltz

    (c) Samplers using response surface modeling, possible application to big data

3. Physical models

    (a) Using coarse grained models in MCMC, multi-level Monte Carlo

    - Papers by Tom Hou

    (b) Checkpoint and nested sampling strategies for configuration transitions

    - Vanden Eijnden, Weare, others

4. Software packages. Good Monte Carlo software for others to use is hard to produce.

    (a) PCN proposal ensemble sampler

    (b) estimating auto-correlation time