TAM 598 Lecture 10:

Quantifying Uncertainty in Monte Carlo Estimates

Announcements:

- HW 2 covers lectures 4-8; due on Feb 26

I. VISUALIZING MONTE CARLO UNCERTAINTY

expectation we want:

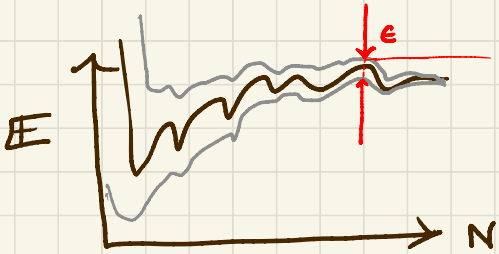
Monte Carlo Approach:

II. THINKING ABOUT EPISTEMIC UNCERTAINTY USING THE CENTRAL LIMIT THEOREM

III. QUANTIFYING EPISTEMIC UNCERTAINTY IN MONTE CARLO ESTIMATES

this means that our Monte Carlo estimates are normal distributed

For example, say we want to reduce the 95% confidence interval to a range ϵ. What is a good choice of N_0?



IV. Uncertainty Propagation Through a Boundary Value Problem

steady-state heat equation, heterogeneous 1D rod, no sources

We are uncertain about $c(x)$ so we'll describe it as a random variable. We'll use what we know to inform the choice of R.V.

Implementation in python: two classes

(1) Rod - a specific rod. Has the following methods:

Rod.get_conductivity(x)

Rod.__repr__()

Rod.plot()

(2) RandomRod - a random rod

RandomRod.rvs() samples a random rod

and Fipy for the 1D heat equation solver.