TAM 598 Lecture 8 :

THE MONTE CARLO METHOD FOR ESTIMATING EXPECTATIONS

Announcements:

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

Our problem today: high dimensional integrals

say we have a random vector $\underset{\sim}{X} = \{ X_1, X_2, \dots, X_d \} \in \mathbb{R}^d$
and some function $g(\underset{\sim}{X})$.

things we want to compute:

expectation $\mathbb{E}[g(\underset{\sim}{X})] =$

variance $\mathbb{V}[g(\underset{\sim}{X})] =$

CDF $F(\underset{\sim}{X}) =$

CURSE OF DIMENSIONALITY - why high dim. integrals are hard

LAW OF LARGE NUMBERS

Say we have an infinite series of independent random variables $X_1, X_2, \dots$ all with the same distribution.

MONTE CARLO

Ulam, von Neumann (1940s)

Say we want to estimate not only the expectation of a distribution by sampling, but also the variance. We can do this by deriving an expression for a variance estimator.

Show that the average of the estimator converges to the expectation.

VARIANCE OF A MONTE CARLO ESTIMATOR