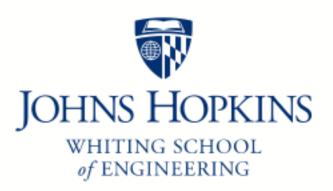
Johns Hopkins Engineering 625.464 Computational Statistics

Importance Sampling Theory

Module 5 Lecture 5A



Variance Reduction Techniques

mc estimator for M= (hox) fox) dx Mmc = 1 Sh(Xi) Where Xi, xn are sampled from f. Importance Sampling A Motivating Example

Importance Sampling A Motivating Example 1, 1, 1, 45, 6 P~ 5 1.10 Poddem. We are no longor sampling from the target distribution of a fair die. Solution: Weight each roll of 1693

Why does it work?

importance sampling distribution importance weighting

Importance Sampling - More Formally

$$M = \int h(x) f(x) dx = \int h(x) \frac{f(x)}{g(x)} \frac{g(x)}{g(x)} dx$$

$$E[h(x)]$$

$$X_1, ... X_n iid \sim G$$

$$function$$

$$M_{TS} = \int \int h(xi) W^*(Xi)$$

$$W^*(xi) = f(xi)$$

$$G(xi)$$

Importance Sampling Comments

Choice of distribution g

- want fix to be bounded · good for g to have heavier tails than f - in practice we would like of to be nearly proportional to [Nextext] So that Then food is nearly constant

Unstandardized Weights

$$W^*(X) = \frac{\int (X)}{g(X)}$$