

Predictive design

Tianxiang Gao
University of North Carolina at Chapel Hill

August 14, 2015

1 Introduction

The aim of predictive design is to produce a design (or a series of design) that can estimate parameter θ (or other metric score) accurately with all the information at hand. We consider the following model in this text: μ is the current prior for the true parameter θ , so we have a prior model $p(\theta|\mu)$. Given the true parameter θ^* and Design D from space \mathbb{D} , we can sample the observed data $p(\mathbf{X}|D, \theta)$. We can calculate the estimation error through an estimation procedure $\delta(D, \theta, \mathbf{X}) = (\hat{\theta}(\mathbf{X}) - \theta)^2$. We call $V(D, \theta) = \int_{\mathbf{X}} \delta(D, \theta, \mathbf{X}) p(\mathbf{X}|\theta, D) d\mathbf{X}$. And $\bar{V}(D, \mu) = \int_{\theta} V(D, \theta) p(\theta|\mu) d\theta$ as the expected loss under knowledge μ . An optimal design $D^* = \operatorname{argmin}_{D \in \mathbb{D}} \bar{V}(D, \mu)$.