

Authors : Prof. Lisa Hellerstein (NYU Tandon School of Engineering)

Title : Stochastic Evaluation of Symmetric Boolean Functions

Abstract: We examine the Stochastic Boolean Function Evaluation problem (also known as the sequential testing problem) for symmetric Boolean functions. In this problem, you are given a symmetric Boolean function and must determine its value on an unknown input x . For each bit i , you are told the independent probability p_i that the bit is 1. Each bit i of x can only be accessed by paying a given cost c_i . The problem is to determine an adaptive strategy for choosing the bits to access, so as to determine the value $f(x)$ with minimum expected cost. An exact algorithm for evaluation of k -of- n functions is known. We present approximation algorithms for general symmetric Boolean functions and also consider the non-adaptive setting. Our techniques exploit the known algorithm for k -of- n function evaluation, the modified round robin technique of Allen et al., and the submodular goal value approach of Deshpande et al. We give an $O(\log n)$ approximation algorithm for general symmetric Boolean functions. We show that constant factor approximations are achievable for interesting subclasses of symmetric Boolean functions.