

# *Deterministic Approximate Counting of Depth-2 Circuits*

Michael Luby

Boban Velickovic

Avi Wigderson

## **Abstract**

We describe deterministic algorithms which for a given depth-2 circuit  $F$  approximate the probability that on a random input  $F$  outputs a specific value  $\alpha$ . Our approach gives an algorithm which for a given  $\text{GF}[2]$  multivariate polynomial  $p$  and given  $\epsilon > 0$  approximates the number of zeros of  $p$  within a multiplicative factor  $1 + \epsilon$ . The algorithm runs in time  $\exp(\exp(O(\sqrt{\log(n/\epsilon)})))$ , where  $n$  is the size of the circuit. We also obtain an algorithm which given a DNF formula  $F$  and  $\epsilon > 0$  approximates the number of satisfying assignments of  $F$  within a factor of  $1 + \epsilon$  and runs in time  $\exp(O(\log(n/\epsilon))^4)$ .