

# Probabilistic and Deterministic Approximations of the Permanent

Avi Wigderson

The Hebrew University, Jerusalem and  
The Institute for Advanced Study, Princeton

**Abstract.** The exact computation of the permanent of a matrix is  $\#P$ -complete. Many efforts have been made to efficiently approximate the permanent. In this talk we will survey some of these methods, both probabilistic and deterministic.

The papers below and the references within them serve as a good source of information on this topic.

## References

1. A. I. Barvinok, Computing Mixed Discriminants, Mixed Volumes, and Permanents, *Discrete & Computational Geometry*, 18, 205-237, 1997.
2. P. Dagum, M. Luby, Approximating the Permanent of Graphs with Large Factors *Theoretical Computer Science*, Part A, Vol. 102, pp. 283-305, 1992.
3. U. Feige and C. Lund. On the hardness of computing the permanent of random matrices, *STOC* 24, 643-654, 1992.
4. M. Jerrum and A. Sinclair, Approximating the permanent, *SIAM J. Comput.*, 18, 1149-1178, 1989.
5. M. Jerrum and U. Vazirani, A mildly exponential approximation algorithm for the permanent, *Algorithmica*, 16(4/5), 392-401, 1996.
6. P. W. Kasteleyn, The statistics of dimers on a lattice 1. The number of dimer arrangements on a quadratic lattice. *Physica*, 27, 1209-1225, 1961.
7. N. Karmarkar, R. Karp, R. Lipton, L. Lovasz and M. Luby, A Monte-Carlo algorithm for estimating the permanent, *SIAM Journal on Computing*, 22(2), 284-293, 1993.
8. L. G. Valiant, The complexity of computing the permanent, *Theoretical Computer Science*, 8(2), 189-201, 1979.