
THE GÖDEL PRIZE 2011

LAUDATIO FOR JOHAN T. HÅSTAD

The Gödel Prize 2011 is awarded to

JOHAN T. HÅSTAD

for his paper:

Some optimal inapproximability results, Journal of the ACM, 48:
798–859, 2001.

This is a landmark paper in computational complexity, specifically, the study of approximation properties of NP-hard problems. It improves on the PCP Theorem (recognized in a previous prize in 2001) to give novel probabilistic verifiers that can check membership proofs for NP languages while reading very few bits in them – as little as 3 bits. The existence of such verifiers implies that existing approximation algorithms for several problems such as MAX-3SAT cannot be improved if P is different from NP. In other words, there is a *threshold* approximation ratio which is possible to achieve in polynomial time, but improving upon which is NP-hard. Before this paper such *optimal* inapproximability results seemed beyond reach. The Fourier analytic techniques introduced in this paper have been adapted in dozens of other works, and are now taught in graduate courses in computational complexity. They also directly influenced subsequent work, such as the formulation of the unique games conjecture for proving further optimal inapproximability results, and lower bounds for geometric embeddings of metric spaces.

The Award Committee

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