

# The Sensitivity Conjecture and its Resolution

Subrahmanyam Kalyanasundaram <sup>1</sup>

<sup>1</sup>Department of CSE,  
Indian Institute of Technology Hyderabad.

November 7, 2021

## Abstract

The sensitivity and block sensitivity are two of the many complexity measures that give an idea of how "complex" a given boolean function is. In 1992, Nisan and Szegedy conjectured that the sensitivity and block sensitivity are polynomially related. Though very simple to state, this conjecture remained open till 2019. It was resolved by Huang using a short, simple and elegant proof.

The proof uses an equivalence result by Gotsman and Linial that states that it is sufficient to lower bound the maximum degree of a  $2^{n-1} + 1$  induced subgraph of the  $n$ -dimensional boolean hypercube. Huang shows a tight bound of  $\sqrt{n}$  for this quantity, thus proving the sensitivity conjecture.

In the talk, I will briefly survey sensitivity and related complexity measures before explaining the proof. I shall also try to explain some of the associated results on which the proof is built on. The talk will be largely self-contained and assume only basic graph theory and linear algebra.

Huang's paper is available here and was published in Annals of Mathematics in Nov 2019.