UNIVERSITY AT BUFFALO

STATE UNIVERSITY OF NEW YORK

DEPARTMENT OF COMPUTER SCIENCE

Presents

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SPARSE HARD SETS FOR NL

—Resolution of the Second Hartmanis Conjecture

A set S is called sparse if there are at most a polynomial number of strings in S up to length n. Intuitively sparse sets are sets with low information content. Sparse sets have been studied in complexity theory for the past 20 years, as they reveal inherent structure and limitations of computation. For instance, it is well known that the class of languages Cook reducible to a sparse set is precisely the class of languages with polynomial size circuits. Some fundamental results concerning the existence of sparse sets hard for various classes: Karp and Lipton proved that if a Turing hard sparse set exists for NP, then the polynomial time hierarchy collapses to its second level Σ_2^p. Mahaney showed that if a sparse set exists which is hard for NP under many-one reductions, then P = NP.

Hartmanis in 1978 made two conjectures concerning the non-existence of sparse hard sets for P and for NL. The conjecture for P was resolved last year by Cai and Sivakumar, following progress by Ogihara.

In this talk we present the resolution of the second Hartmanis conjecture for non-deterministic logspace (NL). We show that there exists a sparse hard set S for NL under logspace many-one reductions if and only if NL = L (deterministic logspace). (All terms will be defined; To understand most of this talk, no prior knowledge is assumed.)

The techniques used include some finite fields, Discrete Fourier Transform and the Immerman-Szelepcsényi theorem.

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Place: 110 Knox, Amherst Campus
Date: Friday, Sept. 6, 1996
Time: 3:00 – 4:15 p.m.

A reception follows the talk in 224 Bell Hall.

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