THE UNIVERSITY OF CHICAGO

Departments of Mathematics and Statistics

ALGEBRAIC GEOMETRY SEMINAR

KETAN MULMULEY

Department of Computer Science
The University of Chicago

The GCT Chasm

TUESDAY, January 15, 2013, from 4:30–6:00 PM

312 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

We show that the problem of derandomizing Noether's Normalization Lemma (NNL) that lies at the heart of the wild problem of classifying tuples of matrices can be brought down from $EXPSPACE$, where it was earlier, to $PSPACE$ unconditionally, to PH assuming the Generalized Riemann Hypothesis (GRH), and even further to P assuming the black-box derandomization hypothesis for symbolic trace (or equivalently determinant) identity testing.

Furthermore, we show that the problem of derandomizing Noether's Normalization Lemma for any explicit variety can be brought down from $EXPSPACE$, where it is currently, to P assuming a strengthened form of the black-box derandomization hypothesis for polynomial identity testing (PIT).

These and related results reveal that the fundamental problems of Geometry (classification) and Complexity Theory (lower bounds and derandomization) share a common root difficulty, namely, the problem of overcoming the formidable $EXPSPACE$ vs. P gap in the complexity of NNL for explicit varieties. We call this gap the *GCT chasm*.

On the positive side, we show that NNL for the ring of invariants for any finite dimensional rational representation of the special linear group of fixed dimension can be brought down from $EXPSPACE$ to quasi-P unconditionally.

Organizers:

For further information on this event, please email Lek-Heng Lim at lekheng@galton.uchicago.edu or Madhav Nori at nori@math.uchicago.edu.

UCAGS Seminar URL: `http://www.stat.uchicago.edu/~lekheng/ag.html`