Berlin Mathematical School

BMS Friday Colloquium

Friday 24 April 2015 at 14:15
Tea & Cookies starting at 13:00

BMS Loft, Urania, An der Urania 17, 10787 Berlin
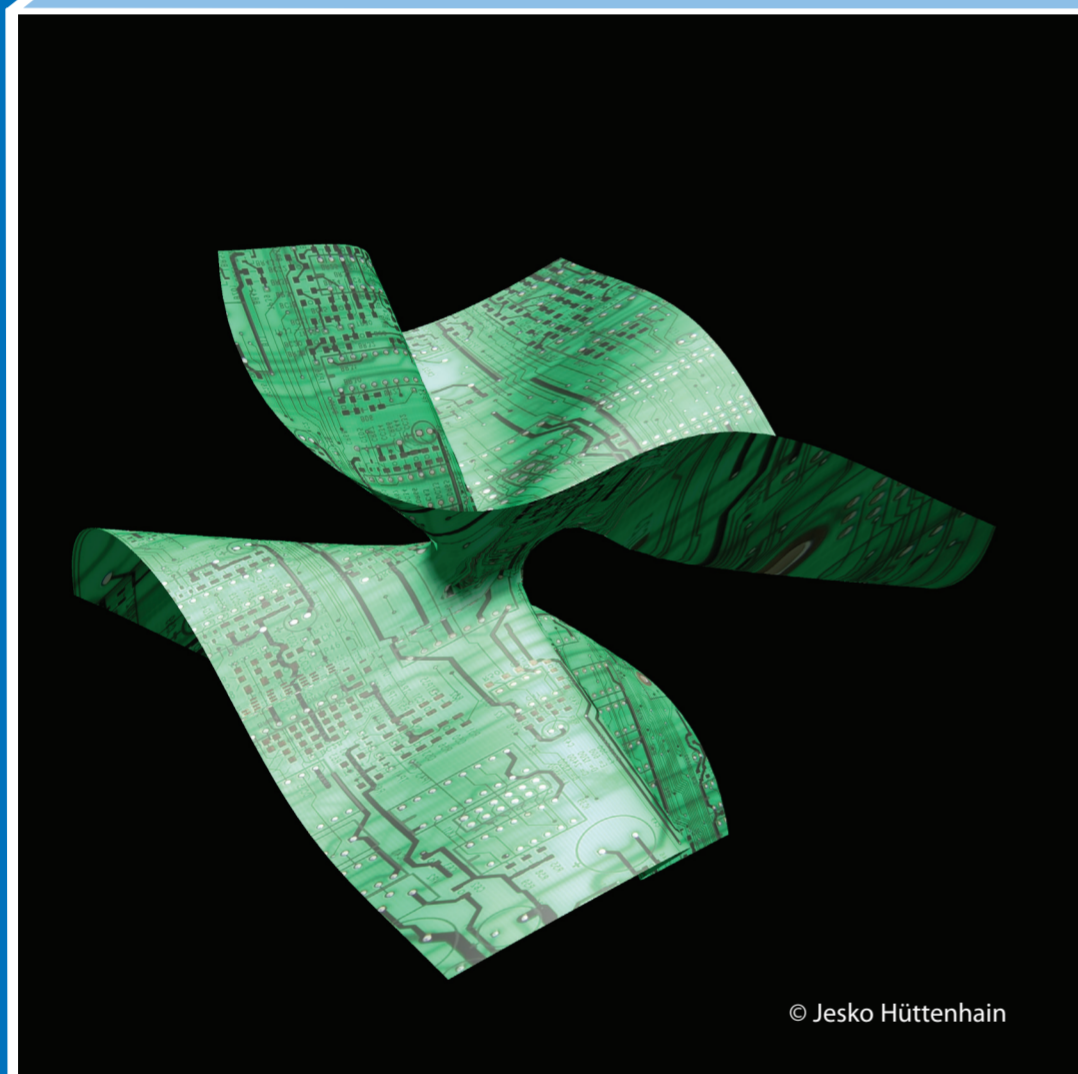
Peter Bürgisser
(TU Berlin)

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Geometry, invariants, and the elusive search for complexity lower bounds

Since the 1970s, it has been known that algebraic geometry provides concepts and methods for proving that the evaluation of certain polynomials is algorithmically difficult. However, the range of these methods so far has been limited, and its successful application to algebraic versions of NP–complete problems has remained elusive.

The flagship question, introduced by Leslie Valiant in 1979, is the "permanent versus determinant problem". It is simple to state, but despite considerable efforts, completely open. A recent suggestion, named "geometric complexity theory", is to attack this and similar problems by representation theory of groups (symmetries) and geometric invariant theory. The approach reveals fascinating and unexpected connections with other areas of mathematics. A remarkable recent insight is an intimate connection of effective questions of classical invariant theory (as studied in the 19th century), and the presumed hardness of the permanent.

Peter Bürgisser has been a professor of mathematics at TU Berlin since 2013. Previously, he was a professor of mathematics at the University of Paderborn. His research interests are algebraic complexity theory, symbolic and numeric computation, and more recently, the probabilistic analysis of numerical algorithms. Bürgisser was an invited speaker at the International Congress of Mathematicians in Hyderabad, India in 2010 and plenary speaker at Foundations of Computational Mathematics 2008 in Hong Kong. He is currently editor-in-chief of "Computational Complexity" and editor of "Foundations of Computational Mathematics".

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