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**Jurij Volčič\*** (volcic@math.tamu.edu). *Positive trace polynomials.*

Trace polynomials are polynomials in noncommuting variables and traces of their products. While originating in invariant theory as equivariant maps between tuples of matrices, trace polynomials more recently received attention in free probability and quantum information theory. This talk addresses positive semidefiniteness of their evaluations on matrices or operators from von Neumann algebras. New algebraic certificates for positivity (Positivstellensätze) in terms of sums of squares and their traces are presented. In the dimension-fixed setting, these certificates are proved using invariant theory, polynomial identities and real algebraic geometry; on the other hand, functional analysis and operator algebras are applied in the dimension-free setting. As a consequence, optimization of trace polynomials over von Neumann algebras subject to tracial constraints can be tackled using semidefinite programming.

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