Mathematics Department Colloquium

SAS 1102, 3:00–4:00, November 11, 2022

Naihuan Jing, NCSU

Quantum Linear Algebra

Abstract: In linear algebra we know that the Pfaffian of an antisymmetric matrix is a square root of the determinant of matrix. In this talk I will explain how one does the *quantum linear algebra*, a recent popular area that can be traced back to Gauss and is well connected with many areas of mathematics such as algebraic combinatorics, representation theory, mathematical physics, to name a few.

Specifically, we consider matrices with entries from a noncommutative coordinate ring of the quantum semigroup. I will explain what the right relations for the matrix entries to define the quantum determinant and quantum Pfaffian are. I will explain why the square root of the quantum determinant is no longer the quantum Pfaffian. Instead the square of the quantum Pfaffian is a new kind of determinant called the Sklyanin determinant, an extremely useful notion from quantum integrable systems and quantum groups. I will show that many classically well-known identities (such as Jacobi, Cayley–Hamilton, Muir, Sylvester, etc.) are available for the Sklyanin determinant and the quantum Pfaffian.

Naihuan Jing received a Ph.D. from Yale University in 1989. After postdoctoral positions at the Institute for Advanced Study, Princeton, in 1989–1990 and the University of Michigan, Ann Arbor, in 1990–1992, he worked at the University of Kansas, Lawrence, during 1992–1994. He joined North Carolina State University in 1994 and has been a full professor since 2001. He was a Fulbright Scholar in 2003 and a recipient of Humboldt Fellowship in 2004–2005. He has had visiting positions at Mathematical Sciences Research Institute in Berkeley, Max Planck Institute of Mathematics in Bonn and Max Planck Institute for Mathematics in the Sciences in Leipzig. Dr. Jing's main research areas are representation theory, quantum groups, infinite-dimensional Lie algebras, vertex algebras, algebraic combinatorics, and quantum computation.