STEPHEN ANCO, Brock University

Symmetry analysis and exact solutions of nonlinear wave equations

Exact solutions have an important role in the study of nonlinear wave equations, particularly for understanding blow-up or dispersive behaviour, attractors, and critical dynamics, as well as for testing numerical solution methods. This talk will illustrate the application of a novel symmetry-group method to obtain explicit solutions to semilinear Schrodinger equations in multi-dimensions.

Semilinear Schrodinger equations provide a model of many interesting types of nonlinear waves, e.g. laser beams in nonlinear optics, oscillations of plasma waves, and free surface water waves. Many explicit new solutions are obtained which have interesting analytical behavior connected with blow-up and dispersion in such models. These solutions include new similarity solutions and other new group-invariant solutions, as well as new solutions that are not invariant under any symmetries of the Schrodinger equation. In contrast, standard symmetry reduction methods lead to nonlinear ODEs for which few if any explicit solutions can be derived by familiar integration methods.