**Applied and Computational Algebraic Geometry**
**Géométrie algébrique appliquée et calculatoire**
(Org: **Taylor Brysiewicz** (University of Western Ontario), **Greg Smith** (Queen's University) and/et **Maksym Zubkov** (University of British Columbia))

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**HIROTACHI ABO**, University of Idaho
*Hunting for surfaces: a computer-aided approach to constructing surfaces in projective four-space*

This talk explores a long-standing problem in classifying algebraic surfaces in projective four-space, inspired by the work of Ellingsrud and Peskine in the 1980s. I will review the classification problem and discuss recent progress, including our new findings. I will also introduce a companion Macaulay2 package developed to support these computations and to encourage further exploration of this classification problem. This is joint work with Kristian Ranestad and Frank-Olaf Schreyer.

**KEVIN DAO**, University of Wisconsin–Madison

**DAVID JOHNSON**, University of Western Ontario

**ELANA KALASHNIKOV**, University of Waterloo

**ILIAS KOTSIREAS**, Wilfrid Laurier University

**JAKE, LEVINSON**, Université de Montréal

**QIXIA LUO**, University of British Columbia

**BRENT PYM**, McGill University
*Graph complexes and the motivic Galois group*

Classical Galois theory studies the symmetries of solutions of polynomial equations. Motivic Galois theory extends this philosophy to symmetries of period integrals on algebraic varieties. It is typically quite difficult to compute the Galois conjugates of a given period integral. I will describe a simple, combinatorial algorithm to compute Galois conjugates for periods of the moduli space of marked curves of genus zero, via graph complexes. While the algorithm itself is quite concrete, the proof that it works involves some new ideas in logarithmic geometry and the theory of operads. This talk is based on forthcoming joint work with Clément Dupont and Erik Panzer.

**ÁLVARO RIBOT**, Harvard University
*Do neural models prefer their submodels?*

A neural model is the set of functions that can be expressed by a given neural network architecture. Neural models contain natural submodels, such as those obtained by setting some neurons to be inactive. We study the geometry of neural models and ask whether they prefer their submodels. By this we mean whether local minimizers of the loss function lie in a given submodel. We introduce a geometric framework to determine if this occurs. For shallow multilayer perceptrons, we show that subnetworks with inactive hidden neurons are never preferred. For deep multilayer perceptrons, we give conditions under which subnetworks with inactive hidden neurons are not preferred. For lightning self-attention, lower-rank submodels are usually not preferred, but we identify examples where they are because they lie on a boundary of the model. Our results show that, aside from a few exceptions, preference for submodels cannot be explained by the geometry of the neural model, and must instead come from other sources such as training dynamics. This is joint work with Yulia Alexandr and Anna Seigal.

**MATT SATRIANO**, University of Waterloo
*NCCRs and the McKay correspondence for reductive groups*

The classical McKay correspondence relates the geometry of quotient singularities with the representation theory of finite groups. In recent joint work with Jeremy Usatine, we generalize this to a McKay correspondence for reductive groups, obtaining explicit formulas for stringy invariants in terms of Weyl group actions and invariants of toric varieties. Using this reductive McKay correspondence, we construct a counter-example to three conjectures relating non-commutative crepant resolutions (NCCRs) and stringy invariants.

**EMMA SCHMIDT**, University of Notre Dame
*Real Monodromy Action and the 3RPR Mechanism*

The algebraically-defined Galois group directly corresponds to the geometric monodromy group over the complex numbers, which studies how solutions permute along loops in parameter space. In applications, it is more useful to study the real monodromy action based on the behavior of tiered collections of real solutions. This talk will introduce an algorithm to compute real monodromy structures. As a practical example, we will explore the monodromy action of the kinematic 3RPR planar mechanism. This is a joint work with Jonathan Hauenstein, Margaret Regan, and Charles Wampler.

**MATIJA TOMIC**, University of British Columbia