ALGEBRA AND ALGEBRAIC GEOMETRY

Eugenii Shustin (Tel Aviv University)

Quantum index and real enumerative geometry

Recently, G. Mikhalkin introduced an integral-valued quantum index of real curves on toric surfaces and defined new refined real rational enumerative invariants of toric surfaces. The talk is devoted to an extension of Mikhalkin's theory to higher genera and to arbitrary del Pezzo surfaces. This is a joint work with I. Itenberg.

Sa'ar Zehavi (Weizmann)

Arithmetic Wu formulas and the generalized Hecke theorem

Several classical theorems in arithmetic, geometry, and topology can be viewed as asserting the mod-2 vanishing of certain Chern classes. Examples include Heckes theorem on the different, Atiyahs theorem on theta characteristics, and Serres RiemannHurwitz formula for spin bundles. In this talk, I will explain a common mechanism behind these results: they arise from Wu-type formulas. I will discuss joint work with Shachar Carmeli and Mark Shusterman in which we extend Wus formula from topology to arithmetic and prove a generalized Hecke theorem: an infinite family of universal mod-2 congruences between Chern classes of varieties over rings of integers, away from the prime 2. This framework extends classical results from topology and geometry into arithmetic and gives a uniform conceptual explanation for a broad family of Hecke-type phenomena through the study of arithmetic characteristic classes.

Boris Kunyavskii (Bar-Ilan University)

Linearization of finite subgroups of Cremona groups over non-closed fields

We study linearizability properties of finite subgroups of the Cremona group $\mathrm{Cr}(n, k)$ in the case where k is a global field, with the focus on the local-global principle. For every global field k of characteristic different from 2 and every $n > 2$, we give an example of a birational involution of the projective n-space, i.e. an element $g \in \mathrm{Cr}(n, k)$ of order 2 isuch that g is linearizable everywhere locally but not globally.

Howard Nuer (Technion)

Quadratically enriched enumeration in pencil problems

Motivic homotopy theory has recently provided the tools to bridge classical and real enumerative geometry, allowing us to compute invariant counts over an arbitrary field k. Valued in the Grothendieck-Witt ring $\mathrm{GW}(k)$ of non-degenerate quadratic forms, these "quadratic enrichments" breathe new life into classical geometric invariants. A milestone in this area is Kass and Wickelgrens enriched count of the 27 lines on a cubic surface, achieved by computing the $\mathbb{A}^1$-homotopy Euler class of a corank 0 oriented vector bundle over a Grassmannian. But what happens when previous Euler class techniques fail?

In this talk, I will discuss ongoing joint work with T. Brazelton, A. Jaramillo-Puentes, and M. Zeng where we tackle the quadratic enrichment of enumerative problems described by vector bundles of positive corank on Grassmannians. To overcome the limitations of existing techniques, we develop a new correspondence that shifts the positive corank problem into a solvable corank 0 framework.

We will focus our applications on enumerative pencil problems. I will outline how this relationship yields quadratic enrichments for classical counts, including the lines in a general pencil of degree $2n2$ hypersurfaces in $\mathbb{P}^n$, and the planes in a general pencil of cubic fourfolds. The latter elegantly provides a quadratic enrichment for the Gromov-Witten invariant $\mathrm{GW}_{1,3}$ on a general $(3, 3)$ complete intersection Calabi-Yau threefold. Finally, time permitting, we will ground these enriched invariants by connecting them back to classical constructions like discriminants and resultants.