Title: **Recent progress on the exponential type conjecture**

Abstract: Take a Fano variety (or closed monotone symplectic manifold). Gromov-Witten theory associates to it a linear differential equation in one variable, with poles at zero and at infinity. One of those poles is very well understood, the other less so: at the most basic level, our expectations are encoded into the exponential type conjecture.

There are now two partial proofs of this conjecture. One uses a geometric assumption, the existence of a smooth anticanonical divisor (Pomerleano-Seidel 2023); the other involves a homological algebra assumption (Chen 2024). The proofs use quite different strategies, but have some philosophical ingredients in common, none of which are apparent from the formulation of the problem: reduction to mod p coefficients; and (different kinds of) Fukaya categories. The outcome is a slightly confusing situation, where we have clearly made some progress, but don’t yet see how the puzzle pieces fit together.

I will try to explain what the problem is; what basic tools about differential equations can be useful; and then say a bit about what enters into the proofs.

Title: **The loss of Smith-Thom maximality by Hilbert square**

Abstract: In an ongoing joint work with R. Rasdeaconu, we investigate the maximality of the Hilbert square of real algebraic varieties. We found that, starting from dimension two, many deformation classes of algebraic varieties do not contain any real variety whose Hilbert square is maximal. For example, the K3-surfaces have never a maximal Hilbert square.

In this talk I intend to outline the current state of our knowledge on this subject.

Title: **Internal waves in a domain with topography**

Abstract: Stratification of the density in an incompressible fluid is responsible for the propagation of internal waves. In domains with topography, these waves exhibit interesting properties. In particular, in 2D these waves concentrate on attractors for some generic frequencies of the forcing. At the mathematical level, this behaviour can be analyzed in the inviscid case with tools from geometry, spectral theory and micro local analysis.

Title: **Non-degeneracy of closed orbits for a generic potential**

Abstract: We prove that adding a generic potential to a convex Hamiltonian on a cotangent bundle makes all periodic orbits on a given energy level non-degenerate.

Title: **Closed characteristics on the boundary of convex domains**

Abstract: An old question in symplectic dynamics is whether closed characteristics on the boundary of a four dimensional smooth convex bounded domain which minimise the action are unknotted. I will show how this question can be addressed by a combined use of Clarke’s duality, Floer homology and the theory of pseudoholomorphic curves in symplectizations. This talk is based on a joint work with Oliver Edtmair and Jungsoo Kang.