FEZA GÜRSEY CENTER FOR PHYSICS AND MATHEMATICS

Dual Perspectives Meetings

Symplectic Almost Squeezings of Large 4-balls

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Abstract: In this first general talk I will explain what "symplectic" means, and sketch a proof of Gromov's non-squeezing theorem and of Gromov's 2-ball theorem. These basic symplectic rigidity results already have applications to problems in dynamics, such as short-time super-recurrence and the non-existence of local attractors of certain Hamiltonian PDEs. For the second part, write $B^4(a)$ for the ball of capacity $a= \pi r^2$, and Z^4 for the symplectic cylinder $D^2(1)xR^2$ where $D^2(1)$ is the disc of area 1. Going beyond Gromov's non-squeezing theorem, Sackel, Song, Varolgunes, and Zhu recently showed that for $a>1$ the complement $B^4(a) - S$ of a subset S in the ball cannot be embedded symplectically into Z^4 if the Minkowski dimension of S is less than 2. They also found that this result is sharp provided that $a<2$, and then Brendel extended this to $a<3$. In joint work with Emmanuel Opshtein, we find in any ball $B^4(a)$ a finite union of planar Lagrangian discs S such that $B^4(a) \setminus S$ symplectically embeds into Z^4. Among the applications are: capacity killing; non-displaceability of the Clifford torus $T(1/d,1/d)$ from S in $B^4(d)$; and the existence of very short Reeb chords from a Legendrian knot back to itself or to S.

Date: Friday, June 09, 2023

Program: Morning session 10:30-12:00, Afternoon session 13:30-15:00

Location: Boğaziçi University, Kandilli Campus, Üsküdar-İstanbul