Theoretical Statistics and Mathematics Unit, Kolkata
INDIAN STATISTICAL INSTITUTE

SEMINAR

Date: October 30, 2025
Time: 04:00 PM

VENUE:

L- Infinity
(5th Floor, A.N. Kolmogorov Bhavan), ISI Kolkata

TITLE:

Maximal Gromov hyperbolic spaces

SPEAKER:

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ABSTRACT:

It is well-known that an isometry between real hyperbolic spaces extends naturally to a Möbius homeomorphism - i.e. cross-ratio preserving homeomorphism - between their Gromov (or visual) boundaries. The same phenomenon holds for any boundary continuous Gromov hyperbolic space. The natural question then arises:
Does a Möbius homeomorphism between the Gromov boundaries extends to isometry of the underlying spaces?
This is the Möbius rigidity problem, related to other problems such as the marked length spectrum rigidity and geodesic conjugacy problem for negatively curved manifolds. Möbius rigidity is known to hold for real hyperbolic spaces, and plays a role in several rigidity results, such us Mostow rigidity.

For “good” (i.e. proper geodesically complete) Gromov hyperbolic spaces the Gromov boundary is a special type of compact metrisable space called quasi-metric antipodal space. In a paper published in 2024, Biswas gave a positive answer to the Möbius rigidity problem for a distinguished sub-class of good Gromov hyperbolic spaces called ‘maximal Gromov hyperbolic spaces’. These Gromov hyperbolic spaces are ‘maximal’ in the sense, any other good Gromov hyperbolic space with the same Gromov boundary isometrically embeds into them, i.e. it is the maximal hyperbolic filling. Biswas showed that given any quasi-metric antipodal space one can naturally construct the maximal Gromov hyperbolic space, hence established an equivalence of categories between the quasi-metric antipodal spaces and maximal Gromov hyperbolic space.

Maximal Gromov hyperbolic spaces exhibit several geometric properties. In this talk, we will see :

(1) Gromov–Hausdorff convergence of maximal Gromov hyperbolic spaces and their boundaries, along with applications of these results. As a byproduct, we also obtain a convergence result for CAT(-1) spaces.

(2) The Polyhedral complex structure of Maximal Gromov hyperbolic spaces with finite Gromov boundaries. Such spaces admit a finite-dimensional ℓ^∞-polyhedral complex structure. Furthermore, we introduce the space of deformations of maximal Gromov hyperbolic spaces with a fixed boundary of finite cardinality, an associated “Teichmuller space”. We outline some natural questions for future study.

This is joint work with Prof. Kingshook Biswas.

ALL ARE CORDIALLY INVITED