December 9, from 4:45 p.m. to 6:20 p.m. (Moscow time)
room 16-10 and broadcast via ZOOM

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The problem of constructing geodesics in Gromov–Hausdorff class.

The talk is dedicated to the proper class of all metric spaces considered up to isometry and equipped with the Gromov–Hausdorff distance. We discuss the properties of geodesics in this Gromov–Hausdorff class.

The Gromov–Hausdorff distance measures the degree of difference between two metric spaces. This distance was introduced by Gromov in 1981 and defined as the smallest Hausdorff distance between isometric images of the considered spaces. Later, an equivalent definition of this distance was given using correspondences.

In the work of Ivanov–Nikolaeva–Tuzhilin, an optimal correspondence between finite metric spaces was used to construct a geodesic between arbitrary compact metric spaces. Subsequently, the existence of an optimal correspondence between compact metric spaces was proven, and as a result, a geodesic between these spaces, generated by the optimal correspondence, was constructed. Such geodesics are called linear. However, it is still unknown whether any pair of metric spaces at a finite distance from each other can be connected by some geodesic.

There is a known special class of metric spaces called spaces in general position. For any space Y from a sufficiently small neighborhood of such a space E, the set of optimal correspondences $\mathbb{R}_{opt}$ is non-empty. The report will discuss some extensions of this class. The author will also provide a construction demonstrating that metric spaces in general position are dense everywhere in $\mathcal{GH}$. Various examples of complete and incomplete spaces, between which no optimal correspondence exists, will also be discussed.

Apart from the definition through correspondences, there is another definition of the Gromov–Hausdorff distance. It is equal to the infimum of Hausdorff distances between different isometric embeddings into enveloping spaces. It will be shown that the existence of an optimal correspondence implies the existence of an optimal Hausdorff realization. The existence and non-existence of an optimal realization for spaces at zero Gromov–Hausdorff distance will be discussed, and it will be shown that there are complete metric spaces at a strictly positive Gromov–Hausdorff distance for which such a realization does not exist.

SCIENTIFIC SEMINAR
“DIFFERENTIAL GEOMETRY AND APPLICATIONS”

headed by Academician of RAS Anatoly T. Fomenko

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