Abstract

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Over the past three decades, there has been a total revolution in the classic branch of mathematics called 3-dimensional topology, namely the discovery that most solid 3-dimensional shapes are hyperbolic manifolds. A hyperbolic manifold is a Riemannian Manifold that is locally isometric to the hyperbolic space $\mathbf{H}^n$. Despite this quite restrictive definition, plenty of hyperbolic manifolds exist, especially in dimensions 2 and 3. For that reason, hyperbolic manifolds and hence hyperbolic geometry play a central role in the study of surfaces and 3-manifolds.

With the idea of developing maps, it has been established that every complete hyperbolic n-manifold is isometric to $\mathbf{H}^n/\Gamma$ for some subgroup $\Gamma < \mathrm{Isom}^+(\mathbf{H}^n)$ acting freely and properly discontinuously on $\mathbf{H}^n$. Thus the study of complete hyperbolic manifolds is tightly connected to that of specific subgroups of $\mathrm{Isom}^+(\mathbf{H}^n)$. So it has both an algebraic and geometric flavor.

In this talk, we will define what a hyperbolic manifold is and how is it related to the subgroups of the isometries of $\mathbf{H}^n$. We will mainly concentrate on Hyperbolic $3-$manifolds

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