

COLUMBIA MATH UNDERGRADUATE SUMMER RESEARCH
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FRANCESCO LIN

Independent Project: Hyperbolic three-manifolds with large isometry groups.

Abstract: The Hurwitz automorphism theorem states that the symmetry group of a compact Riemann surface of genus $g \geq 2$ has at most $84(g-1)$ elements. This can also be interpreted in terms of isometries of hyperbolic surfaces (i.e. surfaces with constant curvature -1), in which case it intuitively says that in order for a surface to have many symmetries, it also needs to have very large area. In this Independent Project, the participant will explore analogous phenomena in the extremely rich context of hyperbolic three-manifolds.

Essential prerequisites: Modern Algebra I and Intro Differentiable Manifolds, or equivalent.

Timeline: depending on the participant's background, the first few weeks will be dedicated to learning material on topics such as hyperbolic geometry, branched coverings and the Hurwitz theorem. The rest of the time will be dedicated to the research project.

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