Fall 2025

Geometry and Topology Seminar

Title

Small genus, small index critical points of the systole function

Speaker:	Ni An, South University of Science and Technology
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Abstract: In this talk, I will introduce a family of critical points of the systole function on Teichmüller space, for which we have computed the index. The members of this family are interesting in that their existence implies the existence of strata in the Thurston spine for which the systoles do not determine a basis for the homology of the surface. Previously, index calculations of critical points with this pathological feature were impossible, because the only known examples were in surfaces with huge genus. A related concept is that of a "minimal filling subset" of the systoles at the critical point. Such minimal filling sets are studied, as they relate to the dimension of the Thurston spine near the critical point. We find an example of a minimal filling set of simple closed geodesics in genus 5 with cardinality 8, that are presumably realised as systoles. More generally, we determine the smallest and largest cardinality of a minimal filling set related to a tesselation of a hyperbolic surface by regular, right-angled m-gons for $m \in \{5, 6, 7\}$. For this, we use integer linear programming together with a hand-tailored symmetry breaking technique.