

Exploring Affine Invariants and Equivariants: Wigner Caustic, Centre Symmetry Set, and Beyond

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In this course, we explore the realm of affine invariants and equivariants within the domain of planar curve geometry (with potential generalization to surfaces and other manifold contexts), drawing from differential geometry, singularity theory, and selected concepts from convex geometry. We will focus on the examination of significant geometric structures such as the Wigner caustic and the Centre Symmetry Set, alongside other sets that offer insights into the departure from symmetry among planar curves (including planar hedgehogs). Our primary objective is to uncover valuable insights into the behavior of curves under the influence of affine transformations and symmetries. We will also demonstrate the utility of the investigated sets in other mathematical domains such as differential equations, isoperimetric problems, and curve shortening flows, which have been studied by generations of mathematicians. Furthermore, we conclude our course by introducing the affine counterpart to the well-known Medial Axis set from Euclidean geometry.