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Topological, Geometric and Analytical Study of Singularities

Singularity theory is a transversal research subject in which many different techniques converge (algebraic, analytic, geometric, topological), with different perspectives (local, global), but with a very strong interconnection. Our research involves the study of analytic singularities from different perspectives. Specific topics are the vanishing cohomology of singularities with its D-module and Hodge structure, the topology of the Milnor fibre, the embedded topology of the link, topological equisingularity, versal deformations and their base spaces with additional structure (such as Frobenius manifolds), invariants of surface singularities, rational cuspidal curves, global polynomial mappings, hyperesolutions and descent categories.

More concretely we intend to work at the following topics and their interactions:
1.- Study a new class of non-isolated singularities introduced by the applicant which already had striking applications. Study the sheaf of vanishing cycles of non-isolated singularities.
2.- Develop a new program towards characterisation of topological equisingularity and apply it to the study of global polynomial mappings. Study several old fundamental questions in topological equisingularity such as the μ-constant problem.
3.- Study some conjectures on rational cuspidal plane curves, Q-acyclic open surfaces and normal surface singulatities with rational homology sphere links, via algebro-geometric and topological techniques.
4.- Study specific problems on configurations of varieties and their complements.
5.- Study moduli of polynomial maps and algebraic endomorphisms.
6.- Study descent categories and applications to D-modules, Hodge Theory and Singularity Theory.