

MEGL Project Proposal: Exploring Geometric Flows

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Geometric flows are differential equations that reshape manifolds in order to simplify or understand their structure. Applications of geometric flows include finding minimal energy surfaces (mean curvature flow, soap films, etc.), the proof of the Poincaré conjecture (Ricci flow), and machine learning algorithms (figure below). The goal of this project is to explore geometric flows using simple examples and numerical experimentation. The project will include an individual study course introducing some needed concepts such as partial differential equations, manifolds, and curvature. Concurrently, the team will work together to develop numerical algorithms for simulating geometric flows, starting from simple examples. Once these tools are developed, we will explore various flows by experimentation and visualization, and in particular we will be interested in the long time limits of the flow.

Applicants should have some programming experience, preferably Matlab or Python.

