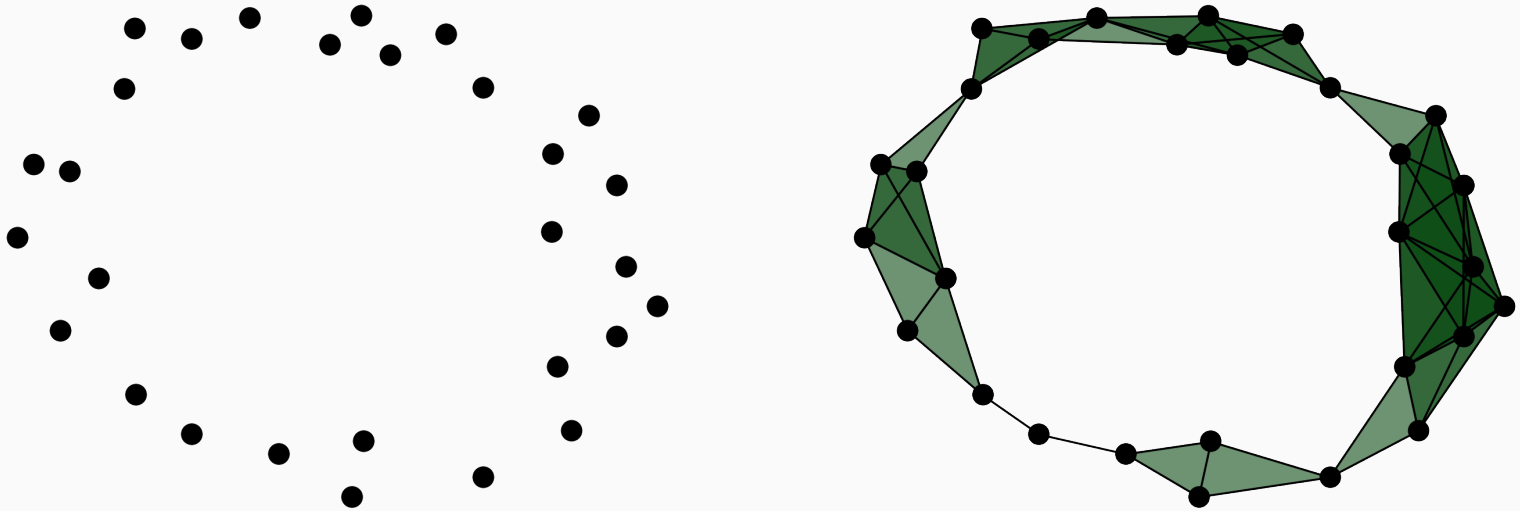
Metric Spaces in Applied Topology

Joshua Mirth, Colorado State University

QG&T at OSU – April 27, 2019

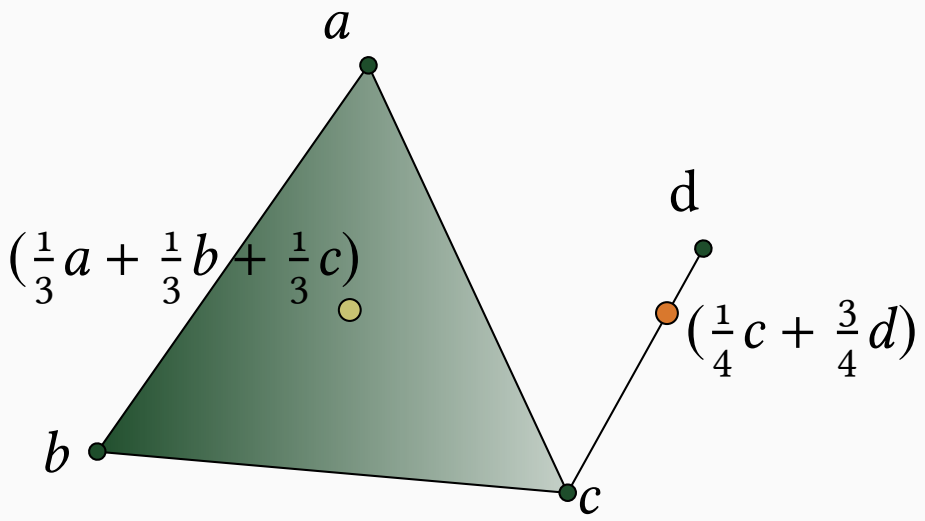
Two principles:

- Datasets are metric spaces.
- Datasets have shapes.



A dataset in $\mathbb{R}^2$ and its Vietoris–Rips complex.

Synthesis: make simplicial complexes metric spaces!



- Metrizes the simplicial complex topology when finite.
- More natural when the vertex set is a (possibly infinite) metric space.

Questions:

- If M is a manifold, for what r is $\mathrm{VR}^{\mathrm{m}}(M; r) \simeq M$?
- When $\mathrm{VR}^{\mathrm{m}}(M; r)$ is not homotopy equivalent to M, what is its homotopy type?