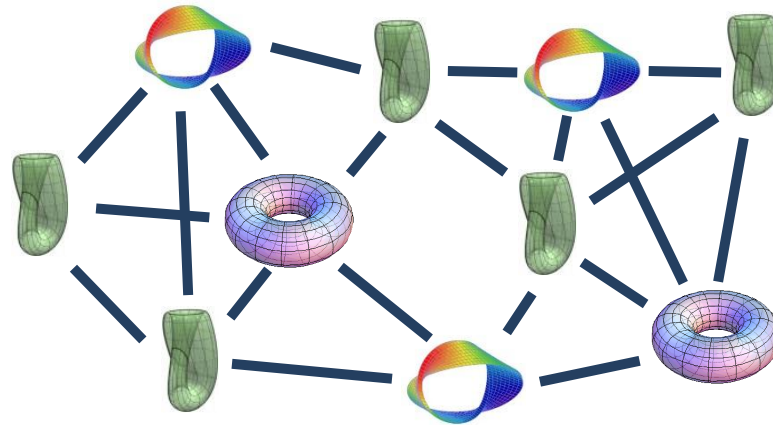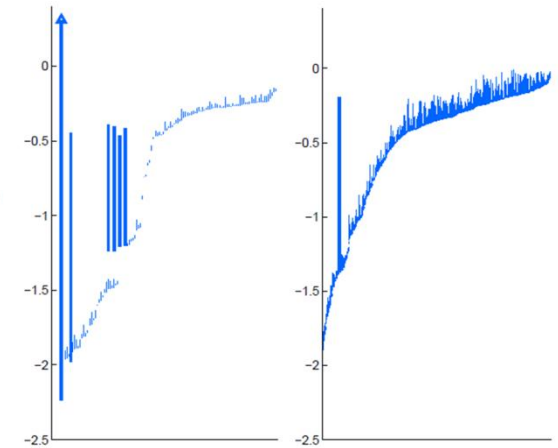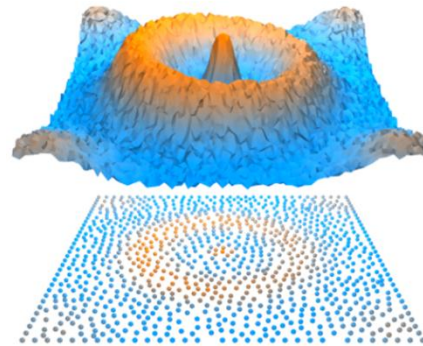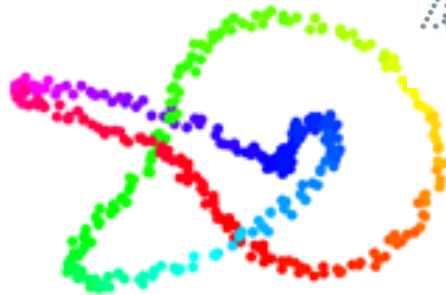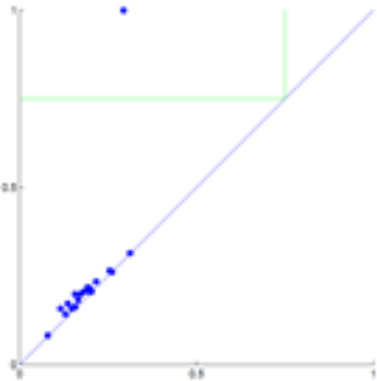# **TOPOSYS**
Topological Complex Systems

PRIMOZ SKRABA

JOZEF STEFAN INSTITUTE

TOPOSYS

- Tools/techniques from computational topology
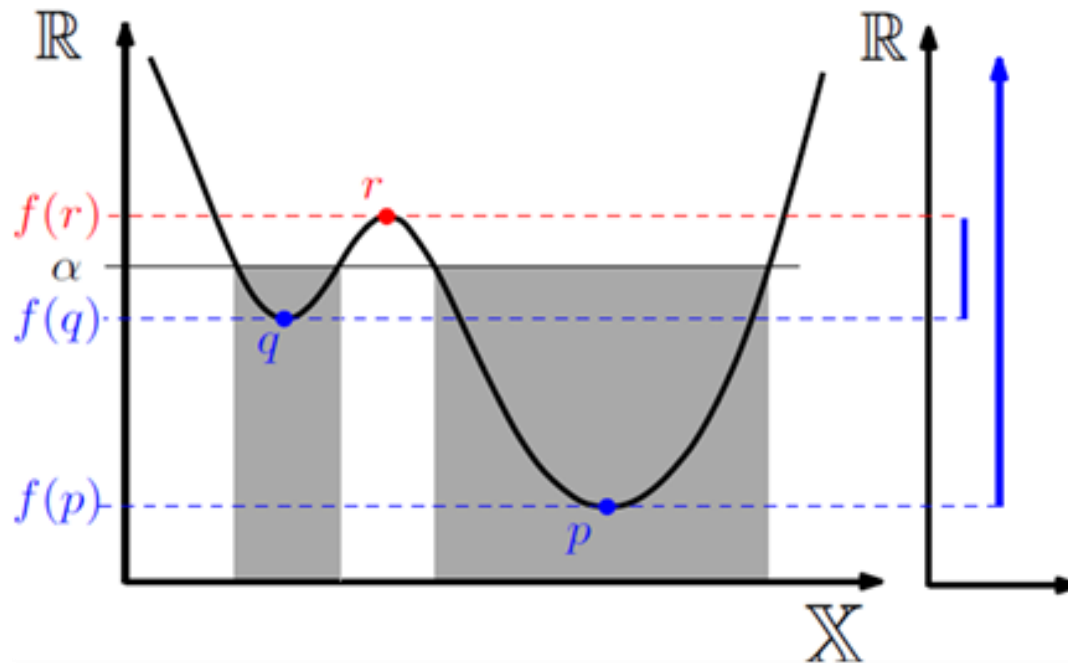- Topological data analysis
- Extend and formalize
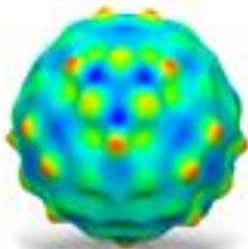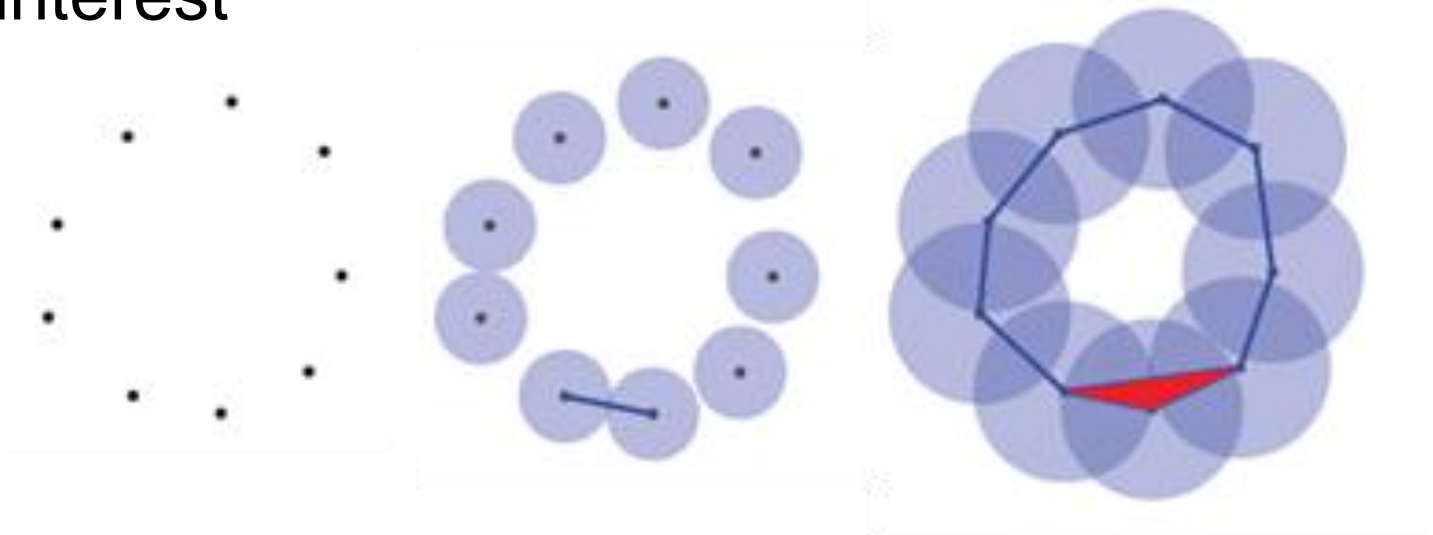
COHOMOLOGY & NLDR

HOMOLOGY & CLUSTERING

PERSISTENCE

- Topology inherently unstable
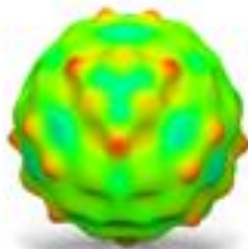- Persistent invariants are stable

MULTI-SCALE

- Multi-scale analysis – all scales together form the object of interest

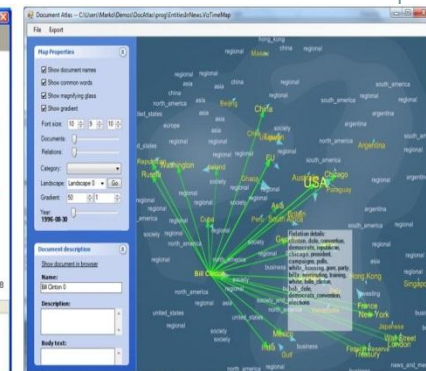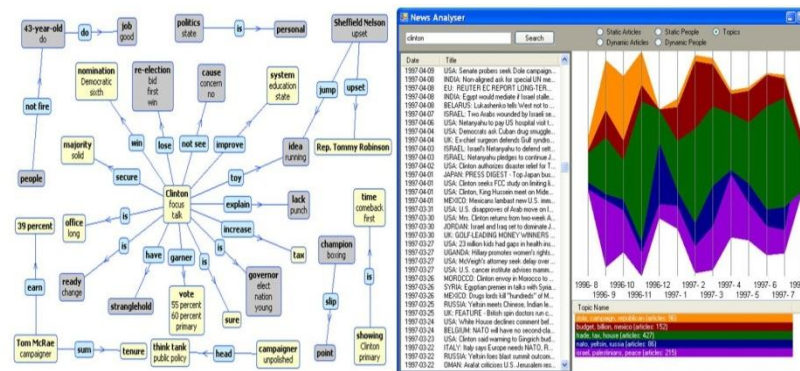$t = 0.004$ $t = 0.008$ $t = 0.02$ $t = 2$

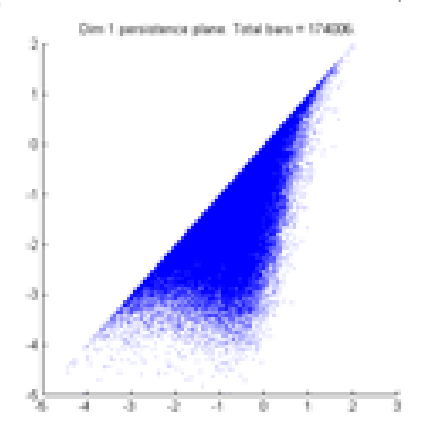# OVERVIEW

- Dynamical systems
- Statistics
- Category theory
- Validation
  - Robotics
  - Social Media

$$f \circlearrowleft V \qquad \begin{bmatrix} 1 & \lambda \\ 0 & 1 \end{bmatrix}$$
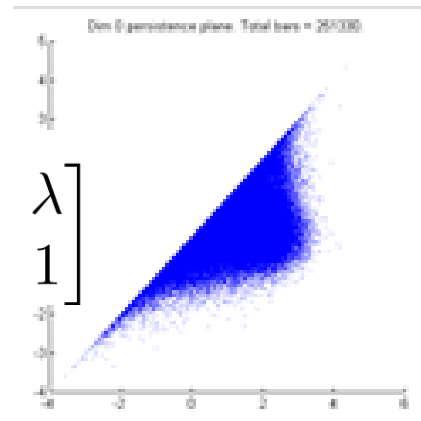
INTERDISCIPLINARY
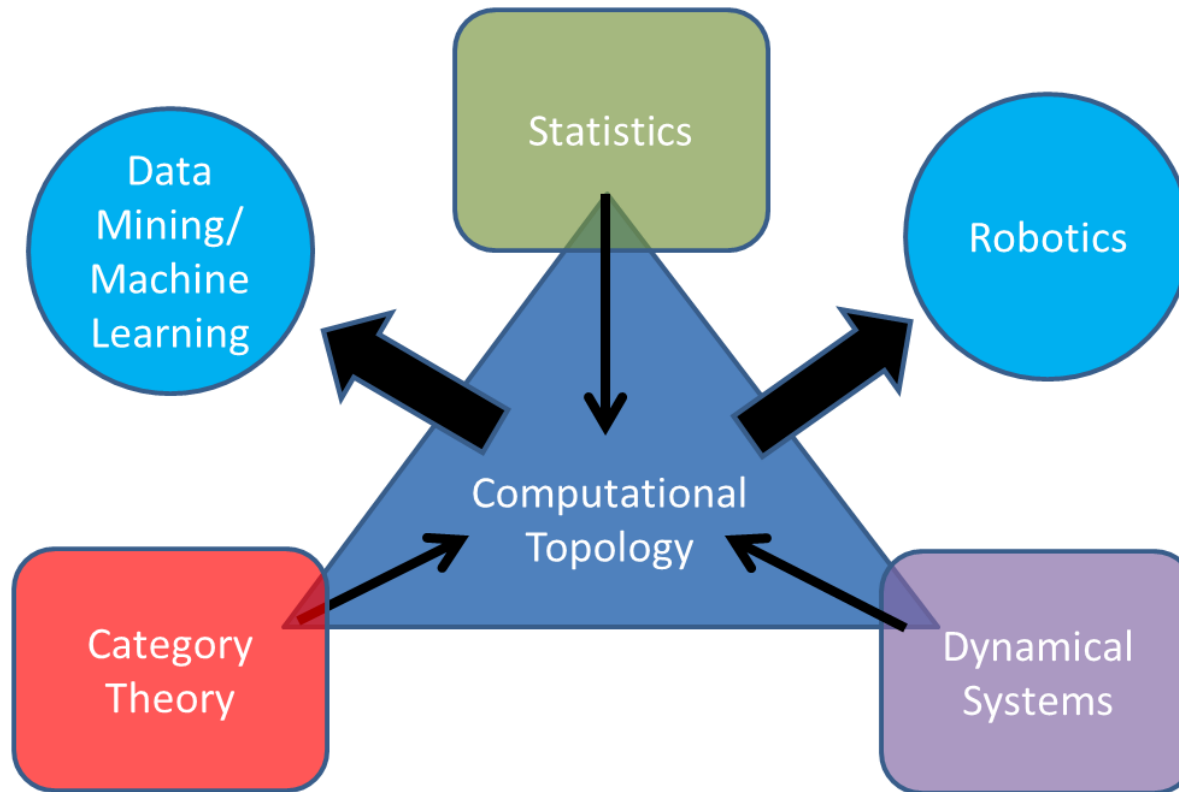
CONSORTIUM

- Jozef Stefan Institute (JSI)
  - Primoz Skraba
- Institute of Science and Technology Austria (IST)
  - Herbert Edelsbrunner
- KTH Royal Institute of Technology (KTH)
  - Danica Kragic
- Jagiellonian University (UJ)
  - Marian Mrozek
- Israel Institute of Technology Technion (IIT)
  - Robert Adler

COLLABORATION

- Complexity Science
- ECCS – consensus for a central venue

- Introduce complexity science problems to other areas
  - Computation Topology and Geometry
  - Dynamical Systems
  - Machine Learning and Theoretical Computer Science

- Tutorials and summer schools

COLLABORATION

- Institutional connections
  - JSI – Sophocles
  - IIT – Congas

- Communication (meetings & preprints)
  - Developed algorithms
  - Analysis of datasets
  - Theoretical assumptions and developments

- Preprint server – part of arXiv/project website

COLLABORATION

- Consistency and towards a common framework

- Impact
  - # of papers published within the project
  - Citations
  - Key words in conferences/journals

- Active dissemination through areas of overlap

THANK YOU!