Introduction to Tutorial on the R package TDA

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R is a programming language for statistical computing and graphics.

- Many packages for statistical computing.
- Easy to make (interactive) plots.
- Script language.
- Easy to use.
- Functional language.

- ... but slow.
R has short **development** time, while C/C++ has short **execution** time.

- Many packages
- Easy to make plots
- Script language
- Easy to use
- Functional language
- Slow

R

**short development time**

- Many packages
- Difficult to make plots
- Compiler language
- Difficult to use
- Not functional
- Fast

C / C++

**short execution time**
GUDHI, Dionysus, and PHAT are C++ library for Topological Data Analysis.

- R
  short development time

- GUDHI / Dionysus / PHAT
  short execution time
R package **TDA** bridges between R and C++ library GUDHI/Dionysus/PHAT.

- **R**
  - short *development time*

- **GUDHI / Dionysus / PHAT**
  - short *execution time*
R package **TDA** provides an R interface for GUDHI, Dionysus, and PHAT.

- **R**
  - **short development time**

- **TDA**

- **GUDHI / Dionysus / PHAT**
  - **short execution time**
R package **TDA** provides tools for Topological Data Analysis.

You can compute:
- common distance functions and density estimators
- persistent homology of the Rips filtration
- persistent homology of sublevel sets of a function over a grid
- confidence band for the persistence diagram
- cluster density trees for density clustering