

## Project 2: Letters

The goal of this project is to classify letters of the alphabet using persistent homology.

### Data:

Images of letters, transformed into 1-dimensional simplicial complexes are in the files a.png, b.png, ... , l.png

Images of the resulting simplicial complexes (so that you can see what they look like) are in t\_a.png, t\_b.png, ... , t\_l.png

Triangulations of the letters: a.out, b.out, ... , l.out

Each file contains only edges which are given as a list of two points: the starting point and the ending point of the edge. Each point is given by a pair of coordinates.

### Project description:

We are given simplicial complexes representing ten capital letters of the Slovenian alphabet. Can you figure out which is which using persistent homology?

In order to do this you should design an algorithm which will take as input a simplicial complex representing a capital letter, and will return only one symbol: the letter represented by the simplicial complex.

**Hint.** Take a simplicial complex representing one letter. Imagine that we are slowly sinking it into water under different angles (for example 0, 90, 180, 270 degrees) and looking at the underwater part of the simplicial complex. This gives us a filtration which determines persistent homology groups. The goal is to classify the simplicial complexes according to the letter they represent based on these.