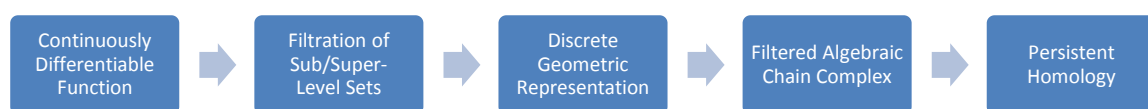


Welcome

Thank you for downloading this C++ code library for calculating the persistent homology of functions. In the documentation folder, you will find a Tutorial.pdf file and an accompanying *Mathematica* notebook file which will teach you how to use this library. You will also find a Reference Guide which details the structure, organization and functionalities of the source code.

Overview

The workflow for these computations generally follows the diagram below:



First you define a continuously differentiable function $f: [0,1]^2 \rightarrow \mathbf{R}$, (which we will refer to as the *primary function*). You'd then define a sequence of *thresholds* $\{\theta_i\}$ to which we'll associate a filtration of *sub-level sets* $\{x \in [0,1]^2: f(x) \leq \theta_i\}$ or *super-level sets* $\{x \in [0,1]^2: f(x) \geq \theta_i\}$. For each threshold, this code library will construct a regular CW complex which has the same homology as the sub/super-level set. From these CW complexes, this code library will produce a filtered algebraic chain complex. At this point you can use a third-party software program to calculate the persistent homology of our function.

Computer Requirements

- In order to define a new primary function you will need to manually edit one of the source code files. For this, and general purposes, you should have a source code editor and C++ compiler.
- This code library requires the Interval class from the Boost library. You can download the Boost library at the following address:
<http://www.boost.org/>
- In order to compute persistent homology you will need a third-party software program. The output of this code library is compatible with Perseus, Version 4.1 Beta. For more information about the Perseus software project, see:
<http://www.sas.upenn.edu/~vnanda/perseus/index.html>