

# Séminaire d'algèbre, topologie et géométrie

## Jeudi 7 juin à 14h

### Salle I

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*Aspects of persistent homology theory*

The theory of persistent homology includes a set of techniques from geometry, algebra and probability to solve the following problem : given a finite set of points sampling an unknown metric shape  $S$ , can we infer the topology of  $S$ ? This problem is in particular motivated by data analysis and statistics.

In this talk, we will give an overview of the theory to solve this problem in a general setting. We will first introduce the reconstruction theorem for compacts and measures, that guarantees homotopy equivalence between shapes and their multi-scale approximations. We will follow with the introduction of persistence modules and their algebraic decompositions, that track the evolution of the homology of a multi-scale reconstruction over increasing scales. Finally, we will review combinatorial and algebraic stability theorems for persistent homology, that measure similarities between algebraic decompositions of persistence modules.

If time permits, we will mention recent ramifications of the theory, towards more general persistence modules, stability theorems, and probabilistic results.