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# GASTVORTRAG

## Andrea Cerri

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### “The Foliation Method: Recent Results in Multidimensional Persistent Topology”

#### Abstract:

Persistent Topology studies stable properties of topological spaces by analyzing the lower level sets of suitable functions, called filtering functions, and encoding the arising information in a parameterized version of the Betti numbers, i.e. the ranks of persistent homology groups, also known as rank invariant or persistent Betti number. The notion of rank invariant is also strongly related to the one of natural pseudodistance. This is another key tool of Persistent Topology, defining a (dis)similarity measure between compact and locally connected topological spaces endowed with filtering functions. Indeed, rank invariants provide easily computable lower bounds for the natural pseudodistance. Since its introduction, Persistent Topology has revealed to be a suitable framework when dealing with concrete problems in the field of Shape Analysis and Comparison. However, a common scenario in applications is to deal with multidimensional information: This can be easily understood if we consider, e.g., the representation of color in the RGB model. Such an observation has led to the generalization of Persistent Topology to a multidimensional setting, i.e. to the case of vector-valued filtering functions, and consequently to studying the ranks of multidimensional homology groups. In this talk we illustrate some new results concerning multidimensional Persistent Topology, and related applications to shape comparison problems. Such results are obtained by means of the so-called foliation method, a procedure allowing us to reduce the study of the the ranks of multidimensional homology groups to the (well known) one-dimensional setting.

#### Biography:

Andrea Cerri graduated cum laude in Mathematics in 2003 at the University of Bologna. In the same year he was granted a scholarship for a Ph.D. in Mathematics, and joined the ARCES Centre of Excellence at the University of Bologna. He received a Ph.D. in Mathematics in 2007, focusing his research on geometrical/topological methods for shape description and comparison. From then on, he has worked as a temporary research associate at ARCES. He has co-authored 10 refereed papers, published in scientific journals and in the proceedings of international conferences. Currently, Andrea Cerri works on multidimensional Persistent Topology and Homology, and related applications in the fields of Pattern Recognition, Shape Analysis and Comparison.

**Datum:** 28. Mai 2010 10:30 Uhr s.t.

**Ort:** TU Wien, Favoritenstr. 9, Stiege 1, 5. Stock, Seminarraum E186

