ON INTERVAL DECOMPOSABILITY OF 2D PERSISTENCE MODULES

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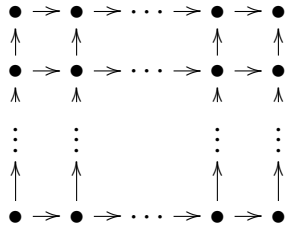
In persistent homology of filtrations, the indecomposable decompositions provide the persistence diagrams. In multidimensional persistence [1], it is known to be impossible to classify all indecomposable modules: There does not exist a complete discrete invariant that captures all the indecomposable modules. One direction is to consider the subclass of interval-decomposable persistence modules, which are direct sums of interval indecomposables. In this talk, we introduce the definition of pre-interval indecomposables, a more algebraic definition, and study the relationships among thin, pre-interval, and interval indecomposables.

Definition 0.1. The *equioriented 2D commutative grid* is the quiver



with full commutative relation.

Then we show the follwoing statement over the equioriented 2D commutative grid.

Theorem 0.2. Let M be a indecomposable representation over the equioriented 2D commutative grid. Then the following are equivalent.

(1) M is thin,
(2) M is a pre-interval, and
(3) M is an interval.

Moreover, we provide an algorithm for answering the following question under certain finiteness conditions and without explicitly computing decompositions: Given an nD persistence module, determine whether or not it is (pre)interval-decomposable or thin-decomposable.

References

[1] G. Carlsson and A. Zomorodian: *The theory of multidimensional persistence*, Discrete Comput. Geom., **42** no. 1 (2009), 71–93.

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