

Title: Bipath persistence and interval approximation for persistence modules over finite posets

Abstracts: In persistent homology, interval modules over a totally ordered set play a central role in describing the birth and death of topological features across a filtration. More generally, the description using indecomposable modules over a poset is considered, however, the indecomposable modules are not necessarily intervals. This talk aims to introduce bipath persistence and properties of interval covers and interval resolutions. First, we give a complete classification of posets whose modules are interval-decomposable. Related to the result, we propose bipath persistent homology and its computational method as a new tool for topological data analysis. Next, we show that the restriction of interval cover of modules to each direct summand is injective. Finally, we show the monotonicity of the interval resolution global dimension. This talk is based on joint works with Toshitaka Aoki and Emerson G. Escolar (arXiv:2308.14979, 2404.02536).

Keywords: Persistence modules, Interval modules, Relative homological algebra, Computational topology, Algorithm