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Graphcode: Learning from multiparameter persistent homology using graph neural networks

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The general topic of this paper is a topological data representation method, called graphcodes, which have been designed to encode multiparameter persistent homology. They were developed to solve the problem of finding an informative summary for the multiparameter persistence of data sets. The classical methods of multiparameter topological summaries are "usually based on complicated theoretical foundations and difficult to compute."[1] The central research question can be summed as "can we efficiently compute a useful multiparameter topological summary for bi-filtrated datasets and can this summary be integrated with GNNs to improve classification accuracy?"[1] Breaking down this question, the paper looks at how the graphcodes are constructed, how they can be used in machine learning pipelines, and how they compare to other state-of-the-art classification methods. The authors found that "graphcodes achieve better classification accuracy than state-of-the-art approaches on various datasets."[1] As evidence for this claim, they conduct benchmark classification tasks. Their statistical analysis compares classification accuracy and computation time against other state-of-the-art techniques.

References Cited

[1] M. Kerber and F. Russold. Graphcode: Learning from multiparameter persistent homology using graph neural networks, 2024.