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Embedding a Geometric Hypergraph

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Many data sets and mathematical models involve higher-order, or beyond-pairwise, interactions. Such group-level connections, or hyperedges, arise when we study human activities; for example, coauthorships of documents, memberships of clubs or the use of office spaces. They also occur naturally in many biological and digital settings. Recent studies of disease propagation, message passing and the dissemination of ideas and opinions have shown that higher-order effects can play an important role. From a linear algebra perspective, moving from graphs to hypergraphs takes us from matrices to tensors. A geometric model for graphs [1,2] or hypergraphs [3,4,5] starts by placing elements in Euclidean space and then creates interactions according to "nearness." We consider the inverse problem, where location in Euclidean space is to be inferred from the connectivity structure. In the graph context, addressing this problem has proved useful for visualisation, dimension reduction and other data processing tasks. Here, we will describe and illustrate a new embedding algorithm that is designed for hypergraphs.

References

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