

Matlab implementation of a spectral algorithm for the seriation problem

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Abstract

Seriation is an important ordering problem which consists of finding the best ordering of a set of units whose interrelationship can be defined by a bipartite graph. It is frequently used in archaeology and it has important applications in many fields such as anthropology, biology, bioinformatics, genetics and psychology. We will present a Matlab implementation of an algorithm for spectral seriation by Atkins et al. [1], based on the use of the Fiedler vector of the Laplacian matrix associated to the problem and which encodes the set of admissible solutions into a particular data structure called PQ-tree.

We will discuss the case of the presence of a multiple Fiedler value which may have a substantial influence on the computation of an approximate solution to the seriation problem and some numerical examples for which is not possible to find an exact solution [2].

References

- [1] Atkins, Jonathan E. and Boman, Erik G. and Hendrickson, Bruce. *A spectral algorithm for seriation and the consecutive ones problem*. SIAM Journal on Computing, **28**(1), 297-310 (1998)
- [2] A. Concas, C. Fenu, and G. Rodriguez. *PQser: a Matlab package for spectral seriation*. arXiv:1711.05677 [cs.MS], 2017.