

Bachelor or Master Thesis: Finding Voids and groups

Background

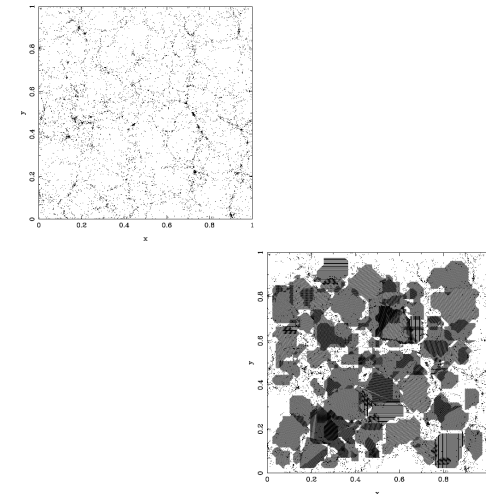
Voids can be defined as empty areas in different distributions that exist in technical systems and in the nature. One can think them also as “holes”. For example, out of service areas in cellular communications coverage can be seen as voids. Similarly in many point distributions have voids, e.g. galaxies in the sky are clustered to groups and between them there are very large empty areas called cosmic voids. Other side of voids is to see that data is “clumped” to groups or clusters. Over a decades a lot of different clustering algorithms have been developed to find groups, but the void detection is still a challenging problem for realistic data sets. With the emergence of big data analytics, we need to solve these problems

Tasks

In your Bachelor thesis you should review the selected group and void algorithms. After familiarising yourself with the algorithms, you will implement selected sub-set of these algorithms and test their efficiency with suitable test datasets in multi-core cluster with large memory. One of the tasks is to also optimize the coding of the selected algorithms to work as fast as possible with large amounts of data. In the case of interest you could also work with detailed parallelization of algorithms (especially in the case of Master thesis the parallelization for massive multi-core environment is an interesting research topic).

Tools

You will be provided the initial literature material. The algorithm implementation can be tested by Matlab, but the final aim is to implement as fast executable most likely using C/C++ or other highly efficient compiled language. The work can be extended, if student so wishes and there is time, also to consider parallelization of algorithms and possible use of GPU accelerators (institute has a dedicated CUDA processor platform for such work).



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