Random walks on simplicial complexes

Date(s)
le 20 mai 2021
14h10-15h10 (attention, horaire exceptionnel)

Lieu(x)
En direct sur Teams
Plan d'accès

Résumé :
A natural and well-known way to discover the topology of random structures (such as a random graph G), is to have them explored by random walks. The usual random walk jumps from a vertex of G to a neighboring vertex, providing information on the connected components of the graph G. The number of these connected components is the Betti number $\beta_0$. To gather further information on the higher Betti numbers that describe the topology of the graph, we can consider the simplicial complex $C$ associated to the graph $G$: a k-simplex (edge for $k=1$, triangle for $k=2$, tetrahedron for $k=3$ etc.) belongs to $C$ if all the lower $(k-1)$-simplices that constitute it also belong to the $C$. For example, a triangle belongs to $C$ if its three edges are in the graph $G$. Several random walks have already been propose recently to explore these structures, mostly in Informatics Theory. We propose a new random walk, whose generator is related to a Laplacian of higher order of the graph, and to the Betti number $\beta_k$. A rescaling of the walk for $k=2$ (cycle-valued random walk) is also studied and an application to statistical topology is proposed.
This is a joint work with T. Bonis, L. Decreusefond and Z. Zhang.

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