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Monte Carlo methods for data mining in complex systems.

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Many complex systems are modular. Such systems can be represented as "component systems", i.e., sets of elementary components, such as proteins in cells or neurons in the brain. These systems are strongly constrained but the underlying functional design and architecture (for example the structure of gene-regulatory interactions in the cell) is not obvious a priori, and its detection is often a challenge of both scientific and practical importance, requiring a clear understanding of component statistics. In this talk I will discuss a set of tools based on a hierarchical version of Stochastic Block Modeling (hSBM) which allow to infer the functional modules of such systems. These algorithms are based on the minimization of an information-theoretic quantity known as "description length" which behaves in many respects as the free energy of a statistical mechanics model and can be explored using algorithms similar to those adopted in more standard statistical mechanics problems.

Special requests

I will only be arriving on Tuesday evening, so I would kindly ask that my talk be scheduled on one of the final three days of the workshop.

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