Canonical measures on the configuration space of disks in a square

Jeremy Mason, Bogazici University

Atomic systems in the physical sciences can be modelled as dynamical systems of disks in a unit square. The discipline of statistical mechanics is concerned with connecting the observable quantities of a physical system to the configurations of the corresponding atomic system. This involves averaging an observable quantity along a trajectory in the atomic system's configuration space, or equivalently, integrating a function on the configuration space with respect to some canonical measure. This talk will derive a one-parameter family of canonical measures parameterized by the temperature $T > 0$ using the equivalence described above, a few experimental observations, and the information theoretic entropy proposed by Claude Shannon in `A Mathemtical Theory of Communication'. Of particular interest is the pathological behavior of the measure in the limit $T \rightarrow 0$, where the support of the measure can break into multiple disconnected components. No prior background in the physical sciences will be assumed.