Random hard sphere packings and constraint satisfaction problems

Francesco ZAMPONI

Ecole Normale Superieure (ENS) Laboratorire de Physique Theorique 24 rue l'homond F-75231 Paris cedex 05 FRANCE

I will review the work that has been done on random hard sphere packings and more generally on random constraint satisfaction problems, using statistical mechanics tools (such as the replica and cavity methods) that originate from spin glass physics. I will review the non-trivial structure of phase space that is predicted by these methods, and briefly discuss some of its algorithmic consequences.