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*Counting Problems: Complexity and Applications*

The problem of finding the number of solutions of combinatorial problems have found a wide range of applications from discrete mathematics, to sampling and approximation, to statistical physics. In this talk we focus on one of the problems of this kind: counting homomorphisms between relational structures, also known as the Counting Constraint Satisfaction Problem (Counting CSP). We review the connections of the Counting CSPs to other areas of mathematics and computer science, and survey (relatively) recent results that have led to an exhaustive classification of such problems in terms of their computational complexity.