

1145-68-2307

**Ankur Moitra\***, MIT, Department of Mathematics, Cambridge, MA 02139. *Connections to theoretical computer science.*

Many hard optimization problems—like finding large cliques in a graph—can be cast as maximizing a linear function over a convex, but highly complicated domain. For example, if the feasible region is a polytope it often has an exponential number of vertices and facets without an obvious way to decide if a given point is contained inside. The SOS hierarchy gives a sequence of tighter and tighter relaxations. Each of them can be efficiently optimized over, and so it yields a sequence of algorithms that trade off complexity with accuracy. However in many cases, understanding exactly how powerful these algorithms are turns out to be quite challenging.

In this survey, we will discuss two central problems in theoretical computer science: (1) In the planted clique problem, the goal is to find a large clique that has been added to a random graph, and has recently found important applications in establishing computational vs. statistical tradeoffs in machine learning. (2) The unique games conjecture asserts that it is hard to find an assignment that satisfies many clauses in certain two-variable constraint satisfaction problems. (Continued at <http://www.ams.org/short-course>) (Received September 25, 2018)