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Optimization, Invariant Theory, Computer Science and Math

What do the following problems, from seemingly unrelated areas of mathematics, quantum information theory and computer science, have in common?

- perfect matching in bipartite graphs
- word problem for the free skew field
- optimal constant in Brascamp-Lieb inequalities
- one-body quantum marginal problem
- the Paulsen problem
- Horn's problem
- sample complexity of matrix and tensor normal model

As it turns out, these problems are all instances of the moment polytope problem from geometric invariant theory. Moreover, these problems can be cast as (geodesically) convex optimization problems over geodesically convex Riemannian manifolds. In this talk we will discuss these connections and how a recent series of works was able to give efficient algorithms for the problems above (via the unifying view of moment polytopes), as well as mention several open questions.