1145-90-2300 **Hamza Fawzi***, University of Cambridge, DAMTP, Cambridge, United Kingdom. *Lifts of convex sets.*

A central question in optimization is to maximize (or minimize) a linear function on a given convex set. Such a problem may be easy or hard depending on the geometry of the convex set. Motivated by this problem, this lecture considers the following question: given a convex set, is it possible to express it as the projection of a simpler convex set in a higher-dimensional space? Such a lift of the convex set allows us to reformulate the original optimization problem as an easier one over the higher-dimensional convex set. In order to make this question precise we need a way to measure the complexity of convex sets. We will focus in this lecture on two classes of lifts, namely polyhedral and spectrahedral lifts, where a natural notion of complexity can be defined. For spectrahedral lifts, we will see that the existence of lifts is characterized by the existence of SOS certificates for a certain class of nonnegative functions. We will give some examples of convex sets that admit small lifts, and others that do not, and will discuss applications in optimization. (Received September 25, 2018)