1161-05-103 **Matthew Kwan**, **Lisa Sauermann*** (lsauerma@mit.edu) and **Yufei Zhao**. *Extension complexity of low-dimensional polytopes.*

Sometimes, it is possible to represent a complicated polytope as a projection of a much simpler polytope. To quantify this phenomenon, the extension complexity of a polytope P is defined to be the minimum number of facets in a (possibly higher-dimensional) polytope from which P can be obtained as a (linear) projection. This notion has been studied for several decades, motivated by its relevance for combinatorial optimisation problems. It is an important question to understand the extent to which the extension complexity of a polytope is controlled by its dimension, and in this paper we prove three different results along these lines. First, we prove that for a fixed dimension d, the extension complexity of a random d-dimensional polytope (obtained as the convex hull of random points in a ball or on a sphere) is typically on the order of the square root of its number of vertices. Second, we prove that any cyclic n-vertex polygon (whose vertices lie on a circle) has extension complexity at most $24\sqrt{n}$. This bound is tight up to the constant factor 24. Finally, we show that there exists an $n^{o(1)}$-dimensional polytope with at most n facets and extension complexity $n^{1-o(1)}$. (Received August 13, 2020)