1135-52-1641 **Adam Jaffe*** (aqjaffe@stanford.edu), 531 Lasuen Mall, P.O. Box 15878, Stanford, CA 94305, and **Henry Adams** and **Samir Chowdhury**. *Vietoris-Rips Complexes of Regular Polygons.*

Persistent homology has emerged as a novel tool for data analysis in the past two decades. However, there are still very few non-convex shapes or manifolds whose persistent homology barcodes (say of the Vietoris–Rips complex) are fully known. Towards this direction, we provide a near-complete characterization of the homotopy types of Vietoris–Rips complexes of the boundary of any regular polygon in the plane. Indeed, for P_n the boundary of a regular polygon with n sides, we describe the homotopy types and persistent homology of the Vietoris–Rips complexes of P_n up to scale r_n, where r_n approaches the diameter of P_n as $n \to \infty$. Surprisingly, these homotopy types include spheres of all dimensions (as $n \to \infty$) and wedge-sums thereof. Roughly speaking, the number of 2ℓ-dimensional spheres in such a wedge sum is linked to the number of equilateral (but not necessarily equiangular) stars with $2\ell + 1$ vertices that can be inscribed in P_n. We furthermore show that the Vietoris–Rips complex of an arbitrarily dense subset of P_n need not be homotopy equivalent to the Vietoris–Rips complex of P_n itself. As our main tool, we employ the recently-developed theory of cyclic graphs and winding fractions. (Received September 24, 2017)