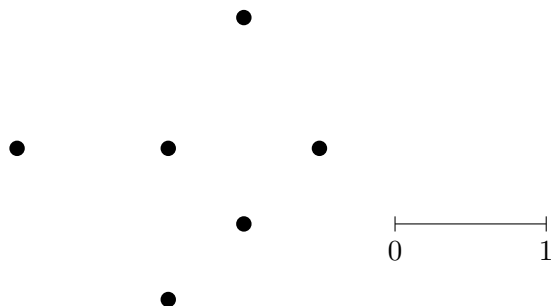


# Simplicial Complexes from Data

MATH 348

1. Consider the following point cloud in  $\mathbb{R}^2$ . For several  $\epsilon > 0$  of your choice, construct the simplicial complexes  $VR_\epsilon(Q)$  and  $\check{C}_\epsilon(Q)$ .

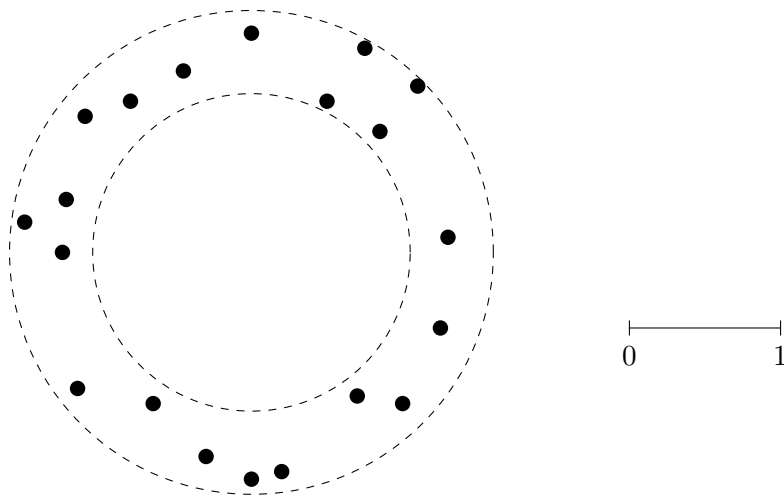


2. Let  $Q$  be a set of points in  $\mathbb{R}^n$ .

(a) For what parameters  $\epsilon$  and  $\delta$  is  $VR_\epsilon(Q)$  a subcomplex of  $\check{C}_\delta(Q)$ ?

(b) For what parameters  $\epsilon$  and  $\delta$  is  $\check{C}_\delta(Q)$  a subcomplex of  $VR_\epsilon(Q)$ ?

3. The following point cloud  $Q$  was sampled from an annulus.



(a) For approximately what values of  $\epsilon$  is  $VR_\epsilon(Q)$  homotopy equivalent to an annulus?

(b) For approximately what values of  $\epsilon$  is  $\check{C}_\epsilon(Q)$  homotopy equivalent to an annulus?