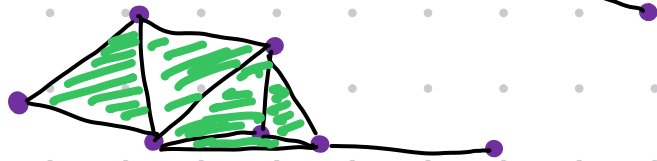
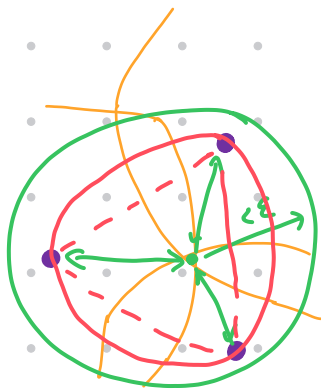
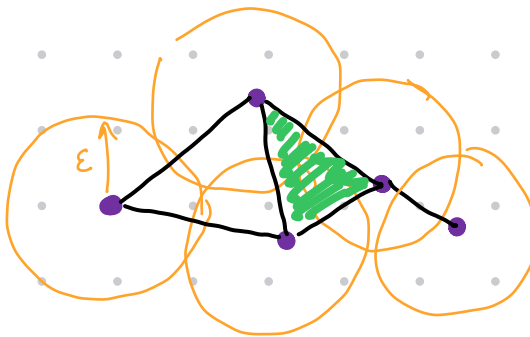


SIMPLICIAL COMPLEXES FROM DATA

• Vietoris-Rips Complex

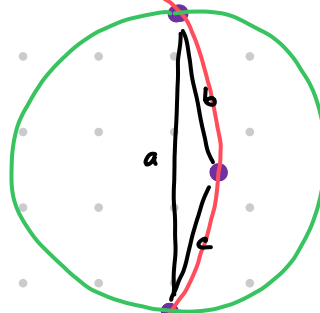


• Čech complex



Circum sphere

*

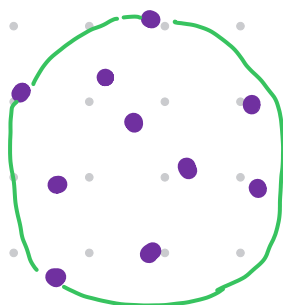


Smallest enclosing circle

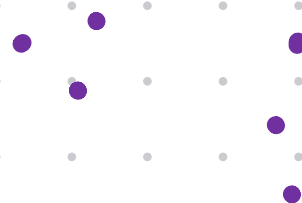
Welzl's Algorithm

recursive

P



base cases:



QUESTION:

For what parameters $\varepsilon, \delta > 0$ is

$$VR_{\varepsilon}(S) \subset C_{\delta}(S)$$

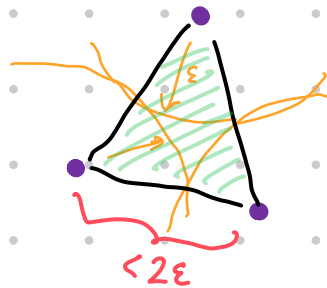
or

$$C_{\varepsilon}(S) \subset VR_{\delta}(S)$$

↑
sub complex

OBSERVE:

$$C_{\varepsilon}(S) \subset VR_{2\varepsilon}(S) \subset C_{\varepsilon}(S)$$



(For simplicial complexes in the plane, 2ε is unnecessarily large.)

EULER CHARACTERISTIC

of a simplicial complex K is

$$\chi(K) = (\text{number of points}) - (\text{number of edges}) + (\text{number of faces}) - \dots$$

Example: $K =$
A diagram of a simplicial complex K consisting of a shaded triangle, a line segment, and a single point.

$$\chi(K) = 6 - 5 + 1 = 2$$