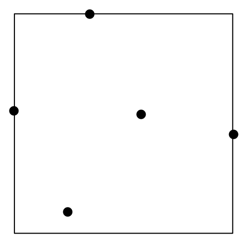
Exercises

Problem 1. Prove: the minimum enclosing disc (MED) algorithm we presented in the class (i.e., fixing no points) is correct and has expected running time $O(n)$.

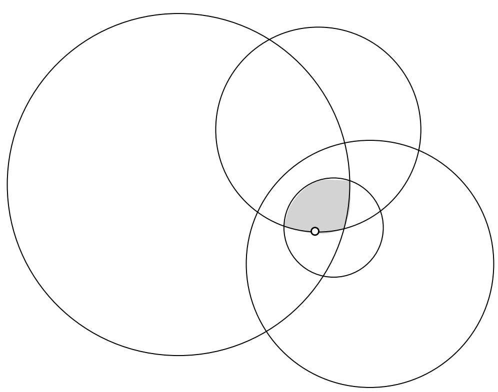
Problem 2*. Give an algorithm to solve the 3D minimum enclosing ball (MEB) problem in $O(n)$ expected time.

Problem 3. Let P be a set of n points in $\mathbb{R}^2$. Find an axis-parallel square of the smallest size to cover the whole P. The figure below shows such a square on an example of $n = 5$.



- Show that this problem can be cast as a linear programming problem with a constant dimensionality.
- Give a deterministic algorithm to solve the problem in $O(n)$ time (hint: what are the points that can determine the edges of the square?).

Problem 4. Let S be a set of n discs in $\mathbb{R}^2$. Design an $O(n)$ expected time algorithm to find the lowest point that is inside all the discs (or report nothing if there are no such points). Your algorithm may assume that no three circles pass the sample point in $\mathbb{R}^2$.



In the example above, your algorithm should output the white point.