

**Computational Geometry****Exercise Set 6****HS07**URL: <http://www.ti.inf.ethz.ch/ew/courses/CG07/>**Exercise 1 (10 points)**

- a) Let  $S$  be a set of  $n$  disjoint line segments in the plane. Determine all segments in  $S$  that intersect a ray which starts in a query point  $(q_x, q_y)$  and runs vertically upwards. Find a data structure with size  $O(n \log n)$  and query time  $O(\log n + k)$ , where  $k$  is the number of intersecting segments.
- b) Now we only want to find the first segment that is intersected by the query ray. Find a data structure with expected size  $O(n)$  and expected query time  $O(\log n)$ .

**Exercise 2 (10 points)**

Show that a Range Tree for  $n$  points can be constructed in  $O(n \log n)$  time.

**Exercise 3 (10 points)**

Find a data structure for  $n$  points in the plane which allows to answer dominance queries efficiently. For a given query point  $p = (x, y)$  find in  $O(\log n + k)$  time all  $k$  points that dominate  $p$ . A point  $q = (x', y')$  dominates  $p$  if  $x' > x$  and  $y' > y$ .