

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE  
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## COMPUTER SCIENCE COLLOQUIUM

### External Memory Three-Sided Range Reporting and Top-k Queries with Sublogarithmic Updates

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**Abstract:**

An external memory data structure is presented for maintaining a dynamic set of  $N$  two-dimensional points under the insertion and deletion of points, and supporting 3-sided range reporting queries and top- $k$  queries, where top- $k$  queries report the  $k$  points with highest  $y$ -value within a given  $x$ -range. For any constant  $0 < \varepsilon \leq \frac{1}{2}$ , a data structure is constructed that supports updates in amortized  $O(\frac{1}{\varepsilon B^{1-\varepsilon}} \log_B N)$  IOs and queries in amortized  $O(\frac{1}{\varepsilon} \log_B N + K/B)$  IOs, where  $B$  is the external memory block size, and  $K$  is the size of the output to the query (for top- $k$  queries  $K$  is the minimum of  $k$  and the number of points in the query interval). The data structure uses linear space. The update bound is a significant factor  $B^{1-\varepsilon}$  improvement over the previous best update bounds for the two query problems, while staying within the same query and space bounds.

Host: Jørgen Bang-Jensen