

# Fast and Space Optimal Streaming Algorithms

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# Turnstile Streaming

- Initialize  $x \leftarrow 0 \in \mathbb{R}^n$
- On update  $(i, \Delta)$  :
  - Set  $x_i \leftarrow x_i + \Delta$
- Answer queries about  $x$  using **small space**
  - $\max_i |x_i|$
  - $\sum_i |x_i|^p$  ( $F_p$  moments)

