Our Results

- $F_p(x) = \sum_{i=1}^{d} |x_i|^p$

- **Theorem** [K, Pagh, Thorup, Woodruff FOCS ’23]: For $p > 2$, there is an algorithm using $\tilde{O}(d^{1-2/p})$ space and an update time of $O(1)$
  - Space is optimal unto polylog factors!
  - Time in the WordRAM model with $O(\log d)$ bits word size
  - Improves on poly(d) update time of Andoni ‘17

Our Results

- **Theorem**: For $0 < p < 2$, can approximate $F_p(x)$ up to $1 \pm \varepsilon$ using $\varepsilon^{-2} \log d$ bits of space and $O(\log d)$ update time
  - Valid only for $\varepsilon < 1/d^c$
  - Improves on $O(\log^2 d \log\log d)$ update time of [KNPW '11]
- Many other results for CountSketch, $\|x\|_\infty$ estimation etc.