



# Linear Measurements vs Matrix-Vector Products

• If  $A$  is  $n \times n$ , matrix-vector products can be simulated with  $n$  linear measurements

• **Tractable and computable exactly with one linear measurement**

- Requires  $\Omega(n)$  matrix-vector products for exact trace

- Sun, Woodruff, Yang, Zhang '21 ( $\Delta$  detection)

- $n$  linear measurements  $\geq 1$  matrix vector product for LRA?





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- Trace can be computed exactly with **one** linear measurement
  - Requires  $\Omega(n)$  matrix-vector products for exact trace
    - Sun, Woodruff, Yang, Zhang '21 ( $\Delta$  detection)
- $n$  linear measurements  $\gg$  1 matrix vector product for LRA?

# Upper Bounds