# LRA via Linear Measurements

# *A*

# Measure

with

and get $\langle \text{vec}(A), \text{vec}(S_1) \rangle$

and get $\langle \mathrm{vec}(A), \mathrm{vec}(S_2) \rangle$

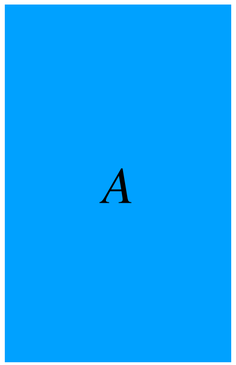
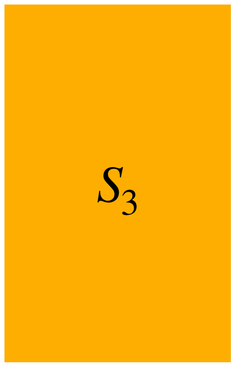

$S_3$

and get $\langle \mathrm{vec}(A), \mathrm{vec}(S_3) \rangle$

- Output $B$ at the end

- Non-adaptive algorithms decide all $S_i$ upfront

# LRA via Linear Measurements

Measure  with  and get $\langle \mathrm{vec}(A), \mathrm{vec}(S_3) \rangle$

- Output $B$ at the end
- Non-adaptive algorithms decide all $S_i$ upfront

# Linear Measurements vs Matrix-Vector Products

- If $A$ is $n \times n$, matrix-vector products can be simulated with $n$ linear measurements
- $n$ linear measurements are **at least** as powerful as one matrix-vector product
- Trace can be computed exactly with ***one*** linear measurement
  - Requires $\Omega(n)$ matrix-vector products for exact trace
    - Sun, Woodruff, Yang, Zhang ’21 (Triangle detection)
  - Requires $\Omega(1/\varepsilon^2)$ for approximating unto $1 \pm \varepsilon$
    - Wimmer, Wu, Zhang ‘14