

Main idea

- Define action a to be $Q^{(2)}[r^{(1)}]$ as a function of the response $r^{(1)}$
- Define loss function

$$L((u, v), Q^{(2)}[r^{(1)}]) = 1[\|Q^{(2)}[r^{(1)}] \cdot (u \otimes v)\|_2^2 < \text{some value}]$$

- Using Bayes risk lower bounds, argue that loss is close to 1 in expectation
- Second round query doesn't have a large information about (u, v) as well
 - Induct using Bayes risk

Next Steps

- See if similar techniques can be employed to study matrix-vector product lower bounds for

$$\|A - B\|_2 \leq (1 + \varepsilon)\sigma_{r+1}(A)$$

- Current algorithms use $O(r/\sqrt{\varepsilon})$ matrix-vector products
 - Tight for $r = 1$ [Bakshi, Narayanan '23]
 - Extending it to all r ?