Mapping to Our Problem

- $\Theta = \{(u, v) : u, v \in \mathbb{R}^n\}$
- w is the Gaussian distribution over Θ
- $\mathscr{P}_{(u,v)}$ is the distribution of $(\alpha/\sqrt{n}) \cdot Q^{(1)}(u \otimes v) + Q^{(1)} \cdot \text{vec}(G)$
    - By rotational invariance : $Q^{(1)} \cdot \text{vec}(G) \sim N(0, I_t)$
    - $\mathscr{P}_{(u,v)} = N(\mu = (\alpha/\sqrt{n}) \cdot Q^{(1)}(u \otimes v), \Sigma = I_t)$

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