

Journée au vert — Polaris

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Zeroth-order convex optimization in MIMO systems

- **MIMO** multiple-access-channel:
 - wireless network with
 - K users with M_k antennas
 - one receiver with N antennas
 - vector multiple access channel (**MAC**) :

$$\mathbf{y} = \sum_{k=1}^K \mathbf{H}_k \mathbf{x}_k + \mathbf{z}$$

- Goal: maximize the users' achievable total **transmission rate**

$$R(\mathbf{Q}_1, \dots, \mathbf{Q}_K) = \log \det \left(\mathbf{I} + \sum_{k=1}^K \mathbf{H}_k \mathbf{Q}_k \mathbf{H}_k^\dagger \right) \quad (\text{Shannon-H.})$$

where $\mathbf{Q}_k = \mathbb{E}[\mathbf{x}_k \mathbf{x}_k^\dagger]$, s.t. power consumption constraints.

- **Zero-th order feedback**: measurements of transmission rates $R(\mathbf{Q})$ rather than full gradients $\nabla R(\mathbf{Q})$.

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