Distributed Estimation over Shared Networks

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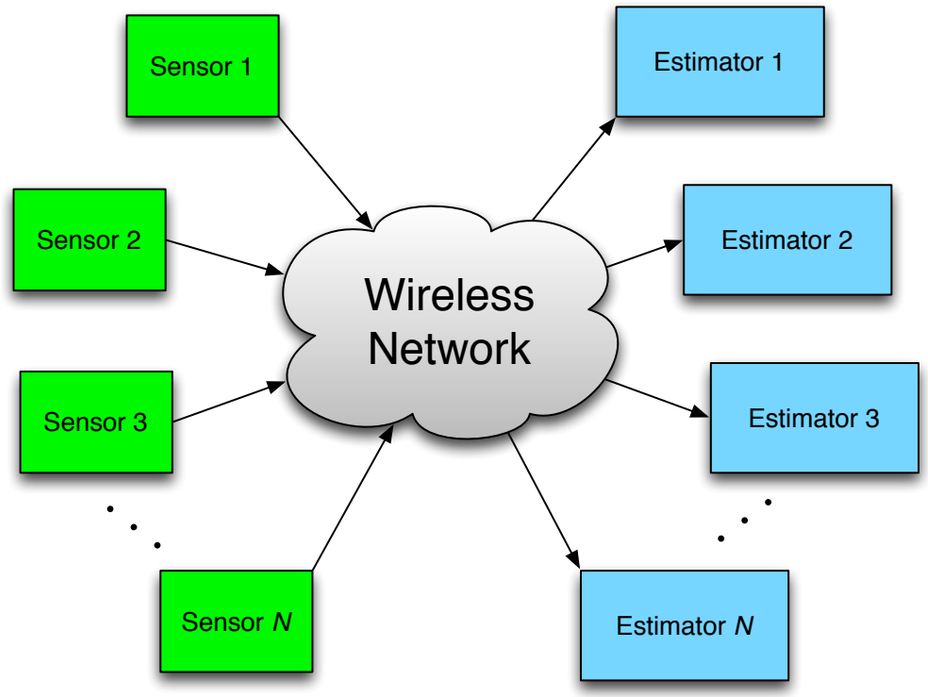
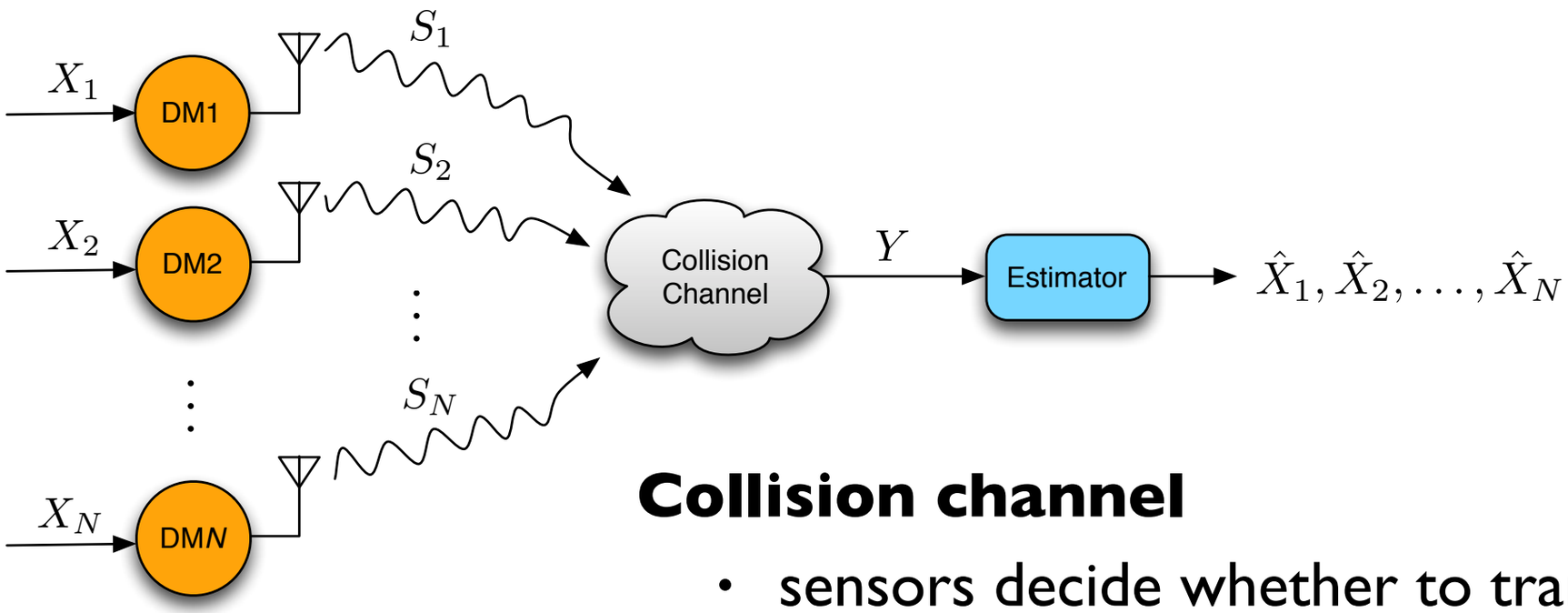
Sensors and estimators

- connected through a wireless network
- cooperate to achieve a common goal



Network

- introduces an information bottleneck
- capacity limited by interference



Collision channel

- sensors decide whether to transmit or not
- a collision occurs when 2 or more sensors transmit

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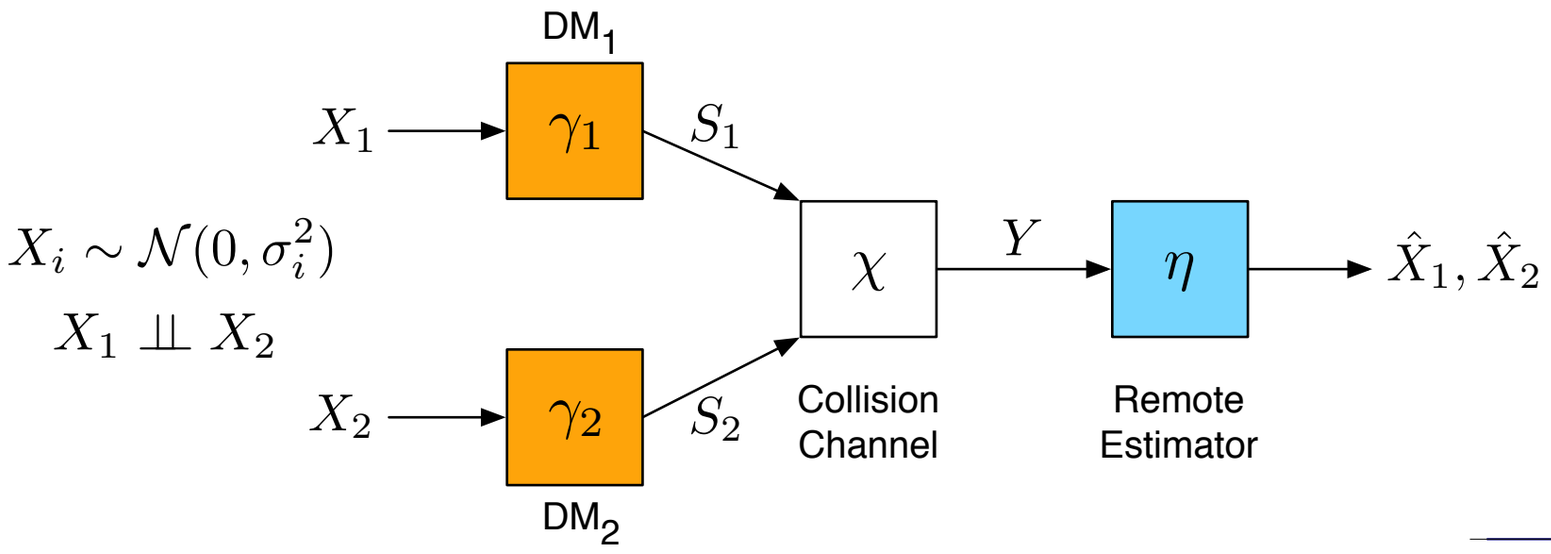

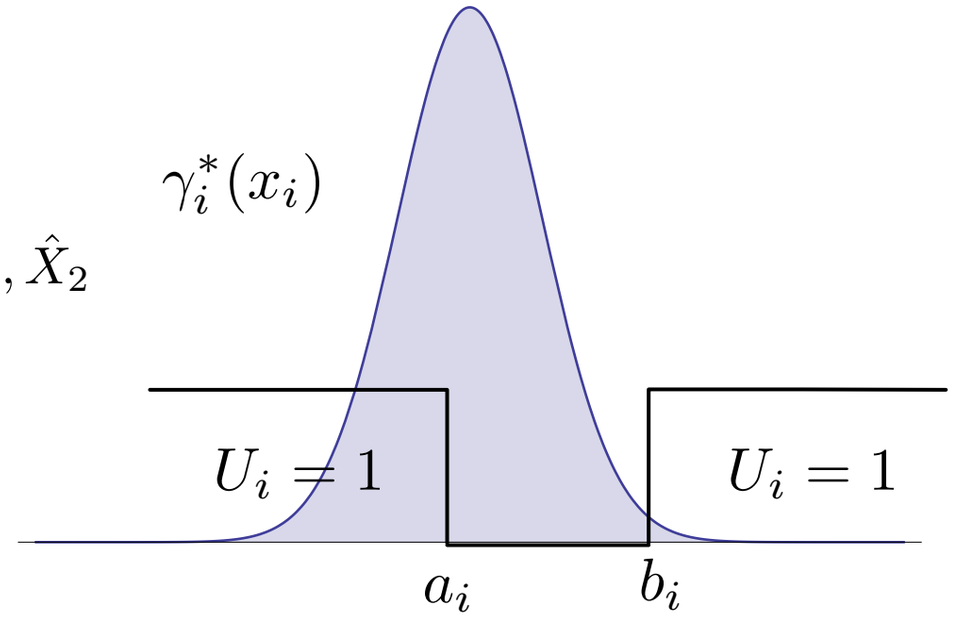

Problem

Find the communication and estimation policies that jointly minimize

$$\mathcal{J}(\gamma_1, \gamma_2, \eta) = \mathrm{E}\left[(X_1 - \hat{X}_1)^2 + (X_2 - \hat{X}_2)^2\right]$$

Team decision problem

Non-classical information pattern

Non-convex, in general

Results

1. Optimality of threshold policies
2. Design via quantization theory
3. Structure is independent of the probability distributions