Handling Data Loss in Wireless Sensor Networks

- Data loss is inevitable in wireless sensor systems and leads to reduced QoI
  - Retransmission strategies are common but inefficient in many cases (e.g., high latency links)
  - Proactive channel coding is computationally expensive for constrained sensor nodes
- Compressive Sensing (CS) is cheaper and uses randomness inherently, is robust to stochastic losses
- Key observation: Missing samples at receiver are indistinguishable from a lower CS sampling rate

Recovering Missing Data with Randomized Oversampling

- For certain sampling matrices, CS measurements carry roughly equal amounts of information
- If some measurements are lost, additional measurements can compensate and improve QoI

Evaluating Randomized Oversampling Using RIP

- Restricted Isometry Property constant ($\delta_s$) shows recovery ability of sampling matrix (lower $\delta_s$ is better)
- Evaluate by comparing RIP constant of $\Phi\Psi$ (No Loss), $C\Phi\Psi$ (Loss) and $\Phi\Psi$ (over-sampling) cases
- Mean RIP computed across $10^3$ random matrices using Monte-Carlo, min-max variation included