

## **Remote State Estimation with an Eavesdropper**

Abstract:

We study transmission scheduling for remote state estimation in the presence of an eavesdropper. A sensor transmits local state estimates over a packet dropping link to a remote estimator. At the same time, an eavesdropper can successfully overhear each sensor transmission with a certain probability. The objective is to determine at which instances the sensor should transmit, in order to minimize the estimation error covariance at the remote estimator, while trying to keep the eavesdropper error covariance above a certain level. This is done by solving an optimization problem that minimizes a linear combination of the expected estimation error covariance and the negative of the expected eavesdropper error covariance. Structural results on the optimal transmission policy are presented, and shown to exhibit thresholding behaviour in the estimation error covariances. In the infinite horizon situation, it is shown that with unstable systems one can keep the expected estimation error covariance bounded while the expected eavesdropper error covariance becomes unbounded.