Journal Watch: Trans. Info. Theory-Mar-2011 and April-2011

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Minimax Robust Quickest Change Detection: J. Unnikrishnan, .V. V. Veeravalli, and Sean P. Meyn

- Criteria of optimality in quickest change detection:
  - Lorden criterion,
  - Pollak criterion,
  - Bayesian criterion.
- So far: Observation comes from a distribution ν (before change) and μ (after change)
- Generalization: Observation comes from a distribution $\nu \in \mathcal{P}_1$ (before change) and $\mu \in \mathcal{P}_2$ (after change)
- Answer: Pick the worst (or least favorable) distribution and design the optimal test for it (Under certain conditions on the uncertainty sets: see paper)
- An upper bound on the average delay (asymptotic) has been derived
- It is easier to implement (than CUSUM)
- Shows better performance than GLR (I think they haven't proved it analytically!)

To Decode the Interference or to Consider It as Noise: A. S. Motahari, and Amir K. Khandani

- Setup: point to point communication with interference from other users in the network
- Setup: The rx has the knowledge of other users code book whereas the tx doesn't
- Partition the interference into two sets; maximal part that it can decode (bad part) and the part that it can't (ugly part)
- How do you partition? A polynomial time algorithm is proposed
- Jointly decode the good and the bad and treat ugly as noise
- How? pick the rate such that it can be done (use the polynomial time algorithm)
- It achieves the capacity in a Gaussian network channel!

Wireless Network Information Flow: A Deterministic Approach: A. Salman Avestimehr, Suhas N. Diggavi, and David N. C. Tse

- Key ingredients of a network:
  - Superposition
  - Broadcast
- Question: “what is the maximum rate of information flow achievable?”
- Provides only an approximate answer. How?
- Usual Tse’s technique:
  - Remove unnecessary elements from a network
  - Keep the key element of a network (SP and BC)
  - Use deterministic model to get insights
- What is the use?
- Insights from the deterministic model provides potential coding scheme
- In a Gaussian network, one can achieve a rate within a constant gap of max flow min cut bound

Open Problem: Bharath

- Consider transmitting S over the following state dependent channel:
$$Y = X + S + N$$
- What is the optimal distortion that can be achieved?
- Answer: Transmit $X = \sqrt{SNR}S$.
- Approximate and see if it is close!
- If so, then consider the problem of transmitting h over $Y = hX + N$
- What is the optimal distortion?
- Answer: Open problem! Approximate method may help!

Information Rates for Multi-antenna Systems With Unknown Fading: Krishnan Padmanabhan, Sundeep Venkatraman, and Oliver M. Collins

- Setup: Multiuser fading channel with no CSI at the receiver and the transmitter
- Channel model: Block fading as well as correlated models
- Rates of the individual user is kept constant whereas the BW and the number of users are taken to infinity (ratio fixed)
- Result: Analytical lower and upper bounds on the data rate
- They show that these bounds converge as BW and the number of users are taken to infinity with a fixed ratio whenever the users rate is small compared to the BW (I dont know the precise relation).

Other Papers: Trans IT 2011 and Trans Comm.

- Recovering Low-Rank Matrices From Few Coefficients in Any Basis (Mar 2011)
- On Two-User Gaussian Multiple Access Channels With Finite Input Constellations
- Water-filling Power Allocation at High SNR Regimes (IEEE tran. Comm, Mar 2011.)
- The Sensing Capacity of Sensor Networks (Mar 2011)
- Estimation in Gaussian Noise: Properties of the Minimum Mean-Square Error