# Journal Watch (ArXiv Watch (Machine Learning/Information Theory))

Abhay Sharma

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# Social Teaching: Being Informative vs. Being Right in Sequential Decision Making (arXiv:cs.IT)

Authors: Joong Bum Rhim and Vivek K Goyal
MIT

- Framework of sequential decision making with *social teaching*
    - Effect of agent's decision/action on subsequent agents
    - Compared to prior work, non-herding framework has been considered
    - Previous agent can be considered as *advisers* for the next agent
- An agent has access to (unbounded) private signal, biased (incorrect) prior probability and access to previous agent's decision (No access to the prior probabilities of other agents)
- Each agent uses decision rule optimized for her own belief (in contrast to adjusting decisions to minimize Bayes risk for last agent)
- The interest is in last agents decision (and the rule)

- Conclusions
  - Each agent updates it's belief based on previous agents action
  - It is the probability of each hypothesis conditioned on the decision of previous agents
  - A counter intuitive conclusion is that having a wrong belief is not always bad !!
    - For N=2, the optimal belief update is not equal to true prior probability
  - Best *Advisers* are necessarily open-minded people

# Structure estimation for discrete graphical models: Generalized covariance matrices and their inverses (arXiv: stat.ML)

Authors: Po-Ling Loh and Martin Wainwright
UC Berkley

- For Gaussian graphical models, zeros in the inverse of covariance matrix indicate missing edges in the graph structure
- For Non-Gaussian this is not generally true
- In this paper, this linkage of inverse of covariance matrix with graph structure is explored and some results are proven for certain graph structures in context of exponential family of distributions
    - Multinomial distribution has been treated mainly but many important results generalize to exponential family
    - Instead of covariance matrix an augmented covariance matrix is considered (i.e. include higher order interaction terms)
    - One result is that, for a tree graphs the inverse of generalized covariance is always graph-structured
    - Some results are also proved for arbitrary graphs that are augmented with graph triangulations
- This explains that why the graphical selection methods like graph-Lasso ( that are derived based on Gaussian Models) also work for other distributions

# Distributed Sparse Signal Recovery For Sensor Networks (arXiv:cs.IT)

Authors: Stacy Patterson, Yonina C Eldar, Idit Keidar

Technion, Haifa, Israel

- Distributed algorithm for sparse signal recovery
- Setup
    - Each sensor is making a compressive measurement
    - Individual measurement matrices are not known to different sensors
    - Emphasis is on reducing the communication amongst different nodes
- Based on Iterative Hard Thresholding
    - $x_{t+1} = \mathcal{T}_k(x_t - \alpha \mathbf{A}^T(b - \mathbf{A}x_t))$
- Communication cost is reduced based on solutions to the distributed top-K problem
    - Send the highest component to the central node which decides when it has received top K items
- Caution: Not a complete work yet, lot of items left unexplained !

# Low-rank Matrix Completion using Alternating Minimization (arXiv: stat.ML)

Authors: Prateek Jain, Praneeth Netrapalli, Sujay Sanghavi
MSR India, UT Austin

- Theoretical analysis of Alternate Minimization algorithm used for low-rank matrix sensing (recovery) and completion methods
- Recovery with matrix sensing
  - We have $d$ measurements of type: $b_i = tr(\mathbf{A}_i^H \mathbf{M})$
  - Need to recover $M$ from $b$, $rank(M) = k \ll m$ and with $d \ll mn$
  - Find $\mathbf{X}$ $s.t.$ $\mathcal{A}(\mathbf{X}) = b, rank(\mathbf{X}) \leq k$
  - Let $\mathbf{X} = UV^T$, then $\min_{U \in \mathbb{R}^{m \times k}, V \in \mathbb{R}^{n \times k}} \|\mathcal{A}(UV^T) - b\|_2^2$
  - The algorithm finds approximate solution to above by alternating between finding an optimal $U$ and $V$ by keeping the other fixed
  - Note that $U$ and $V$ are much smaller than $X$
- Assuming that *linear map* $\mathcal{A}$ satisfies equivalent RIP, theoretical guarantees have been provided for convergence of above algorithm

Optimal Classification in sparse Gaussian Graphic Model

Authors: Yingying Fan, Jiashun Jin, and Zhigang Yao
USC, CMU, EPFL

On the Diversity-Multiplexing Tradeoff of Unconstrained Multiple-Access Channels

Authors: Yair Yona, Meir Feder
Tel-Aviv Univ