Journal Watch

IEEE Transactions on Signal Processing, Vol. 60, No. 11 (Nov 2012).

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02 Nov 2012

Separating Function Estimation Tests: A New Perspective on Binary Composite Hypothesis Testing

Ali Ghobadzadeh, Saeed Gazor, Mohammad Reza Taban, Ali Akbar Tadaion and Majid Gazor
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- Relationship between detection (decision statistic) and estimation (estimate) of a parameter
- If $T(\mathbf{x})$ is the MVUE of θ, then the UMP for a one-sided test on θ is of the form $T(\mathbf{x}) \gtrless \eta$
- If MVUE is not available/does not exist, a UMPU test can be constructed from the MLE
- A Separating Function (SF) $g : \mathbb{R}^M \to \mathbb{R}$ continuously maps sets Θ_0 and Θ_1 into two separate real intervals i.e., $\Theta_0 \subseteq g^{-1}((-\infty, 0])$ and $\Theta_0 \subseteq g^{-1}((0, \infty))$
- Using SF, the performance of any (ϵ,p)-estimate $\widehat{\theta}$ can be analyzed, for the detection problem
- Additional questions like how to find an SF, corresponding optimal tests are addressed. Examples are discussed.

On l_q Optimization and Matrix Completion

Goran Marjanovic, and Victor Solo
University of New South Wales, Sydney

- Noisy incomplete observations $Y_{i,j} = M_{i,j} + \epsilon_{i,j}$, where (i, j) are uniformly random and $\epsilon_{i,j}$ are Gaussian
- l_q penalized MC problem:
  $\min_M J(M) \triangleq \frac{1}{2} \sum_{(i,j)\in\Omega}(Y_{i,j} - M_{i,j})^2 + \lambda||M||_q^q$
- Previously, the cases $q = 0$ and $q = 1$ were studied, partially. This is an extension for $0 < q < 1$
- New in this work : Scalar case study, an algorithm based on Majorization-Minimization technique to obtain the solution, its convergence analysis, extensive simulations.

- On a Related Note... :

Reconstruction of Sparse Signals From l_1 Dimensionality-Reduced Cauchy Random Projections

Ana B. Ramirez, Gonzalo R. Arce, Daniel Otero, Jose-Luis Paredes and Brian M. Sadler
University of Delaware (Newark, USA), Universidad de Los Andes (Merida, Venezuela), Army Research Labs (USA)

Linear Decentralized Estimation of Correlated Data for Power-Constrained Wireless Sensor Networks

Alireza S. Behbahani, Ahmed M. Eltawil and Hamid Jafarkhani
University of California, Irvine

- Linear, distributed estimation of a random vector $\theta = [\theta_1, \theta_2, \cdots, \theta_p]$, using K sensors and a FC, with a MAC between them (noiseless/noisy)
- Signal at FC (assuming perfect sync.): $\mathbf{y}_{N_{FC}\times 1} = \mathbf{G}_{N_{FC}\times \sum_{i=1}^{K} N_i} \mathbf{F}_{\sum_{i=1}^{K} N_i \times \ell} \mathbf{H}_{\ell\times p} \theta_{p\times 1} + \mathbf{G}\mathbf{F}\mathbf{n_r}_{\ell\times 1} + \mathbf{n_d}$
- When the S$\rightarrow$FC channel is lossless, the precoder **F** is designed such that the MSE at the FC is minimized
- In the noisy case, a filter **W** is designed to nullify the effect of noise at FC
- Additionally, a special case, asymptotic study, effect of the average power constraints are studied

- On a Related Note... :

A PHD Filter for Tracking Multiple Extended Targets Using Random Matrices

Karl Granstrom and Umut Orguner
Linkoping University (Linkoping, Sweden) and Middle East Technical University (Ankara, Turkey)

Large Deviations Performance of Consensus+Innovations Distributed Detection With Non-Gaussian Observations

Dragana Bajovic, Duan Jakovetic, Jose M. F. Moura, Joao Xavier, and Bruno Sinopoli
Technical University of Lisbon (Lisbon, Portugal), CMU (USA)

- Large Deviations analysis of the setup shows a phase transition behavior w.r.t. n/w degree of connectivity (existence of a "optimal" detection threshold)
- N/w degree of connectivity is defined in the paper (following the authors' earlier work) by a parameter $|logr| \in (0, \infty)$
- Calculation of the threshold depends on the distribution of the observations
- Interestingly, with the same n/w connectivity and same centralized EE, the distributions following Laplace (or Gaussian) distn.

- On a Related Note... :

Analysis of Max-Consensus Algorithms in Wireless Channels

Franck Iutzeler, Philippe Ciblat, and Jeremie Jakubowicz
Telecom Paris-Tech, Institut Mines-Telecom/Telecom SudParis)

Linear Degrees-of-Freedom for the $M \times N$ MIMO Interference Channels With Constant Channel Coefficients

Sungkyu Jung and Jungwoo Lee
Seoul National University (Seoul, Korea)

- Linear DoF for K-user $M \times N$ MIMO IC with constant coefficients. Method to compute the “proper” LDoF
- An upper bound on LDoF is derived and it is shown to be $K\frac{M+N}{K+1}$ when $\frac{M+N}{K+1}$ is an integer, and $\lceil K\frac{M+N}{K+1}\rceil + 1$ otherwise
- Achievability proof is not discussed (still open)
- Even if the MIMO system is partially symmetric, the per user LDoF may be different