Parth K. Thaker

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Research Interests: Nonconvex Optimization, Online Learning (Bandits) and Probability.

Education

Ph.D. candidate, Electrical Engineering, Arizona State University, Arizona, USA.
Expected: August 2024

- GPA: **3.83/4** (As of 8 Semesters)
- Advisor: Gautam Dasarathy

M.Tech, **Indian Institute of Technology, Madras**, Chennai, India
May 2016

- GPA: **8.19/10**
- Specialization: Communication
- Advisor: Radha Krishna Ganti

B.Tech, **Indian Institute of Technology, Madras**, Chennai, India
May 2015

- GPA: **8.19/10**
- Department: Electrical Engineering
- Minor: Systems Engineering
- Advisor: Radha Krishna Ganti

Preprints

1. **Pure Exploration in Multi-armed Bandits with Graph Side Information**
Thaker P., Rao N., Malu M., Dasarathy G.
arXiv preprint, Aug. 21

   This paper targets pure exploration in multi-armed bandits with inaccurate graph side-information. A novel algorithm GRUB (GRaph based UcB) is proposed and a theoretical characterization of its sample complexity is provided eliciting the advantages of the graph side-information.

2. **On the Sample Complexity and Optimization Landscape for Quadratic Feasibility Problems (Extended Version)**
Thaker P., Dasarathy G., Nedich A.
arXiv preprint, Dec. 20

   This paper considers the problem of recovering an unknown complex vector $\mathbf{x}^* \in \mathbb{C}^n$ through its random quadratic measurements. Sufficiency conditions for identifiability of $\mathbf{x}^*$ are established. The paper analyzed landscape properties for the nonconvex loss functions allowing first order algorithms to recover the unknown vector despite problem setup being non-convex.

Publications

1. **Differentiable Programming for Hyperspectral Unmixing using a Physics-based Dispersion Model**
Janiczek J., Thaker P., Dasarathy G., Edwards C., Christensen P., Jayasuriya S.
European Conference on Computer Vision (ECCV), Nov. 20

   This paper proposes a physics-based approach for solving spectral variation via differentiable programming. The dispersion model is introduced to simulate realistic spectral variation and is utilized as a generative model within an analysis-by-synthesis spectral unmixing algorithm. Further, an inverse rendering technique is introduced to boost performance.

2. **On the Sample Complexity and Optimization Landscape for Quadratic Feasibility Problems**
Thaker P., Dasarathy G., Nedich A.
IEEE International Symposium on Information Theory (ISIT), Jun. 20

   This paper targets utilization of measurements of the form $\langle \mathbf{x}^*, A\mathbf{x}^* \rangle$ for the recovery of the unknown generator $\mathbf{x}^* \in \mathbb{C}^n$. Conditions for successful recovery of $\mathbf{x}^*$, upto a phase constant, are established. Non-convex loss landscape of the feasibility problem is analyzed to enable gradient based methods to recover $\mathbf{x}^*$ successfully with probability 1.

3. **Queuing Optimal WiFi Sensing**
Thaker P., Gopalan A., Vaze R.
RAWNET, WiOpt, 2017

   This paper proposes a randomized distributed learning algorithm (strategy to sample the server) for each player. The learning algorithm is shown to converge to a unique non-trivial Nash equilibrium of a sensing game, where each players utility function is demonstrated to possess all the required selfishness tradeoffs.

Thesis

1. **Factored gradient descent**
Advisor: Radha Krishna Ganti
Master's Thesis
Indian Institute of Technology, Madras

   The master's thesis focusses on the rank preserving properties of factored gradient descent algorithms. Rank preserving flows and their connection to factored gradient descent are analyzed. The algorithm is extended to the case of asymmetrical low rank decomposition by proposing a bi-level optimization algorithm to further expand the scope of factored gradient descent.

Professional Experience

1. Systems Engineer : Netradyne
Aug 2016 - May 2017
Bangalore, IN.

2. Intern : Securifi Systems Pvt. Ltd
May 2014-July 2014
Hyderabad, IN.

3. Intern : Cisco Systems Pvt. Ltd
May 2013-July 2013
Bangalore, IN.

4. Conference Volunteer : WiOpt, 2015
Mumbai, IN.

Social Initiative

1. **Sahaay**
Worked closely with **NGO Vidhyasagar**, based in Chennai, to develop software to assist patients affected with Cerebral Palsy to have an independent life.

Teaching Experience

1. Teaching Assistant : **EE5011: Computer Methods in Electrical Engineering**
Conducted By: Harishankar Ramachandran

2. Teaching Assistant : **EE6151: Advanced Topics in Networks**
Conducted By: Radha Krishna Ganti

Graduate Courses

- Statistical Machine learning
- Convex Optimization
- Real analysis
- Applied probability
- Functional analysis
- Spectral graph theory
- Information Theory
- Game Theory

Summer Schools and Workshops

1. **Recent Advances in Reinforcement Learning Workshop 2015**
   Conducted By: National Mathematics Initiative
2. **Summer School on Machine Learning**
   Conducted By: Miscrosoft Research, Bangalore
3. **Summer School on Applied Mathematics**
   Conducted By: Indo-French Centre for Applied Mathematics
4. **Summer school on Information Theory**
   Conducted By: Joint Telematics Group/IEEE Information Theory Society