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Phoenix, US

Education

Arizona State University

M.S. & Ph.D. in Electrical Engineering Aug. 2017 – Present

o Topics: Structured Bandit Learning, Non-convex Optimization.

• Advisor: Dr. Gautam Dasarathy

 \circ **GPA** : 3.79/4

Indian Institute of Technology, Madras

Chennai, IN B.Tech. & M.Tech. in Electrical Engineering; CGPA: 8.19/10 Aug. 2011 – Aug. 2016

o Thesis: Factored Gradient Descent o Advisor : Dr. Radha Krishna Ganti

 \circ **GPA** : 8.19/10

Research Experience

Pure exploration in bandits with graph information

- Proposed a novel algorithm GRUB(GRaph UCB based Action Elimination) algorithm capable of capitalizing on structural graph information in Best-arm identification in stochastic bandits.
- Established rigorous theoretical complexity guarantees for GRUB showcasing the dependence of a graph based speedup factor (scales as $\Omega(\text{nodes/clusters})$)
- o Modular python implementation of GRUB is available at this Git repository with accompanying evidence of performance boost compares to baseline algorithm.

Solving for Quadratic feasibility

- o Identified a subclass of Quadratically constrained quadratic programs (QCQPs), generally non-convex and NP-hard to solve, which can be tackled computationally efficiently by first-order gradient descent methods.
- o Theoretically established, under sufficiency conditions, that a non-convex loss function surrogate for the said QCQO satisfy all local minima are in-fact global minima and all saddle points have strict negative curvature property to guarantee success. Provided order-optimal sample complexity bounds in terms of number of measurements for solving quadratic feasibility problems.
- o (unpublished) Established necessary conditions required to be satisfied by any contending QCQPs to ensure the existence of a first-order gradient descent algorithm that can solve it.

Differential programming using hyperspectral unmixing

- Hyperspectral unmixing is an important problem with applications like material identification and analysis. Incorporated physics-based spectral variation model into spectral unmixing pipeline to obtain superior performance.
- Part of a multi-departmental team to draw insights from optimization theory, physics and Deep learning methodology to propose sequence of experiments to be performed for tacking spectral unmixing problem.
- o Provided conditions for initialization and theoretical convergence of alternate minimization approaches for spectral unmixing.

Sensor Fusion

- o Developed module to determine the deviation of the real-time orientation to ideal orientation of any mounted device using inertial sensors.
- Developed algorithms for detecting aggressive driving patters (Hard acceleration, Hard braking, heavy swirling, etc.) using inertial sensor data.
- Worked on end-to-end implementation of the inertial modules including implementing inertial data acquisition algorithms from on-board inertial sensors, analysis of acquired data on cloud network and displaying and sounding alerts on mobile and web applications.

Factored gradient descent

- o In most real-world applications, projection is generally a computationally intensive operation. Proposed a cost-efficient variant of projected gradient descent by splitting gradient step and projection step into two timescale update algorithm. Performed experimental evaluation of trade-off for the proposed method.
- Extended factored gradient descent methods to be applicable to fat and tall matrices using alternate minimization routines.

Publications

Published

- Parth Thaker, Mohit Malu, Nikhil Rao, Gautam Dasarathy. "Maximizing and Satisficing in Multi-armed Bandits with Graph Information", Neural Information Processing Systems (NeurIPS), 2022.
- John Janiczek, Parth Thaker, Gautam Dasarathy, Christopher Edwards, Philip Christensen, and Suren Jayasuriya. "Differentiable Programming for Hyperspectral Unmixing using a Physics-based Dispersion Model."
 In 16th European Conference on Computer Vision (ECCV), 2020. Springer International Publishing.
- Parth Thaker, Gautam Dasarathy, and Angelia Nedić. "On the sample complexity and optimization landscape for quadratic feasibility problems." In IEEE International Symposium on Information Theory (ISIT), 2020.
- Parth Thaker, Aditya Gopalan, and Rahul Vaze. "When to arrive in a congested system: Achieving
 equilibrium via learning algorithm." In 15th International Symposium on Modeling and Optimization in
 Mobile, Ad Hoc, and Wireless Networks (WiOpt). IEEE, 2017.

Preprint

 Parth Thaker, Gautam Dasarathy, and Angelia Nedić. "On the sample complexity and optimization landscape for quadratic feasibility problems." arXiv preprint 2002.01066.

Thesis

o Parth Thaker, Radha Krishna Ganti. Master's Thesis, Indian Institute of Technology, 2016.

Skill Summary

Interested in sustainable and modular implementation of provable theoretical methods to real-world applications.

Theory-based coursework

o Real Analysis, Functional Analysis, Applied Probability, Large-scale Optimization, Graph Theory.

Implementation-based coursework:

o Statistical Machine learning, Process optimization, Computation methods in EE, Multivariate Data Analysis.

Practical Skills:

o Python, Bash scripting, MySQP, Cassandra, OpenCV.

Work Experience

Mitsubishi Electric Research Laboratories	Boston, MA
Algorithms Intern	May 2022 - August 2022
Netradyne	Bangalore, IN
Systems Engineer	Aug 2016 - May 2017
Securifi Systems	Hyderabad, IN
Intern	May 2014 - Aug 2014
Cisco Systems Pvt. Ltd	Bangalore, IN
Intern	May 2013 - Aug 2013
Teaching Assistant IIT Madras • EE5011: Computer Methods in Electrical Engineering • EE6151: Advanced Topics in Networks	Chennai, IN Aug 2015 – May 2016
WiOpt 2015	Mumbai, IN
Conference Volunteer	May 2015

Awards and Achievements

- Recipient of Engineering Graduate Fellowship for the year 2019-2020.
- As a part of social initiative Sahaay, worked closely with NGO Vidhyasagar, based in Chennai, India. Developed software to assist patients affected with Cerebral Palsy to have an independent life.