JAYADEV NARAM

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EDUCATION

IIIT Hyderabad *July 2017 – Present*
B.Tech and MS by Research in Computer Science CGPA - 8.09
MS Thesis adviced by Dr. Pawan Kumar
Title: Applications of Riemannian Optimization to Machine Learning Problems

EXPERIENCE

CSTAR, IIITH *April 2019 – Present*
Undergrad Research Assistant

- Worked on the applications of Optimization Methods on Matrix-Manifolds to Machine Learning problems such as Extreme Classification, Tensor Completion problem, where the underlying geometry of the constrained space is exploited to propose novel Riemannian algorithms.

IHub-Data *Aug 2021 – July 2022*
Research Fellow

- Received Research Grant for the project titled "Optimization Models & Solvers for recommendation with additional feedback or constraints for high dimensional tensor data".

IIIT Hyderabad *Aug 2020 – May 2022*
Teaching Assistant

- Topics in Applied Optimization - Monsoon 20', 21'
- Advanced Optimization - Spring 22'

Responsibilities: Taking tutorial sessions, setting problem sets for quizzes and assignments and their evaluation.

PROJECTS

Generalized Structured Low-Rank Tensor Completion *June 2021 - March 2022*

- Proposed a Riemannian solver based on the dual formulation to Tensor Completion problem which have low-rank and structure constraints. Proved duality gap and experimentally verified the correctness of the proposed algorithm. **Accepted to OPT 2021, NeurIPS workshop.**
- Extended our formulation to consider a general convex low-rank regularizer and have shown theoretically that the duality gap approaches zero.
- An efficient algorithm was implemented using MANOPT for the special case of nonnegative constraints. Experiments were carried out on color images, hyperspectral datasets and video datasets. **Accepted to WACV 2022.**

Riemannian approach to Extreme Classification *Sept 2020 - April 2021*

- Proposed and implemented a Riemannian solver to the baseline SLEEC algorithm to solve Extreme Classification problem using MANOPT. **Accepted to CODS-COMAD 2022.**

Deflation Preconditioner for Large Sparse Linear systems *Sept 2019 - Aug 2020*

- Worked on an implicitly restarted Lanczos type algorithm to compute approximate extreme eigenvectors of a symmetric positive definite matrix and proposed a deflation preconditioner from the approximate eigenvectors to efficiently solve linear systems.
- Implemented a dense variant of the solver in MATLAB and a sparse variant C++ using EIGEN and Ceres-Solver libraries.

Riemannian Preconditioning *May 2021*

- Worked on a preconditioning approach to Optimization problems on Manifold and explored its applications to Linear Discriminant Analysis and Principle Component Analysis problems.

PUBLICATIONS

- J. Naram, T. K. Sinha, P. Kumar. "A Riemannian Approach to Extreme Classification Problems." CODS-COMAD, 2022.
- J. Naram, T. K. Sinha, P. Kumar. "Structured Low-Rank Tensor Learning", OPT Workshop, NeurIPS 2021.
- T. K. Sinha, J. Naram, P. Kumar. "Nonnegative Low-Rank Tensor Completion via Dual Formulation With Applications to Image and Video Completion", WACV, 2022.

TECHNICAL SKILLS

- **Numerical Linear Algebra** - EIGEN, Ceres-Solver, MANOPT, MATLAB
- **Programming** - Python, C, C++
- **Web Development** - HTML, CSS, Javascript, ReactJS, Go
- **Miscellaneous** - GIT, Bash, LaTeX

RESEARCH INTERESTS

Riemannian Optimization • Optimization for Large-Scale Machine Learning • Low-Rank Tensor Completion • Extreme Classification • Convex Analysis • Variational Analysis • Saddle point problem • Numerical Linear Algebra.

ACHIEVEMENTS

- Shortlisted for participating in "Research Week with Google", conducted by Google Research India during Feb 8-11, 2022.
- External Reviewer for ECML-PKDD 2022.
- Dean's List Award for Academic Performance (top 5% of the class) for 2020-2021 Spring Semester.
- Listed in top 0.07% in JEE Mains, 2017 and top 5% in JEE Advanced, 2017