Shalmoli Gupta

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Research Interests

Approximation Algorithms, Submodular Optimization, Big Data and Streaming Algorithms

Education

2012 – Present **University of Illinois Urbana-Champaign**
PhD in Computer Science. Advisor : Prof. Chandra Chekuri

2010 – 2012 **Indian Institute of Technology Delhi**
MTech in Computer Science. Advisor : Prof. Amit Kumar

2005 – 2009 **Jadavpur University**
B.E. in Computer Science.

Work Experience

2012 – Present **University of Illinois Urbana-Champaign.** *Teaching / Research Assistant*
TA for CS473 : Fundamental Algorithms, CS225 : Data Structures (two semesters)
RA with Prof. Chandra Chekuri.

2010 – 2012 **Indian Institute of Technology Delhi.** *Teaching Assistant*
TA for Discrete Mathematics, Data Structure (two semesters).

2009 – 2010 **D. E. Shaw India Software Private Limited.** *Member IT/FO*
Worked as a software developer in DESIS Front Office and was involved in building quantitative analysis tools (mostly Risk Analysis tools).

Publications

- Chandra Chekuri, Shalmoli Gupta, Kent Quanrud. *Constrained Submodular Maximization in Streams.* To be Submitted.
- Mainak Ghosh, Indranil Gupta, Shalmoli Gupta, and Nirman Kumar. *Fast Compaction Algorithms for NoSQL Databases.* Submitted.
- Venkatesan T. Chakaravarthy, Anamitra R. Choudhury, Shalmoli Gupta, Sambuddha Roy and Yogish Sabharwal. *Improved Algorithms for Resource Allocation Under Varying Capacity.* ESA 2014.
- Hyung-Chan An, Aditya Bhaskara, Chandra Chekuri, Shalmoli Gupta, Vivek Madan and Ola Svensson. *Centrality of Trees for Capacitated k-Center.* IPCO 2014.
- Suman K. Bera, Shalmoli Gupta, Amit Kumar, Sambuddha Roy. *Approximation Algorithms for the Partition Vertex Cover Problem.* WALCOM 2013.
- MTech Thesis: Shalmoli Gupta. *Approximation Algorithms for Partitioned Partial Covering Problems.* Department of Computer Science and Engineering, IIT Delhi, June 2012.

Research Experience & Projects

2012- Present **Research at University of Illinois Urbana-Champaign**
I have been working on approximation algorithms for NP-hard problems. The main areas I have focused on are clustering and scheduling problems.

2014 **Space Lower Bound for Quantile**
In this project we proved an improved space lower bound for computing approximate quantiles in streaming setting.

2013 **IBM Research - India.** *Summer Internship*
Mentors: Venkatesan T. Chakaravarthy & Sambuddha Roy. Worked on the classical Unsplittable Flow Problem on a line and its bag variant.

2013	**Modeling Term Identification as a Compression Problem** In this project we modeled the problem of term identification as a compression problem and formulated it as an integer linear program (ILP). We further showed that the optimization problem we have is infact a submodular function minimization with set covering constraint.
2013	**Entity and Relation Extraction using Constrained Conditional Models** The project was about labeling entities and relation between these entities in the ACE-2004 dataset. The methodology used for solving the problem was Constrained Conditional Model where the problem was modeled as an appropriate ILP with a set of hard and soft constraints. Gurobi Optimization tool was used for solving the ILP.
2011 – 2012	**Indian Institute of Technlogy Delhi.** *Master's Thesis* **Advisor:** Prof. Amit Kumar. Worked on approximation algorithms for partition version of the partial vertex cover problem and robust facility location problem.
2011	**Efficient Object Detection using Prize Collecting Steiner Tree** The objective of this project was to implement an efficient region-based object detection algorithm. This can be formulated as an instance of the prize-collecting Steiner tree(PCST) problem. The project involved using machine learning techniques like kmeans and linear-svm and also efficient implementation of the bag-of-feature mechanism and approximation algorithm for PCST problem.
2011	**Bayesian Spam Filter** Implemented the Naive Bayesian filter, Paul Graham's "Better Bayesian filtering" and Gary Robinson's Chi Square based spam filtering methods. Also did a comparative study between the three based on classification error.
2011	**Obscuring Objectionable Part of an Image using Image Encryption** Developed an application for obscuring part of an image selected by the user using fast, JPEG and other image enhancement tolerant image encryption technique. It also involved doing a comprehensive survey of the existing image encryption techniques and analyze their performance on our application.
2010	**Face Detection using PCA and LDA** The project involved training a learning system with human face dataset using Principal Component Analysis (PCA) & Fisher's linear discriminant Analysis (LDA) such that the system recognize any human face from the training dataset. Also did a comparative analysis of the accuracy of the two.

Technical Skills

- **Programming Languages :** C/C++, Java, Python, MATLAB

Professional Activities

- UIUC Computer Science Graduate Student Academic Council (CSGAC) member
- Reviewed Paper for: i) Theoretical Computer Science, ii) STACS 2015
- UIUC Graduate Admissions (FAA) committee, 2014, 2015
- Sun Microsystems Campus Ambassador, Jadavpur University, 2007

Academic Achievements

- Class Rank 3 in MTech at IIT Delhi.
- Class Rank 3 in B.E. at Jadavpur University.
- Secured ALL INDIA RANK of 44 (out of approximately 45,000 students) in Graduate Aptitude Test for Engineering (GATE) 2009 in Computer Science and Engineering.
- Ministry of Human Resource and Development Scholarship, India (2010 - 12), as a GATE -qualified student.
- Secured a rank of 98 (out of approximately 50,000 students) in West Bengal Joint Entrance Examination (WBJEE) 2005.
- Selected for National Merit Scholarship, Government of India, for outstanding performance in Higher Secondary Examination (+12 examination), 2005.

Champaign, Illinois, USA
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