Eklavya Sharma

Curriculum Vitae

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Education

August 2021 – Present: **PhD (Industrial Engineering)**, *Department of Industrial & Enterprise Systems Engineering, University of Illinois at Urbana-Champaign (UIUC)*, IL, USA.

July 2019 – July 2021: **M.Tech. (Research)**, *Computer Science and Automation (CSA), Indian Institute of Science (IISc)*, Bangalore, GPA: 9.7 / 10.0.
Did research on approximation algorithms for variants of bin packing and knapsack. Advised by Prof. Arindam Khan.

Aug 2014 – June 2018: **B.E. (Hons) Computer Science**, *Birla Institute of Technology and Science (BITS)*, Pilani, India, GPA: 9.14 / 10.00.

Research Interests

Algorithms, Graph theory, Fair division, Packing and scheduling.

Papers

Arindam Khan and Eklavya Sharma. Tight Approximation Algorithms For Geometric Bin Packing with Skewed Items. In *APPROX*, volume 207, pages 22:1–22:23, 2021. doi:10.4230/LIPIcs.APPROX/RANDOM.2021.22.

Eklavya Sharma. Harmonic Algorithms for Packing d-Dimensional Cuboids into Bins. In *FSTTCS*, volume 213, pages 32:1–32:22, 2021. doi:10.4230/LIPIcs.FSTTCS.2021.32.

Arindam Khan, Eklavya Sharma, and K. V. N. Sreenivas. Geometry meets vectors: Approximation algorithms for multidimensional packing, 2021. arXiv:2106.13951.

Eklavya Sharma. An approximation algorithm for covering linear programs and its application to bin-packing, 2020. arXiv:2011.11268.

Vishal Gupta and Eklavya Sharma. Mitigating DNS amplification attacks using a set of geographically distributed SDN routers. In *2018 International Conference on Advances in Computing, Communications and Informatics (ICACCI-2018)*, Bangalore, India, September 2018. doi:10.1109/ICACCI.2018.8554459.

Projects

Jan 2020 – Present **Approximation Algorithms for Geometric Packing Problems**.
Topics: approximation algorithms, bin packing.
Supervisor: Prof. Arindam Khan, CSA, IISc Bangalore.

Oct 2017 – Nov 2017 **Analysis of Primality-testing Algorithms**.
'Advanced Algorithms and Complexity' course project.
Topics: abstract algebra, number theory.
Supervisor: Prof. Sundar S Balasubramaniam, BITS Pilani.

- Attempted to improve the running time of the AKS primality test.
- Surveyed compositeness-proving algorithms like Miller-Rabin and Solovay-Strassen.

Sept 2017 – Dec 2017 **Mitigating DNS-related DoS attacks using SDN**.
Topics: computer networks, network security, SDN.
Supervisor: Prof. Vishal Gupta, BITS Pilani.
Devised a new mechanism for mitigating DNS Amplification attacks, which uses a set of geographically-distributed SDN routers. Presented this work at ICACCI in September 2018.

Nov 2017 – Jan 2018 **CT-means clustering algorithm**.
Topics: machine learning, algorithms, math.
Supervisor: Prof. Surekha Bhanot, BITS Pilani.
Invented a clustering algorithm that is a fast approximation to C-means fuzzy clustering. Mathematically proved its convergence and approximation guarantees. Implemented the algorithm and benchmarked its performance. It was not significantly faster in practice and its applicability was limited.

Work Experience

Oct 2020 – Jan 2021 **Teaching Assistant**, *Design and Analysis of Algorithms*, IISc Bangalore.

Aug 2018 – July 2019 **Platform Engineer**, *media.net*, Bangalore, India.
Topics: machine learning, large-scale systems.
media.net is an advertisement-technology company. I worked on improving their real-time bidder.

Jan 2018 – June 2018 **Intern**, *American Express*, Gurgaon, India.
Topics: neural networks, machine learning, big data.
Trained a neural network to predict credit-card defaulting. The input format was unconventional, so a custom architecture was devised. Its performance was at par with the production model, which was tuned over many years.

May 2017 – July 2017 **Intern**, *Directi*, Mumbai, India.
Topics: machine learning.
Made Directi's news article classification algorithm recognize more categories.

May 2016 – Aug 2016 **Google Summer of Code (GSoC) Student** ↗, *Zulip*.

Topics: software development.

Zulip is an open-source group chat application. 3 students were selected from over 100 applicants to work on Zulip as part of the GSoC program.

- Added type annotations to Zulip's python code (around 50,000 lines) so that it could be statically type-checked using a tool called mypy. This improved developer productivity and made Zulip the first major open source project to be 100% statically typed with PEP-484 annotations.
- Switched from an apt repository to using virtualenvs in production. This simplified dependency management and testing deployment workflow.
- Migrated Zulip's python code from Python 2 to Python 3. Apart from a lot of ad-hoc bug-fixing, this involved:
  - Writing scripts which used static code analyzers to find Python 3 bugs.
  - Migrating to python3-compliant dependencies. This required some sections of code to be entirely rewritten.
  - Standardizing the way Zulip uses different kinds of strings (text and byte strings).
- A more detailed description of my work:
  `https://gist.github.com/sharmaeklavya2/57c2420865f17fc9b58a78033de61422`.

Achievements

BITS-Pilani Merit Scholarship.

Scored GPA within top 2% in three semesters.

March 2018 **Graduate Aptitude Test in Engineering (GATE)**.

Secured all-India rank 86 (out of approximately 100,000 candidates) in the 'Computer Science and IT' test.

ACM-ICPC

ACM-ICPC is an international annual multi-tiered programming contest for college students. Around 3000 teams (of 3 students each) participate in the Indian online qualifying round each year. Top few teams qualify for on-site regional contests in India.

Dec 2017 Ranked 29 out of 250 teams in Amritapuri regional contest.

Dec 2016 Ranked 66 out of 450 teams in Amritapuri regional contest.

Dec 2016 Ranked 30 out of 70 teams in Kharagpur regional contest.

Dec 2015 Ranked 88 out of 250 teams in Amritapuri regional contest.

Selected Coursework

UIUC: Advanced Stochastic Processes and Applications (IE 410, grade A+), Optimization of Large Systems (IE 411, grade A+), Integer Programming (IE 511, ongoing), Combinatorial Optimization (IE 519, ongoing).

IISc Bangalore: Approximation Algorithms (grade A+, rank 1), Design and Analysis of Algorithms (grade A+, rank 1), Computational Methods of Optimization (grade A+, rank 1), Cryptography (grade A).

BITS Pilani: Advanced Algorithms and Complexity, Discrete Structures in Computer Science, Design and Analysis of Algorithms, Cryptography, Graphs and Networks, Theory of Computation, Data Structures and Algorithms, Logic in Computer Science, Machine Learning.

Computer Skills

Programming Languages.
Python, C/C++, Java, JavaScript, Bash

Others.
NumPy, SQL, LaTeX, HTML, CSS

Student Societies

BITS-ACM, *BITS Pilani ACM Student Chapter*.

- Problem setter for 6 programming contests organized by BITS-ACM.
- Created backends for web applications used in online quizzing events.
- Conducted intra-BITS-ACM workshops on 'Competitive Programming' and 'Linux and CLI'.

Referees

Arindam Khan
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Vishal Gupta
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