Eklavya Sharma

Curriculum Vitae

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Education

July 2019 – Present
M.Tech. (Research), *Computer Science and Automation (CSA), Indian Institute of Science (IISc)*, Bangalore, GPA: 9.7 / 10.0.
Doing 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, GPA: 9.14 / 10.00.

Research Interests

Algorithms, Approximation algorithms, Online algorithms.

Papers

Eklavya Sharma. Harmonic algorithms for packing d-dimensional cuboids into bins, 2020. arXiv:2011.10963.

Sreenivas Karnati, Arindam Khan, and Eklavya Sharma. Geometry meets vectors: Approximation algorithms for multidimensional packing. Manuscript, December 2020.

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

Eklavya Sharma. Analysis of the harmonic function used in bin-packing, 2020. arXiv:2011.11618.

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 **Algorithms for packing problems**.
Topics: online algorithms, approximation algorithms, bin-packing.
Supervisor: Prof. Arindam Khan, CSA, IISc Bangalore.
- Designed approximation algorithms for a variant of bin-packing that generalizes geometric bin-packing and vector bin-packing.
- Designed an approximation algorithm for d-dimensional geometric bin-packing when items are allowed to be rotated. This algorithm gives the best-known approximation factor for $d \geq 3$.
- Worked on the online knapsack problem in the random-order model. Obtained hardness results and improved algorithms for some special cases (profit = size and profit = 1).

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.
- Did a survey of compositeness-proving algorithms like Miller-Rabin, Solovay-Strassen, Baillie PSW.

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.
- Annotated python code (∼ 50,000 lines) for use with a static type-checker.
- Migrated code to Python 3 by switching to newer dependencies, using automated code conversion, standardizing string types, and fixing bugs.

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.

Computer Skills

LaTeX, Python, C/C++, Java, Bash, HTML, CSS, JavaScript.

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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