Eklavya Sharma

Curriculum Vitae

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Education

August 2021 – Present
PhD, *Department of Industrial & Enterprise Systems Engineering (ISE), University of Illinois at Urbana-Champaign (UIUC)*, IL, USA
Doing research on fair division algorithms. Advised by Prof. Jugal Garg.

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, Fair division, Graph theory, Packing and scheduling

Publications

- New fairness concepts for allocating indivisible items,
  with Ioannis Caragiannis, Jugal Garg, Nidhi Rathi, and Giovanna Varricchio, to appear in IJCAI 2023.
- Simplification and improvement of MMS approximation,
  with Hannaneh Akrami, Jugal Garg, and Setareh Taki,
  to appear in IJCAI 2023. `arXiv:2303.16788`
- Geometry meets vectors: approximation algorithms for multidimensional packing, with Arindam Khan and K.V.N. Sreenivas, in FSTTCS 2022.
- Tight approximation algorithms for geometric bin packing with skewed items, with Arindam Khan, in Algorithmica and APPROX 2021.
- Harmonic algorithms for packing d-dimensional cuboids into bins, in FSTTCS 2021.
- An approximation algorithm for covering linear programs and its application to bin-packing, `arXiv:2011.11268`
- Mitigating DNS amplification attacks using a set of geographically distributed SDN routers, with Vishal Gupta, in ICACCI 2018.

Achievements

July 2023 **Dr. MNS Swamy Medal for Best MTech (Research) Thesis**

April 2023 **Sharp Outstanding Graduate Student Award**

August 2021 – July 2022 **Samuel Brainin Engineering Fellowship**

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.

BITS-Pilani Merit Scholarship
Scored GPA within top 2% in three semesters.

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.

Invited Talks

22 Dec 2022 **Existence and computation of epistemic EFX allocations**
Indian Institute of Science, Bangalore

19 Dec 2022 **Approximation algorithms for multidimensional packing**
FSTTCS 2022, Chennai, India

17 Dec 2021 **Harmonic algorithms for packing *d*D cuboids into bins**
FSTTCS 2021, Online

16 Aug 2021 **Algorithms for geometric bin packing with skewed items**
APPROX 2021, Online

Projects

June 2022 – Present **Algorithms for Fair Division of Indivisible Items**
Topics: fair division.
Supervisor: Prof. Jugal Garg, ISE, UIUC.

Jan 2020 – July 2021 **Approximation Algorithms for Geometric Packing Problems**
Topics: approximation algorithms, bin packing.
Supervisor: Prof. Arindam Khan, CSA, IISc Bangalore.

Sept 2017 – Dec 2017 **Mitigating DNS-related DoS attacks using SDN**
Topics: computer networks, network security, SDN.
Supervisor: Prof. Vishal Gupta, BITS Pilani.

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.

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.

Professional Service

Subreviewer for STOC 2022, SAGT 2022, EC 2023, IJCAI 2023.

Work Experience

Spring 2023 **Teaching Assistant**, *IE 310: Deterministic models in optimization*, UIUC

Fall 2022 **Teaching Assistant**, *IE 300: Analysis of Data*, UIUC

Fall 2020 **Teaching Assistant**, *Design and Analysis of Algorithms*, IISc Bangalore

Aug 2018 – July 2019 **Software 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`.

Selected Coursework

UIUC:

- (CS 598 TH1) Recent Advances in Theoretical CS: grade A+
- (CS 473) Algorithms: grade A+
- (IE 511) Integer Programming: grade A
- (IE 519) Combinatorial Optimization: grade A
- (IE 410) Advanced Stochastic Processes and Applications: grade A+
- (IE 411) Optimization of Large Systems: grade A+

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

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

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

Jugal Garg
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Arindam Khan
Assistant Professor, CSA, IISc Bangalore
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