# Eklavya Sharma

## *Curriculum Vitae*


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## Research Interests

**Economics and computation, Social choice theory, Game theory, Markets, Approximation algorithms**

## Education

Aug 2021 – present
**PhD**, *Department of Industrial & Enterprise Systems Engineering (ISE), University of Illinois at Urbana-Champaign (UIUC)*, IL, USA
Research on data markets and fair allocation. 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
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

## Publications

Submitted to ICML'26
Equilibrium pricing for oligopolistic data markets
with Bhaskar Ray Chaudhury, Jugal Garg, and Jiaxin Song

Submitted to STOC'26
Revenue-optimal pricing for budget-constrained buyers in data markets
with Bhaskar Ray Chaudhury, Jugal Garg, and Jiaxin Song

AAMAS'26
Exploring relations among fairness notions in discrete fair division
with Jugal Garg

AAMAS'26
Proportional and Pareto-optimal allocation of chores with subsidy
with Jugal Garg and Xiaowei Wu

EC'24
Improving approximation guarantees for maximin share
with Hannaneh Akrami, Jugal Garg, and Setareh Taki

IJCAI'23
New fairness concepts for allocating indivisible items
with Ioannis Caragiannis, Jugal Garg, Nidhi Rathi, and Giovanna Varricchio

IJCAI'23 Simplification and improvement of MMS approximation
with Hannaneh Akrami, Jugal Garg, and Setareh Taki

FSTTCS'23 Two-player matrix games repeated until collision
with Aniket Murhekar

ArXiv Automating the search for small hard examples to approximation algorithms

ArXiv EF1 for mixed manna with unequal entitlements
with Jugal Garg

ArXiv Best-of-both-worlds fairness of the envy-cycle-elimination algorithm
with Jugal Garg

FSTTCS'22 Approximation algorithms for multidimensional packing
with Arindam Khan and K.V.N. Sreenivas

Algorithmica, APPROX'21 Tight approximation algorithms for geometric bin packing with skewed items, with Arindam Khan

FSTTCS'21 Harmonic algorithms for packing $d$-dimensional cuboids into bins

ArXiv An approximation algorithm for covering linear programs and its application to bin-packing

ICACCI'18 Mitigating DNS amplification attacks using a set of geographically distributed SDN routers, with Vishal Gupta

## Fellowships and Achievements

Aug 2024 **Mavis Future Faculty Fellowship, UIUC**
A program that trains fellows on various aspects of an academic career through workshops, seminars, and activities.

April 2024 **William A. Chittenden II Award, UIUC**
Given to an outstanding graduate student at ISE.

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

April 2023 **Sharp Outstanding Graduate Student Award, UIUC**

Aug 2021 – July 2022 **Samuel Brainin Engineering Fellowship, UIUC**

March 2018 **Graduate Aptitude Test in Engineering (GATE), India**
Rank 86 (out of ∼100,000 candidates) in the 'Computer Science and IT' test.

Aug 2014 – Dec 2015 **BITS Pilani Merit Scholarship**
Scored GPA among top 2% of students in the first three semesters of my Bachelors.

### 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 the Amritapuri regional contest.

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

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

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

## Invited Talks

27 Oct 2023 **Fair allocation of indivisible items**
Capital Area Theory Seminar, University of Maryland, College Park

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

## Professional Service

Program committee member for EC'26, AAMAS'26, AAAI'26, EC'25, AAMAS'25, AAMAS'24.

Conference subreviewer for EC'24, ICALP'24, EC'23, ESA'23, IJCAI'23, FCT'23, STOC'22, SAGT'22, MFCS'21.

Journal reviewer for Optimization Letters (2024).

## Implementation Projects

April 2024 – Dec 2024 **Exploring relations among fairness notions in discrete fair division**
*Published in AAMAS'26, code at* github.com/sharmaeklavya2/cpigjs
Wrote a program in JavaScript that helped prove many new results for the problem of fairly allocating indivisible items among multiple agents. These results help arrange fairness notions in a hierarchy.

Sept 2023 – March 2024 **Automating the search for hard examples to approximation algorithms.** *code:* github.com/sharmaeklavya2/code2dtree, *paper in IJCAI'23.*
Wrote a python library that converts any function to a decision tree (for a fixed input size). Then wrote a program to find tight hard examples for approximation algorithms by running a linear program for each leaf of the algorithm's decision tree. Used this to find tight hard examples for the then-best-known approximate-MMS algorithm for fairly allocating goods.

May 2020 **Interactive app for rectangular bin packing**
*code:* github.com/sharmaeklavya2/packing-game

## Research Projects

August 2025 – Present **Data Markets**
*Topics*: markets.
*Supervisors*: Prof. Jugal Garg and Prof. Bhaskar Ray Chaudhury, ISE, UIUC.

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.

## Work Experience

**Teaching Assistant**, *IE 300: Analysis of Data (Fall'22, Spring'24, Spring'25, Spring'26)*, UIUC

Spring 2023 **Teaching Assistant**, *IE 310: Deterministic models in optimization*, 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 machine-learning-based algorithm for bidding in real-time ad auctions.

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 I devised a custom architecture. 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`.

## Computer Skills

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

## Selected Coursework

**UIUC**:

- (CS 580) Algorithmic Game Theory: grade A
- (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+
- Design and Analysis of Algorithms: grade A+
- Computational Methods of Optimization: grade A+
- 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.

## 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'.

## References

**Jugal Garg**
Assistant Professor, ISE, UIUC
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https://jugal.ise.illinois.edu/

**Arindam Khan**
Assistant Professor, CSA, IISc Bangalore
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https://www.csa.iisc.ac.in/~arindamkhan/