Suryanarayana Sankagiri

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Research Interests

My research develops interactive AI systems that learn human preferences for personalised recommendation and search.

- **Interactive AI Systems:** recommender systems, personalised search, bandit algorithms, active learning
- **Learning Human Preferences:** choice models, context effects, representation learning
- **Decentralised Systems:** pricing mechanisms, consensus protocols, blockchains, message passing algorithms

Education

2019 – 2022 **Ph.D.**, Electrical and Computer Engineering,
University of Illinois, Urbana-Champaign.

2016 – 2018 **M.S.**, Electrical and Computer Engineering,
University of Illinois, Urbana-Champaign.
GPA: 3.82/4

2012 – 2016 **B.Tech**, Electrical Engineering, *minor in Systems and Control Engineering*,
Indian Institute of Technology, Bombay.
GPA: 9.66/10

Publications

AI/ML papers

- **S. S.**, Jalal Etesami, Pouria Fatemi, and Matthias Grossglauser.
"Recycling History: Efficient Recommendations from Contextual Dueling Bandits"
Conference on Algorithmic Learning Theory (ALT), 2026
- Oscar Villemaud, **S. S.**, and Matthias Grossglauser.
"Ranking Items from Discrete Ratings: The Cost of Unknown User Thresholds"
Conference on Algorithmic Learning Theory (ALT), 2026
- **S. S.**, Jalal Etesami, and Matthias Grossglauser.
"Recommendations with Sparse Comparison Data: Provably Fast Convergence for Nonconvex Matrix Factorisation"
International Conference in Machine Learning (ICML), 2025

- Hugo Correa, **S. S.**, Daniel Figueiredo, and Matthias Grossglauser.
  "Measuring IIA Violations in Similarity Choices with Bayesian Models"
  Conference on Uncertainty in Artificial Intelligence (UAI), 2025
- K. Sampath, S. Nishad, D.S.K. Reddy, P. Dayama, and **S. S.**
  "Inventory Pooling using Deep Reinforcement Learning."
  IEEE International Conference on Service Computing, 2022
- Bruce Hajek and **S. S.**
  "Community Recovery in a Preferential Attachment Graph."
  IEEE Transactions on Information Theory, November 2019
- Bruce Hajek and **S. S.**
  "Recovering a Hidden Community in a Preferential Attachment Graph."
  IEEE International Symposium on Information Theory (ISIT), 2018

Blockchain papers

- **S. S.** and Bruce Hajek.
  "Pricing for Routing and Flow-Control in Payment Channel Networks."
  IEEE/ACM Transactions on Networking, 2025
  Workshop on Mathematical Performance Modeling and Analysis (MAMA), ACM SIGMETRICS 2024
- **S. S.**, Shreyas Gandlur, and Bruce Hajek
  "The Longest-Chain Protocol Under Random Delays."
  INFORMS Journal on Stochastic Systems, July 2023
- Taha Ameen, **S. S.**, and Bruce Hajek.
  "Blockchain Security When Messages are Lost."
  ACM Workshop on Developments in Consensus, CCS, 2022
- **S. S.***, Xuechao Wang*, Sreeram Kannan, and Pramod Viswanath.
  "Blockchain CAP theorem Allows User-Dependent Adaptivity and Finality."
  Conference on Financial Cryptography and Data Security (FC), 2021
- Bolton Bailey and **S. S.**
  "Merkle Trees Optimized for Stateless Clients in Bitcoin."
  Workshop on Trusted Smart Contracts, FC, 2021
- K. Sampath, D.S.K. Reddy, K. Kumar, K. Narayanam, P. Dayama, and **S. S.**
  "Spot Collaborative Shipping sans Orchestrator Using Blockchains."
  IEEE International Conference on Blockchain, 2020

Other Papers

- T. P. Vinutha, **S. S.**, K. K. Ganguli, and Preeti Rao.
  "Structural Segmentation and Visualization of Sitar and Sarod Concert Audio."
  Conference of International Society for Music Information Retrieval (ISMIR), 2016
- T. P. Vinutha, **S. S.**, and Preeti Rao.
  "Reliable Tempo Detection for Structural Segmentation in Sarod Concerts."
  National Conference on Communications (NCC), 2016

Full, up-to-date list: Google Scholar

Research Experience

Aug 2022 – Present **Postdoctoral Researcher**, *with Matthias Grossglauser*, EPFL, Switzerland.
Design and analysis of recommender systems that learn from comparisons and choices. Proved theoretical guarantees for nonconvex matrix factorisation, showing learning from comparisons is statistically and computationally efficient. Developed active learning algorithms that exploit user history, showing that even sparse exploration yields rich comparison data. Demonstrated that human similarity judgements deviate from classical Bradley–Terry assumptions, motivating richer context-effect models. These works combine theoretical guarantees with new insights into how to learn human preferences for personalisation in AI systems.

Jan 2019 – July 2022 **Graduate Research Assistant (Ph.D.)**, *with Bruce Hajek*, UIUC, USA.
Researched blockchain security and efficiency, spanning consensus protocols, payment channel networks, and finality gadgets. Developed new security guarantees for blockchains under random delays. Proposed safety gadgets to strengthen longest-chain consensus under network delays and failures. Designed pricing-based routing and flow-control protocols for payment channel networks, with optimality guarantees. Analysed these systems using tools from probability theory and communication networks.

Aug 2016 – Dec 2018 **Graduate Research Assistant (M.S.)**, *with Bruce Hajek*, UIUC, USA.
Worked on message-passing algorithms for community recovery in random graphs, developing theoretical guarantees for detecting hidden communities.

July 2015 – July 2016 **Undergraduate Research Assistant**, *with Preeti Rao*, IIT Bombay, India.
Worked on music information retrieval, developing methods to separate percussion and string rhythm patterns in Indian classical instrumental music for automatic concert segmentation.

Teaching Experience

Fall 2025 **Principles of Online Decision Making**, EPFL (Prof. Matthias Grossglauser)
Contributing to the design of a new course on bandits and reinforcement learning by developing teaching slides, codebase, homework assignments, and exams.

Fall 2021 **Communication Networks Analysis**, UIUC (Prof. R. Srikant)
Taught three lectures on blockchains and payment channel networks.

Spring 2021 **Principles of Blockchains**, UIUC (Prof. Pramod Viswanath)
Developed new course notes. Gave an invited lecture on hybrid consensus protocols.

Fall 2019 **High-Dimensional Geometric Data Analysis**, UIUC (Prof. Zhizhen Zhao)
Taught four lectures on spectral graph theory and its application in manifold learning. Prepared and graded exams. Evaluated project presentations.

Fall 2018 **Random Processes**, UIUC (Prof. Olgica Milenkovic)
Conducted weekly tutorial sessions which involved discussing concepts beyond class material. Solved illustrative problems and held revision sessions for exams.

Spring 2018 **Statistical Learning Theory**, UIUC (Prof. Max Raginsky)
Held office hours, evaluated projects, and graded homework for 30 students.

Spring 2016 **Linear Algebra**, **Differential Equations-I**, IIT Bombay
Conducted weekly tutorial sessions for a class of 50 students.

Mentorship Experience

2024 – Present **Hugo Correa**, *Ph.D. Student at UFRJ, Brazil*.
Collaborating on designing new models for similarity choice data, leading to Hugo's first paper

2023 – Present **Oscar Villemaud**, *Ph.D. student at EPFL, Switzerland*.
Collaborating on multiple projects, both theoretical and empirical, under the theme of understanding comparisons as an effective mode of feedback for recommender systems

2023 **Pouria Fatemi**, *Summer intern at EPFL, Switzerland*.
Worked together on contextual bandits that learn from comparisons, led to a research paper

2020 – 2022 **Taha Ameen**, *Ph.D. Student at UIUC, USA*.
Mentored him on a project on blockchain security, leading to his first Ph.D. paper

Industry Experience

Summer 2019 **Research Intern**, *with Dr. Kameshwaran Sampath*, at IBM Research, India.
Applied multi-agent reinforcement learning methods for distributed inventory control. Also implemented matching algorithms on a blockchain for decentralised shipment management.

Summer 2015 **Undergraduate Intern**, *with Dr. Apu Sivadas*, at Qualcomm, India.
Improved the design of analog circuits that convert radio-frequency signals to baseband signals; slated to be implemented over a billion mobile phones.

Achievements and Awards

2021 ZkCapital weekly newsletter recognition for two papers on blockchains

2021 Rambus Fellowship, ECE Department, University of Illinois

2019 Mavis Future Faculty Fellowship, College of Engineering, University of Illinois

2019 Ranked as Excellent as a TA based on student feedback, University of Illinois

2016 Nominated for EE Department Colloquium Series, IIT Bombay

2013 Best poster award at the Undergraduate Research Symposium, IIT Bombay

2012 All-India Rank 41 in IIT-JEE 2012 out of 450,000 students

2012 Gold medal in Indian National Chemistry Olympiad

Organizational Experience

2019 – 2020 **General Chair, CSL Student Conference 2020**, *CSL, Illinois*.
Organized the 15th CSL Student Conference, co-leading a team of fourteen students. Raised funding from multiple corporate and academic sources, including Microsoft. Conducted technical sessions with invited speakers, a poster session, a panel discussion, a robotics session, a mentoring circles session, and a workshop on communicating research.

Graduate Coursework

Electrical Engineering Random Processes, Statistical Learning Theory, Information Theory, Control Theory, Introduction to Optimization, Big Data Optimization

Computer Science Advanced Algorithms, Distributed Systems, Principles of Blockchains, Consensus Algorithms, Lattice Cryptography

Mathematics Real Analysis, Measure Theory, Theory of Probability I & II, Graph Theory

References

- **Prof. Matthias Grossglauser**, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland
  Postdoctoral mentor
  matthias.grossglauser@epfl.ch
- **Prof. Bruce Hajek**, University of Illinois, Urbana-Champaign (UIUC), USA
  Ph.D. advisor
  b-hajek@illinois.edu
- **Prof. Jalal Etesami**, TU Munich, Germany
  Collaborator
  j.etesami@tum.de