

# Swaprava Nath

Computer Science and Engineering  
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## Research Interests

Artificial intelligence, multi agent systems, game theory, mechanism design, computational social choice, crowdsourcing, social networks.

## Academic Employment

- Assistant Professor *2017 - till date*  
**Department of Computer Science and Engineering**  
**Indian Institute of Technology, Kanpur, India**
- Fulbright-Nehru Post Doctoral Fellow *2015 - 2017*  
**Computer Science Department**  
**Carnegie Mellon University, Pittsburgh, USA**  
*Host: Dr. Ariel Procaccia*  
**Research:** *Computational Social Choice*
- Lecturer and Post Doctoral Fellow *2013 - 2015*  
**Economics and Planning Unit**  
**Indian Statistical Institute, New Delhi, India**  
*Host: Prof. Arunava Sen*  
**Research:** *Mechanism Design Theory*

## Education

- Doctor of Philosophy (Ph.D.) in Computer Science *2013*  
**Indian Institute of Science, Bangalore, India**  
**Research:** *Mechanism Design for Strategic Crowdsourcing*  
**Thesis Supervisor:** Prof. Y. Narahari
- Master of Engineering (M.E.) in Telecommunication *2008*  
**Indian Institute of Science, Bangalore, India**  
**Research:** *Self Organization in Wireless Sensor Networks*  
**Research Supervisor:** Prof. Anurag Kumar
- Bachelor of Engineering (B.E.) in Electronics & Telecommunication *2006*  
**Jadavpur University, Kolkata, India**  
**Final year project:** *Analysis of Time Modulated Linear Antenna Array*

## Awards and Achievements

- Received **Fulbright-Nehru Postdoctoral Fellowship** for research in Internet Economics, 2015.
- Received **Honorable Mention Award** in Yahoo! Key Scientific Challenges Program, 2012.
- Selected for a research internship at *Harvard School of Engineering and Applied Sciences* during Fall 2011, worked with **Prof. David C. Parkes**.
- Received the **Tata Consultancy Services PhD Fellowship** for 2010.

- Awarded **Intern Day Prize** for the presentation on Intern Day, August 30, 2010, at Xerox Research Centre Europe, Grenoble, France.
- Graduate Aptitude Test in Engineering (GATE, Entrance test for graduate studies in engineering) 2006: **All India Rank 34** out of approximately 40,000 candidates in Electronics and Communication stream.
- **Bronze medal** for securing the second highest aggregate of marks among all the courses of the Bachelor of Engineering examination 2006, Jadavpur University, Kolkata, India, out of approximately 800 students in 13 departments.
- State Level Joint Entrance Examination (WBJEE, Entrance test for undergraduate studies in engineering) 2002: **Rank 25 (Engineering)** out of approximately 80,000 candidates.
- 10+2 Level School Leaving Examination (WBHS, Combined Test on Physics, Chemistry, Mathematics, Biology, and Languages) 2002: **Rank 28** out of approximately 1,20,000 candidates.

## Research Abstract

My research lies in the intersection of microeconomics and computer science. In particular, I work on the theory and applications of mechanism design that actively involve computational science as a tool of analysis and the Internet as a method of implementation. My research has two complementary themes: one provides solutions to combat the strategic behavior of the multiple rational and intelligent agents or systems in these applications, and the other theme uses artificial intelligence to assist humans take provably efficient decisions. We model the strategic behavior using a game theoretic framework and provide mechanism design solutions that are provably efficient and stable. On the other hand, we use a computational framework to analyze the performance of the system quantitatively. The connection between these two analysis techniques gives rise to many interesting questions and elegant solutions in the versatile domain of multi-agent systems.

## Publications\*

*\*I am a primary contributor in all the papers mentioned here. Depending on the conventions of certain research communities, e.g., in economics and theoretical computer science, author orders are alphabetical in certain papers. Impact factor and acceptance rate statistics courtesy: DBLP, CiteSeerX, RePEc (for economics).*

### Working Paper(s):

- [W2] Palash Dey, Pravesh K. Kothari, and **Swaprava Nath**, “*Surprise in Elections*”. Technical Report, 2017.
- [W1] Debasis Mishra, **Swaprava Nath**, and Souvik Roy, “*Separability and Decomposition in Mechanism Design with Transfers*”. Technical Report, 2017.

### Journals:

- [J5] Ioannis Caragiannis, **Swaprava Nath**, Ariel Procaccia, and Nisarg Shah, “*Subset Selection Via Implicit Utilitarian Voting*”. In **Journal of Artificial Intelligence Research (JAIR)**, Volume 58, 2017, pp 123-152. **Impact factor: 1.691**
- [J4] **Swaprava Nath**, Onno Zoeter, Y. Narahari, and Chris Dance, “*Dynamic Mechanism Design with Interdependent Valuations*”. In **Review of Economic Design (ROED)**, 19(3), 2015, pp 211-228. **Impact factor: 3.461**
- [J3] **Swaprava Nath** and Arunava Sen, “*Affine Maximizers in Domains with Selfish Valuations*”. In **ACM Transactions on Economics and Computation (ACM-TEAC)**, 3(4), 2015, article 26, pp 26:1-19. *Impact factor not yet assigned*
- [J2] **Swaprava Nath** and Onno Zoeter, “*A Strict Ex-post Incentive Compatible Mechanism for Interdependent Valuations*”. **Economics Letters**, 121(2), 2013, pp 321-325. **Impact factor: 5.059**

- [J1] **Swaprava Nath**, Venkatesan N. E., Anurag Kumar, and P. Vijay Kumar, “*Theory and Algorithms for Hop-Count-Based Localization with Random Geometric Graph Models of Dense Sensor Networks*”. In **ACM Transactions on Sensor Networks (ACM-TOSN)**, 8(4), 2012, article 35, pp 35:1-38. **Impact factor: 1.388**

#### Peer-reviewed Conferences:

- [C13] Stefanos Nikolaidis, **Swaprava Nath**, Ariel Procaccia, and Siddhartha Srinivasa, “*A Game-Theoretic Formalism of Human Partial Adaptation: Models and Experiments*”. In Proceedings, **Human Robot Interaction (HRI)**, March 6-9, 2017, Vienna, Austria, pp 323-331. **Acceptance rate: 24%**
- [C12] Gerdus Benade, **Swaprava Nath**, Ariel Procaccia, and Nisarg Shah, “*Preference Elicitation For Participatory Budgeting*”. In Proceedings, **AAAI Conference on Artificial Intelligence (AAAI)**, February 4-9, 2017, San Francisco, California, USA, pp 376-382. **Acceptance rate: 25%**
- [C11] **Swaprava Nath** and Tuomas Sandholm, “*Efficiency and Budget Balance*”. In Proceedings, **Web and Internet Economics (WINE)**, December 11-14, 2016, Montreal, Canada, pp 369-383. **Acceptance rate: 24%**
- [C10] Ioannis Caragiannis, **Swaprava Nath**, Ariel Procaccia, and Nisarg Shah, “*Subset Selection Via Implicit Utilitarian Voting*”. In Proceedings, **International Joint Conference on Artificial Intelligence (IJCAI)**, July 9-15, 2016, New York, USA, pp 151-157. **Acceptance rate: 25%**
- [C9] **Swaprava Nath** and Balakrishnan Narayanaswamy, “*Productive Output in Hierarchical Crowdsourcing*”. In Proceedings, **Autonomous Agents and Multi-Agent Systems (AAMAS)**, May 5-9, 2014, Paris, France, pp 469-476. **Acceptance rate: 24%**
- [C8] Satyanath Bhat, **Swaprava Nath**, Onno Zoeter, Sujit Gujar, Y. Narahari, and Chris Dance, “*A Quality Assuring Mechanism for Crowdsourcing with Strategic Agents*”. In Proceedings, **Autonomous Agents and Multi-Agent Systems (AAMAS)**, May 5-9, 2014, Paris, France, pp 917-924. **Acceptance rate: 24%**
- [C7] Kundan Kandhway, **Swaprava Nath**, Bhushan Kotnis, Balakrishnan Narayanaswamy, and David C. Parkes, “*On Profit Sharing and Hierarchies in Organizations*”. Presented in the **Asian Meeting of the Econometric Society (AMES)**, Dec 20-22, 2012, New Delhi, India, paper 119, pp 1-19.
- [C6] **Swaprava Nath**, Pankaj Dayama, Dinesh Garg, Y. Narahari, and James Zou, “*Mechanism Design for Time Critical and Cost Critical Task Execution via Crowdsourcing*”. In Proceedings, **Web and Internet Economics (WINE)**, December 9-12, 2012, Liverpool, UK, pp 212-226. **Acceptance rate: 24%**
- [C5] **Swaprava Nath**, Pankaj Dayama, Dinesh Garg, Y. Narahari, and James Zou, “*Threats and Trade-offs in Resource Critical Crowdsourcing Tasks over Networks*”. In Proceedings, **AAAI Conference on Artificial Intelligence (AAAI)**, July 22-26, 2012, Toronto, Canada, pp 2447-2448. **Acceptance rate: 26%**
- [C4] **Swaprava Nath**, Onno Zoeter, Y. Narahari, and Chris Dance, “*Dynamic Mechanism Design for Markets with Strategic Resources*”. In Proceedings, **Conference on Uncertainty in Artificial Intelligence (UAI)**, July 14-17, 2011, Barcelona, SPAIN, pp 539-546. **Acceptance rate: 34%**
- [C3] **Swaprava Nath**, “*Dynamic Learning-based Mechanism Design for Dependent Valued Exchange Economies*”. PhD proposal, in Proceedings, **World Wide Web (WWW), PhD Symposium Track**, ACM, March 28 - April 1, 2011, Hyderabad, INDIA, pp 397-402. **Acceptance rate: 15%**
- [C2] **Swaprava Nath** and Anurag Kumar, “*Performance Evaluation of Distance-Hop Proportionality on Geometric Graph Models of Dense Sensor Networks*”. In Proceedings, **International Conference on Performance EVALUation Methodologies and TOOLS (VALUETOOLS)**, ACM, October 21-23, 2008, Athens, GREECE, pp 4247:1-10. **Acceptance rate: 35%**

- [C1] **Swaprava Nath** and Subrata Mitra, “*Linear Antenna Array with Suppressed Sidelobe and Sideband Levels using Time Modulation*”. In International Conference On Computers And Devices For Communication (**CODEC**), December 2006, Kolkata, INDIA, pp 73-76.

#### Dissertations:

- [D2] “*Mechanism Design for Strategic Crowdsourcing*”, PhD Thesis, Indian Institute of Science, Bangalore, December 2013.  
**Advisor:** Prof. Y. Narahari
- [D1] “*Self Organisation in Random Geometric Graph models of Wireless Sensor Networks*”, Masters Thesis, Indian Institute of Science, Bangalore, June 2008.  
**Advisor:** Prof. Anurag Kumar

#### Other Paper(s):

- [O1] **Swaprava Nath** and Balakrishnan Narayanaswamy, “*Improving Productive Output in Influencer-Influencee Networks*”. Technical Report, 2013.

## Teaching

- **Topics in Game Theory and Collective Choice**, July - November, 2017, at Indian Institute of Technology Kanpur.
- **Scientific Computing using Python**, July - November, 2014, at Indian Statistical Institute, Delhi.
- **Mathematical Programming with Applications to Economics**, January - April, 2014, at Indian Statistical Institute, Delhi. (co-taught with Debasis Mishra)

## Student Advising

- **Rahul Bhatta**, (thesis supervised, title: “Strategyproof Voting with Cardinal Preferences”) Master of Science in Quantitative Economics (MSQE), Indian Statistical Institute, New Delhi, 2015.
- **Aditya Aradhye**, Summer Intern from Chennai Mathematical Institute, supervised at Indian Statistical Institute, New Delhi, 2015.

## Invited Talks

- ‘Economics and Computation’
  - at CSE, Indian Institute of Technology Madras, October 7, 2016.
  - at CSE, Indian Institute of Technology Kanpur, October 2, 2016.
  - at CSE, Indian Institute of Technology Kharagpur, September 26, 2016.
  - at TCS, Tata Institute of Fundamental Research, September 23, 2016.
  - at CSE, IEOR, Indian Institute of Technology Bombay, September 20,22, 2016.
- ‘Affine Maximizers in Domain with Selfish Valuations’
  - at Indian Statistical Institute, Kolkata, June 17, 2014.
  - at Xerox Research Centre Europe, Meylan, France, May 13, 2014.
  - at ISI-Warwick Workshop in Economics, New Delhi, February 28, 2014.
- ‘Productive Output in Hierarchical Crowdsourcing’
  - at the International conference of AAMAS, Paris, May 7, 2014.
  - at Xerox Research Centre Europe, Meylan, France, May 12, 2014.
- ‘On Profit Sharing and Hierarchies in Organizations’, at the Asian Meeting of the Econometric Society, Delhi School of Economics, New Delhi, December 21, 2012.

- ‘Mechanism Design for Time Critical and Cost Critical Task Execution via Crowdsourcing’
  - at the International conference on Web and INternet Economics (WINE), University of Liverpool, UK, December 12, 2012.

## Professional Activities

### Academic

- Organizer, Computational Social Choice Theory Workshop (part of the conference *Foundations of Software Technology and Theoretical Computer Science (FSTTCS)*, 2017), **IIT Kanpur**.
- Program committee and reviewing service: *International Joint Conference on Artificial Intelligence (IJ-CAI)*, 2016, 2017, *Web and Internet Economics (WINE)*, 2012, 2015, 2017, *Computational Social Choice (COMSOC)*, 2016, *Mathematical Social Science*, 2015.
- Student coordinator of the *Electrical Sciences Divisional Symposium (ESDS) 2013*, an annual symposium for the graduating PhD students of the Electrical Sciences Division of **Indian Institute of Science**.
- Internship at EconCS, **School of Engineering and Applied Sciences, Harvard University**, September - November, 2011, (worked on *Incentivizing Mechanisms on Social and Professional Networks*).
- Summer internship at **Xerox Research Centre Europe**, Grenoble, France, June - August, 2010. Worked on *Incentive Compatible Learning*.

### Teaching Assistantship

- **Algorithms and Programming** (Undergrad level, Instructors: Y. Narahari and T. Matthew Jacob) Indian Institute of Science, Bangalore, August - December, 2012.
- **Game Theory** (Graduate level, Instructor: Y. Narahari) Indian Institute of Science, Bangalore, January - April, 2010, 2011, 2012, 2013.
- **Linear Algebra** (Graduate level, Instructor: R. Vittal Rao) Indian Institute of Science, Bangalore, August - December, 2010.
- **Mathematical Foundations for Modern Computing** (Graduate level, Instructor: Ravi Kannan) Indian Institute of Science, Bangalore, January - April, 2011.

## Industry Experience

- Summer intern at **Xerox Research Centre Europe**, Grenoble, France. *June - August, 2010*
- Software engineer in **Cisco Systems (India) Private Limited**. *August 2008 - July 2009*

## References

Available upon request.

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