

Abira Sengupta

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Summary: I recently finished my PhD thesis on multi-agent systems for collective action, a collaboration between Imperial College, London, and Otago University, New Zealand. I worked as a research assistant in the computer science department at Otago University in 2021. I am a member of the Centre for Artificial Intelligence and Public Policy (CAIPP) at Otago since I am passionate about fair and transparent AI. I am also an IEEE member. Previously, I worked on my pre-PhD research at the Indian Statistical Institute in collaboration with the University of Technology, Sydney.



EDUCATIONAL QUALIFICATIONS

- Doctor of Philosophy (PhD) in Information Science ( 2019 - 2022, graduate in 2023)
University of Otago, New Zealand.
 - Supervisor: Prof. Stephen Cranefield
 - Co-supervisor: Prof. Jeremy Pitt
- Master of Technology (M.Tech) in Computer Science ( 2011 - 2013)
West Bengal University of Technology, India. (GPA: 8.87/10)
- Bachelor of Technology (B.Tech) in Computer Science ( 2006 - 2010)
West Bengal University of Technology, India. (GPA: 7.43/10)
- Math Honours
I completed two years of a three-year honour course before switching to BTech.



RESEARCH EXPERIENCE (Multi-Agent Systems, Artificial Intelligence, Planning)

- PhD Research at the Information Science Dept, Univ. of Otago, NZ (Submitted)
 - Thesis Title: A generic approach to reasoning about collective action problems using expectations.
 - Funding: PhD funded by Marsden Fund, in collaboration with Imperial College.
 - Research paper accepted in COINE 2021 and COINE 2023, and another paper from the bursary period wanted to submit to the Journal of Artificial Intelligence Research.

Thesis Summary: My research focused on how generalised representation and logical reasoning about expectations can assist computational agents in solving a variety of collective action problems. Included explanations of the various applications of expectation-related reasoning, including expectation, team reasoning norms, norm, and norm emergence from emotion. The central claim of my research is to construct a generalized computational model in which expectation and norms are input data, and an Expectation Event Calculus is used (Prolog based) to represent how explicit reasoning of expectation is generated and how it is fulfilled or violated, both from the logic and game theoretic perspectives.

- Post-PhD bursary Research ( 2023)

- To investigate how emotions aid in the retrieval of normative reasoning in a multi-agent system.
- We are using a Graph neural network for the clinical decision-making of cancer cells.
- Research Assistant at the Computer Science Dept, Univ. of Otago, NZ (📅 2021).
 - Short project on the computational analysis of text data for emotion recognition.
- Research collaboration at the Computer Science Dept, Univ. of Otago, NZ.
 - **Prediction of Wildfire Susceptibility Using Machine Learning Approach**
Project: We focused on developing wildfire prediction models using Support Vector Machine, Isolation Forest, AutoEncoder, and Variational AutoEncoder to delve deeper into this problem. To avoid bias in selecting training and testing data sets, outcomes were validated using five-fold cross-validation. These models achieved high mean accuracy ranging from 98 to 99 percent. In addition, the best-performing models are operationalized by deploying the ML models as a REST API using Python Flask via a Web-based tool.
- **A Preliminary Investigation of LEACH, TEEN and DEEC Towards Wireless Sensing Application (Extension of MTech Thesis)**
Project: In wireless sensor networks, the nodes operating in a distributed environment operate on a limited source of energy and rely on efficient power optimisation protocols to operate for the appropriate duration of their wireless data-sensing applications. In this paper, we present a comparative analysis of three prominent hierarchical clustering protocols: LEACH, TEEN, and DEEC.
- Pre-doctoral Research at the Indian Statistical Institute (📅 2017 - 2018)
 - **Research: Machine Learning applied to facial image and pin-code detection.**
 - 3 papers were published in collaboration with Univ. of Technology, Sydney and the Indian Statistical Institute (ISI).Project: During my pre-PhD research, I collaborated with the ISI CVPR department under the supervision of Dr. Umapada Pal. Convolutional neural networks were used to detect the pin-code in both structural and unstructured postal documents, as well as to authenticate facial images. CNN has been found to be effective at identifying individuals from degraded face images.

+ RESEARCH SUPERVISION:

- Co-Supervised the final year thesis of one Master of Information Science student at Kalyani Government Engineering College in 2020-2021. In that project, we classified various types of road obstacles using a convolutional neural network. We also used the YOLO algorithm to classify and locate various types of objects in front of the car.

- Research project supervision for four Bachelor students of Computer Science at Narula Institute of Technology in 2017-2018.



TEACHING EXPERIENCE

- Tutor/Demonstrator at the University of Otago, NZ (📅 2019 - 2023: 7 semesters)
 - 2023, 2022, 2021: COMP 120, Data Science using R.
 - 2022, 2021, 2020: INFO 204, Machine learning using Python coding.
 - 2022: INFO 301, Software development.
 - 2021: INFO 310, Software and system development using JAVA.
 - 2019: COMP 101, R and SQL coding.
- Guest Lecturer (part-time) at several universities in Kolkata, India (📅 2013 - 2018)
 - Jadavpur University - Taught multimedia systems.
 - Kalyani Govt Engg College - Taught Algorithms, Automata, Graphics, Multimedia.
 - Aliah University - Taught Sensor Networking theory.
 - Narula Institute of Technology - Taught C, Multimedia, Networking theory.

+ RESEARCH FUNDING/GRANTS

- 57250 NZD: Marsden scholarship (3 years PhD studies).
- 2964 NZD: Pūtea Tautoko - Student Relief Fund.
- 2800 NZD: Departmental award.
- 3500 NZD: Technical Education Quality Improvement Programme



REFERENCES

- **DR. STEPHEN CRANEFIELD** (relation: primary PhD supervisor at Otago)
Affiliation: Professor, Department of Information Science, University of Otago, NZ.
Email: stephen.cranefield@otago.ac.nz, Phone: +64 3 479 8083.
- **DR. GRANT DICK** (relation: Hove done tutoring under him)
Affiliation: Head of Department (HOD), University of Otago, NZ,
Email: grant.dick@otago.ac.nz, Phone: +64 3 479 8180.
- **DR. SHERLOCK LICORISH** (relation: Tutored for him and completed one paper under his supervision.)
Affiliation: Associate Professor, Dept of Information Science, University of Otago, NZ.
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- **DR. BRENDON WOODFORD** (relation: Tutored for him and completed one paper under his supervision.)
Affiliation: Lecturer, Dept of Information Science, University of Otago, NZ.

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+ MEMBERSHIP OF PROFESSIONAL BODIES

- Member of the Centre for Artificial Intelligence and Public Policy (CAIPP), NZ.
- Member of the Artificial Intelligence Researchers Association (AIRA), NZ.
- Student member of IEEE.
- Reviewed papers submitted to International Conference like SMC-2023.



CONFERENCE PUBLICATIONS

- Abira Sengupta, Stephen Cranefield, Jeremy Pitt, “Generalising Axelrod's Metanorms Game through the use of explicit domain-specific norms”, (COINE) 2023. [Accepted]
- Abira Sengupta, Stephen Cranefield, Jeremy Pitt, “Solving social dilemmas by reasoning about expectations”, (COINE) 2022: 1-18.
- Abira Sengupta, Saurabh Malgaonkar, Nikita Mehrotra, Tejas Hirave, “A Preliminary Investigation of LEACH, TEEN and DEEC Towards Wireless Sensing Application”, (ICCICT) 2021: 1-6.
- Abhijit Das, Abira Sengupta, Muhammad Saqib, Umapada Pal, Michael Blumenstein, “More Realistic and Efficient Face-Based Mobile Authentication using CNNs”, (IJCNN) 2018:1-8.
- Abhijit Das, Abira Sengupta, Miguel A. Ferrer, Umapada Pal, Michael Blumenstein, “Linking face images captured from the optical phenomenon in the wild for forensic science”, (IJCB) 2017: 781-786.
- Nabin Sharma, Abira Sengupta, Rabi Sharma, Umapada Pal, Michael Blumenstein, “Pincode detection using deep CNN for postal automation”, (IVCNZ) 2017: 1-6.



POSTER PRESENTATION

- Abira Sengupta, Stephen Cranefield, “Normative Reasoning Based On Emotions In Multi-Agent System To Solve Social Dilemmas”, (Student Research Symposium of Otago) 2021.
 - Abira Sengupta, Stephen Cranefield, Jeremy Pitt “Generalising Axelrod’s metanorm game with the expectation event calculus”, (Artificial Intelligence Researchers Association (AIRA), NZ).
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