Ankani Chattoraj

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EDUCATION

Doctor of Philosophy (PhD), Brain and Cognitive Sciences **September 2015-August 2021 (expected)**
University of Rochester, Rochester, USA

Masters of Science, Applications of Mathematics (2nd in class) **August 2012 - August 2014**
Chennai Mathematical Institute, Chennai, India

Bachelors of Science, Mathematics (Minor: Statistics and Computer Science) **July 2009 - July 2012**
St. Xavier's College, Kolkata, India

EXPERIENCE

GRADUATE RESEARCH ASSISTANT **University of Rochester (2015 - 2021)**

➢ **PROJECT MANAGEMENT**

- Led and managed end to end research projects:
  - Formulated testable scientific hypotheses
  - Developed human experiment protocols and designed experiments
  - Executed the experiments on human subjects and collected data
  - Analyzed the data using statistical and mathematical tools
  - Modeled empirical observations using machine learning concepts
- Mentored, trained and managed 7 undergraduates on diverse projects leading to 5 conference submissions.
- Collaborated with researchers from mathematics, computer science, social sciences and industrial research in multi-disciplinary projects.
- Led and co-authored projects published in scientific conferences: **UAI 2021**, **NeurIPS 2018** (selected for talk), **NIPS 2015, AAAI 2020** (selected for talk)**, COGSCI 2021** (selected for 2 talks), **ICLR Neural Compression Workshop and ICLR Responsible Workshop 2021** (3 papers), **UP-STAT 2018** (3rd in competition) and **NEUROMATCH 2020**, **VSS 2020, CCN 2019**, **Bernstein 2019**, **COSYNE 2018**, **COSYNE 2017**.

➢ **RESEARCH**

- **Human Behavior: Experiment Design, Data Analysis and Modeling**
  - Designed psychophysics visual experiments using the Psychtoolbox of MATLAB and EYELINK eye tracker.
  - Analyzed human behavioral data of >100 subjects across 12 experiments.
  - Modeled human behavior with sampling-based approximate inference on a hierarchical generative model implemented using MATLAB.
- **Network Models of Neurons**
  - Implemented a network of >100 leaky integrate-and-fire neurons in BRIAN and Python that perform Gibbs sampling based probabilistic inference.
- **Applications of Machine Learning**
  - Developed fair rating predictor for public speeches using feedforward neural network, counterfactual fairness and causal models on TED talks.
  - Designed edge pruning method for feedforward neural networks based on Determinantal Point Processes.
  - Used the Lovasz theta function as a measure of diversity in graphs thereby incorporating it in Max-Cut, correlation clustering and document summarization algorithms.

➢ **TEACHING**

- **Teaching Assistant**: •Neural Mechanisms of Behavior, Fall 2016, 2017, University of Rochester, USA •Action and Perception, Fall 2018, University of Rochester, USA •Undergraduate Research in Cognitive Science, Fall 2018 - Spring 2019, Fall 2019 - Spring 2020, University of Rochester, USA •Machine Learning, Spring 2015, Chalmers University of Technology, Sweden.
- **Role:** Organized weekly revision lectures for a class of ~200 students, trained 4 undergraduate TAs, gave 2 class lectures on neural mechanisms of visual illusions, graded examinations and organized help sessions for coding.

➢ **TRAINING IN SUMMER SCHOOLS**

- **Summer course in mining and modeling neuroscience data** **UC Berkeley, USA (CRCNS 2017)**

Fit general linear models and applied PCA on neuronal data, implemented in Python.

- **Summer School in Computational Sensory-Motor Neuroscience University of Minnesota, USA (CoSMo 2017)** Designed experiments using point-light walkers and used Bayesian models for biological motion perception **(ranked 2nd in group project competition)**.

SKILLS

PROGRAMMING

- **MATLAB** (PsychToolbox, Eyelink, eyetracking, optimization, fitting), **Python** (NumPy, pandas, scikit-learn, Pytorch, matplotlib, Seaborn), **SQL**, **Tableau**

TECHNICAL SKILLS

- **Experiments**: Design Experiments, Implement Psychophysical and Eye-tracking Experiments, Data Collection
- **Modeling and Analysis**: Hierarchical Generative Models, Probabilistic Inference, Bayesian Inference, Approximate Inference, MCMC Methods, Causal Model, Counterfactual Fairness, Biological Neuron Model, Model Fitting, Model Comparison, Deep Learning, Logistic, Ordinal, and Linear regression, Statistical Analysis, Optimization, Hypothesis testing, Significance testing, Cross Validation, Hyperparameter Search, Regularization, Bootstrapping, Supervised Learning, PCA

SELECTED PUBLICATIONS

- R. Acharyya**, A. Chattoraj*,** B. Zhang*, S. Das, D. Stefankovic. Statistical Mechanical Analysis of Neural Network Pruning - **UAI 2021. Paper**
- **A. Chattoraj**, M. Snarskis, R M. Haefner. Relating confidence judgements to temporal biases in perceptual decision-making - **COGSCI 2021 (Selected for talk). Paper**
- **A. Chattoraj***, S. Shivkumar*, Y S. Ra, R M. Haefner. A confirmation bias due to approximate active inference - **COGSCI 2021 (Selected for talk), VSS 2020 Paper, Talk at Neuromatch 2020, Paper**
- R. Acharyya, **A. Chattoraj***, B. Zhang*, S. Das, D. Stefankovic. Understanding diversity based neural networks pruning in teacher-student setup - **Neural Compression ICLR 2021 Workshop**. **Paper**
- R. Acharyya, **A. Chattoraj***, B. Zhang*, S. Das, D. Stefankovic. Diversity based edge pruning of neural networks using determinantal point process - **Neural Compression ICLR 2021 Workshop**. **Paper**
- **A. Chattoraj***, R. Acharyya*, S. Das, I. Tanveer, E. Hoque. Removing racial bias in TED talk ratings by awareness of verbal and gesture quality - **Responsible AI ICLR 2021 Workshop**. **Paper**
- R. Acharyya**,** S. Das, **A. Chattoraj**, I. Tanveer**.** FairyTED: A fair rating predictor for TED talk data **- AAAI 2020 (Selected for talk in AI for Social Impact). Paper**
- **A. Chattoraj**, R D. Lange, R M. Haefner. Using the perceptual confirmation-bias to study learning and feedback in fovea and periphery (Journal version in prep.). **VSS 2020 Paper, CCN 2019 Paper**
- **A. Chattoraj**, R D. Lange, S. Wu, R M. Haefner. A neural sampling based model of early visual processing based on leaky integrate-and-fire neurons (Journal version in prep.). **Bernstein 2019 Paper, COSYNE 2018 Paper**
- **A. Chattoraj***, S. Shivkumar*, R D. Lange*, R M. Haefner. A probabilistic population code based on neural samples **- NeurIPS 2018 (Selected for talk, 1% acceptance rate). Paper**
- R D. Lange, **A. Chattoraj**, J M. Beck, J L. Yates, R M. Haefner. A confirmation bias in perceptual decision-making due to hierarchical approximate inference. (Journal paper under review). **CCN 2018 Paper, COSYNE 2017 Paper, Paper**
- **A. Chattoraj***, R. Acharyya*, S. Shivakumar*, R. Ali*, I. Tanveer*. To be or not to be? A spatial predictive crime model for Rochester - **UP-STAT 2018** (**Won 3rd position in the data competition**). **Paper**
- R D. Lange, **A. Chattoraj**, Ralf M. Haefner. On the computational basis of the confirmation bias - **Bounded Optimality and Rational Metareasoning NIPS 2015 Workshop. Paper**
- FD Johansson, **A Chattoraj**, C Bhattacharyya, D Dubhashi. Weighted theta functions and embeddings with applications to max-cut, clustering and summarization - **NIPS 2015, Paper**
- R D. Lange, **A. Chattoraj***, S. Shivkumar*, R M. Haefner. Bayesian encoding and decoding as distinct perspectives on neural coding. **(Journal paper under review in Nature Neuroscience). Paper**

LEADERSHIP EXPERIENCE

- Participated and performed Indian music and dance in >15 cultural and charity events in Rochester **2015 - Present**
- Cultural Secretary of BAGR **(Bengali Association of Greater Rochester)** **Summer 2018 - Spring 2019**
- Organized a national level annual seminar at St Xavier's College **(ANALYTICA)** **2009, 2010 and 2011**
- Organized an annual collegiate festival at Chennai mathematical Institute **(FIESTA)** **2013**