Ankani Chattoraj

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SUMMARY

Experienced data research scientist with a machine learning, computational and mathematical background. I am currently employed at a Boston based start-up Perceptive Automata, aimed at improving and increasing safety of autonomous driving outcomes around pedestrians in crowded and complicated urban environments. I develop tools for quantitative analysis and modeling of our datasets as well as testing robustness of deep learning based model predictions of pedestrian behavior. I closely collaborate with the product and development team to help with customer engagement. Before joining Perceptive Automata, I led, published and presented research across various domains, e.g, computational models to understand human visual perception, fairness in rating prediction systems and theoretical understanding of neural network pruning.

EDUCATION

Doctor of Philosophy (PhD), Brain and Cognitive Sciences **September 2015 - September 2021**
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

RESEARCH ENGINEER, **DATA RESEARCH TEAM** **Perceptive Automata, Boston, USA (Jan 2022 - present)**

- Focus on understanding pedestrian behavior in complex urban environments, including challenging pick-up and drop-off areas
  - Analyze and evaluate deep learning model performance, robustness and failure modes for complicated urban driving scenarios
  - Develop quantifiable metrics and analysis pipeline for evaluation of experiments aimed at understanding pedestrian behaviors, to improve customer's AV and ADAS safety and social driving capabilities
  - Data wrangling and product driven data analysis to create compelling examples for customer engagement
- Work in a cross-functional team of researchers and closely collaborate with the product and development team on customer engagements.
- Part of the hiring committee for data-research and machine learning engineer roles, mentor a data-research intern for the Summer of 2022.
- Won first place in *Innovation-week* of the first quarter of 2022 for developing tools to investigate performance of our models in crowds.

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

➤ **PROJECT MANAGEMENT**

- Led and managed research projects:
  - Developed human experiment protocols and designed experiments for human subjects and collected data
  - Analyzed the data using statistical and mathematical tools and modeled empirical observations using machine learning concepts
- Led, co-authored and presented projects published in scientific conferences and collaborated with researchers from Mathematics, Computer Science and Social Sciences: **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 **VSS 2022** (1 talk, 3 abstracts), **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.

SKILLS

PROGRAMMING
- **Python** (NumPy, pandas, scikit-learn, Pytorch, matplotlib, seaborn), **MATLAB** (PsychToolbox, Eyelink, eyetracking, optimization, fitting), **SQL, git, LATEX**

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. Diversity based edge pruning of neural networks using determinantal point process - **Neural Compression 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. (**PLoS CB 2021**). **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**

LEADERSHIP EXPERIENCE

- Part of **Perceptive Automata**'s **DEI committee** to improve policies around hiring practices   **2022 - 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**