MAHI LUTHRA

Cognitive Science | Data Science | Machine Learning
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EDUCATION

Indiana University, Bloomington ***2017-2022***
Dual PhD, Cognitive Science and Psychology
Relevant Coursework: Bayesian Modelling, Machine Learning, Artificial Intelligence, Neural Networks and Brain, Databases, Dynamical Systems Analysis, Math and Logic for Cognitive Science

Max Planck Institute for Human Development ***2018***
Participant, Summer Institute on Bounded Rationality

Mumbai University ***2015-2017***
MA, Applied Psychology

Jai Hind College, Mumbai University ***2012-2015***
BA, Major in Psychology

EXPERIENCE

Graduate Researcher, Indiana University *(Advisor: Dr. Peter Todd)* ***2017-Present***
Identified relevant research problems; designed research studies; analyzed results using methods from cognitive science and machine learning.

Project: Human Decision Making and Informational Use

- Research question: How do people process information to make effective decisions? How do information processing bottlenecks influence decision processes?
- Designed experiments in JavaScript to track decision behaviors and information processing capacities.
- Developed Bayesian MCMC models of human decision-making in R; used regression modelling to predict human decisions from information processing capacities.
- Conducted time series analyses of mouse movement trajectories to gain insight into real-time decision making processes.

Project: Collective Search Behaviors

- Research question: How do people search for resources (e.g., information, food)? How do collective search behaviors dynamically interact with the environment?
- Designed Markov and neural network multi-agent frameworks optimized by genetic algorithms in Python to simulate collective search for resources.
- Analyzed multi-agent frameworks using dynamical systems analysis and regression models to derive a composite view of behavior-environment interactions during search.

Undergraduate Research Intern, Open Spaces Consulting Ltd. ***2015***

- Used statistical modelling on organizational data to identify factors of employee engagement.

SELECTED DATA SCEINCE/MACHINE LEARNING PROJECTS

Information Efficiency in Binary Prediction
Used signal detection analysis to demonstrate performance superiority of frugal prediction algorithms (e.g., fast-and-frugal decision trees) over information intensive algorithms (e.g., regular decision trees, logistic regression) for binary prediction in real-world data sets.

Topic Modelling of *Cognition* Research Journal
Performed latent Dirichlet allocation on cleaned data of >3000 research abstracts published in *Cognition* from 1980 onward to identify patterns of change in the field of cognitive psychology.

Image Classification
Created feedforward neural networks to classify image orientations; developed convolutional neural networks on TensorFlow for image classification; used Bayesian networks to identify image horizons.

Optimization of Continuous-Time Recurrent Neural Networks through Genetic Algorithms
Trained embodied CTRNN agents to perform simple control tasks using genetic algorithms.

SKILLS

Analysis/Modelling Methods

Bayesian networks, regression analyses, deep learning, genetic algorithms, reinforcement learning, agent-based modelling, clustering, multi-dimensional scaling, dynamical systems analysis, natural language processing, time series analysis, experiment design, A/B testing

Programming Languages, Packages, and Tools

Python (NumPy, pandas, scikit-learn, TensorFlow, matplotlib, seaborn), R (shiny, Tidyverse, ggPlot), JavaScript, HTML, CSS, SQL, Hadoop, JAGS, MATLAB, Mathematica

Communication Skills

Associate Instructor for 2 courses (Brains and Minds, Robots and Computers; Research Methods in Psychology); given 10+ conference presentations

RESEARCH PUBLICATIONS

Luthra, M., Izquierdo, E. J., & Todd, P. M. (2020). Cognition evolves with the emergence of environmental patchiness. *Artificial Life Proceedings. 32,* 450-458.

Luthra, M., & Todd, P. M. (2019). Role of working memory on strategy use in the probability learning task. *Proceedings of Cognitive Science Society. 41,* 721-728.

SELECTED CONFERENCE PRESENTATIONS

Luthra, M., Izquierdo, E. J., & Todd, P. M. (2020). Cognition evolves with the emergence of environmental patchiness. *Presented as talk at Meeting of Artificial Life Conference.*

Luthra, M., & Todd, P. M. (2019). Role of working memory on strategy use in the probability learning task. *Presented as talk at Meeting of Cognitive Science Society.*

Luthra, M., & Todd, P. M. (2019). Coevolution of ecological patchiness and cognitive strategies. *Presented as talk at Meeting of Human Behavior and Evolution Society..*

Luthra, M., & Todd, P. M. (2018). Role of limited working memory in dynamic environments. *Presented as poster at Summer Institute on Bounded Rationality, Max Planck, Berlin, Germany.*

GRANTS AND FELLOWSHIPS

Templeton Foundation Fellowship: "What drives human cognitive evolution"	*2021, 2018, 2017*
NSF-NRT Fellowship: Interdisciplinary Training in Complex Networks and Systems	*2019*
Supplemental Research Fellowship, Cognitive Science, Indiana University	*2019, 2020*
Lotus Foundation Scholarship, Psychology Department, Mumbai University	*2016*
Gold Medal, Mumbai University for 1st Rank among 16000 students in BA	*2015*

EXTRA-CURRICULARS

Graduate Student Representative of Equity, Diversity, and Inclusion Committee for Cognitive Science, IU	*2020*
Graduate Panelist at the 11th Midwest Undergraduate Cognitive Science Conference	*2018*
Student Representative of Internal Quality Assurance Cell for Higher Education, Mumbai University	*2017, 2016*
Organizing Team Member, United Nations Young Changemakers Conclave	*2014*