Krishn Bera

Cognitive Science PhD student · Brown University

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Education

Brown University — *Providence, US*

Ph.D. in Cognitive Science — *2021 - present (exp. Dec 2026)*

- Advisor: Michael J. Frank (Laboratory of Neural Computation and Cognition)
- Cumm. GPA: 10/10

International Institute of Information Technology - Hyderabad (IIIT-H) — *Hyderabad, India*

M.S.(research) in Computing and Human Sciences — *2019 - 2021*

- Thesis: An Empirical and Computational Investigation of Skill Learning in Internally-guided Sequencing
- Advisor: Bapi Raju S. (Cognitive Science Lab)
- Cumm. GPA: 9.75/10

International Institute of Information Technology - Hyderabad (IIIT-H) — *Hyderabad, India*

B.Tech.(Honors) in Computer Science — *2015 - 2019*

- Twice awarded Dean's List-I academic merit award
- Cumm. GPA: 8.26/10

Research Interests

Cognitive Modeling
Reinforcement learning, sequential sampling models (e.g. Drift Diffusion Model), cognitive control, computational psychiatry

Neural Networks and Deep Learning
Meta-learning, in-context learning

Bayesian Statistics
Simulation-based inference, efficient Bayesian inference on complex, hierarchical models

Technical Skills

Programming	Python (Expert), MATLAB (Proficient), C/C++ (Familiar)
Deep Learning	PyTorch, JAX, HuggingFace, Keras
Probabilistic Modeling	PyMC, HSSM
Core	NumPy, SciPy, Pandas, scikit-learn, Matplotlib
Other	Linux, Git, Latex, Django, HTML/CSS

Research Experience

Neural Computation and Cognition Lab, Brown University — *Providence, US*

Graduate Research Assistant — *Aug 2021 - present*

- Project 1: Computational Cognitive Modeling of Learning and Decision Dynamics in Healthy and Clinical Populations
  - Investigated and developed efficient Bayesian parameter estimation methods for fitting a large class of previously intractable, joint computational models of human decision-making and learning. Employed these methods and models to enable accurate, model-based and mechanism-oriented computational phenotyping of psychopathologies (schizophrenia, major depressive disorder, bipolar disorder).
  - Designed and implemented end-to-end pipelines for fast, tractable hierarchical Bayesian inference on large-scale human behavioral data ($>$ 31k trials) for fitting high-dimension cognitive models ($>$ 900 parameters).
  - Collaborated with a team of researchers and software engineers to implement statistical and modeling research advances in a popular open-source Python toolbox for cognitive modeling.
  - Streamlined application of state-of-the-art cognitive models and methods facilitating adoption and accessibility for diverse, non-technical research stakeholders.
- Project 2: Cognitive Control in Transformer Neural Networks
  - Investigating 'cognitive control' as a key computational mechanism underlying flexible goal-directed behaviors in brain and transformer neural networks.
  - Examining mechanistic basis of context processing in transformers trained from scratch on simple cognitive tasks. Surveyed the literature on dual mechanisms of cognitive control and mechanistic interpretability in transformers to design computational experiments for hypothesis testing.
  - Employed mechanistic interpretability methods such as feature attribution, attention analysis, ablation and decoding to demonstrate how different control and context processing strategies emerge in transformers over the course of learning.

Neural Computation and Cognition Lab, Brown University *Providence, US*

Visiting Research Fellow *May 2020 - Jul 2021*

- Reviewed the literature on Bayesian inference methods for cognitive process models that do not have analytical, closed-form likelihoods. Outlined future directions for making Bayesian inference tractable for a large class of cognitive models.
- Investigated the use of simulation-based inference approaches via neural network likelihood estimation for drift-diffusion models of human decision-making. Achieved 10x speed-ups in inference with gradient-based MCMC.

Cognitive Science Lab, IIIT-Hyderabad *Hyderabad, India*

Research Assistant *Apr 2018 - Jun 2021*

- Conceptualized study designs, collected data (> 90 participants) and developed statistical analysis methods for 4 behavioral experiments to investigate cognitive processes in motor sequence learning.
- Devised and implemented computational cognitive models using reinforcement learning and sequential sampling models accurately fitting the empirical data.

US Army Research Labs (West) *Los Angeles, US*

Visiting Researcher *Jul 2018 - Oct 2018*

- Engineered data pre-processing pipeline for physiological (EMG, EEG) and IMU data (accelerometer, gyroscope) experimental data for classification of hand gestures and user state under high cognitive load.
- Developed a multi-modal deep learning framework for integrating high-dimensional sensor fusion data for accurate, robust and near real-time gesture classification.

Center for Exact Humanities, IIIT-Hyderabad *Hyderabad, India*

Research Assistant *Dec 2016 - Apr 2018*

- Conceptualized an interdisciplinary project on color perception and computational photography. Reviewed and explored various image processing and visualization for constructing linguistic photographic filters.
- Collaborated with Computer Vision Lab (CVIT) to develop language-specific color grading and photographic filtering methods. Built a multilingual dictionary of 2000+ color terms in 3 languages, derived linguistic photographic filters and achieved artifact-free color transfer using derived filters.

Other Experience

Indian Institute of Management - Ahmedabad (IIM-A) *Ahmedabad, India*

Winter School Intern *Dec 2016 - Jan 2017*

- Selected among 70 students for RTERC Winter School at IIM-A. The main theme of the programme was Public Policy with a special focus on education policy.
- Received special mention for the research report titled “A Case Study on Scope of Alternative Education in Mainstream Schooling”.

Gibbr Technologies *Hyderabad, India*

Software Developer Intern *Aug 2016 - Dec 2016*

- Coordinated product development of the ‘Project Leonardo’: A social platform for creating and sharing 360-degree photo-spheres constructed from regular DSLR/mobile images.
- Successfully prototyped and developed the overall back-end of the application (using Django-Python, Hugin and Pannellum) in less than 3 months.

Publications

Thesis

1. Bera, K. (2021). An Empirical and Computational Investigation of Skill Learning in Internally-guided Sequencing (Master’s thesis). International Institute of Information Technology Hyderabad.

Journal

1. Bera, K., Fengler, A., Boudewyn, M.A., Carter, C.S., Erickson, M., Gold, J., Luck, S.J., Ragland, J.D., Yonelinas, A.P, MacDonald III, A.W., Barch, D.M., Frank, M.J. (under review). Modeling decision dynamics disentangles working memory, cognitive control and reinforcement learning and reveals clinical differences.
2. Fengler, A., Xu, Y., Bera, K., Paniagua, C., Omar, A., & Frank, M. J. (2026). HSSM: A Widely Applicable Toolbox for Hierarchical Bayesian Neuro-cognitive Modeling. bioRxiv, doi:10.64898/2026.06.05.730398.
3. Ging-Jehli, N.R., Rac-Lubashevsky, R., Bera, K., Roberts, A., Loder, A., Boudewyn, M.A., Carter, C.S., Erickson, M., Gold, J., Luck, S.J., Ragland, J.D., Yonelinas, A.P, MacDonald III, A.W., Barch, D.M., Frank, M.J. (2025). Model-based EEG phenotyping uncovers distinct neurocomputational mechanisms underlying learning impairments across psychopathologies. Biological Psychiatry: Global Open Science.

4. Fengler, A., Bera, K., Pedersen, M. L., & Frank, M. J. (2022). Beyond Drift Diffusion Models: Fitting a Broad Class of Decision and Reinforcement Learning Models with HDDM. Journal of Cognitive Neuroscience, 34(10), 1780–1805.
5. Bera, K., Shukla, A., & Bapi, R. S. (2021). Motor Chunking in Internally Guided Sequencing. Brain Sciences, 11.
6. Bera, K., Shukla, A., & Bapi, R. S. (2021). Cognitive and Motor Learning in Internally-Guided Motor Skills. Frontiers in Psychology, 12, 1035.

Conference

1. Bera, K., Fengler, A., & Frank, M. J. (2025). Fast and robust Bayesian inference for modular combinations of dynamic learning and decision models. In 47th Annual Meeting of the Cognitive Science Society. CogSci. (San Francisco, CA, US)
2. Bera, K., Fengler, A., & Frank, M. J. (2025). Fast and robust Bayesian inference for modular combinations of dynamic learning and decision models. In 6th Multidisciplinary Conference on Reinforcement Learning and Decision Making. RLDM. (Dublin, Ireland)
3. Bustamante, L., Bera, K., Pagnier, G., Cruz, A., Zimmerman, A., Gillan, C., Barch, D.M., Boudewyn, M.A., Carter, C.S., Erickson, M., Gold, J., Luck, S.J., Ragland, J.D., Yonelinas A.P., Frank, M.J., MacDonald III, A.W. (2025). Working Memory-Supported Reinforcement Learning Related to Mental Health Phenotypes in a Representative Sample. In 6th Multidisciplinary Conference on Reinforcement Learning and Decision Making. RLDM. (Dublin, Ireland)
4. Bera, K., Fengler, A., & Frank, M. J. (2022). Likelihood Approximation Networks enable fast estimation of generalized sequential sampling models as the choice rule in RL. In 5th Multidisciplinary Conference on Reinforcement Learning and Decision Making. RLDM. (Providence, RI, US)
5. Bera, K., Mandilwar, Y., & Bapi, R.S. (2019). Value-of-Information based Arbitration between Model-based and Model-free Control (Oral). In 6th Annual Conference of Cognitive Science. ACCS. (Goa, India)

Poster/Abstract

1. Bera, K., & Frank, M. J. (2026). Proactive-Like Context Processing Emerges in Transformers Learning Simple Cognitive Tasks. In 9th Annual Conference on Cognitive Computational Neuroscience. CCN. (New York City, NY, US)
2. Russin, J., Bera, K., Pavlick, E., & Frank, M. J. (2026). Transformers capture individual differences in reinforcement learning via in-context learning. In 9th Annual Conference on Cognitive Computational Neuroscience. CCN. (New York City, NY, US)
3. Russin, J., Bera, K., Pavlick, E., & Frank, M. J. (2026). Transformers capture individual differences in reinforcement learning via in-context learning. Computational and Systems Neuroscience Conference. COSYNE. (Lisbon, Portugal)
4. Bera, K., Fengler, A., & Frank, M. J. (2025). Fast and robust Bayesian inference for modular combinations of dynamic learning and decision models. In 8th Annual Conference on Cognitive Computational Neuroscience. CCN. (Amsterdam, Netherlands)
5. Bustamante, L., Bera, K., Pagnier, G., Cruz, A., Zimmerman, A., Gillan, C., Barch, D.M., Boudewyn, M.A., Carter, C.S., Erickson, M., Gold, J., Luck, S.J., Ragland, J.D., Yonelinas A.P., Frank, M.J., MacDonald III, A.W. (2025). Working Memory-Supported Reinforcement Learning Related to Mental Health Phenotypes in a Representative Sample. In 8th Annual Conference on Cognitive Computational Neuroscience. CCN. (Amsterdam, Netherlands)
6. Bustamante, L., Bera, K., Pagnier, G., Cruz, A., Zimmerman, A., Gillan, C., Barch, D.M., Boudewyn, M.A., Carter, C.S., Erickson, M., Gold, J., Luck, S.J., Ragland, J.D., Yonelinas A.P., Frank, M.J., MacDonald III, A.W. (2025). Working Memory-Supported Reinforcement Learning Related to Mental Health Phenotypes in a Representative Sample. In 3rd Computational Psychiatry Conference. CPC. (Tübingen, Germany)
7. Bustamante, L., Bera, K., Pagnier, G., Cruz, A., Zimmerman, A., Roberts, A., Loder, A., Barch, D.M., Boudewyn, M.A., Carter, C.S., Erickson, M., Gold, J., Luck, S.J., Ragland, J.D., Yonelinas A.P., Frank, M.J., MacDonald III, A.W. (2024). Associations between Working Memory Contributions to Reinforcement Learning and Mental

Health Phenotypes in a Representative Online Sample. American College of Neuropsychopharmacology Annual Meeting. ACNP. (Phoenix, AZ, US)

8. Bustamante, L., Bera, K., Pagnier, G., Cruz, A., Zimmerman, A., Roberts, A., Barch, D., Boudewyn, M.A., Carter, C.S., Erickson, M., Gold, J., Luck, S.J., Ragland, J.D., Yonelinas A.P., Frank, M.J., MacDonald III, A.W. (2024). Associations between Working Memory Contributions to Reinforcement Learning and Mental Health Phenotypes in a Representative Online Hypothesis-Generating Sample. Society for Biological Psychiatry Annual Meeting. SOBP. (Austin, TX, US)
9. Bera, K., Shukla, A., & Bapi, R. S. (2020). Motor Chunking in Internally-guided Sequencing Learning (Poster). In 7th Annual Conference of Cognitive Science. ACCS. (Virtual)
10. Bera, K., Shukla, A., & Bapi, R. S. (2020). Motor Chunking During Sequence Learning in Grid-Navigation Tasks. In 42nd Annual Meeting of the Cognitive Science Society. CogSci. (Virtual)
11. Bera, K., Shukla, A., & Bapi, R. S. (2020). Grid-Navigation Tasks involve Skill Learning. In 42nd Annual Meeting of the Cognitive Science Society. CogSci. (Virtual)
12. Bera, K., Mandilwar, Y., Shukla, A., & Bapi, R. S. (2020). Value-of-Information based Arbitration between Model-based and Model-free Control. In 42nd Annual Meeting of the Cognitive Science Society. CogSci. (Virtual)
13. Bera, K., Savalia, T., & Bapi, R.S. (2018). A Computational Framework for Motor Skill Learning. In 5th Annual Conference of Cognitive Science. ACCS. (Guwahati, India)

Scholarly Presentations

1. Hierarchical Sequential Sampling Models (HSSM) - Advanced Tutorial. Computational Modeling Workshop, Carney Institute for Brain Science, Brown University (Jul 2026)
2. Advanced Concepts in Reinforcement Learning. Computational Modeling Workshop, Carney Institute for Brain Science, Brown University (Jul 2026)
3. RTs Reveal What Choices Hide: Disentangling RL, WM and Cognitive Control (Blitz Talk). CoPsy Retreat, Brown University (Jan 2026)
4. Fast and robust Bayesian inference for modular combinations of dynamic learning and decision models. MathPsych/ICCM. (Jul 2025, Columbus, OH, US)
5. Working memory load modulates speed-accuracy trade-offs in decision dynamics during instrumental learning. Symposium Talk. MathPsych/ICCM. (Jul 2025, Columbus, OH, US)
6. Advanced Concepts in Reinforcement Learning. Computational Modeling Workshop, Carney Institute for Brain Science, Brown University (Jul 2025)
7. Hierarchical Sequential Sampling Models (HSSM) - Advanced Tutorial. Computational Modeling Workshop, Carney Institute for Brain Science, Brown University (Jul 2025)
8. Intro. to the Modeling Challenge. Computational Modeling Workshop, Carney Institute for Brain Science, Brown University (Jul 2025)
9. Hierarchical Sequential Sampling Models (HSSM) - Combining Sequential Sampling Models with Reinforcement Learning, Panel Talk. Winter Conference on Brain Research. (Jan 2025, Lake Tahoe, CA, US)
10. Hierarchical Sequential Sampling Models (HSSM) - A Hands-on Tutorial. CoPsy Retreat, Brown University (Jan 2025)
11. Transformers & Cognitive Control. PI Meeting, ONR MURI Project (Oct 2024)
12. Hierarchical Sequential Sampling Models (HSSM) - A Hands-on Tutorial. Computational Modeling Workshop, SRNDNA. University of Pennsylvania (Jul 2024)
13. Reinforcement Learning - Sequential Sampling Models. Computational Modeling Workshop, Carney Institute for Brain Science, Brown University (Jul 2024)
14. Combining Sequential Sampling Models with Reinforcement Learning. Computational Modeling Workshop, Carney Institute for Brain Science, Brown University (Jul 2023)

15. Combining Sequential Sampling Models with Reinforcement Learning. Computational Modeling Workshop, Carney Institute for Brain Science, Brown University (Jul 2022)
16. An Empirical and Computational Investigation of Skill Learning in Internally-guided Sequencing. Social-Cognitive Seminar Series, Brown University (Oct 2021)

Symposia, Workshops and Tutorials

1. Bringing Cognitive Modeling Up to Speed with Simulation-Based Inference, a tutorial approach. Tutorial. MathPsych/ICCM. (Jul 2025, Columbus, OH, US)
2. Simulation-Based Inference for Computational Cognitive Modeling. Symposium. MathPsych/ICCM. (Jul 2025, Columbus, OH, US)
3. Associations Between Working Memory Contributions to Reinforcement Learning and Mental Health Phenotypes in a Representative Online Hypothesis-Generating Sample. Symposium Talk (presenter: Laura B.). SOBP Annual Meeting. (Apr 2025, Toronto Canada)

Guest Lectures

1. Reinforcement Learning, *Core Concepts in Cognitive and Psychological Sciences I*, Brown University (Nov 2025)
2. Intro. to Sequential Sampling Models, *Intro. to Neural and Cognitive Modeling*, IIIT-Hyderabad (Nov 2025)
3. Transformers & LLMs, *Core Concepts in Cognitive and Psychological Sciences I*, Brown University (Nov 2024)
4. Reinforcement Learning & Basal Ganglia, *Computational Cognitive Neuroscience*, Brown University (Oct 2024)
5. Sequential Sampling Models and Reinforcement Learning, *Intro. to Neural and Cognitive Modeling*, IIIT-Hyderabad (Oct 2023)
6. Reinforcement Learning, *Computational Cognitive Neuroscience*, Brown University (Oct 2023)
7. Reinforcement Learning and Human Decision Making, *Making Decisions*, Brown University (Apr 2023)
8. Reinforcement Learning & Basal Ganglia, *Computational Cognitive Neuroscience*, Brown University (Oct 2022)
9. Sequential Sampling Models and Reinforcement Learning, *Intro. to Neural and Cognitive Modeling*, IIIT-Hyderabad (Oct 2021)

Teaching Experience

Brown University *Providence, US*

Teaching Assistant *Sep 2022 - Dec 2024*

- CLPS1492 'Computational Cognitive Neuroscience' (Fall 2024, Fall 2023, Fall 2022)
- CLPS0220 'Making Decisions' (Spring 2023)

IIIT-Hyderabad *Hyderabad, India*

Teaching Assistant *Aug 2017 - Nov 2020*

- CSE486 'Introduction to Neural and Cognitive Modeling' (Spring 2020, Monsoon 2020)
- CSE611 'Discrete Maths and Algorithms' (Monsoon 2019)
- IHS201 'Introduction to Human Sciences' (Spring 2018, Spring 2019)
- HSS367 'Introduction to Political Science' (Monsoon 2017)

Neuromatch Academy *Remote*

Teaching Assistant *Jul 2020 - Jul 2020*

- TA for NMA, the online school for computational neuroscience.
- Assisted instructors with conducting tutorials, moderating Q&A sessions and mentoring group projects.

Professional Activites

Reviewing

Ad-hoc: Current Opinion in Behavioral Sciences; Journal of Neuroscience; Nature; Nature Communications; Nature Human Behavior; PLOS Computational Biology; Proceedings of the National Academy of Sciences; Psychonomic Bulletin & Review; Science Advances;

Conference: Annual Meeting of the Cognitive Science Society, Annual Conference on Cognitive Computational Neuroscience

Memberships
Cognitive Science Society, Society for Mathematical Psychology

Service
Student Lead, AI Research Institute on Interaction for AI Assistants, Brown University (Oct 2025 - Nov 2025); Treasurer, Indian Community at Brown (Sep 2024 - Sep 2025); Coordinator, CLPS Social-Cognitive Seminar Series, Brown University (Sep 2022 - May 2024); Student Organizer, Teaching the Learning Brain Workshop, IIIT-Hyderabad (2019); Student Coordinator, Placements Committee, IIIT-Hyderabad (2018); Talks and Workshops Coordinator, Felicity, IIIT-Hyderabad (2018); Coordinator, Economics and Finance Club, IIIT-Hyderabad (2017); Teaching Volunteer, Ashakiran, IIIT-Hyderabad (2017)