DR. KEVIN L. MCKEE

OVERVIEW

Senior AI researcher with 10+ years of experience and leadership in developing novel algorithms for machine learning and scientific modeling. Dedicated to strong theoretical foundations, scientific rigor, and ethics in AI and cognitive science.

EXPERIENCE

Astera Institute, Obelisk Lab — Berkeley, CA

SENIOR RESEARCH SCIENTIST — 2024 - Present

- Spearheaded AI agent prototype called "Fluid", integrating neural networks with cellular automata and episodic memory
- Recruited and led team of 5 engineers and 2 researchers for Fluid
- Trained team in reinforcement learning, scientific methods, and theory
- Published 3 research papers on exploration, memory, and thinking
- Collaborated on projects to implement reflection and uncertainty-aware processing in LLM coding agents

Reinforcement Learning | Cellular Automata | Episodic Memory | Uncertainty Quantification

MACHINE LEARNING ENGINEER — 2022 - 2024

- Published 2 independent research manuscripts at intersection of neuroscience and ML
- Prototyped modules for spiking neural network agent called Axon

Spiking Neural Networks | Reinforcement Learning

University of California, Davis, P.I. Randall O'Reilly — Davis, CA

POSTDOCTORAL RESEARCHER — 2021 - 2022

- Published collaborative research on mechanisms of Bayesian inference in spiking neural networks
- Presented workshops on Bayesian state-space models for cognitive and psychiatric data analysis

Spiking Neural Networks | Bayesian Brain | Hidden Markov Models

Virginia Tech, Department of Statistics — Blacksburg, VA

POSTDOCTORAL STATISTICIAN — 2020 - 2021

- Translated research questions into mathematical models for neuroscience, psychiatry, behavioral economics, and biomedical engineering, resulting in 7 published peer-reviewed papers, and several awarded NIH grants
- Reviewed NIH grant applications and manuscripts for peer-reviewed journals
- Mentored undergraduate and graduate students and presented workshops and seminars to the broader research community

Statistical Modeling | Epidemiology | Grant Writing

Virginia Commonwealth University, Statistical Genetics — Richmond, VA

GRADUATE RESEARCH ASSISTANT — 2015 - 2020

- Dissertation "Phenotype Extraction" demonstrates Bayesian multi-level state-space modeling for genetic and psychiatric research
- Published peer-reviewed papers in statistical and psychometric methodology and theory

State-Space Models | Bayesian Multi-level Models | Genetics

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Google Scholar

EDUCATION

Ph.D., Statistical Genetics
Virginia Commonwealth University

B.S., Psychology
Virginia Commonwealth University

INTERESTS

Reinforcement Learning (RL)
Episodic Memory
Bayesian Brain
Uncertainty Quantification
Meta-reinforcement learning
Model-free planning
Neural Algorithmic Reasoning (NAR)
Reservoir Computing (RC)
Spiking Neural Networks (SNN)
Cellular Automata (CA)
Computational Neuroscience
Multiagent Communication

SKILLS

Programming Languages:
Python, R, MATLAB, Mathematica, Go, C#, Java, C++

Frameworks:
JAX, PyTorch, Stan, Unity, Rcpp

Presentation & Tools:
LaTeX, Adobe Suite, R Markdown, R Shiny, Microsoft Office

PREPRINTS

- Miconi, T., McKee, K., Zheng, Y., & McCaleb, J. (2025). Thinking agents for zero-shot generalization to qualitatively novel tasks. arXiv preprint arXiv:2503.19815.
- Zheng, Y., Wolf, N., Ranganath, C., O'Reilly, R. C., & McKee, K. L. (2025). Flexible prefrontal control over hippocampal episodic memory for goal-directed generalization. arXiv preprint arXiv:2503.02303.
- McKee, K. L. (2025). Meta-Learning to Explore via Memory Density Feedback. arXiv preprint arXiv:2503.02831.
- McKee, K. (2025). A Method of Selective Attention for Reservoir Based Agents. arXiv preprint arXiv:2502.21229.
- McKee, K. (2024). Reservoir computing for fast, simplified reinforcement learning on memory tasks. arXiv preprint arXiv:2412.13093.
- McKee, K., Crandell, I., Chaudhuri, R., & O'Reilly, R. (2022). Adaptive Synaptic Failure Enables Sampling from Posterior Predictive Distributions in the Brain. arXiv preprint arXiv:2210.01691.
- McKee, K. L., Crandell, I. C., Chaudhuri, R., & O'Reilly, R. C. (2021). Locally Learned Synaptic Dropout for Complete Bayesian Inference. arXiv preprint arXiv:2111.09780.

PUBLICATIONS

- McKee, K.L. Hierarchical Biometrical Genetic Analysis of Longitudinal Dynamics. Behavior Genetics (2021). https://doi.org/10.1007/s10519-021-10060-0
- Kaplan, B. A., Franck, C. T., McKee, K. L., Gilroy, S. P., Koffarnus, M. N. (2021) Applying Mixed-Effects Modeling to Behavioral Economic Demand: An Introduction, Perspectives on Behavior Science (in press)
- Hunter, M. D., McKee, K. L., Turkheimer, E. (2021). Simulated Nonlinear Genetic and Environmental Dynamics of Complex Traits. Development and Psychopathology (in press)
- Saby, L., McKee, K. L., Lakshmi, V., Goodall, J. L., Band, L. E. (2021) Comparing SoilMERGE Root Zone Soil Moisture and IMERG Precipitation as Predictors of Vegetation Greenness in the Colorado River Basin, 2001-2019. JAWRA (in press)
- McKee, K. L., Crandell, I. C., Hanlon, A. L. (2020) US County-Level Social Distancing and Policy Impact: A Dynamical Systems Model. Journal of Medical Internet Research
- McKee, K. L., Russell, M., Mennis, J., Mason, M., & Neale, M. C. (2019). Emotion Regulation Dynamics Predict Substance Use in High-Risk Adolescents. Addictive Behaviors
- McKee, K. L., Phenotype Extraction: Estimation and Biometrical Genetic Analysis of Individual Dynamics, Virginia Commonwealth University. \href{https://doi.org/10.25772/5NY2-ED51} {doi.org/10.25772}
- McKee, K. L., & Neale, M. C. (2019). Direct estimation of the parameters of a delayed, intermittent activation feedback model of postural sway during quiet standing. PloS one, 14(9), e0222664.
- McKee, K. L., Hunter, M. D., & Neale, M. C. (2019). A Method of Correcting Estimation Failure in Latent Differential Equations with Comparisons to Kalman Filtering. Multivariate behavioral research, 1-20.
- McKee, K. L., Rappaport, L. M., Boker, S. M., Moskowitz, D. S., & Neale, M. C. (2018). Adaptive Equilibrium Regulation: Modeling Individual Dynamics on Multiple Timescales. Structural Equation Modeling: A Multidisciplinary Journal, 1-18.
- Moscati, A., Verhulst, B., McKee, K. L., Silberg, J., & Eaves, L. (2018). Cross-Lagged Analysis of Interplay Between Differential Traits in Sibling Pairs: Validation and Application to Parenting Behavior and ADHD Symptomatology. Behavior genetics, 48(1), 22-33.