DR. KEVIN L. MCKEE

OVERVIEW

AI research scientist developing autonomous agents with algorithmic reasoning, long-horizon memory, and self-guided exploration, grounded in cognitive neuroscience and probabilistic modeling.

EXPERIENCE

Astera Institute, Obelisk AGI Lab

SENIOR RESEARCH SCIENTIST

2024 - Present

- Spearheaded AI agent prototype integrating long-term memory, exploration, and algorithmic reasoning
- Recruited and led team of 4 engineers and 4 researchers
- Trained team in reinforcement learning, scientific methods, and theory
- Published 4 research manuscripts on long-context memory, exploration, and thinking

Reinforcement Learning | Long-term Memory | Agentic Exploration

MACHINE LEARNING ENGINEER

2022 - 2024

- Prototyped and benchmarked novel spiking architectures against SOTA algorithms
- Replicated results in SOTA RL agents including Mu-Zero and Dreamer V2
- Published 2 independent research manuscripts at intersection of neuroscience and ML

Reinforcement Learning | Spiking Neural Networks | Predictive Learning

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

POSTDOCTORAL RESEARCHER

2021 - 2022

- Published novel research on Bayesian inference and uncertainty in spiking neural networks
- Presented workshops on Bayesian state-space models of cognitive and psychiatric data

Spiking Neural Networks | Bayesian Brain | Hidden Markov Models

Virginia Tech, Department of Statistics

POSTDOCTORAL STATISTICIAN

2020 - 2021

- Translated research questions into mathematical models for neuroscience, psychiatry, behavioral economics, and biomedical engineering, resulting in 7 published peer-reviewed manuscripts, 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

GRADUATE RESEARCH ASSISTANT

2015 - 2020

- Dissertation "Phenotype Extraction" demonstrated Bayesian multi-level state-space modeling of genetic covariance structures
- Published peer-reviewed manuscripts in statistical genetics, and psychometric methodology, and behavior genetics theory

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

CONTACT

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Google Scholar

EDUCATION

Ph.D., Statistical Genetics
Virginia Commonwealth University
2020

B.S., Psychology
Virginia Commonwealth University
2012

INTERESTS

Reinforcement Learning (RL)
Episodic Memory
Generative Modeling
Uncertainty Quantification
Bayesian Brain
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#, C++, Java

Frameworks:
JAX, PyTorch, Stan, Unity, Ray

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

PREPRINTS

- Zheng, Y., McKee, K. L., Miconi, T., Bugaud, Z., van Gelderen, M., & McCaleb, J. (2025). Goal-Directed Search Outperforms Goal-Agnostic Memory Compression in Long-Context Memory Tasks. arXiv preprint arXiv:2511.21726.
- 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., Alt, E. Grebenisan, A., van Gelderen M., Miguel, G. (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.