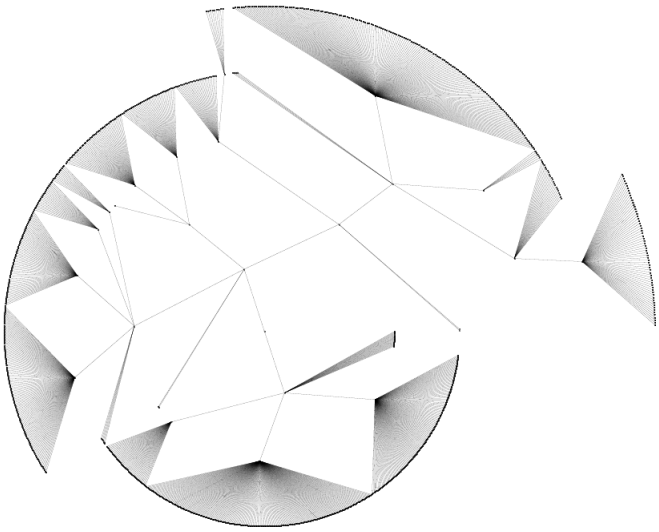

Nigel Stepp

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Education

Ph.D., Experimental Psychology, Jan 2012
Perception, Action, & Cognition
University of Connecticut
Storrs, CT

B.S., Materials Science & Engineering, May 2001
Carnegie Mellon University
Pittsburgh, PA

Professional Societies International Society for Ecological Psychology

Research Interests Emergent/novel Computation, Perception & Action, Self-Organization & Criticality, Spiking Neural Networks, Applied Functional Programming

Professional Experience

08/2010–present	Research Scientist, HRL Laboratories, LLC
06/2003–06/2005	Software Developer, IMAKE Financial Consulting, Inc.
05/2001–05/2002	Software Developer, United States Steel

Technical Skills

Programming Languages AWK & friends, **C/C++**, C#, Fortran, **Haskell**, Java, **Matlab**, **Python**, **Prolog**, Rust, UNIX Shells, x86 Assembly

Hardware and Software Platforms Human movement and eye tracking, Simulink, Neuromorphic hardware & simulation, PyTorch, Autonomous driving

DevOps Git{,Hub,Lab}, Agile management, Docker/Docker-Compose

Methods Dynamical systems, Neural Networks, Graph Theory, Quaternions, Autonomy

If we need it, I will learn it Too many to list have been developed for specific projects

Agency Projects

Other projects performed on include directed research for Boeing and GM, and internal HRL research that cannot be disclosed publicly.
Broad themes include: ***Autonomous driving, IMU data and quaternion manipulation, neural network models, Saliency and attention, Novel computing architectures, Computer vision, Satellite topologies, Quantum device data, and general software engineering****.*

DARPA-L2M Consulting role: homology-based task detection and labeling in an online machine learning setting; context detection using self-organizing spiking neural networks.

DARPA-ASED Multi-network clustering techniques for threat-actor identification; Visualizations and UIs for demonstration; DevOp support.

IARPA-HFC Election model integration into a hybrid human-machine forecasting system; frontend and UI support; DevOps support.

DHS-MobileTech Hardware-based spiking neural network topologies for mobile user identification through IMU signals; UI for hardware demonstration.

DARPA-UPSIDE High-level software simulation of custom convolution circuits; system-level programming for hardware interface, UI for hardware demonstration

DARPA-SyNAPSE System-level programming for interfacing with custom neuromorphic hardware; development of functional spiking neural network topologies and UI for hardware demonstration; maintenance and enhancement of a large-scale neuromorphic hardware simulator, including routing and placement.

DARPA-PhysicalIntelligence Partial differential equation simulation of thermodynamic systems; reservoir computing; self-tuning critical spiking neural networks.

Publications

Washburn, A., Kallen, R. W., Lamb, M., Stepp, N., Shockley, K., & Richardson, M. J. (2019). Feedback delays can enhance anticipatory synchronization in human-machine interaction. *PloS one, 14(8)*, e0221275.

Stepp, N. & Jammalamadaka, A. (2018). A Dynamical Systems Approach to Neuromorphic Computation of Conditional Probabilities. In Proceedings of the International Conference on Neuromorphic Systems (ICONS '18). Association for Computing Machinery, New York, NY, USA, Article 7, 1–4.

Stepp, N., & Turvey, M. T. (2017). Anticipation in manual tracking with multiple delays. *Journal of Experimental Psychology: Human Perception and Performance, 43(5)*, 914.

Salas, S. M., Patrick, R. J., Roach, S. M., Stepp, N. D., Cruz-Albrecht, J., Phillips, M. E., De Sapio, V., Lu, T., & Sritapan, V. (2017, April). Neuromorphic and Early Warning behavior-based authentication in common theft scenarios. In 2017 IEEE International Symposium on Technologies for Homeland Security (HST) (pp. 1-6). IEEE.

Voss, H. U., & Stepp, N. (2016). A negative group delay model for feedback-delayed manual tracking performance. *Journal of computational neuroscience, 41(3)*, 295-304.

Srinivasa, N., Stepp, N. D., & Cruz-Albrecht, J. (2015). Criticality as a set-point for adaptive behavior in neuromorphic hardware. *Frontiers in neuroscience, 9*, 449.

Stepp, N., & Turvey, M. T. (2015). The muddle of anticipation. *Ecological Psychology, 27(2)*, 103-126.

Stepp, N., Plenz, D., & Srinivasa, N. (2015). Synaptic plasticity enables adaptive self-tuning critical networks. *PLoS computational biology, 11(1)*, e1004043.

Stepp, N. & Srinivasa, N. (2012). A formal model for autocatakinetic systems. *Ecological Psychology, 24*, 204–219.

Moreno, M., Stepp, N. & Turvey, M. T. (2011). Whole body lexical decision. *Neuroscience Letters, 490*, 126–129.

Stepp, N., Chemero, A. & Turvey, M. T. (2011). Philosophy for the Rest of Cognitive Science. *Topics in Cognitive Science, 3*, 425–437.

Stepp, N. & Turvey, M. T. (2010). On Strong Anticipation. *Cognitive Systems Research, 11*, 148–164.

Stepp, N. (2009). Anticipation in feedback-delayed manual tracking of a chaotic oscillator. *Experimental Brain Research, 198*, 521–525.

Stepp, N. & Frank, T. D. (2009). A data-analysis method for decomposing synchronization variability of anticipatory systems into stochastic and deterministic components. *European Physical Journal B: Condensed Matter Physics, 67*, 251–257.

Stephen, D. G., Stepp, N., Dixon, J. A. & Turvey, M. T. (2008). Strong anticipation: Sensitivity to long-range correlations in synchronization behavior. *Physica A, 387*, 5271–5278.

Stepp, N. & Turvey, M. T. (2008). Anticipating synchronization as an alternative to the internal model. *Behavioral and Brain Sciences*, 31, 216–217.

Patents & Patent Applications

Stepp, Nigel, Tsai-Ching Lu, and Franz David Betz. "Detection of anomalous states in multivariate data." **U.S. Patent No. 11,928,971**. 12 Mar. 2024.

Huber, David J., et al. "System and method for human-machine hybrid prediction of events." **U.S. Patent No. 11,625,562**. 11 Apr. 2023.

Stepp, Nigel D., Alexander N. Waagen, and Tsai-Ching Lu. "Remaining useful life predictions using digital-twin simulation model." U.S. Patent Application No. 17/684,868.

Stepp, Nigel D., David J. Huber, and Tsai-Ching Lu. "System of structured argumentation for asynchronous collaboration and machine-based arbitration." **U.S. Patent No. 11,238,470**. 1 Feb. 2022.

Stepp, Nigel D., and Aruna Jammalamadaka. "Network composition module for a bayesian neuromorphic compiler." **U.S. Patent No. 11,521,053**. 6 Dec. 2022.

Stepp, Nigel D., and Aruna Jammalamadaka. "Programming model for a bayesian neuromorphic compiler." **U.S. Patent No. 11,288,572**. 29 Mar. 2022.

Chang, Hao-Yuan, Aruna Jammalamadaka, and Nigel D. Stepp. "Spiking neural network for probabilistic computation." **U.S. Patent No. 11,449,735**. 20 Sep. 2022.

Stepp, N., Soleyman, S., Khosla, D. "Trajectory classification and response." **U.S. Patent No. 11,455,893**. 2022.

Stepp, Nigel, et al. "Testing system and method for detecting anomalous events in complex electro-mechanical test subjects." U.S. Patent Application No. 17/453,304.

Skorheim, Steven W., Nigel D. Stepp, and Ruggero Scorcioni. "Artificial neural networks having competitive reward modulated spike time dependent plasticity and methods of training the same." **U.S. Patent No. 11,347,221**. 31 May 2022.

Jiang, Qin, et al. "Method of real time vehicle recognition with neuromorphic computing network for autonomous driving." **U.S. Patent No. 11,199,839**. 14 Dec. 2021.

De Sapio, Vincent, et al. "System for continuous validation and threat protection of mobile applications." **U.S. Patent No. 10,986,113**. 20 Apr. 2021.

Jiang, Qin, et al. "System and method for synthetic aperture radar target recognition utilizing spiking neuromorphic networks." **U.S. Patent No. 10,976,429**. 13 Apr. 2021.

Patrick, Richard J., et al. "Neuromorphic system for authorized user detection." **U.S. Patent No. 10,902,115**. 26 Jan. 2021.

Martin, Charles E., et al. ”Method and system for detecting change of context in video streams.” **U.S. Patent No. 10,878,276**. 29 Dec. 2020.

Huber, David J., Nigel D. Stepp, and Tsai-Ching Lu. ”Aircraft maintenance message prediction.” **U.S. Patent No. 10,787,278**. 29 Sep. 2020.

Jammalamadaka, Aruna, and Nigel D. Stepp. ”Neuronal network topology for computing conditional probabilities.” **U.S. Patent No. 10,748,063**. 18 Aug. 2020.

Pilly, Praveen K., Nigel D. Stepp, and Narayan Srinivasa. ”Sparse inference modules for deep learning.” U.S. Patent Application No. 15/079,899.