zlaborde@iu.edu

Zachary Laborde

zacharylaborde.com

Highly motivated research scientist with expertise in neuronal development and learning, seeking to leverage knowledge of brain development and learning mechanisms to advance the field of machine learning and contribute to innovative solutions for complex problems.

Skills

Machine Learning | Information Theory | Quasistatic Approximation | Neural Networks | Simulated Annealing | Particle Swarm Optimization | Boids | Ant Colony Optimization | Hebbian Learning | Evolutionary Algorithms | Backpropagation | Gradient Descent | K-means++ | Theta Sparse Grouping | Hierarchical Agglomerative Clustering | Autoencoders | Gene Regulatory Networks | Stoichiometry | Bifurcation Diagrams | Bayesian Networks | Markov Chains | Hidden Markov Models | Graph Theory | Graph Embedding | Graph Clustering | Graph Neural Networks | Dynamical System Analysis | Simulated Robotics | Cellular Automata | Cellular Differentiation | fMRI Analysis | Connectomics | Izhikevich Spiking Models | Continuous-Time Recurrent Neural Networks | Leaky Integrate-and-Fire Models | Hodgkin-Huxley Models | FitzHugh-Nagumo Models | Kuramoto Models | Hopfield Networks | Convolutional Neural Networks | Boltzmann Machines | Recurrent Neural Networks | Long Short-Term Memory Networks | Transformers | Level Set Method | Topological Data Analysis | Computational Topology | Lifetime Learning | Bootstrapping | Agent Based Modeling | Game Theory | L-Systems

Software

PyTorch | TensorFlow | NetworkX | NumPy | SciPy | Hadoop | Spark | Matplotlib | Plotly | Git | Python | Mathematica | R | C++ | Java | JavaScript | MATLAB | Groovy | Ruby | Scikit-learn | Pandas | Jupyter | LaTeX | HTML | CSS | SQL | MongoDB | Docker | Kubernetes | Tellurium | nanoHub

Publications & Conferences

Laborde, Z., & Izquierdo, E. J. (2023). Spatial embedding of edges in a synaptic generative model of C. elegans. *ALIFE 2023: Ghost in the Machine: Proceedings of the 2023 Artificial Life Conference*, *ALIFE 2023: Ghost in the Machine: Proceedings of the 2023 Artificial Life Conference*(26). https://doi.org/10.1162/isal_a_00611

Severino, G. J., Laborde, Z., & Barwich, A.-S. (2023). The degeneracy of control architectures in cell lineages: Implications for tissue homeostasis. *ALIFE 2023: Ghost in the Machine: Proceedings of the 2023 Artificial Life Conference*, *ALIFE 2023: Ghost in the Machine: Proceedings of the 2023 Artificial Life Conference*(23). https://doi.org/10.1162/isal_a_00608

Laborde, Z., & Cohen, J. (2016). Nostalgia and the perception of time. *XULAnEXUS*, *14*(1). https : / / digitalcommons.xula.edu/xulanexus/vol14/iss1/1

Education

Indiana University Bloomington Aug. 2021 - Present
Neuroscience & Cognitive Science Ph.D.*

Xavier University of Louisiana Aug. 2013 - May 2017
Psychology Bachelor of Science
Computer Science (minor)

Research Experience

Indiana University Bloomington Aug 2021 - Present
Dr. Eduardo Izquierdo & Dr. Justin Wood

- Pioneered the evolution of optimal sensorimotor configurations in simulated agents utilizing Continuous Time Recurrent Neural Network (CTRNN) controllers achieving neural networks that were simultaneously smaller and more performant
- Modeled development of a C. elegans connectome leading to improved accuracy versus existing models and new perspectives on its structure
- Discovered a new biologically-realistic dynamic control system for cellular lineages with potential applications in synthetic biology and regenerative medicine
- Developed and launched an online application for the dynamical analysis of cellular differentiation in multi-compartment systems integrating multiple control mechanisms (see https://nanohub.org/resources/dynsysregen)
- Conceived and implemented a novel level set approximation algorithm for high-dimensional manifolds significantly reducing computational complexity and resource usage by 90%.

Xavier University of Louisiana Aug 2013 - May 2017
Dr. Jeremy Cohen

- Designed administered and published research on nostalgia and the perception of time
- Developed computational tools with one automating a 2-4 hour manual process
- Created shell scripts transform neuroimaging data with Advanced Normalization Tools

Dartmouth College June 2016 - Aug 2016
Dr. Todd F. Heatherton

- Compiled and analyzed gigabytes of 4-dimensional fMRI data for correlations between the ventromedial prefrontal cortex (vmPFC) the reward network and attention scores

Work Experience

IBM July 2017 - Aug 2021
Software Engineer

- Developed features to automate event analytics analysis and prediction for operation engineers using machine learning
- Developed two internationally-used mobile apps for both Android and iOS
- Automated entire team saving IBM approximately $1 000 000/year

* coursework complete