Gabriel Tucker

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**Professional Experience**

**Carnegie Mellon University – Functional Modeling Systems Group**

*Machine Learning Research Scientist | June 2023 – June 2024 | Pittsburgh, PA*

• Implemented supervised machine learning pipeline using neural networks for intrusion detection and nonbinary classification, achieving 93% threat identification accuracy and 81% classification accuracy on the NSL–KDD dataset.

• Developed modular supervised training system integrating ACT–R cognitive architecture, achieving 91% accuracy with only 10 training instances per threat type, reducing data dependency for classification tasks.

• Applied feature engineering via SelectKBest and Random Forest–based feature selection algorithms. Automated visualizations and performance benchmarking and presented model efficiency comparisons for publication-ready figures.

• **Publication:** “Comparison of Cognitively-Inspired Salience and Feature Importance Techniques,” *Proc. SPIE 13054.*

**University of Southern California – Social Affective Neuroscience of Decision–Making Lab**

*Applied ML Research Scientist | June 2022 – June 2023 | Los Angeles, CA*

• Built agent-level models of personality-driven behavior using reinforcement learning for unsupervised behavioral clustering, enabling high-fidelity behavioral forecasting and generative simulation without prior behavioral data.

• Designed a modular front-end interface for configuring neural network architectures, enabling dynamic layer setup, hyperparameter tuning, and faster model prototyping across reinforcement learning experiments.

• Integrated a Go-based neural network with a C# simulation via a custom interlanguage communication system, enabling real-time prediction of agent interactions and improving model interoperability across Go and C#.

• Implemented a spatially embedded, multi–agent Unity simulation in C#, allowing the neural network to learn temporal dynamics and spatial interactions in 3D environments.

• Authored *gostack*, a modular Go library with 55 parametric functions and 648 unit tests, reducing boilerplate by 87% through generic Card/Stack abstractions. Enabled expressive, pointer-safe, shape-aware, callback-driven logic for reusable ETL pipelines with matrix and deep-traversal support. **GitHub:** github.com/gabetucker2/gostack

• **Presented:** "A Neural Network Model for the Structure & Dynamics of Personality Across Simulated Environments"

– **Psychonomics 2022** (*Boston, MA*) – Designed and presented a research poster to 20 professors and researchers.

– **MathPsych 2023** (*Amsterdam, NH*) – Delivered an oral presentation to 40 professors and graduate students.

**City of Grove City, Ohio (via OSU Buckeye Leadership Fellows)**

*Technical Consulting Internship (Statistical Modeling) | January 2022 – May 2022 | Columbus, OH*

• Selected as 1 of 30 from 200+ for competitive data-driven program focused on applied technical consulting.

• Built and presented a regression-based economic impact model using Python and Pandas, incorporating feature engineering and data preprocessing to forecast tax abatement effects and consult city leadership on policy decisions.

**The Ohio State University – Model-Based Cognitive Neuroscience Lab**

*Research Assistant (Statistical Machine Learning) | August 2021 – May 2022 | Columbus, OH*

• Developed and visualized a linear ballistic accumulator (LBA) model using R, simulating decision-making dynamics and evaluating parameter sensitivity through statistical plots in RStudio.  
• Derived gradient-based update rules for the QAlcove reinforcement learning algorithm and analyzed algorithmic performance via cross-validation and statistical testing across multiple pathfinding tasks.

**Education**

**The Ohio State University** – *August 2020 – December 2024*

• B.A. Psychology (Computational Focus), major GPA: 3.8 | B.A. Philosophy (Analytical Focus), major GPA: 3.6

• Honors & Affiliations: President, Psi Chi (Psychology Honor Society); VP, Software Development Club; Volunteer, 988 Crisis Line; Laureate, Chimes Junior Honorary; Web Coordinator, Student Government; President, The NeuroLaw Group

**2024 Gold Medalist – Annual Nationwide Quantitative Finance Competition**

• Led 3–person team in developing multi–strategy trading simulation; placed 1st for best statistical analysis and Sharpe ratio–adjusted return out of 15 teams, simulating portfolio growth from $20K to $124K over 10 years.

• Built time series forecasting model using regression on lagged volatility indicators and financial sentiment features.

• Implemented Geometric Brownian Motion and Black–Scholes–based strategies for baseline comparison. Visualized feature importance using SelectKBest and Random Forest. **GitHub:** github.com/gabetucker2/QuantFinanceCompetition

**Skills:** *Python, SQL, R, C#, Go, TensorFlow, Apache Spark, Docker, Scikit-learn, NumPy, Pandas, Flask, Machine Learning*