Matthew R. Conrad

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Skills

Languages: Python, C++, JavaScript, SQL, Bash

Frameworks & Tools: PyTorch, TensorFlow, Flask, React, Docker, Fireblocks, Postgres, Pandas, NumPy, Scikit-learn, Power BI

Techniques: Reinforcement Learning, Ensemble Methods, Time Series Analysis, Explainability (SHAP/GAM), Q-Learning, Dyna-Q, Clustering, Statistical Modeling, Kernel Methods

Infrastructure: AWS Bedrock, Containerized Compute (Docker), Hybrid Networking (VoIP, L2/L3), Linux/Windows Server Management, Secure System Design

Security: Cyber Threat Analysis, Multi-Party Computation (MPC), Smart Contract Custody, Incident Response, Zero-Downtime Patching

Selected Publications

- Harmanpreet Kaur, **Matthew R. Conrad**, et al. 2024. "Interpretability Gone Bad: The Role of Bounded Rationality in How Practitioners Understand Machine Learning." Proc. ACM HCI, 2024 ⌞.

Experience

Principal Computer Systems Architect   *Los Angeles, CA*
Northrop Grumman   *Apr 2023 – Present*

- Designed and deployed scalable Layer 2/3 networking systems supporting real-time data processing and sub-millisecond failover.
- Built and automated inventory systems (MySQL, MS Access) tracking over $1M in infrastructure assets.
- Engineered and secured hybrid compute environments (Linux, Windows) to support containerized applications and data pipelines.
- Deployed and monitored VoIP infrastructure enabling secure communication between distributed systems.
- Led patching, compliance hardening, and zero-downtime update cycles across 500+ nodes in mission-critical networks.
- Collaborated cross-functionally to debug and optimize system throughput, aligning networking and software stack performance.

Machine Learning Researcher   *Ann Arbor, MI*
University of Michigan   *Oct 2021 – Present*

- Conducted deep learning research applying convolutional neural networks (CNNs) using Keras to study model trust, interpretability, and failure modes.
- Co-authored CSCW 2024 and CHI 2026 papers on cognitive biases and contrastive explanations in AI model evaluation.
- Developed and evaluated a quiz-based active learning framework to improve user understanding of AI limitations via contrastive example selection.
- Designed end-to-end pipelines for automated selection of model failure cases using statistical similarity (SIFT, clustering) and human-meaningful contrastive pairs.
- Applied SHAP, GAMs, and regression analysis to connect model predictions with behavioral outcomes in user studies (N=400+).
- Led experimental design, IRB approval, and full deployment of a cross-sectional study measuring AI literacy outcomes.

Information Technology Analyst   *Massillon, OH*
Seifert Technologies Inc.   *Feb 2021 – Jun 2021*

- Built Power BI dashboards (DAX) for analytics across logistics, billing, and production cycles.
- Supported ERP systems, Microsoft 365, and remote IT infrastructure in a client-facing support role.
- Automated backup verification and streamlined invoicing workflows via QuickBooks APIs.

Counterintelligence Agent, Team Chief, Cyber Network Operator   *Various Locations*
United States Marine Corps   *Aug 2012 – Jan 2021*

- Directed cyber threat assessments and incident response protocols for sensitive operations, including the F-35 program.
- Conducted HUMINT and SIGINT operations; contributed to secure information systems across Indo-Pacific deployments.
- Designed remote operational networks, integrating encryption and secure routing for joint-force communication.
- Led 40+ briefings on information security and network defense; trained 750+ personnel in threat awareness.
- Managed SIPRNet services for 1,500+ users, resolving infrastructure and access control issues in high-security zones.

Projects

Machine Learning-Driven Trading Simulator   *Python, Ensemble Learners,*
Pandas, NumPy

- Engineered a portfolio backtester and strategy learner to simulate equity trading with realistic constraints (impact, commission)
- Implemented Q-Learning and ensemble random tree learners to model adaptive trading policies

- Outperformed benchmark with cumulative return 70% vs. 0.01 and Sharpe ratio 1.61 vs. 0.25
- Conducted experiments across three market periods to evaluate strategy robustness and cost sensitivity
- Analyzed the relationship between market impact and trade frequency

Stock Price Movement Prediction *SVM, KRR, PCA*
- Built classification models using SVMs and KRR, achieving F1-score of 0.80 on out-of-sample data
- Applied unsupervised learning (K-Means) to cluster equities into 30+ distinct behavioral segments
- Conducted principal component analysis (PCA), variance inflation factor (VIF), and Augmented Dickey-Fuller (ADF) testing
- Skills: SVM, Kernel Methods, Time Series Analysis, Unsupervised Learning, Python

Market Simulator *Python, Pandas, NumPy*
- Built a realistic market simulator to model equity portfolio performance over time from executed trade orders
- Implemented logic for cash management, transaction costs, and market impact to evaluate strategy robustness
- Developed vectorized pipeline for computing portfolio value, daily returns, Sharpe ratio, and cumulative return
- Compared simulated strategy performance against SPY benchmark using financial metrics and visual diagnostics

Q-Learning/Dyna-Q Agent *Python, Reinforcement Learning, Q-Learning, Dyna-Q*
- Implemented a tabular Q-learning agent with support for Dyna-Q planning and ϵ-greedy action selection
- Designed reinforcement learning update rules using Bellman equations to estimate state–action values
- Enabled support for stochastic exploration via decay-controlled random action rate and synthetic experience replay
- Used as a learning component in a broader ML4T trading strategy system to improve long-term returns
- Skills: Q-Learning, Dyna-Q, Reinforcement Learning, Exploration vs Exploitation

Martingale Strategy Simulator *Python, NumPy, Matplotlib*
- Implemented Monte Carlo simulations of the Martingale betting strategy under various constraints (bankroll limits, timeouts)
- Analyzed risk, variance, and success rates across 1,000+ episodes using statistical metrics and graphical summaries
- Generated publication-ready plots to visualize convergence, volatility, and outcome distributions of betting strategies
- Designed custom bankroll logic to track bankruptcy, early exit, and timeouts with labeled outcome breakdown

Education

Georgia Institute of Technology *In Progress*
Master of Science in Computer Science (Machine Learning)

University of Michigan *Aug 2021 – May 2024*
Bachelor of Science in Computer Science

Certifications

- CompTIA Security+ (exp. 9/2028)
- CompTIA A+ (exp. 9/2028)

Other

- Security Clearance: TS/SCI with CI-scope polygraph
- Awards: Navy & Marine Corps Commendation Medal (2020), Navy & Marine Corps Achievement Medal (2016, 2018)