

Chuck de Sully

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AI/ML Research Engineer

Machine Learning · Deep Learning · Representation Learning · Reinforcement Learning · AI Systems

Summary

AI/ML researcher and Staff Software Engineer with extensive experience building and optimizing complex production systems and a Master's in Artificial Intelligence from Johns Hopkins University. Conducts independent research across deep learning, reinforcement learning, evolutionary optimization, representation learning, computer vision, and AI systems. Particularly interested in reverse-engineering how SOTA models work, developing novel approaches, and testing ideas through experimentation. Brings deep production engineering experience in architecture, debugging, optimization, and deployment to ML research and development.

Selected AI/ML Research

- **Quantitative Finance Research: Predictive Geometry of Markets** | 2026 | [*cdesully/ML_Research*](#)
Independent research exploring predictive structure in financial markets through custom PyTorch architectures, including JEPA, VAE-based modeling, and manifold learning.
- Investigated a decision-oriented architecture combining autoencoder-based latent compression, JEPA-style predictive regularization, and an attention-based action codebook.
- Explored latent representations for downstream asset-allocation decisions, emphasizing the relationship between predictive structure and actionable market states.
- **Model Behavior: Label-Free Drift Detection** | 2022 | [*cdesully/nn-drift-shadow-weights*](#)
Developed a reverse batch-norm method that monitors drift inside frozen neural networks using shadow standardization of hidden activations. It detected concept drift on noisy streams where output error showed no signal, and found that drift becomes more visible in deeper layers.
- **Reinforcement Learning: Adaptive State-Map Compression** | 2024 | [*cdesully/RL_RoboVac*](#)
Developed a Q-learning agent for robotic-vacuum search using multiple state-action maps activated by battery level. Observed that policy optimization could eliminate the need for the lowest-battery map, motivating an adaptive compression strategy that prunes unused maps and splits remaining maps to preserve state resolution as learning progresses.
- **Computer Vision: Real-Time Accessibility** | 2024
Developed a PyTorch CNN for facial-feature detection that translates eye blinks into Morse code in real time, exploring practical computer-vision inference under constrained interaction requirements.
- **Evolutionary Optimization: Genetic Algorithms & Differential Evolution** | 2015–2023
Conducted independent research into evolutionary optimization, including a genetic algorithm for interpretable discrete optimization, a hybrid genetic algorithm/neural-network approach to population optimization, and novel modifications to differential evolution using double target-vector adjustment and fuzzy mutation control.

Professional Experience

STAFF SOFTWARE ENGINEER | INSEEGO | REMOTE | JUNE 2022 – PRESENT

Lead advanced engineering initiatives across AI experimentation and complex production systems.

- Leading research and implementation of agentic AI systems for client ordering assistance and internal documentation search, including exploration of AI guardrails.
- Developed a custom MCP server connecting coding agents to internal application endpoints and error logs, enabling agents to validate changes against live system behavior.
- Researched the application of Spec Driven Development and agentic coding approaches for engineering workflows increasing productivity.
- Re-engineered post-ordering processes, achieving a 97% efficiency increase in operational workflows.
- Optimized critical SQL queries, producing an average 80% efficiency increase across core production systems.
- Resolve complex full-stack production issues through deep stack tracing, debugging, and system-level analysis.
- Managed production deployment processes and release coordination for reliable software delivery.
- Provide technical consultation for legacy modernization and system architecture.

SENIOR SOFTWARE ENGINEER | INSEEGO | REMOTE | JULY 2017 – JUNE 2022

Architected and led development of high-volume order procurement and integration systems.

- Led architecture and development of core order-procurement functionality for a scalable, high-volume platform.
- Implemented API integrations that increased automated order processing capacity by 100x.
- Developed customer-support auditing tools that reduced manual work by 83%.
- Designed error and order-flow systems providing actionable insight into complex cross-system failures.
- Prototyped a headless, white-label architecture and complex SOAP integrations for telecom systems.

SOFTWARE ENGINEER | FEENEY WIRELESS / INSEEGO | EUGENE, OR | JULY 2011 – JULY 2017

- Led engineering for cellular-device procurement and administration systems, including major application and backend re-architecture.
- Developed and open-sourced the Symmetry MVC framework for lightweight client-server data flow.
- Mentored engineers, conducted technical interviews, and helped establish on-site machine-learning training for the engineering team.

Technical Skills

- **Machine Learning:** PyTorch, TensorFlow, scikit-learn, deep neural networks, reinforcement learning, CNNs, transformers, LLMs, RAG, representation learning
- **AI Research:** JEPA, VAE, genetic algorithms, differential evolution, fuzzy logic, particle-swarm optimization, model evaluation, data drift
- **Engineering:** Python, NumPy, Pandas, SQL, Git, API design, system architecture, database optimization, production deployment, agentic tools

Education

Johns Hopkins University - Master of Science in Artificial Intelligence | 2024 | **GPA: 3.91**

Oregon State University - Bachelor of Science in Computer Science

How I Work:

I've been fascinated by machine learning since I was a teenager, and after years of exploring it independently, I finally had the opportunity to study it deeply through my Master's in Artificial Intelligence. What I enjoy most is understanding how a system actually works, not just getting an answer that happens to work today. I tend to take problems apart, explore several possible explanations, and follow the behavior down through the layers until I understand what is really happening. From there, I like building an architecture that fits the problem without making it more complicated than it needs to be. I especially enjoy finding the underlying ideas that make a system intuitive and understandable, then experimenting with them to see where they lead.