Frederick Dehmel

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Education

University of California, Berkeley *Aug 2023 – May 2027*

B.A. *Computer Science*, **B.A.** *Pure Mathematics*, **Technical GPA:** *3.936 / 4.0*

Relevant Coursework: Data Structures (A+), Efficient Algorithms, Computability and Complexity, Discrete Mathematics & Probability, Computer Security, Digital Design and Integrated Circuits, Linear Integrated Circuits, Signals & Systems, Multivariable Calculus, Linear Algebra & Differential Equations (A+), Honors Abstract Linear Algebra, Quantum Computing (A+)

Experience

Co-Instructor / Head TA — CS 161 (Computer Security) | *UC Berkeley EECS* *Jan 2025 – Present*

- Summer 2025 Lecturer: Designed and delivered 20+ lectures/demos on encryption, network security, and secure software design, attended by 150+ students; achieved 4.8/5.0 average course evaluation score.
- Head TA: Managed weekly sections and labs for 500+ students; led creation of 8 new assignments and 3 exams; coordinated grading turnaround from 7 to 3 days; provided 150+ hours of targeted office-hour support.

ML Research Mentor / Principal Investigator (PI) | *Algoverse AI Research* *Jan 2025 – Present*

- Built transformer/GNN-based pipelines in PyTorch/TensorFlow, scaling to 150M+ parameters; lead distributed training on Kubernetes (20-node GPU cluster) with Optuna tuning and MLflow tracking, cutting experiment turnaround by 35%.
- Mentored 10+ researchers, delivering 15+ seminars on LLMs/MLOps; standardized Dockerized workflows across 5 concurrent research tracks; coordinated collaborations with OpenAI, Microsoft Research, Princeton, and UCSD; guided 3 papers to NeurIPS/EMNLP/ACL submission stage.

LLM Lead Research Assistant | *UC Berkeley CNR* *Dec 2024 – Present*

- Applied audio signal processing, transformer architectures (CNNs, RNNs), and LLMs to 200+ hours of indigenous consultation recordings from La Guajira, Colombia, achieving 91% transcription accuracy.
- Leveraged NLP for multilingual translation (7 languages, BLEU +14%) and sentiment analysis on 50k+ utterances, surfacing conflict dynamics and informing 3 policy recommendation reports.

Projects

Real-Time Threat Detection & Response Platform Zeek | Kafka | LightGBM | Kubernetes | React

- Built streaming pipeline for network (Zeek, Suricata) and endpoint (osquery) telemetry in a unified envelope; enriched with GeoIP/WHOIS/JA3, applied Sigma/Suricata rules, anomaly baselines (EWMA, quantiles, Drain3), and LightGBM classifier; clustered alerts into MITRE ATT&CK–mapped incident graphs, achieving p95 latency < 300 ms at 200–1000 EPS.
- Developed policy blender with pattern-of-life guardrails for safe auto-containment; integrated SOAR actions, Postgres audit store, and React/Grafana analyst console; deployed to Kubernetes with Prometheus/OpenTelemetry monitoring and replay-based precision/recall evaluation.

Base-native USDC Checkout Stack Solidity | ERC-4337 | EIP-712 | TypeScript | Postgres | Docker | CI/CD

- Built full-stack USDC payment system on Base with 6 smart contracts for fee-splitting, double-spend prevention, and merchant vaulting; integrated ERC-4337 Paymaster for gasless payments; deployed 4 monorepo apps and 13 validated REST API endpoints with HMAC-SHA256 security and 3 EIP-712 signature flows.
- Achieved 0.12–37 ms API response times, sub-3 s payment intent creation, and 0.001 fees (21k gas/tx) in testnet; production-ready deployment with Kubernetes, CI/CD, monitoring, and real USDC integration.

Earth Observation & Weather Alert Platform Python | GDAL | Rasterio | Kafka | Kubernetes | S3 | MapLibre

- Built distributed pipeline ingesting 1,200+ GOES ABI tiles/hr with < 90s median latency; implemented cloud masking and smoke detection (F1 $= 0.81$) validated against VIIRS data.
- Delivered real-time alerts with predictive autoscaling sustaining p99 lag < 2 min during 5× traffic spikes; MapLibre dashboard supported 10k+ daily tile renders with time-slider replays.

High-Frequency Statistical Arbitrage Strategy Development C++ | Python | LSTM | Monte Carlo

- Implemented low-latency C++ data pipeline and a Python alpha framework (PCA, Elastic Net, LSTM); achieved 1.8 Sharpe in out-of-sample backtests.
- Built GPU-accelerated Monte Carlo for exotic options (Heston/SABR) and a DQN execution policy reducing implementation shortfall by 12%.

Parallel Matrix-Multiply Accelerator (Systolic Array) Verilog | SystemVerilog | ASIC | FPGA | Parallel Computing

- Designed parameterizable N×N systolic array GEMM engine with pipelined MAC units, configurable fixed-/floating-point precision, and double-buffered BRAM tiling; integrated DMA for operand streaming and AXI4-lite host interface; verified with directed/randomized SystemVerilog testbenches against C reference model.
- Optimized throughput via fully pipelined dataflow and parallel load/store units; achieved speedup over CPU GEMM on FPGA; completed ASIC synthesis and timing closure using Synopsys/Cadence tools

Skills

Software: PyTorch, TensorFlow, FastAPI, Docker, Kubernetes, Pandas, React, Spark

Languages: Python, C/C++, Go, Java, JavaScript, TypeScript, SQL, R, MATLAB, Assembly, RISC-V, Scala, Rust, Shell/Bash