

# Dean Kelley

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## PROFESSIONAL SUMMARY

Master's-level computer scientist with expertise in machine learning, distributed systems, and cloud infrastructure. Experienced in building scalable applications, deploying ML models, and contributing to secure, privacy-focused research. Passionate about applying data-driven solutions across diverse domains.

## CORE COMPETENCIES

ML & DL | MLOps | Cloud & Distributed Systems | Data Engineering | Statistics | Software Development | Privacy-Preserving ML

## TECHNICAL SKILLS

**Programming:** Python, Java, MATLAB, Rust

**Machine Learning:** SciKit-Learn, XGBoost, PyTorch, TensorFlow, Computer Vision, NLP, Object Detection

**Data Engineering:** SQL, SQLite, Spark, Pandas, NumPy, Selenium

**Visualization:** Matplotlib, Seaborn, Tableau

**Software Engineering:** CI/CD Pipelines, Test Automation, Code Review, DevOps Practices

**Cloud & Tools:** AWS (EC2, S3), GCP, Docker, GitHub

**Statistics:** Hypothesis Testing, Regression Analysis (Linear & Logistic), Bayesian Inference

## EXPERIENCE

**PPML Researcher** | UW Privacy-Preserving ML Group, University of Washington, Tacoma May 2022 - March 2024

- Collaborated with a cross-functional research group on privacy-preserving techniques for anomaly detection and fraud detection systems
- Contributed to the development of a federated learning pipeline that achieved **AUPRC > 0.94** across multiple rounds of the PETs Prize Challenge
- Participated in system performance testing, feature engineering, and model evaluation in secure ML environments
- Co-authored a peer-reviewed paper published in *Proceedings on Privacy Enhancing Technologies*, 2024

## AWARDS AND CERTIFICATIONS

**Andrew & Julie Fry Innovation Award** School of Engineering and Technology, University of Washington March 2024  
*Recognized for demonstrating innovative solutions to business, social, and environmental problems.*

**Outstanding Graduate Research Award** School of Engineering and Technology, University of Washington March 2024  
*Awarded for excellence in graduate-level research contributions in computer science.*

## EDUCATION

University of Washington **Master of Science in Computer Science and Systems** | GPA : 3.84 March 2024  
*Relevant Courses: Machine Learning, Privacy-Preserving ML, Big Data Analytics, Applied Distributed Computing, Cryptology, Software Development & QA, Digital Signal Processing*

Washington State University **Bachelor of Science in Mechanical Engineering** | GPA : 3.79 May 2017  
*Relevant Courses: Engineering Statistics*

## PROJECTS

### — MACHINE LEARNING & AI —

**RSNA 2024 Lumbar Spine Degenerative Classification** | Kaggle Competition Project May 2024 - October 2024

- **Tools/Technologies:** PyTorch, OpenCV, Matplotlib, 3D CNNs (I3D)
- Developed deep learning models to classify lumbar spine degeneration severity from multi-sequence MRI scans
- Successfully predicted severity levels using sagittal T1 and T2 series by aligning slices and creating 3D volumetric inputs
- Struggled with axial T2 series due to alignment complexity and view-specific features, impacting model generalization
- Modified the Inflated 3D ConvNet (I3D) to accept multi-view MRI inputs; implemented preprocessing pipelines for image normalization and spatial registration
- Submitted final model with a log loss of 1.714, gaining hands-on experience with 3D medical imaging challenges, evaluation metrics, and Kaggle competition dynamics

**Cancer Hormone Receptor Status Inference** | UW Master's Capstone (GPA:4.0) April 2023 - March 2024

- **Tools/Technologies:** PyTorch, Computer Vision, Multiple Instance Learning
- Collaborated with oncology researchers and lab technicians at the National Cancer Institute of Brazil to reproduce and enhance clinical models for predicting breast cancer hormone receptor status
- Engineered scalable parallel-processing pipeline for tissue sample image preprocessing, supporting efficient resource utilization, achieving up to **50x speedup** on a 64-core AMD Threadripper CPU versus serial execution
- Developed and implemented machine learning models utilizing PyTorch-based Multiple Instance Learning (MIL) models leveraging ResNeXt50 architecture, attention mechanisms, and Automatic Mixed Precision (AMP), achieving strong performance metrics
- Achieved an **AUROC of 0.789 and 0.803** for cross-validation and test sets, respectively, in estrogen receptor status classification, demonstrating robust model performance and generalizability

**NFL Big Data Bowl 2025 | Kaggle ML Competition**

October 2024 – January 2025

- **Tools/Technologies:** PyTorch, LSTM Networks, Optuna, Time-Series Analysis
- Developed time-series forecasting model to predict play outcomes using NFL player tracking data (position, velocity, orientation)
- Implemented LSTM networks in PyTorch for sequential prediction of play outcomes using player tracking data
- Integrated game context by modeling player alignment, movement patterns, and situational features (yardline, down, quarter)
- Optimized architecture and hyperparameters using Optuna, evaluating model with AUROC and validation loss metrics

**Kaggle Titanic Machine Learning from Disaster | UW Big Data Analytics (GPA: 4.0)**

November 2022 - December 2022

- **Tools/Technologies:** Sci-Kit Learn, XGBoost
- Utilized feature engineering, data cleaning, and visualization techniques with pandas to effectively transform training and test datasets for modeling
- Built a Scikit-learn-based machine learning model to accurately infer whether a passenger would survive using an ensemble comprised of logistic regression, support vector machines, and XGBoost decision trees
- Achieved a best-in-class **79.7% accuracy**

**User Profiling in Social Media | UW Machine Learning (GPA:3.8)**

October 2022 - December 2022

- **Tools/Technologies:** Sci-Kit Learn, XGBoost
- Utilized Facebook user ‘likes’ data to accurately infer gender
- Implemented one-hot encoding to more effectively use ‘like IDs’ as the input data
- Built a Scikit-learn-based ensemble model comprising Naive Bayes, logistic regression, and XGBoost to maximize prediction accuracy
- Achieved **82% accuracy** for gender on unseen test data

**— CLOUD INFRASTRUCTURE & SYSTEMS ENGINEERING —****Homelab Infrastructure & Kubernetes Cluster | Personal Home Project**

June 2018 - Ongoing

- Designed and deployed a three-node K3s cluster on Dell OptiPlex 7050 Micro PCs with a Raspberry Pi 4 load balancer for containerized ML workloads and Spark for distributed database processing
- Utilized a Dell R720 server running Windows Server 2019 to provide network-wide data storage and host virtual machines
- Built and secured a home network with enterprise-grade Ubiquiti UniFi hardware for traffic management and remote access
- Deployed self-hosted applications (Plex, Prometheus, Grafana) for monitoring and observability
- Installed fiber optic connectivity to support a telescope observatory with remote monitoring

**Distributed Key-Value Store with AWS Deployment | UW Applied Distributed Computing (GPA:4.0)** February 2023 - March 2023

- **Tools/Technologies:** AWS (EC2, S3), Docker
- Designed and deployed a cloud-based distributed key-value store on AWS EC2 instances, ensuring high availability and fault tolerance
- Implemented a two-phase commit (2PC) protocol to ensure transactional consistency across multiple nodes in a distributed system
- Developed an automated AWS deployment pipeline using Docker and AWS CloudFormation, enabling seamless scaling of nodes
- Utilized AWS S3 for persistent data storage, ensuring durability and enabling efficient data access across distributed instances
- Optimized performance and fault tolerance by configuring AWS Auto Scaling Groups to dynamically adjust resource allocation based on workload
- Conducted performance benchmarking across 1-node, 3-node, and 5-node configurations, demonstrating improved response times and scalability

**— MLOPS & SOFTWARE ENGINEERING —****MLOps Project: Continuous Deployment of ML API with Docker & GitHub Actions | Personal Project** March 2025 - April 2025

- **Tools/Technologies:** FastAPI, Docker, Prometheus, Grafana, GitHub Actions, AWS EC2, Python
- Developed and deployed a FastAPI application serving ML model predictions.
- Containerized the application using Docker and managed services with Docker Compose.
- Automated CI/CD pipeline with GitHub Actions for seamless deployment to EC2.
- Integrated Prometheus for monitoring and Grafana for visualizing metrics.
- Configured EC2 for secure SSH access and managed private keys with GitHub Secrets.

**Automated Resume Populator | Personal Project**

January 2025 - March 2025

- **Tools/Technologies:** LLMs, SQL, GPT API
- Developed an AI-driven resume customization tool that scrapes job posting websites using Zyte and OpenAI GPT APIs to extract key job details and store them in a structured database.
- Designed and implemented an SQLite database to store and retrieve data, optimizing SQL queries for efficient data retrieval.
- Utilized Large Language Models (LLMs) to analyze job descriptions, extract employment responsibilities, and determine the most relevant skills and experiences for automatic resume population.
- Automatically create Word Doc resume utilizing collected data

**Tetris Videogame Development** | UW Software Development and QA (GPA:4.0)

March 2020 - May 2020

- **Tools/Technologies:** Java, Swing

- Developed a fully functional Tetris game from scratch using Java, implementing all core mechanics, including piece movement, rotation, collision detection, and line clearing
- Designed an intuitive UI with Java Swing and implemented smooth user controls for an engaging gameplay experience
- Integrated a scoring system and game-over detection for full feature parity with classic Tetris
- Applied object-oriented principles, event-driven programming, and game loop design to create a polished and efficient implementation

**— PRIVACY & SECURITY ENGINEERING —****PETs Prize Challenge Financial Crime** | University of Washington PPML

May 2022 - March 2023

- **Tools/Technologies:** Federated Learning, Differential Privacy, SWIFT

- Collaborated with team members and professors on privacy-preserving financial fraud detection system, contributing to 2nd place achievement in PETs Prize Challenge
- Conducted feature engineering and optimization to improve model accuracy and resource efficiency
- Contributed to system testing and data collection analysis, helping achieve **AUPRC > 0.94** across three rounds
- Participated in cross-functional collaboration between machine learning and cryptography specialists

**Advanced Cryptographic Analysis & Implementation** | UW Cryptology (GPA:4.0)

May 2023 - June 2023

- **Tools/Technologies:** RSA, DHKE, El Gamal

- Demonstrated textbook RSA's vulnerabilities to chosen-ciphertext and no-message attacks through formal cryptanalysis
- Implemented a hybrid cryptosystem in Python, combining symmetric and asymmetric encryption to achieve CCA security in the random oracle model
- Exposed MITM vulnerabilities in Diffie-Hellman Key Exchange (DHKE) and proposed mitigations using Schnorr signatures
- Proved ElGamal encryption's security under the Decisional Diffie-Hellman (DDH) assumption, validating resistance to passive attacks.

**— SIGNAL PROCESSING & MATHEMATICAL FOUNDATIONS —****Signal Analysis and System Modeling in MATLAB** | UW Digital Signal Processing (GPA: 3.5)

November 2019

- **Tools/Technologies:** MATLAB, DSP

- Analyzed continuous- and discrete-time signals using Fourier and Z-transform techniques to evaluate system behavior and response characteristics
- Verified theoretical properties such as duality, modulation, and convolution-multiplication relationships through MATLAB simulations and symbolic math
- Derived and implemented transfer functions, impulse responses, and frequency responses  $H(e^{j\Omega})$  for causal LTI systems, confirming system stability
- Solved high-order difference equations with given initial conditions and input signals; validated numerical results against analytical solutions
- Plotted frequency responses, including magnitude and phase, over  $0 \leq \Omega \leq \pi$  using MATLAB to visualize system dynamics

**PUBLICATIONS****Kelley, D. et al (2024). Privacy-Preserving Membership Queries for Federated Anomaly Detection** | Proceedings on Privacy Enhancing Technologies, 2024(3), 186–201 <https://doi.org/10.56553/poops-2024-0074>**Contributions:** Led resource analysis for scalable ML training, contributed to feature engineering.