

# Jayden G. McKenna

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## EDUCATION

### University of Texas at Austin

*Master of Science* in Computer Science

May 2027

GPA: 3.89/4.0

#### Relevant Coursework:

- *Applications*: Machine Learning
- *Mathematics & Theory*: Algorithms
- *Systems & Architecture*: Distributed Systems, Parallel Systems

### University of Florida

*Bachelor of Science* in Computer Science (*cum laude*)

December 2024

GPA: 3.75/4.0

#### Relevant Coursework:

- *Programming & Software Development*: Programming Fundamentals I & II, Data Structures & Algorithms, Software Engineering, Programming Language Concepts, Senior Design
- *Mathematics & Computational Foundations*: Analytical Calculus I-III, Differential Equations, Computational Linear Algebra, Engineering Statistics, Applications of Discrete Structures, Algorithms Abstraction & Design
- *Systems & Architecture*: Digital Logic and Computer Systems, Computer Organization, Operating Systems
- *Data & Security*: Information and Database Systems, Data Science, Computer Information Security
- *Additional Engineering*: Computer-Aided Design, Professional Communications for Engineers

### Study Abroad: Université Catholique de Lille

Summer 2022

## EXPERIENCE

### Student Engineering Intern II

June 2023 – August 2023

*Honeywell Federal MFG & Tech, LLC*, Albuquerque, New Mexico

- Developed internal testing software to store and retrieve circuit part numbers, implementing a custom hash-based lookup mechanism to ensure efficient and consistent access to test data.
- Applied structured data modeling and validation practices to analyze circuit performance metrics across test runs.
- Designed and validated integrated circuit schematics in Altium and delivered a final PCB, documenting design decisions and testing outcomes in a technical report.

### Undergraduate Research Assistant

January 2023 – May 2023

*Ebrahimi Lab, University of Florida*, Gainesville, Florida

- Designed and simulated common-source and common-gate RF amplifier topologies in Cadence, evaluating performance across multiple MOSFET configurations.
- Analyzed gain, bandwidth, and stability tradeoffs to identify effective transistor–circuit pairings under varying design constraints.
- Documented experimental results and design insights in a formal research report comparing transistor behaviors and amplifier performance.

### Engineering Project Intern

April 2021 – May 2021

*Verus Research*, Albuquerque, New Mexico

- Developed a standardized kit for support on field tests, including technical needs for projects and human and safety factors. Solved transportation and equipment organization problems. Updated field test checklists, equipment lists, and safety considerations / checklists.
- Worked with Mechanical and Electrical Engineers to get an understanding of field testing and to learn Computer Aided Design in Solidworks.

## PROJECTS

### Canvas-Lite

February 2026

*FastAPI, PostgreSQL, SQLAlchemy, Alembic, Docker, JWT*

- Designed and implemented a Canvas-like learning management backend with role-based authentication (students, instructors, TAs) using FastAPI and JWT, enforcing access control via dependency injection.
- Built a normalized PostgreSQL schema for users, courses, enrollments, and permissions, implementing migrations with Alembic and ensuring referential integrity, cascading deletes, and duplicate-safe enrollment workflows.
- Containerized the application with Docker Compose and validated API behavior through OpenAPI (Swagger) testing and seeded end-to-end scenarios.

### Distributed Raft-Based Key-Value Store

August 2025 – December 2025

*Python, Raft Protocol, gRPC*

- Implemented a multi-node distributed key-value store using Raft, including leader election, log replication, and fault-tolerant state machine application.
- Designed leader-aware request routing, inter-node gRPC communication, and majority-based commit logic.
- Ensured safety and liveness through term management, randomized election timeouts, and conflict-resolving AppendEntries handling.

### Parallel Barnes–Hut N-Body Simulation

December 2025

*C++, MPI*

- Parallelized an N-body simulation using MPI, distributing force computations across processes with block decomposition and coordinating global state via collective communication (MPI\_Allreduce).
- Designed a hybrid serial–parallel architecture, performing Barnes–Hut tree construction locally per rank while parallelizing per-body force evaluation and synchronizing body updates.
- Instrumented execution with MPI\_Wtime and conducted scaling experiments across varying process counts and input sizes to analyze speedup, communication overhead, and parallel efficiency.

### Kernel Regression with Cross-Validation

December 2025

*Python, NumPy, Machine Learning*

- Implemented Gaussian RBF kernel regression from scratch, including kernel matrix construction and closed-form regularized solutions.
- Applied the median heuristic for bandwidth selection and built a custom 5-fold cross-validation pipeline to jointly tune kernel bandwidth and regularization parameters.
- Analyzed the effect of bandwidth and regularization on model smoothness and compared performance against linear regression to evaluate nonlinear modeling behavior.

### Unsupervised Learning with K-Means and PCA

October 2025

*Python, Machine Learning, PCA*

- Implemented k-means clustering from scratch and applied it to high-dimensional MNIST image data.
- Used PCA for dimensionality reduction and visualization, analyzing clustering behavior in both reduced and original feature spaces.
- Evaluated clustering quality using optimal label–cluster matching, assessed sensitivity to random initialization, and achieved up to 86% clustering accuracy across multiple restarts.

### Distributed Two-Phase Commit Protocol Simulator

November 2025

*Rust, IPC*

- Implemented a complete Two-Phase Commit (2PC) protocol in Rust, modeling clients, a state-machine–driven coordinator, and multiple participants communicating via IPC message passing.
- Simulated realistic failure modes including probabilistic message loss, participant failures, and timeouts, validating atomic commit/abort semantics and protocol behavior under partial failures.
- Applied participant-side logging and recovery, enforced vote deduplication and stale message filtering, and verified global decision consistency with a log-based checker.

### Parallel Binary Search Tree Deduplication Engine

October 2025

*Go, Goroutines, Channels, BST*

- Implemented a parallel Go pipeline to construct, hash, and deduplicate large sets of binary search trees, with comparable sequential and parallel baselines for performance analysis.

- Designed and evaluated multiple concurrency strategies, including channel-based aggregation, mutex-protected shared maps, naïve goroutine-per-task, and bounded worker-pool models, analyzing synchronization overhead and scalability.
- Implemented inorder-traversal-based BST hashing and equivalence checking, and instrumented fine-grained timing to measure hashing, comparison, and end-to-end performance across coarse and fine datasets.

### CUDA-Accelerated K-Means Clustering

September 2025

*C++, CUDA, Thrust*

- Implemented and benchmarked multiple K-Means variants (sequential CPU, CUDA global memory, CUDA shared memory, and Thrust) to analyze performance trade-offs in parallel clustering.
- Designed custom CUDA kernels for label assignment, centroid recomputation, and convergence, achieving up to  $\sim 25\times$  end-to-end speedup over the CPU baseline on large datasets.
- Optimized memory access by caching centroids in shared memory and instrumented fine-grained timing to quantify compute vs. data-transfer overhead and explain scalability limits.

### Parallel Prefix Scan with Pthreads

September 2025

*C++, pthreads, synchronization primitives*

- Implemented a work-efficient parallel prefix scan using pthreads with a two-phase block decomposition strategy (local scans followed by global offset propagation).
- Designed and evaluated custom spin barriers and pthread barriers, analyzing synchronization overhead, contention, and scalability across 2–32 threads.
- Conducted empirical performance analysis across varying input sizes and operator costs, identifying scalability inflection points and explaining speedup behavior using Amdahl's Law and work efficiency.

### Subleaser – Project Manager

August 2024 – December 2024

*React, Firebase, Redux, Node.js, MongoDB*

- Organized the development of a full-stack web platform aimed at streamlining apartment subleasing, leading code review, meetings, and design sprints. Coordinated GitHub version control, implementing branching and merging strategies.
- Managed a team of developers, ensuring proper implementation of Firebase for real-time database and user authentication.
- Designed and led development of key features, including search filters for subleases, a real-time messaging system, and dynamic user profiles for renters and sublandlords.

### World Cup Outcome Predictor

July 2024

*Python, Machine Learning, Data Engineering, SQL*

- Developed a machine learning model to predict FIFA World Cup outcomes using a dataset of over 47,000 matches, employing techniques like Logistic Regression, Random Forest, and Gradient Boosting.
- Utilized MongoDB to manage and query the dataset, enabling flexible data storage and data preprocessing for model training.
- Achieved improved model accuracy with ensemble methods and evaluated performance using confusion matrices, F1-scores, and MSE.
- Visualized data insights and model results using histograms, heatmaps, ROC curves, and feature importance plots.

### CRUD: Connecticut Real Estate Unified Database

May 2024

*SQL, Oracle, Web Development*

- Developed a comprehensive database and web interface to analyze Connecticut real estate trends, integrating data on weather, crime, pollution, and traffic.
- Designed a complex schema and implemented advanced SQL queries for multi-dimensional trend analysis.
- Built an interactive web interface for dynamic data visualization.

### Memory Manager Design

March 2024

### C++, Memory Management, Systems Programming

- Implemented a memory manager in C++ to handle dynamic memory allocation, deallocation, and memory state tracking, integrating it into a console-based testing program.
- Designed a system to prevent memory leaks while optimizing usage, with the ability to log memory state changes.
- Developed advanced skills in memory management, system-level programming, and C++ development for performance-critical applications.

### Elementary CPU Design

April 2023

### Digital Logic Design, Verilog, FPGA

- Developed a basic CPU architecture, programming ROM contents using assembly language.
- Coordinated interactions between RAM and registers to ensure efficient data processing.
- Built and tested the CPU on a breadboard using programmable logic devices (PLDs) and switch circuits.
- Documented the design process and results in a comprehensive report with an accompanying video demonstration.

### Simplified PageRank Algorithm

April 2023

### C++

- Developed a simplified version of Google's PageRank algorithm using an adjacency list to efficiently manage sparse graph data.
- Implemented core graph operations and optimized the PageRank computation to run in  $O(n \times E^2)$  time, where n is the number of iterations and E is the number of edges.
- Gained experience in algorithmic optimization and graph data structures, emphasizing efficient memory usage and computational complexity.

## SKILLS

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### Programming Languages:

- *Mastery*: C/C++, Java, Python, Go
- *Working Proficiency*: SQL, C#, JavaScript, Rust
- *Fundamental*: Matlab, R

### Frameworks:

- *Frontend*: React, Angular, Vue.js
- *Backend*: FastAPI, Django, Flask, Node.js, Express.js, .NET
- *Data Science*: TensorFlow, PyTorch, Scikit-Learn, Regression Analysis, Hypothesis Testing, Correlation, ANOVA, Machine Learning (Supervised/Unsupervised Learning), Model Evaluation (Confusion Matrix, F1, ROC-AUC, MSE), Feature Engineering, clustering, kernel methods, dimensionality reduction (PCA/SVD), cross validation
- *Software*: Figma, Tableau, Microsoft Office, Google Suite

### Tools & Technologies:

- *Database Management*: PostgreSQL, MySQL, MongoDB, Firebase, Oracle
- *Platforms & Embedded Systems*: AWS (EC2, S3), Azure, Google Cloud Platform, Arduino
- *Data Analysis & Visualization*: Pandas, Matplotlib, Seaborn
- *APIs*: JWT, OpenAPI, RESTful APIs, GraphQL, Maps JavaScript API, Places API, gRPC
- *Parallel & Distributed Systems*: MPI, CUDA, pthreads, goroutines, channels
- *Concurrency & Synchronization*: mutexes, condition variables, barriers
- *3D Modeling*: SolidWorks
- *Version Control*: Git/Github
- *CI/CD*: Docker, Docker Compose, Jenkins

### Methodologies:

- *Software Development*: Agile, Scrum, MERN Stack, Wireframing, Storyboarding
- *Testing*: Junit, Pytest, Postman
- *Analysis*: profiling, benchmarking, scalability, analysis

### IT & Systems:

- *Operating Systems*: Windows, Linux (Ubuntu, Debian), MacOS
- *Systems Programming*: IPC, process management, memory management

- *System Administration:* User & Group Management, File Permissions, Active Directory, VPNs, Firewalls
- *Networking:* WebSockets (TCP/IP), DNS, DHCP, Routing
- *IT Support:* Hardware/Software Troubleshooting, Device Imaging, Remote Support, Customer Support

## AWARDS, HONORS, & CERTIFICATIONS

### Academic Honors:

- Graduated *cum laude* Fall 2024
- President's Honor Roll Spring 2022
- Dean's List Fall 2022
- Phi Eta Sigma National Honor Society Inducted 2021

### Scholarships:

- University of Florida Alumni Scholarship 2021 - 2024
- Hispanic Scholarship Fund (HSF) Scholar 2021
  - Awarded the *2021-22 HSF Scholarship Program*

### Professional Certifications:

- Google Certificates:
  - Advanced Data Analytics
    - Google Advanced Data Analytics Spring 2025
    - The Nuts and Bolts of Machine Learning Spring 2025
    - Regression Analysis: Simplify Complex Data Relationships Spring 2025
    - The Power of Statistics Spring 2025
    - Go Beyond the Numbers: Translate Data into Insights Spring 2025
    - Get Started with Python Spring 2025
    - Foundations of Data Science Spring 2025
  - IT Support
    - Google IT Support Summer 2025
    - IT Security: Defense against the digital dark arts Summer 2025
    - System Administration and IT Infrastructure Services Summer 2025
    - Operating Systems and You: Becoming a Power User Summer 2025
    - The Bits and Bytes of Computer Networking Spring 2025
    - Tech Support Fundamentals Spring 2025
  - UX Design
    - UX Design Process: Empathize, Define, and Ideate Fall 2023
    - Foundations of User Experience (UX) Design Fall 2023
- Certified SOLIDWORKS Associate in Mechanical Design Fall 2021

### University-Issued Digital Badges:

- Machine Learning Badge — University of Texas at Austin, College of Natural Sciences 2025
- Parallel Systems Badge — University of Texas at Austin, College of Natural Sciences 2025

## ORGANIZATIONS

### Florida Engineering Society

August 2021 – December 2024

#### Recruitment Committee Chair

- Led initiatives to increase active membership. Boosted membership by 30% through targeted networking events.
- Created activities to raise participation and retention among members.
- Involved with mentorship opportunities with industry professionals, providing members with insights into the engineering field.
- Attended informational sessions on professional development, focusing on skills like resume building, interviewing, and engineering ethics, to prepare members for industry success.

### Society of Software Developers

January 2022 – December 2024

#### Online Ambassador

- Engaged with industry guest speakers about how developers use computing fundamentals and data science in prototype development in real-world applications.
- Participated in educational workshops covering software engineering topics such as version control, test-driven development, and functional programming.

### Society of PC Building

January 2022 – November 2023

*Member*

- Attended technical workshops about computer hardware and software integration, PC components, and troubleshooting.
- Participated in charity PC builds to support underprivileged students by assembling and donating PCs, enhancing access to technology, and fostering community engagement.

**Phi Eta Sigma National Honor Society**

**August 2021 – December 2024**

*Member*

- Maintained a GPA of 3.5+ with a class rank above 20%.
- Participated in networking events to connect with other high-achieving students across disciplines.

**VOLUNTEERING**

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**Roadrunner Food Bank, Albuquerque, New Mexico**

*Volunteer Coordinator*

- Organized and led teammates in volunteer efforts during COVID-19 to assist at New Mexico's largest non-profit food distribution, which provides food to shelters, families, and underserved communities.

**Mountain View & West Side Community Centers, Albuquerque, NM**

*Volunteer Group Leader*

- Supported underprivileged children by organizing activities, donating supplies, and engaging with children during holiday and back-to-school events.

**Sandia Presbyterian Church, Albuquerque, NM**

*Camp Volunteer*

- Assisted with landscaping and leading children's activities at summer camps, creating an engaging and supportive environment.

**Hope Christian School, Albuquerque, NM**

*Middle School Basketball Coach & Youth Camp Volunteer*

- Served as a middle school boys basketball coach for a summer, designing practice drills, mentoring young athletes, and promoting sportsmanship and discipline.
- Led basketball and soccer camp activities for students in grades K-8, supporting early youth engagement in athletics and teamwork.