

ROCHAK GHIMIRE

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EDUCATION

Morgan State University

Baltimore, MD

B.S. Computer Science, GPA: **3.947/4.00**

Expected May 2028

- **Dean's List:** Fall 2024–Present | Clara Adams Honors College Scholar
- **Awards:** 1st Place, CEAMLS Human-AI Collaboration Challenge – ReadAloud (offline K-12 literacy assessment tool)
- **Relevant Coursework:** Data Structures, Algorithms Analysis, Artificial Intelligence, Database Management, Networking, Cyber Security

EXPERIENCE

CEAMLS Lab, Morgan State University

Baltimore, MD

Undergraduate ML Research Intern

May 2026 – Jul. 2026

- Engineered a multimodal concept-drift detection pipeline for early cardiovascular disease prediction, designing a three-branch architecture combining a **1D CNN** for time-domain localization, a **2D CNN** for time-frequency representations, and a **Transformer** for frequency-domain patterns across ECG and PPG signals (PyTorch), achieving **87.86%** drift-classification accuracy and **0.8446** energy-drift correlation.
- Designed and implemented a cross-modal Complementary Feature Domain (CFD) preprocessing pipeline (pyCFD 3.0, NumPy, Pandas), balancing class weights across complementary feature-domain pairs with scikit-learn, and processing **30,000+** physiological signals across PTB-XL (**21,000** records) and MIMIC (**10,000** segments) over **four** benchmarking experiments on **three** datasets.
- Validated the model externally on the held-out MIMIC waveform dataset, confirming generalization beyond the training distribution and outperforming ADWIN, Page-Hinkley, MMD, and Dropout Uncertainty baselines by up to **40 percentage points**.

PROJECTS

MyVoice: AI Self-Advocacy Coach | React, Node/Express, Claude API, ElevenLabs

Jul. 2026

- Architected a full-stack AI coaching platform for K-12 students with IEPs/504 plans, orchestrating **four** Claude model roles (Haiku classification, Sonnet multi-turn roleplay/generation) across a **4-stage** workflow on a stateless Express API and React/Vite frontend.
- Designed a tool-use-constrained classification layer mapping free-text input to **18** canonical accommodation categories, enforcing structured output at the API level for consistent categorization and reviewer-safe generated content.
- Hardened the API surface protecting billed keys with per-IP rate limiting, CORS allowlisting, and **40-turn** history truncation; built a zero-key MOCK fixture mode enabling full 4-stage evaluation with no network calls or cost.

Redis Clone: In-Memory Key-Value Server | Python, asyncio, RESP Protocol

Aug. 2026

- Built a Redis-compatible, in-memory key-value server from raw TCP sockets, hand-writing the RESP2 wire protocol and validating it against the real redis-py client library with zero client-side modifications required.
- Implemented the full core command set (GET, SET, DEL, EXISTS, INCR/DECR, APPEND, MSET/MGET, TYPE) and TTL/EXPIRE with passive and active expiration, proven safe under concurrent access via stress tests simulating **50+** simultaneous clients with zero lost updates.
- Shipped crash-durable append-only persistence and primary-replica replication (full dataset resync on connect, real-time write streaming, enforced read-only replicas), validated by killing the server mid-write and confirming full recovery across a **40+** test automated suite (pytest, real client-library integration, subprocess-spawned crash-recovery and replication tests).
- Benchmarked with **redis-benchmark**, achieving **101,010 req/sec** at sub-millisecond p50 latency on reads (GET) and **~23,000 req/sec** on durable writes (SET); traced the write-path bottleneck to the per-command **fsync()** call.

MoodLens: Wellness Tracking Application | React, Firebase, Groq API

Feb. 2026

- Architected a full-stack wellness-tracking application (React 19, Firebase Auth, Cloud Firestore) with real-time mood, sleep, stress, and energy logging, a **30-day** color-coded mood heatmap, and streak/goal tracking; scoped Firestore security rules so every read and write is enforced against the authenticated user's UID.
- Generated weekly and monthly AI wellness reports via Llama 3.1 (Groq API), analyzing mood, sleep, and stress-trigger patterns from stored check-in history; cached responses locally per user/type/day to eliminate redundant API calls and serve repeat views instantly.
- Optimized load performance with **8** lazy-loaded chunks and IndexedDB-backed Firestore offline persistence; wrapped each tab in an error boundary with skeleton loading states, and shipped a zero-signup guest demo mode with **30 days** of sample data.

TECHNICAL SKILLS

Languages: Python, Java, C, C++, JavaScript, SQL, Rust

Frameworks & Libraries: React, Node.js/Express, Firebase (Auth, Firestore), PyTorch, scikit-learn, NumPy, Pandas

Developer Tools: Git, GitHub Actions/CI/CD, Docker, System Design, Vite, REST APIs, Typser

AI/ML: Machine Learning, Deep Learning (CNNs, Transformers), Natural Language Processing (NLP), Multimodal Learning, Signal Processing, LLM Orchestration, Agentic Workflows