

# HRUDAI NIRMAL

AI/ML Engineer · Full-Stack Builder · Published Researcher

CS undergrad shipping real ML pipelines, full-stack products, and peer-reviewed research — PyTorch to React, CNNs to local LLMs.

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## EDUCATION

**RV Institute of Technology, Bengaluru**  
B.E. Computer Science Engineering

Sep 2023 – Sep 2027  
**CGPA: 8.2 / 10**

## PUBLICATION

### Outlier Detection in Amazon Product Data Using Text-Based Unsupervised Methods

P V Hrudai Nirmal, Shivam, Tejas N G, Malini M Patil

- Built an **unsupervised ensemble pipeline** (DBSCAN · K-Means · Isolation Forest · LOF) over **TF-IDF** text features to flag anomalous Amazon listings with no labelled data — ensemble design balances precision and recall across all four methods.

## PROJECTS

### Surface Defect Detection | Hybrid Routing Ensemble

2026

Python · PyTorch · TorchVision · Faster R-CNN (ResNet-50 FPN) · TorchMetrics · Pascal VOC

- Trained a **Faster R-CNN** generalist across all 10 defect classes, then fine-tuned **per-class specialist models**; a **confidence-based routing gate** activates specialists at inference time — lifting **mAP@50 from 0.8725 → 0.9147** (+4.8%) and overall mAP to 0.6445 vs 0.5859 baseline.
- Class-aware NMS** merges specialist predictions and suppresses duplicates; artifact-driven JSON configs and saved mAP reports keep all experiments **fully reproducible** and auditable.

### Cortana | Local-First Desktop AI Assistant

2025

Electron · React · Vite · Python · Ollama · Dify (Docker) · NDJSON · IPC

- Built a **tray-first desktop AI assistant** using Electron (main process), React/Vite (renderer), and a Python worker routing prompts to **local Ollama models** — offline-first with **crash auto-recovery**, state-repair on restart, and backoff-capped worker respawn.
- Integrated a **self-hosted Dify knowledge pipeline** (Docker) so the assistant can retrieve, add, update, and delete grounded KB entries via **chat slash-commands** (/kb add · search · update · delete) — no cloud dependency for core intelligence.

### Muses | Role-Based Guitar Learning & Commerce Platform

2025

React 18 · Vite · Express.js · MongoDB · WebSockets · JWT Auth · CSS Modules

- Designed a **multi-role product** (student / teacher / performer) with JWT-based role separation: teachers author versioned lessons (BPM · capo · ChordPro · tabs), set pricing, and view sales analytics; students browse, purchase, and access a guided lesson viewer with **chord diagrams, metronome, and bar-jump controls**.
- WebSocket live sessions** let a host control song index and scroll position for all joined participants via a 6-character code — lightweight rehearsal sync without RTC infrastructure.

## TECHNICAL SKILLS

**AI / ML:** PyTorch, TensorFlow, Scikit-learn, Faster R-CNN, CNNs, Generative AI, Deep Learning, TF-IDF, Unsupervised Learning, Ensemble Methods

**AI Systems:** Ollama (local LLMs), Dify (RAG / knowledge pipeline), Qiskit (BB84 QKD), Electron, IPC

**Web & Backend:** React, Next.js, Node.js, Express.js, Flask, WebSockets, REST APIs, JWT Auth, Vite, Tailwind CSS

**Databases & Infra:** MongoDB, PostgreSQL, Redis, Docker

**Languages:** Python, JavaScript, TypeScript, C, Java, C++

## CERTIFICATIONS

Machine Learning · Full-Stack Web Development · Unreal Engine 5