ANAND NAIR

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Education

BS in Computer Science and Physics, Minor in Mathematics
University of Nebraska-Lincoln

- Coursework: Computer Organization, Introduction to Robotics, Computer Systems Engineering, University Physics 1, 2 & 3, Introduction to Discrete Structures, Computer Science II, Calculus 1, 2 & 3, Unix Programming, Electrical & Electronic Circuits, Data Structures & Algorithms, Linear Algebra.

Experience

Undergraduate Research, Cosmic Ray Observatory Project (CROP) August 2024 – Present
Department of Physics and Astronomy, University of Nebraska-Lincoln

- **Research Focus:** Study of cosmic ray air showers and behavior of high-energy cosmic particles.
- **Key Contributions:** Installed and operated cosmic ray detectors across Nebraska as part of an NSF-funded statewide project; analyzed time-stamped data to detect cosmic ray coincidences.
- **Skills:** Data analysis, scientific communication, teamwork.

Undergraduate Research Assistant, Yao Labs Nov 2023 – May 2024
School of Computing, University of Nebraska Lincoln

- **Research Focus:** Collected and analyzed Reddit data related to diseases using API integration.
- **Key Contributions:** Retrieved, cleaned, and processed data to study health trends and public sentiment.
- **Skills:** API integration, data analysis, sentiment analysis, Python, Pandas, NLP.

Undergraduate Research, Fabrikant Labs Jan 2024 – July 2024
Department of Physics and Astronomy, University of Nebraska-Lincoln

- **Research Focus:** Implications of quantum tunneling on nanotechnology and quantum computing.
- **Key Contributions:** Simulated tunneling effects using Python and Qiskit to study electron behavior in nanoscale devices; developed numerical models for tunneling probabilities using Schrödinger's equation.
- **Skills:** Quantum simulation (Qiskit), numerical methods, problem-solving, scientific communication.

Publications

- A Modular Feedback Framework for Escaping Barren Plateaus in Variational Quantum Algorithms (TQC, 2025)

Projects

LitMiner

- **LitMiner: AI-Powered Research Literature Analysis** *(Research Collaboration with VITAM Research Center)*
- Engineered system performing expert-validated qualitative research coding at scale – autonomously processes 1,000+ papers with demonstrated accuracy against published analyses
- Transformed month-long qualitative analyses into 15-minute automated workflows, enabling rapid synthesis of massive research corpora
- Built reproducible analysis framework eliminating researcher variance in systematic literature reviews while maintaining methodological rigor
- Developed structured knowledge architecture capturing hierarchical relationships between raw data

and theoretical constructs, enabling novel cross-study insights

Galaxy Evolution Study Using JWST Data

- **Key Contributions:** Collected and analyzed redshift galaxy data from JWST to study the evolution of galaxies; extracted and processed astronomical data focusing on galaxy morphology, star formation rates, and spectral analysis.
- **Skills Developed:** Data analysis, Python (Astropy), astronomical data processing, astrophysics research.

Mini Drone-Based Surveillance System

- **Key Contributions:** Developed a conceptual framework for a mini drone system with sensor integration and autonomous navigation; designed system architecture for navigation, obstacle detection, and data collection.
- **Skills Developed:** System design, drone control, sensor integration, technical documentation.

Academic Claim Analyzer

- **Academic Claim Analyzer**
- Built system transforming academic evidence synthesis – processes 10,000+ papers simultaneously to surface precisely relevant peer-reviewed research from natural language queries in minutes
- Engineered semantic search architecture autonomously optimizing Scopus/OpenAlex/CORE queries until finding exact claim-evidence matches
- Developed intelligent ranking engine identifying papers that directly address user claims, surfacing top N most relevant papers for detailed review
- Created flexible extraction framework surfacing user-specified qualitative findings and quantitative data, accelerating evidence evaluation

LSTM-Jupyter Notebook

- **LSTM-Based Algorithm for Precision Irrigation Scheduling**
- Engineered an LSTM neural network to predict soil Volumetric Water Content (VWC) for automated irrigation scheduling
- Implemented expanding window cross-validation using TimeSeriesSplit to enhance model generalization across diverse temporal data
- Developed a comprehensive feature engineering pipeline, integrating meteorological, soil moisture, and crop stress indices
- Optimized the model for scalable training and inference using TensorFlow on UNL's SWAN HPC clusters
- Designed the model to integrate with IoT platforms using RESTful APIs for real-time data collection and irrigation control in agricultural settings

LLM Orchestrator

- **LLM Orchestrator**
- Engineered a unified, asynchronous Python interface for multiple LLM APIs (e.g., Gemini, Claude, OpenAI), reducing integration time and enabling seamless model switching for AI applications
- Implemented an intelligent rate-limiting system using asyncio, eliminating limit-related errors and optimizing request throughput for thousands of concurrent operations
- Developed a flexible structured output framework with PydanticAI, facilitating type-safe interactions with diverse LLM outputs

Log Gantry Repository

- **Log Gantry Scanner Control System**
- Designed and debugged a GUI in Python to control a log scanner, using PyQt5 for intuitive UI elements and pandas and NumPy for data processing
- Modeled and assembled CAD components of the scanner's prototype to validate the design via a full

system simulation before physical assembly

- Coordinated frequent communication with clients and stakeholders during all phases of design to ensure alignment with requirements

Coin Picking Robot

- **Coin Picking Robot**
- Designed and tested autonomous and remote controls for a coin-picking robot using nRF24L01 transceivers for communication, STM32 and EFM8 microcontrollers for autonomous movements, and a modified Xbox controller for remote operation

Honors and Awards

- Project Proposal on Galaxy Collisions.
- Gold Medal from former Indian Vice President M. Venkaiah Naidu for the project Bigilla — A robo-drone system.
- Winner, Science Quiz Competition conducted by Manorama magazine for high school students.
- Appreciation from NASA (2018).
- Adi Shankara Young Scientist Award (2019).
- State-Level Champion, BigQ Challenge (2019).
- Global Laureate Scholarship, Emerging Leaders Scholarship.

Technologies

Languages: C++, C, Java, Python, HTML, CSS, Qiskit

Frameworks/Tools: Microsoft SQL, pandas, NumPy, Astropy, GitHub, APIs, scientific hardware integration (scintillation counters, GPS systems)