

Nhoojah Maharjan

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Portfolio | GitHub | LinkedIn

RESEARCH INTERESTS

Machine learning, reinforcement learning, and world models. Interested in causal reasoning, sample-efficient exploration, and building deployable agentic systems that support reliable, real-world decision-making. Open to exploring new directions across ML and autonomous systems.

EDUCATION

University of Southern Mississippi

Aug 2024 – May 2028 (Expected)

B.S. Computer Science, Minor in Economics & Data Analysis | **GPA: 4.0**

Hattiesburg, MS

- Coursework: Data Structures & Algorithms, Discrete Mathematics, Probability & Mathematical Statistics, Secure Software Development, Computer Systems, Computer Networks, Database Concepts, Cyber Law & Ethics, Artificial Intelligence, Linear Algebra

PUBLICATIONS & PRESENTATIONS

- [1] A. Hossain, **N. Maharjan**, M. Hasan, R. Abdelfattah (Senior Member, IEEE), M. Ezz-Eldin, X. Wang (Member, IEEE), M. M. Fouda (Senior Member, IEEE), K. Abdelfattah, “From Classical Pipelines to Promptable Foundation Models: A Cross-Domain Study of Thin-Object Segmentation,” **IEEE Internet of Things Journal**, 2026.
- [2] **N. Maharjan**, B. Khadka, A. Kharal, “Exploring the Promise of Virtual Reality Exposure Therapy (VRET) While Navigating Security Risks in a Digital Age: Examining the Positive and Negative Effects of VR,” Poster, **89th MAS Annual Conference**, Biloxi Gulf Coast Convention Center, MS, 2024.

Under Review:

N. Maharjan, B. Khadka, R. Abdelfattah, “SEU: Siloed Exact Machine Unlearning for Fine-Tuned Models.”

RESEARCH EXPERIENCE

Research AI Engineer

Nov 2025 – Present

Institute for Advanced Analytics and Society (IAAS) | NOAA-funded

Hattiesburg, MS

- Contributing to **AQUAVIEW**, a production cloud-native platform giving researchers and downstream pipelines programmatic access to over a century of NOAA oceanographic and Earth-observation data.
- Building and maintaining the Python data library, REST API, and MCP surface — the interfaces that expose the catalog to human researchers and to LLM/agent clients.
- Supporting the multi-source data-ingestion and indexing pipeline (Dagster + STAC/SFEOS on Elasticsearch), unifying **40+ heterogeneous NOAA sources** into a single searchable catalog covering 125+ years of ocean data.
- Prototyped LLM-based tagging and classification for platform metadata, and helping build **agentic LLM workflows on GCP** for downstream data-product impact analysis by NOAA stakeholders.

Undergraduate Researcher

Apr 2025 – Present

Advised by Dr. Rabab Abdelfattah | *University of Southern Mississippi*

Hattiesburg, MS

- Co-authored the first comprehensive benchmark of deep-learning architectures for cross-domain thin-object segmentation — a 5-family taxonomy (CNNs, Transformers, GANs, classical, foundation models) evaluated across biomedical, infrastructure, and remote-sensing datasets (*IEEE Internet of Things Journal*, 2026).
- Stress-tested vision-language foundation models (SAM, DIS-SAM, CLIPSeg, GSVA) against supervised baselines under zero-shot and prompt-engineered conditions, quantifying up to a **13% absolute precision increase** on infrastructure benchmarks.
- First-authoring **SEU (Siloed Exact Machine Unlearning)** — built an architecture that lets fine-tuned models exactly forget specific training data by pairing a frozen foundation encoder with isolated adapter heads, so deletion is a targeted reset rather than a full retrain (~8,700× faster than exact retraining while matching a from-scratch model).

Undergraduate Researcher

June 2026 – Present

Advised by Dr. Alen Hajnal | *Perception, Action & Cognition Lab, USM*

Hattiesburg, MS

- Developing a model-based reinforcement learning (MBRL) framework for task-agnostic exploration that replaces standard pixel-prediction dynamics with an **action-rooted Causal Affordance World Model**.

- Designing compositional capability graphs over open-world environments (Minecraft, Crafter) where each edge encodes an agent-centric causal intervention; planning happens in latent imagination and drops into the real environment only when the model ensemble is uncertain about a specific affordance edge.
- Formalizing self-termination via graph completeness; framework inherently prunes the classic “Noisy TV” pathology since uncontrollable dynamics produce no stable causal links.

Undergraduate Researcher

Fall 2024

Advised by Dr. Partha Sengupta | *University of Southern Mississippi*

Hattiesburg, MS

- Investigated Virtual Reality Exposure Therapy (VRET) for PTSD, phobias, and anxiety, weighing clinical effect sizes against biometric-data privacy, dissociation risk, and the security gaps that come with immersive data collection in a digital age.
- Presented findings as a poster at the *89th Mississippi Academy of Sciences Annual Conference* (Biloxi Gulf Coast Convention Center).

INDUSTRY EXPERIENCE

Data Engineering Intern

May 2026 – Present

Gulf South Center for Community Engaged Health Research and Innovation

Hattiesburg, MS

- Building **ETL/ELT pipelines** that unify heterogeneous public-health datasets (CDC Social Vulnerability Index, MRI imaging, U.S. Census, CDC surveillance) into a common access layer for interdisciplinary research teams.
- Designing query-layer APIs and metadata cataloging so researchers can pull cross-source datasets without dealing with schema differences or curation overhead.
- Implementing versioned dataset snapshots so downstream analyses stay reproducible against precisely dated slices of federal data.

Optimization Modeling Intern

Jan 2026 – May 2026

Optimal Answers LLC

Gulfport, MS

- Architected prescriptive analytics models using **Dataform (Optimal Modeling Language)** on Azure to solve **Linear and Integer Programming** problems, modeling qualification criteria, solution constraints, and reduced-cost marginal-value outputs across procurement, portfolio, and supply-chain pipelines.
- Modeled large economic datasets from the **Gulf Coast Business Council** and Restoration Fund to optimize grant selection and resource allocation, defining multi-period constraint hierarchies and attribute logic to maximize goal achievement under strict bounds.

SELECTED PROJECTS

Enterprise Data Toolkit (EDT) | *Next.js, Go, ConnectRPC, GCP, Vertex AI, Terraform*

2025 – Present

- Orchestrated long-running AI coding agents in **Daytona sandboxes** via Vertex AI with real-time incremental output over WebSocket/SSE fallback and reconnect-safe session handling for durable workspace state.
- Owned Protobuf API contracts and shipped a **ConnectRPC Go microservice** abstracting the full sandbox lifecycle behind a typed RPC surface, with OpenTelemetry tracing and Terraform-managed GCP infrastructure.

Research.it | *Next.js, FastAPI, Gemini 2.5 Flash, Sigma.js, WebSockets*

Hackathon 2025

- Shipped a multi-stage **LLM pipeline** (extract → normalize → gap-detect → verbalize) that ingests research papers, extracts citations, and builds a **knowledge graph** of the surrounding research landscape, with a regex-first/LLM-fallback extractor that cut parse failures by **~85%**.
- Rendered the citation knowledge graph in real time via Sigma.js + ForceAtlas2 with sub-second layout on **500+ node graphs**; live progress streamed over FastAPI WebSockets + uvloop, cutting perceived latency by 60%.

Vinaya Journal | *Electron, React, Spring Boot, FastAPI, Ollama, SQLite*

2024 – Present

- Privacy-first, offline-capable desktop journaling app integrating a local LLM + RAG pipeline (Ollama), mood classification, and semantic search across user entries.
- Full-stack architecture spanning an Electron/React frontend, a Spring Boot REST backend with SQLite, and a FastAPI microservice for embeddings and vector search; **35+ active users, 150+ GitHub stars** across Windows and Linux.

AWARDS, HONORS & FUNDING

Technology for Health Award, College of Nursing and Health Professions, University of Southern Mississippi (Summer 2026) — competitive research grant funding technology work in community health.

Hatchery Checkpoint Award — \$500 seed funding awarded for the *Research.it* project pitch, University of Southern Mississippi.

President’s List — awarded every semester of enrollment, University of Southern Mississippi.

Academic Excellence Scholarship — Full Tuition, University of Southern Mississippi.

TECHNICAL SKILLS

Languages: Python, TypeScript, Go, Java, C/C++, SQL

ML & AI: PyTorch, HuggingFace Transformers, JAX, PEFT/LoRA/QLoRA fine-tuning, DeepSpeed/FSDP distributed training, model quantization (ONNX, GPTQ), LM-Eval-Harness, WeightWatcher, machine unlearning

LLMs & Agents: LangGraph, Model Context Protocol (MCP), RAG, vector databases (Pinecone, Weaviate), vLLM/TGI inference, prompt engineering, foundation-model APIs (Claude, GPT, Gemini)

Systems & Web: FastAPI, Spring Boot, Node.js/Express, Next.js, React, ConnectRPC/gRPC, GraphQL, Protobuf, WebSockets, Apache Kafka

Cloud & DevOps: GCP (Vertex AI, Cloud Run, GKE), AWS (ECS, Fargate, S3), Azure, Docker, Kubernetes, Terraform, GitHub Actions, OpenTelemetry (Grafana, Tempo, Loki)

Data: PostgreSQL, MongoDB, Elasticsearch, Redis, Firebase, Supabase, Apache Airflow, dbt