Pranav Pushkar Mishra

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TECHNICAL EXPERIENCE

UIC College of Applied Health Sciences: V-ARE Labs | *Graduate Assistant* Feb 2024 - Present

- Spearheaded the design and development of EQUITY, a virtual patient system in **Unreal Engine 5**, integrating UE5's MetaHuman plugin, **Nvidia Omniverse**, and automated GenAI animation generation using **REST APIs** and **Python** scripts, enabling medical learners to identify and mitigate racial biases, with successful deployment to research participants.
- Developed and implemented a virtual avatar for our lab website, enhancing presence and user interaction with real-time avatar features. Integrated **Azure's** Text-to-Speech model with OpenAI for natural language processing. Built **Python** / **Flask** backend and **JavaScript**/ **Django** / **CSS** frontend. while exploring digital twins in healthcare. Implemented **Langchain**-powered chatbot for dental hygiene education, exploring digital twins in healthcare research. Integrated with project IVORY for VARE Labs.

Bipolar Factory | *Software Developer Intern* March 2023 - May 2023

- Contributed to the development of Metawood, a pioneering gamified streaming platform and decentralized creator economy within a virtual world. Assisted in building the platform's website using **React** and **Node.js** to create a seamless user experience.
- Utilized **C++/MERN (MongoDB, Express, React, Node.js)** to implement in-game chat and user communication features, enhancing real-time interactions and user engagement. Developed the in-game theater for hosting and watching media files with users concurrently. Contributed to **Quality Assurance**.

PROJECTS

Big5-Agents: Integrating Teamwork Components into Multi-Agent Systems | - GitHub

- Developed multi-agent framework integrating Big Five teamwork model components inspired by MDAgents for AI agent collaboration.
- Implemented modular teamwork components with dynamic task handling, specialized agent roles, and adaptive agent recruitment.
- Enhanced multi-agent system performance through coordinated collaboration, improving decision-making accuracy from 80% to 88% while reducing computational overhead by 15%.

Automating Prompt Generation for Training-Free Object Segmentation in PaintSeg | - GitHub

- Developed an autoprompting system for PaintSeg using K-means clustering and Dense Prediction Transformer models to automate precise input mask generation & achieved a **72.48%** IOU on the DUTS dataset through a hybrid approach segmentation.

Stellarium: A Space Odyssey - VR Star System | - GitHub | Website

- Designed and developed a VR educational experience in Unity visualizing 107k+ stars and constellations. Data pre-processing with Python
- Implemented custom shaders and GPU Instancing to accurately represent stellar properties while optimizing runtime performance

MetaRAG: Enhancing Enterprise Document Retrieval with LLM-Driven Metadata Enrichment | - GitHub

- Architected production-grade RAG pipeline using LangChain and Pinecone with systematic LLM-driven metadata enrichment framework for enterprise documentation retrieval.
- Achieved 82.5% precision with recursive chunking and TF-IDF weighted embeddings, representing a 27% improvement over baselines.
- Reduced hallucination rates by 65% through hybrid search combining BM25 dense retrievers and custom prompt engineering, with comprehensive evaluation using cross-encoder reranking.

Reproduced InBedder Text embedding: Answer is All You Need | - GitHub

- Reproduced INBEDDER text embedding research (ACL 2024), validating embedding quality and instruction alignment.
- Evaluated 7 benchmark datasets for classification and topic clustering, optimizing hyperparameters for improved performance

EDUCATION

Master of Science, Computer Science *[Graduate Assistant]* August 2023 - Present
University of Illinois at Chicago, Illinois, USA GPA: 3.6/4.0

Bachelor of Science, Computer Science and Engineering August 2019 - June 2023
Dayananda Sagar College of Engineering, Bangalore, Karnataka, India CGPA: 9.1/10

TECHNICAL SKILLS

Languages: C#, Python, C++, JavaScript, R, Java, GLSL, React, Node.js, Ruby, Rust, Tailwind CSS
Version Control: Git, GitHub, PowerShell
Technologies and Tools: Unity, Unreal Engine 5, Blender, Azure Cloud Services, Neural Networks, OpenGL, Vulkan, AWS
Databases: PostgreSQL, MySQL, NoSQL, Pinecone, Amazon S3, CosmosDB, MongoDB, Redis, Cloudfare
Methodologies: Agile, Kanban, Jira
ML Libraries/Frameworks: TensorFlow, PyTorch, Keras, Scikit-learn, OpenCV, LangChain, PySpark, Pandas, NumPy
Development Libraries/Frameworks: .NET Framework, Flask, Node.js, REST APIs, React, Express.js, Django, FastAPI
Machine Learning & AI: Machine Learning, Deep Learning, Computer Vision, NLP, Transfer Learning, Generative Models, Transformers
Mathematics for ML: Linear Algebra, Probability, Statistics, Calculus, Optimization, Graph Theory, Information Theory, Differential Equations
Relevant Courses: Applied AI, Virtual Reality, Game Design & Development, Computer Vision, Advanced Machine Learning, NLP, Algorithms, Object-Oriented Programming, Data Structures, Blockchain Development, Operating Systems, Parallel & Distributed Computing

EXTRACURICULLAR & CAMPUS INVOLVEMENT

Winner of MIT XR Hackathon 2024 | *SnAlder Cut* , a Meta Quest-3 app, utilizing Meshy AI, Hugging face, Unity Engine, Niantic Lightship VPS & Meta Presence platform, demonstrating a tool for pre-production planning of stunts and sequences in film and media.

Presented MetaRAG research on LLM-powered metadata enrichment at INFORMS Analytics+ Conference to 700+ analytics professionals.

Secured first place at HINT 5.0(Hack in the North), April 2022, with an innovative NFT virtual museum concept.