

MUHAMMAD SAAD

AI Researcher

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SUMMARY

AI Engineer with 4+ years of experience building and deploying deep learning systems across vision, natural language processing (NLP), and interactive applications. Skilled in developing full-stack systems that integrate large language models into web-based 3D environments, enabling lifelike avatar interactions and domain-specific digital twins. Experienced in RAG pipeline implementation, real-time AI integration, and optimizing models for deployment across cloud and edge systems. Delivers impactful, research-driven solutions through scalable engineering and intelligent system design.

TECHNICAL SKILLS

- **Programming Languages:** Python, MATLAB, C++, Java, SQL, JavaScript, TypeScript, HTML/CSS
- **AI & Machine Learning:** PyTorch, TensorFlow, Keras, Scikit-learn, Hugging Face, OpenCV, Pandas, NumPy, Matplotlib, Vision Transformers, Diffusion Models, YOLOv5, CNNs, LSTMs, GRUs
- **LLMs & Agentic AI:** LLaMA, DeepSeek, GPT-4, Claude, Groq, Mistral, LangChain, LangGraph, LlamaIndex, Agentic Workflows, Multi-Agent Systems, Prompt Engineering, LoRA/PEFT Fine-Tuning
- **RAG & Vector Databases:** FAISS, Pinecone, ChromaDB, Qdrant, Semantic Chunking, Hybrid Retrieval, Embedding-Based Search
- **Backend & APIs:** FastAPI, Flask, Node.js, REST APIs, WebSockets, JSON-RPC 2.0, OAuth2
- **MLOps & DevOps:** Docker, Docker Compose, Git, GitHub Actions, CI/CD, Webhooks, Nginx, Caddy, Weights & Biases
- **Cloud & Databases:** AWS S3, AWS EC2, AWS SageMaker, DigitalOcean, PostgreSQL, MySQL, MariaDB, Redis, Supabase
- **Platforms & Web/3D:** Open edX, Tutor, Frappé LMS, Mozilla Hubs, React, Next.js, Three.js, A-Frame, Streamlit, Blender, WordPress, LaTeX

EDUCATION

Master of Applied Science in Electrical and Computer Engineering (Applied AI)

Sep 2025 – Expected 2027

University of Ottawa, Ottawa, Ontario, Canada

- **Research Topic:** “OmniTutor: A USD-Based Architecture for Embodied Conversational Agents in Simulated Learning Environments.”
- **Major Courses:** Machine Learning, Ethical Artificial Intelligence, Multimedia, Ubiquitous Sensing

Bachelor of Science, Software Engineering

Aug 2017 – Sep 2021

Islamia College Peshawar (ICP), Pakistan

- Undergraduate research student supervised by [Dr. Muhammad Sajjad](#) and [Dr. Jamil Ahmad](#).
- **Thesis:** “Visual explanation of deep learning-based breast cancer classification via gradient localization.”
- **Major Courses:** Object-Oriented Programming (OOP), Data Structure and Algorithms, Software Architecture, Artificial Intelligence

RESEARCH INTERESTS

- **Medical Image Analysis:** Developing AI methods for accurate diagnosis and clinically meaningful image analysis.
- **Human Action Recognition:** Detecting and classifying human activities for surveillance, sports, healthcare, and intelligent systems.
- **Immersive Human–Computer Interaction:** Designing AI-driven interaction techniques for AR/VR/XR and meta-verse environments.
- **Agentic Operating Systems:** Developing AI agents that can perceive, reason, plan, and autonomously interact with operating systems and applications.

EXPERIENCE

Co-op Intern

Dell Technologies

Ottawa, Canada

May 2026 – Sep 2026

Research topics: Agentic Operating Systems, AI PCs, Human-Agent Collaboration, Research Assistants.

- Conducting research on agentic operating systems for AI PCs, focusing on how intelligent agents can coordinate tasks, tools, and user workflows in next-generation personal computing environments.
- Developing a human-agentic research assistant capable of taking a user-defined topic, decomposing it into research tasks, gathering relevant information, and generating structured, high-quality reports.
- Exploring multi-agent reasoning, task planning, tool use, and human-in-the-loop refinement to improve the reliability, usefulness, and transparency of AI-assisted research workflows.

Software Engineer – AI

EPAM Systems (Client: HUMAIN)

Dubai, UAE

Aug. 2025 – Jun. 2026

- Deployed and customized an Open edX-based academy platform for HUMAIN Academy, including Tutor-based deployment, MySQL configuration, OAuth2 SSO integration, branded themes, enrollment workflows, and production-ready environment setup.
- Built autonomous AI agents for learning-roadmap generation, enabling users to define career or skill goals and receive structured, personalized learning paths with recommended topics, resources, and progression plans.
- Benchmarked and evaluated open-source voice cloning and text-to-speech models, focusing on inference performance, speech quality, model usability, and integration feasibility for AI-driven debate and conversational systems.
- Worked on an autonomous debate system where LLM agents generated arguments, simulated debates between multiple AI debaters, and evaluated debate quality using agent-based judging and scoring pipelines.
- Developed AI-camera research workflows for classroom intelligence, focusing on student emotion recognition, attention detection, and visual analytics to support adaptive learning and classroom engagement monitoring.

Graduate Research Assistant

Metaverse Center, Mohamed Bin Zayed University of Artificial Intelligence

Abu Dhabi, UAE

Jan 2023 – Sep 2025

Research topics: Digital twin, Metaverse, Violence Detection, LLMs for Interactive Avatars.

- Designed and launched **WudFlux**, a customized virtual learning platform built on Hubs, featuring full-body avatars, real-time lip-syncing, and sentiment-aware interaction for immersive web-based learning environments.
- Built **dTalk**, an AI-powered avatar system with expressive 3D animations and real-time lip-sync using Mixamo and Three.js, enabling LLM-driven, speech-based interaction ([GitHub](#)).
- Built expressive 3D avatar animations using Mixamo and enabled real-time lip-sync functionality through Three.js ([GitHub](#)).
- Created a React-based analytics dashboard for the Malaria No More (MnM) project, enabling live data visualization and streamlined decision-making.
- Developed a multimodal real-time violence detection system using LSTM, GRU, and Vision Transformer architectures on Jetson Nano at the Technology Innovation Institute (TII), improving inference performance for edge deployment.

Undergraduate Research Assistant

Digital Image Processing (DIP) Lab Islamia College Peshawar

Peshawar, Pakistan

Dec 2020 – 2022

Research topics: Medical Imaging, Activity recognition, Facial emotion recognition (FER).

- Contributed to NTNU's implementation of the facial emotional recognition module assigned by the ALAMEDA AI Toolkit to analyze facial expressions for pain assessment and emotional state monitoring in neurological healthcare.
- Attention-Based CNN-LSTM, CNN-GRU, and Video Vision Transformer (ViViT) Models for Complex Activity Recognition in Cricket.
- Teaching assistant for Python programming course.

PUBLICATIONS

- **M. Saad**, M. Ullah, H. Afridi, F. A. Cheikh, and M. Sajjad. [BreastUS: Vision Transformer for Breast Cancer Classification Using Breast Ultrasound Images](#), 2022 16th International Conference on Signal-Image Technology & Internet-Based Systems (SITIS), Dijon, France, 2022.
- **M. Saad**, M. Khan, M. Saeed, Abdulmotaleb El Saddik, and Wail Gueaieb. [Combating Counterfeit Products in Smart Cities with Digital Twin Technology](#), 2023 IEEE International Smart Cities Conference (ISC2), Bucharest, Romania, 2023.

- M. Saeed, A. Khan, M. Khan, **M. Saad**, Abdulmotaleb El Saddik, and Wail Gueaieb. [Gaming-Based Education System for Children on Road Safety in Metaverse Towards Smart Cities](#), 2023 IEEE International Smart Cities Conference (ISC2), Bucharest, Romania, 2023.
- M. Khan, **M. Saad**, Abbas Khan, Wail Gueaieb, Abdulmotaleb El Saddik, Giulia De Masi, and Fakhri Karray. [Action Knowledge Graph for Violence Detection Using Audiovisual Features](#), 2024 IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, NV, USA, 2024.
- A. Vayani et al. [All Languages Matter: Evaluating LLMs on Culturally Diverse 100 Languages](#), Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), pp. 19565–19575, 2025.
- M. Saeed, M. Khan, **M. Saad**, N. Rahim, Wail Gueaieb, and Abdulmotaleb El Saddik. [CP-Diffusion: Conditional Prompt-Based Diffusion Models for Video Generation](#), ACM Transactions on Multimedia Computing, Communications and Applications, 2026.

ACCEPTED PAPERS

- **M. Saad**, M. Saeed, F. Laamarti, and Abdulmotaleb El Saddik. [Multimodal Interaction through Embodied Agents: An Intelligent Assistant for Immersive Virtual Environments](#), accepted at the 1st ACM CHI 2026 Workshop on Shaping Future Human Connection: Social Augmentation through XR Technologies, Barcelona, Spain, 2026.
- Z. Wang, **M. Saad**, M. Saeed, and Abdulmotaleb El Saddik. [NewsTwin: An Embodied Multi-Agent Digital Twin for Personalized News Consumption](#), accepted in IEEE Consumer Electronics Magazine, 2026.

PROJECTS

COVID-19 Progression Visualization COVID-19 X-ray Classification Using CNNs

- Applied pre-trained CNN models and proposed a lightweight CNN for COVID-19 X-ray classification.
- Used Grad-CAM to visualize disease progression on X-rays, enhancing model interpretability over time.
- Analyzed CNN performance and identified critical regions in medical imaging for better diagnosis insights.

Machine Learning for Precision Agriculture

- Developed a machine learning pipeline for maize leaf disease classification using SVM, KNN, and Random Forest.
- Extracted key features from maize leaf images based on texture, color, and shape.
- Optimized and compared the performance of algorithms for precision, recall, and overall accuracy.

Sequential Models for Video Analysis

- Used CNNs to extract features from video frames and applied LSTM and GRU models for temporal analysis.
- Integrated temporal attention mechanisms with LSTM and GRU to enhance performance.
- Explored Vision Transformers (ViT) for activity detection in cricket videos, comparing their effectiveness with CNN-sequential model pipelines.

Violence Detection Using Stacked Ensemble Learning

- Proposed a stacked ensemble framework combining advanced architectures (CNN-LSTM, CNN-GRU, ViViT, X3D, and GNN) for real-time violence detection in video surveillance systems.
- Utilized temporal attention mechanisms and ViViT to improve interpretability and accurately detect violent actions in video sequences
- Developed a robust and scalable solution for surveillance, adaptable to different video qualities and environmental conditions

HONORS AND AWARDS

- Awarded the University of Ottawa Graduate Studies Scholarship for September 2025
- Award of appreciation for securing 1st position in Youth Talent Expo
- Awarded with a data science certificate by the government of Pakistan (NAVTTTC)

ACADEMIC SERVICES

- Attended a virtual Omniverse meeting on its academic and research applications.
- Mentor and project evaluator for new batch of DIP Lab, guiding and assessing final-year students' projects.

HOBBIES

- **Academic:** Engaging in reading and writing scholarly articles to stay updated with the latest advancements.

- **Physical Fitness and Sports:** Actively participating in cricket and maintaining physical fitness through regular gym workouts.

REFERENCES

- **Prof. Abdulmotaleb El Saddik**
University Research Chair and Professor in the School of Electrical Engineering and Computer Science at the University of Ottawa, Canada
Adjunct Professor in the Department of Human-Computer Interaction at Mohamed Bin Zayed University of Artificial Intelligence, Abu Dhabi, UAE
Email: elsaddik@uOttawa.ca
- **Dr. Ibrahim Abualhaol**
AI Technical Lead at Dell Technologies
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