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Reza Babaei, M.Sc.

Electrical & Computer Engineering — Applied AI Researcher

AI Engineer & Researcher specializing in **Generative AI, Deep Learning, and Computer Vision**, focused on delivering robust, high-impact AI solutions.

Impact Highlights

- Engineered a multimodal AI assistant for **Meta Quest**, integrating ChatGPT to provide real-time Q&A and visual analysis of the user's mixed-reality field of view.
- Designed a 3D interpretability framework for **Capsule Networks**, visualizing coupling and activation patterns to elucidate internal routing logic.
- **E**ngineered an entropy-regularized Capsule Network, achieving 93% DeepFake detection accuracy on the FaceForensics++ benchmark.
- Developed a **label-free** segmentation framework using **Classifier-Guided DDIM**, isolating pancreatic tumors via difference mapping without pixel-level annotations.
- Co-authored the technical strategy for an **NIH grant proposal**, conceptualizing a personalized AI framework that integrates multimodal data to support obesity and diabetes management.
- Received the **REACH-OUT Convergence Research Award**, in recognition of technical innovation and excellence in cross-disciplinary AI research.

Education

Dec 2024	**M.Sc., Electrical & Computer Engineering**, University of Oklahoma, Norman, OK *Thesis:* Entropy Integrated Dynamic Routing in Capsule Networks and Deepfake Detection Applications; *Supervisor:* Assoc. Prof. Samuel Cheng
Sep 2020	**B.Sc., Mechanical Engineering**, K.N. Toosi University of Technology (KNTU), Tehran, IR *Thesis:* Evaluating Glioma Survival Prediction Models Using Radiomics and Machine Learning; *Supervisor:* Assoc. Prof. Madjid Soltani

Professional Experience

Graduate Research Assistant (2023–current)	***University of Oklahoma, Norman, OK, United States*** • Engineered a multimodal LLM assistant within the Meta Quest Mixed Reality platform using Unity and OpenAI platform • Achieved 93% accuracy in deepfake detection on FaceForensics++ via Entropy Adjusted Dynamic Routing (EADR) in Capsule Networks • Architected an Attention-Gated 3D U-Net for vertebral segmentation in low-resolution FLT PET/CT scans • Pioneered label-free pancreatic cancer segmentation using advanced Diffusion Models (DDPM & DDIM) to eliminate the need for pixel-level annotations
Research Assistant (2019–2021)	***K.N. Toosi University of Technology (KNTU), Tehran, IR*** • Engineered end-to-end machine learning pipelines for Glioblastoma survival analysis and chemotherapy risk stratification • Published two peer-reviewed articles validating novel Glioma overall survival prediction methodologies
Medical AI Intern (Summer 2020)	***I.K Hospital Complex, Tehran, IR*** • Engineered a Variational Autoencoder (VAE) to extract latent representations of chemotherapy efficacy and patient risk profiles • Deployed an interactive AI-driven risk assessment tool to provide real-time clinical decision support
Engineering Intern (Summer 2019)	***Dynamics Lab, KNTU, Tehran, IR*** • Engineered a real-time oscillation monitoring system using C++ and Arduino microcontrollers for automated data acquisition

Technical Skills

Programming	**Python**, **C++**, **MATLAB**, SQL, Bash
Deep Learning Stack	**Frameworks:** PyTorch, TensorFlow, Keras **Ecosystem:** Hugging Face (Transformers), LangChain, WandB
Architectures & Methods	**Generative:** Diffusion Models (DDPM/DDIM), LLMs, RAG, PEFT/LoRA **Vision:** Capsule Networks, Vision Transformers (ViT), U-Net, YOLO
Medical Computing	**Dev Libraries:** SimpleITK, NiBabel, PyDICOM, ITK **Visualization:** 3D Slicer, ITK-SNAP
Infrastructure & Engineering	**Cloud/DevOps:** Docker, AWS, Google Cloud, Linux/Unix, Git **Simulation/XR:** Unity 3D, Meta Quest SDK, SOLIDWORKS, COMSOL

Selected Publications

2025	*EADR: Entropy Adjusted Dynamic Routing Capsule Networks*, **CISS 2025**
2025	*Generative AI and the Challenge of Deepfake Detection: A Systematic Analysis*, **J. Sensors & Actuators Networks**
2024	*Efficacy of Learning Techniques in Model Extraction Attacks on Image Classifiers*, **Applied Sciences**
2021	*Efficacy of Location-Based Features for Survival Prediction of Glioblastoma Patients*, **Frontiers in Oncology**

Leadership & Professional Service

2023–Present	**Scientific Peer Reviewer** *IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)* *Biomedical Signal Processing & Control (BSPC)*
2023–Present	**Professional Memberships** **Member:** IEEE (Institute of Electrical and Electronics Engineers) **Presenter:** The NAIRR Pilot (National AI Research Resource)
2024–2025	**Treasurer, OU-Tulsa SGA** Managed $10K+ annual budget; optimized allocation strategy to increase financial efficiency by 30%.
2023–2024	**Budget Subcommittee Member, OU-Tulsa SGA** Audited departmental funding requests; identified cost redundancies reducing expenses by 10%.
2017–2019	**Executive Committee, Academic Events, KNTU** Led logistics for National Conferences/Competitions, coordinating 500+ attendees.

References

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Assoc. Prof. Samuel Cheng
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