

Reza Babaei

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Personality: ESTJ-A (The Executive)

VISA Status: F-1 Student Visa (OPT eligible)



"Discipline is the bridge between goals and accomplishment."

– Jim Rohn

Profile

Graduate student with a solid foundation in Computer Engineering, specializing in deep learning and computer vision. Proven expertise in AI-driven medical anomaly detection and deepfake technology, aiming to advance research in **personalized LLM multimodal agents**. Strong publication record and interdisciplinary collaboration experience seeking to contribute to innovative AI solutions in real life scenarios.

Keywords: Deep Learning, Computer Vision, Generative AI, Multimodal AI

Education

- Dec 2024 **Master of Science in Electrical and Computer Engineering**, *University of Oklahoma*, Norman, OK, USA,
Thesis: Enforcing Capsule Networks with Information Theory Concepts: Entropy Integrated Dynamic Routing Mechanism
Supervisor: Assoc. Prof. Samuel Cheng
Key Coursework: Advanced Machine Learning, Computer Vision, Information Theory & Probabilistic programming, Computer security
- Sep 2020 **Bachelor of Science in Mechanical Engineering**, *K. N. Toosi University of Technology (KNTU)*, Tehran, IR,
Thesis: Evaluating the Survival Rate Prediction of Brain Cancer Glioma by Radiomics Features of Non-Enhancing Tumor Segment using Deep Learning **Supervisor:** Assoc. Prof. Madjid Soltani
Key Coursework: Artificial Intelligence, Thermodynamics, Fluid Mechanics, Machine Design, Control Systems

Experience

Research

- 2022 – Present **Graduate Research Assistant**, *Image and Information Processing Lab, University of Oklahoma*, Tulsa, OK
- **DeepFake Detection:** Developed an enhanced routing mechanism for Capsule Networks, **achieving 93% accuracy** on the FaceForensics++ dataset
 - **Medical Anomaly Detection:** Implemented Denoising Diffusion Models for pancreatic cancer segmentation using **label-free** CT scans
 - **Grant Writing:** Contributed to **NIH proposal** for a Multimodal LLM advisory system for diabetic patient care
 - **Publications:** published four peer-reviewed journal article and presented at 1 national conference
- 2018 – 2021 **Research Assistant**, *BioMechanics Lab, K. N. Toosi University of Technology*, Tehran, IR
- **Brain Cancer Prognosis:** Developed an ML model with enhanced classification accuracy for predicting 5-year Glioblastoma survival rates
 - **Clinical Collaboration:** Developed an ML chemotherapy risk assessment model using demographic and imaging patient data in collaboration with local hospitals
 - **Publications:** Co-authored two peer-reviewed papers on glioblastoma survival rate prediction

Internships

- Summer 2020 **Medical AI Intern**, *I.K Hospital Complex*, Tehran, IR
- **Risk Assessment:** Developed a Variational Autoencoder model to identify predictive features for assessing chemotherapy risk in brain cancer patients
 - **Feature Analysis:** Identified five key biomarkers through the analysis of patient profiles
 - **Clinical Impact:** Developed a risk assessment tool for hospital practice prior to chemotherapy administration
- Summer 2018 **Engineering Intern**, *Dynamics Lab, K. N. Toosi University of Technology*, Tehran, IR
- Project:** Implemented an Arduino-based oscillation counter, enhancing experimental accuracy and validation

Teaching

2017 – 2022

Mathematics Instructor, Dr. Moein High School, Karaj, IR

- **Tutoring:** Improved student test scores by average 25% through personalized plans
- **Classroom Teaching:** Taught advanced mathematics to 20-30 senior high school students per class

Selected Publications

- 1- **(2024) Pancreatic Tumor Segmentation as Anomaly Detection in CT Images**
R. Babaei, et al. arXiv:2406.02653
- 2- **(2024) Learning Techniques in Model Extraction Attacks on Image Classifiers**
D. Han, R. Babaei, et al. Appl. Sci., 14, 3785
- 3- **(2024) Evaluating Tumor Diameters for Survival Prediction in Glioblastoma**
R. Babaei, et al. J. Electron. & Inf. Syst., 6(1), 22–38
- 4- **(2021) Efficacy of Location-Based Features for Survival Prediction in Glioblastoma**
M. Soltani, A. Bonakdar, N. Shakourifar, R. Babaei, et al. Front. Oncol. 11:661123

Key Projects

- 2023 **Medical AI:** Engineered *label-free pancreatic cancer segmentation* system using **denoising diffusion models**, revolutionizing medical anomaly detection.
- 2023 **Cybersecurity:** Pioneered DeepFake detection algorithm leveraging *capsule networks*, achieving **93% accuracy** across diverse datasets.
- 2019 **Neuro-oncology:** Developed *radiomics-based deep learning model* for extracting critical biomarkers in brain cancer, advancing diagnostic capabilities.
- 2019 **Industrial Optimization:** Created heat exchanger recommendation model, **boosting efficiency by 25%** for large-scale industrial applications.

Technical and Computer Skills

Category	Skills and Proficiency
Programming	Python: Expert (7+ years) - Developed ML models for various applications MATLAB: Proficient (5 years) - Signal processing, probabilistic programming C++: Competent (2 years) - Mathematical modelling
ML & Data Science	PyTorch & TensorFlow: Deep learning frameworks (3+ years) - Developed ML classification and regression models OpenCV: Computer Vision projects - Developed object detection and tracking models NumPy, Pandas, Scikit-learn: Data analysis & ML pipelines
CAD Software	SOLIDWORKS: Certified Professional (5+ years) - Designed components for industrial machinery CATIA: 3 years experience - Developed aerodynamic models for the automotive industry COMSOL: Multiphysics simulations - Modeled heat transfer in shell-and-tube heat exchanger systems
Development Tools	LaTeX: Technical documentation - Authored 20+ research papers and reports Git: Version control - Managed 10+ repositories in collaborative projects
Productivity	AI productivity tools: Proficiency and expertise in Scispace , ResearchRabbit , and DocAnalyzer Project management tools: Experienced in using the Trello project management tool
OS Proficiency	Linux: Shell scripting - Automated data processing tasks, saving 10+ hours weekly

Certificates and Training

Udemy Online Courses (Total: 155h):

- 2019-2021
- Deep Learning A-Z™:** Hands-On Artificial Neural Networks (40h)
 - Advanced Computer Vision:** Cutting-Edge Deep Learning Techniques (35h)
 - Python for Computer Vision:** OpenCV and Deep Learning (30h)
 - Mathematics for Machine Learning:** Data Science Specialization (50h)

KNTU Professional Development Programs (Total: 344h):

- 2018
- MATLAB for Engineers and Scientists:** Advanced data analysis and algorithm development (46h)
 - SolidWorks Certified Associate:** 3D CAD design and simulation (72h)
 - CATIA V5 Fundamentals:** Advanced surface modeling and assembly design (72h)
 - COMSOL Multiphysics® Introduction:** Finite element analysis and multiphysics simulation (24h)
 - Automotive Electronics Systems:** Vehicle ECU programming and diagnostics (30h)
 - LG HVAC Systems Installation and Maintenance:** Commercial cooling systems expertise (40h)
 - Non-Destructive Testing (NDT) Level I Certification:** Quality control and material inspection (60h)

Leadership and Professional Memberships

- 2024– Present **Treasurer, OU-Tulsa Student Government Association:** Managed \$10,000+ budget, implemented a financial tracking system (30% efficiency boost), and led student engagement (15% increase).
- 2023–2024 **Budget Subcommittee Member, OU-Tulsa SGA:** Reviewed funding requests, developed long-term financial strategies, and reduced expenses by 10%.
- 2017–2019 **Member, IR Scientific Association of Mechanical Engineering:** Engaged in seminars, journal discussions, and organized networking events.
- 2018–2019 **Executive Committee Member, Academic Events:**
- **National E-Learning Conference (Feb 2019):** Managed logistics for 500+ attendees and speaker selection.
 - **National Impact Absorption Competition (Dec 2018):** Led 10 volunteers; secured \$5,000 sponsorships.
 - **National 3-Minute Thesis Contest (Feb 2018):** Developed judging criteria; mentored participants, improving quality by 25%.

Honors and Awards

- 2024 **Winner, Convergence Research Award**, REACH-OUT Poster Forum. *Research grant awarded.*
- 2024 **Finalist, 'Research in 5 Minutes' Competition**, College of Engineering, OU-Tulsa. *Top 5 out of 50 participants.*
- 2020 **Academic Excellence, Bachelor's Degree.** Graduated in *top 15% of class*, GPA **16.09/20**. Departmental honors recipient.
- 2016–2020 **Full Government Scholarship** for Undergraduate Studies. Merit-based, awarded to *less than 5% of applicants nationwide.*
- 2015 **National University Entrance Exam:** Ranked 779 among +200,000 participants. **99th percentile** in mathematics and physics.

References

Associate Prof. Samuel Cheng

-  University of Oklahoma
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 Faculty Profile

Associate Prof. Majid Soltani

-  University of Waterloo
 msoltani@uwaterloo.ca
 Faculty Profile