REZA TAVASOLI

Columbia, SC, USA ◇ tavasoli@email.sc.edu ◇ tavasolireza10@gmail.com
Website ◇ Scholar ◇ LinkedIn ◇ ORCID ◇ WoS

SUMMARY

I am a Ph.D. researcher in Computer Science at the University of South Carolina, working at the intersection of **AI** and **high-frequency wireless sensing (millimeter-wave)**. My research builds **end-to-end pipelines**, from hardware prototyping and continuous data acquisition to signal processing and deep learning, to enable **contactless sensing for healthcare monitoring, safety, and autonomous perception**. I also evaluate LLM behavior for computing education, multilingual NLP (Persian), and mental health to inform human-centered AI systems.

SUMMARY OF QUALIFICATIONS

Programming: Python, MATLAB, C/C++
Libraries & Frameworks: NumPy, PyTorch, Keras/TensorFlow, OpenCV
Machine Learning: CNNs, LSTMs, GANs (cGAN), Transformers (ViT), LLM evaluation, Multimodal ML
Sensing & Signal Processing: mmWave radar (FMCW), radar heatmaps/point clouds, motion compensation, sensor fusion (mmWave + camera/LiDAR)
NLP & Evaluation: ROUGE, BERTScore, multilingual evaluation, sentiment/emotion analysis
Soft Skills: Problem solving, research communication, collaboration

EDUCATION

Ph.D. in Computer Science, University of South Carolina (CSE), Columbia, SC, USA Aug 2021 – Present
Dissertation (in progress): *Deep Learning-Enhanced Millimeter-Wave Sensing for Quality Assessment, Autonomous Perception, and Healthcare Monitoring*
M.Sc. in Computer Science (concurrent with Ph.D.), University of South Carolina (CSE), Columbia, SC, USA Aug 2021 – Dec 16, 2024
B.Sc. in Computer Engineering, Amirkabir University of Technology, Tehran, Iran Aug 2016 – Apr 2021
B.Sc. Thesis: *Design of a Dentigerous Lesion Detection System from Radiographic Images Using Deep Learning*

EXPERIENCE

Graduate Research Assistant, University of South Carolina, Columbia, SC, USA Aug 2021 – Present
Advisors: Dr. Sanjib Sur; Dr. Srihari Nelakuditi
Dissertation: *Deep Learning-Enhanced Millimeter-Wave Sensing for Quality Assessment, Autonomous Perception, and Healthcare Monitoring*
Key Contributions:

- Built **end-to-end mmWave sensing pipelines** (data acquisition → signal processing → deep learning → evaluation) spanning healthcare monitoring, safety, and autonomous perception.
- Developed and hardened a **long-term, continuous data collection system** (custom 3D-printed mount; mmWave board + camera + mini-PC) deployed in **two Prisma Health hospitals** under IRB-approved studies (bed entry/exit fall-risk monitoring; sleep-apnea episode detection).
- Proposed mmWave systems for **fruit quality assessment**: achieved median SSC estimation error **1.4 °Bx** on real fruits (SugarWave / SSCense).
- Developed mmWave-based **3D bounding box prediction** for vehicles/pedestrians under adverse conditions; reported **mAP 0.64 @ IoU=0.5** and median IoU up to **0.75** (AutoSense / MiHazeFree3D).
- Co-developed a **contactless stroke-recovery monitoring** pipeline for gait speed and Fugl-Meyer action duration estimation with correlation $R = 0.99$ and gait-speed error mean/SD **0.03/0.02 m/s** for stroke survivors.

Graduate Instructional Assistant, University of South Carolina Jan 08, 2024 – May 15, 2024
Course: *CSCE 416 — Introduction to Computer Networks*

- Supported course delivery through office hours, grading, and student mentorship on core networking concepts (e.g., TCP/IP, routing, congestion control).

SELECTED RESEARCH PROJECTS

- **Clinical mmWave Sensing for Inpatient Monitoring (Fall Risk & Sleep Apnea)** *IRB-approved deployments*
  - Co-Investigator on Prisma Health IRB study *"Ability of Contactless Sensor to Accurately Identify Bed Entry and Exit for Patients at High Risk for Fall on Inpatient Unit"* (Laurens County Hospital; Ref. #2273813-1).
  - Sub-Investigator on Prisma Health IRB study *"Ability of Contactless Sensor to Detect Obstructive Sleep Apnea Episodes in Inpatients Validated With SleepSMART"* (Richland Hospital; Ref. #2366163-1).
  - Implemented a robust sensing platform using safe **60 GHz mmWave** signals with local storage (no Wi-Fi/Internet) and privacy-preserving video (blurred) for timing/ground truth.
- **VolumeSense (SPARC-funded): Camera-Free Body Volume Estimation with mmWave** *Healthcare sensing*
  - PI/Student recipient of a SPARC Graduate Research Grant to develop a contactless and camera-free system for **precise body volume estimation** using mmWave sensing (*VolumeSense*).
  - Goal: translate AI-driven mmWave sensing into clinically relevant anthropometric measurements for longitudinal health monitoring.
- **SugarWave / SSCense: Non-destructive Fruit Soluble Sugar Content (SSC) Estimation** **IEEE MASS'23** **ACM MobiSys'22**
  - Built a low-cost mmWave sensing system for estimating fruit SSC (ripeness/quality control) without cutting fruit.
  - SugarWave evaluated **450** sugar-solution samples and **404** fruit samples (101 fruits × 4 orientations), achieving median SSC error **1.4 °Bx** on real fruits and **0.52 °Bx** on sugar solutions.
  - Designed a **conditional GAN**-based pipeline to learn a mapping from fruit reflections to the latent features of sugar solutions, improving generalization across fruits and orientations.
- **MiHazeFree3D / AutoSense: mmWave-Based 3D Bounding Boxes for Autonomous Perception** **ACM TIOT (Just Accepted)** **ACM MobiSys'24**
  - Developed deep learning architectures for predicting **3D bounding boxes** of vehicles/pedestrians from mmWave radar signals in challenging environments (fog, rain, low light).
  - AutoSense reports median IoU up to **0.75** for vehicles and **mAP 0.64 @ IoU=0.5**; uses a cascaded radar (12 Tx, 16 Rx) and phase-based motion-error correction.
  - MiHazeFree3D was trained on **16,000** real-world samples collected over **100 miles** of urban driving (mmWave radar + stereo camera + LiDAR ground truth).
- **Contactless Stroke Recovery Monitoring: Gait Speed & Fugl-Meyer Action Duration** **Stroke'25 Abstract**
  - Built a contactless sensor pipeline to estimate gait speed and action durations in Fugl-Meyer assessments using RF reflections and spatiotemporal filtering.
  - Achieved high correlation with manual gait-speed measurements for stroke survivors ($R = 0.99$, error mean/SD **0.03/0.02 m/s**); accurately estimated lower-extremity FM action duration (mean errors **0.60 s** stroke survivors; **0.53 s** controls).
- **LLM Evaluation for Education, Multilingual NLP, and Mental Health** *Software AI*
  - **Graduate entrance exams (CS):** evaluated LLMs on graduate-level computer science questions; reported up to **75%** accuracy for GPT-4o and analyzed cross-lingual (English vs. Farsi) performance gaps.
  - **Mathematical reasoning:** tested 6 LLMs on **146** multiple-choice math questions (Persian & English); best performance was **63.7%** (English, Gemini 1.5 Pro) and **52.0%** (Persian, Claude 3.5).

- **Persian news summarization:** evaluated 8 LLMs on **100** news articles; Llama-3.1 405B achieved best reference-based scores (BERTScore F1 **50.60**, ROUGE-L **33.96**).
- **AI in mental health:** analyzed sentiment and emotions in **2,880** LLM responses to depression, anxiety, and stress prompts across 6 user profiles, finding consistent dominance of optimism, fear, and sadness patterns across models.
- **MBTI & career analytics:** performed a meta-analysis of **30** studies (**18,264** participants) to explain MBTI type prevalence in computer-industry careers using Jungian cognitive functions.

- **Hybrid Attention Vision Transformer for Dentigerous Cyst Detection (HA-ViT)** **IEEE ICCKE'24**
  - Proposed a hybrid ViT pipeline for dentigerous cyst detection in panoramic dental radiography using dual-path learning (global image + lesion-focused region).
  - Achieved **94.44%** accuracy, **90.64%** sensitivity, **96.74%** specificity, and AUC-ROC **0.9829**.

HONORS AND AWARDS

SPARC Graduate Research Grant Program — $4,866 (2025)
Proposal #155900-25-70625: *"SPARC: Reza Tavasoli: VolumeSense: A Contactless and Camera-Free Technology for Precise Body Volume Estimation"*
Official announcement

UofSC CSE Research Symposium — 3rd Place Poster ($100 share of $200 award) (2024)
MilliCar: Accurate 3D Bounding Box Prediction of Vehicles and Pedestrians in All Weather Conditions
Authors: Reza Tavasoli; Hem Regmi; Joseph Telaak; Sanjib Sur; Srihari Nelakuditi
Presenter: Reza Tavasoli; Hem Regmi
Poster winners

UofSC CSE Research Symposium — 2nd Place Poster ($300 award) (2023)
SSCense: A Millimeter-Wave Sensing Approach for Estimating Soluble Sugar Content of Fruits
Authors: Reza Tavasoli; Sanjib Sur; Srihari Nelakuditi
Presenter: Reza Tavasoli

Discover USC 2025: Medical Scholar Awards — Populations Outcomes/Quality (Team Award) (2025)
Second Place (Ryan Titus, Medical Student) — *A Novel Approach of Monitoring Stroke Recovery: Contactless Sensor for Gait Speed and Fugl-Meyer Action Duration Estimation*
Role: Co-author / research collaborator (USC–Prisma Health team)
Official highlights

PUBLICATIONS

(Reza Tavasoli indicates my name.)

Wireless Sensing, Healthcare & Autonomous Perception

1. **MiHazeFree3D: 3D Bounding Box Prediction for Vehicles and Pedestrians in Fog and Low-Light Conditions**,
   Hem Regmi, Reza Tavasoli, Sanjib Sur, Srihari Nelakuditi.
   ACM Transactions on Internet of Things (TIOT), **Just Accepted**, 2026. **DOI**
2. **Abstract WP132: A Novel Approach of Monitoring Stroke Recovery: Contactless Sensor for Gait Speed and Fugl-Meyer Action Duration Estimation**,
   Zhuangzhuang Gu, Ryan Titus, Hem Regmi, Reza Tavasoli, Sanjib Sur, Souvik Sen.
   Stroke, Vol. 56 (Suppl_1), 2025. **DOI**
3. **Poster: AutoSense: Reliable 3D Bounding Box Prediction for Vehicles**,
   Hem Regmi, Reza Tavasoli, Joseph Telaak, Sanjib Sur, Srihari Nelakuditi.
   ACM MobiSys Poster Session, 2024. **DOI**

4. **SugarWave: A Non-destructive Estimation of Fruit Sugar Content Using Millimeter-Wave Sensing**, Reza Tavasoli, Sanjib Sur, Srihari Nelakuditi.
IEEE International Conference on Mobile Ad Hoc and Smart Systems (MASS), 2023. **DOI**

5. **SSCense: A Millimeter-Wave Sensing Approach for Estimating Soluble Sugar Content of Fruits**, Reza Tavasoli, Sanjib Sur, Srihari Nelakuditi.
ACM MobiSys Poster Session, 2022. **DOI**

AI for Education, NLP & Mental Health

6. **AI in Mental Health: Emotional and Sentiment Analysis of Large Language Models' Responses to Depression, Anxiety, and Stress Queries**,
Arya VarastehNezhad, Reza Tavasoli, Soroush Elyasi, MohammadHossein LotfiNia, Hamed Farbeh.
arXiv preprint, 2025. **arXiv:2508.11285**

7. **How Jungian Cognitive Functions Explain MBTI Type Prevalence in Computer Industry Careers**, Arya VarastehNezhad, Behnam Agahi, Soroush Elyasi, Reza Tavasoli, Hamed Farbeh.
arXiv preprint, 2025. **arXiv:2504.17248**

8. **Analyzing the Mathematical Proficiency of Large Language Models in Computer Science Graduate Admission Tests**,
Reza Tavasoli, Arya VarastehNezhad, Mostafa Masumi, Fattaneh Taghiyareh.
29th International Computer Conference, Computer Society of Iran (CSICC), 2025. **DOI**

9. **Evaluating LLMs in Persian News Summarization**,
Arya VarastehNezhad, Reza Tavasoli, Mostafa Masumi, Seyed Soroush Majd, Mehrnoush Shamsfard.
15th International Conference on Information and Knowledge Technology (IKT), 2024. **DOI**

10. **LLM Performance Assessment in Computer Science Graduate Entrance Exams**,
Arya VarastehNezhad, Reza Tavasoli, Mostafa Masumi, Fattaneh Taghiyareh.
11th International Symposium on Telecommunications (IST), 2024. **DOI**

Medical Imaging

11. **Hybrid Vision Transformer for Detection of Dentigerous Cysts in Dental Radiography Images**, Reza Tavasoli, Arya VarastehNezhad, Hamed Farbeh.
14th International Conference on Computer and Knowledge Engineering (ICCKE), 2024. **DOI**

PROFESSIONAL SERVICE

Journal Reviewer

- AUT Journal of Electrical Engineering — **4** completed reviews (visible via Web of Science profile).
- Information Processing & Management (Elsevier) — reviewer (ORCID record; Review date: 2025).