Mohammad Farid **Azampour**

Post doctoral researcher

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Professional Employment

Now – Sep. 2024 | Post Doctoral Researcher, Technische Universität München, Munich

- Chair for Computer Aided Medical Procedures with Nassir Navab

Sep. 2024 – Feb. 2021 | Research fellow, Technische Universität München, Munich

- Chair for Computer Aided Medical Procedures with Nassir Navab

Apr. 2021 – Oct. 2020 | Visiting researcher, Imperial College London, London

- The group of Biomedical Image Analysis at the Department of Computing with Bernhard Kainz

Feb. 2019 – Jun. 2016 | Technical director, Daric Pars Solutions, Tehran

- Designed tourism wallet aimed for areas with limited access to major payment services, with Mohammad Javad Salehi

Jun. 2018 – Apr. 2018 | Data scientist, Taraabarnet, Tehran

- Examine truck–goods relationships to extract patterns and propose a pricing algorithm using 40 million data points, with Sharyar Noei and Keivan Jafari

May 2015 – Sep. 2011 | Software developer | R & D member, ETick Pars Intelligent Technologies Development, Tehran

- Developed embedded navigation applications using Qt and C# for public transport devices, with Mohammad Javad Salehi

Education

Sep. 2024 – Sep. 2015 | Bio Electrical Engineering, PhD, Sharif University of Technology, Tehran, Iran

thesis: **Multimodal medical image registration using deep learning**
under supervision of *Dr. Emad Fatemizadeh*
GPA: **18.60/20** - via 16 Credits

Jan. 2014 – Sep. 2011 | Bio Electrical Engineering, Graduate Studies, Sharif University of Technology, Tehran, Iran

thesis: **Image Registration Using Manifold Learning Based Methods**
under supervision of *Dr. Emad Fatemizadeh*
GPA: **17.07/20** - via 32 Credits

Sep. 2011 – Sep. 2007 | Electrical Engineering, B.Sc., Sharif University of Technology, Tehran, Iran

GPA: **17.7/20** - via 140 Credits

Service and Leadership

Academic Service and Teaching

- Member of the Coordination Committee, Chair of CAMP — 2024–present
- Organizer, Practical Course: *Computational Engineering* — 2024–present
- Organizer, Practical Course: *Project Management and Software Development for Medical Applications* — 2023–2024
- Lecturer, *CAMP I & II* — 2023–present

Conference Organization

- (Co-)Organizer, ASMUS Workshop at MICCAI — 2026

Journal Reviewing

- *Medical Physics*
- *IEEE Journal of Biomedical and Health Informatics (JBHI)*
- *IEEE Transactions on Medical Imaging (TMI)*
- *IEEE Robotics and Automation Letters (RA-L)*
- *Medical Image Analysis (MedIA)*

Conference Reviewing

- Medical Image Computing and Computer Assisted Interventions (MICCAI)
- International Conference on Information Processing in Computer-Assisted Interventions (IPCAI)
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE/CVF International Conference on Computer Vision (ICCV)
- European Conference on Computer Vision (ECCV) — *Outstanding Reviewer Award, 2024*
- IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)

Funding

- **ICL–TUM Global Incentive Fund** — 2020
  Grant amount: 10,000 €
- **Nantes–TUM Global Incentive Fund** — 2022
  Grant amount: 5,000 €
- **Bayerische Transformations- und Forschungsstiftung** — Pending final approval
  Total funding: 1,000,000 €; Share for CAMP chair: 280,000 €
- **Deutsche Forschungsgemeinschaft (DFG)** — Submitted
  Total funding: 850,000 €; Share for CAMP Chair: 410,000 €

Mentorship and Teaching

PhD Mentor	Mentor of three PhD students as of Oct. 2023
Co-supervisor of master and bachelor thesis	Successfully co-supervised more than 15 M.Sc. and B.Sc. theses
Lectures, seminars and practical courses	Responsible for the lecture of Image registration at the course CAMP I & II, Co-organizer of the practical courses (Project Management and Software Development for Medical Applications (PMSD) and Computational Surgineering)

Reserch Interests

- Medical Image Processing
- Physics-based Deep Learning
- Generative models
- Ultrasound imaging

Languages

Farsi (Native) ●●●●●

English ●●●●○

German ●●●○○

Publications

Publication summary

I have (first or last/co)-authored 3/5 journal articles, 7/13 conference papers, and 3/3 peer-reviewed workshop papers, and I am an inventor on a patent applications in process. A detailed list is available below and on Google Scholar.

Peer-reviewed Journal Articles

- **MF Azampour**, K Mach, E Fatemizadeh, B Demiray, K Westenfelder, et al. Multitask weakly supervised generative network for mr-us registration. *IEEE Transactions on Medical Imaging*, 43(11), 2024
- **MF Azampour**, M Tirindelli, J Lameski, M Gafencu, E Tagliabue, et al. Anatomy-aware computed tomography-to-ultrasound spine registration. *Medical Physics*, 51(3), 2024
- Y Velikova, W Simson, **MF Azampour**, P Paprottka, and N Navab. Cactuss: Common anatomical ct-us space for us examinations. *International Journal of Computer Assisted Radiology and Surgery*, 19(5), 2024
- MA Gafencu, Y Velikova, M Saleh, T Ungi, N Navab, T Wendler, and **MF Azampour**. Shape completion in the dark: completing vertebrae morphology from 3d ultrasound. *International Journal of Computer Assisted Radiology and Surgery*, 19, 2024
- MY Ansari, Y Yang, S Balakrishnan, J Abinahed, A Al-Ansari, M Warfa, **MF Azampour**, and et al. A lightweight neural network with multiscale feature enhancement for liver ct segmentation. *Scientific Reports*, 12(1), 2022
- A Segato, C Di Vece, S Zucchelli, M Di Marzo, T Wendler, **MF Azampour**, et al. Position-based dynamics simulator of brain deformations for path planning and intra-operative control in keyhole neurosurgery. *IEEE Robotics and Automation Letters*, 6(3), 2021
- D Grzech, **MF Azampour**, H Qiu, B Glocker, B Kainz, and LL Folgoc. Uncertainty quantification in non-rigid image registration via stochastic gradient markov chain monte carlo. *Melba Journal*, 1, 2021
- A Bitarafan, M Mozafari, **MF Azampour**, MS Baghshah, N Navab, et al. Self-supervised 3d medical image segmentation by flow-guided mask propagation learning. *Medical Image Analysis*, 101, 2025

Peer-reviewed Conference and Workshop Papers

- H Hase*, **MF Azampour***, M Tirindelli, M Paschali, W Simson, et al. Ultrasound-guided robotic navigation with deep reinforcement learning. In *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020
- M Wysocki*, **MF Azampour***, C Eilers, B Busam, M Salehi, and N Navab. Ultra-nerf: Neural radiance fields for ultrasound imaging. In *Medical Imaging with Deep Learning (MIDL)*, 2023
- M Tirindelli, C Eilers, W Simson, M Paschali, **MF Azampour**, and N Navab. Rethinking ultrasound augmentation: A physics-inspired approach. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2021
- B Zhang, S Faghihroohi, **MF Azampour**, S Liu, R Ghotbi, H Schunkert, et al. A patient-specific self-supervised model for automatic x-ray/ct registration. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2023
- D Grzech, **MF Azampour**, B Glocker, J Schnabel, N Navab, B Kainz, et al. A variational bayesian method for similarity learning in non-rigid image registration. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022
- M Domínguez, Y Velikova, N Navab, and **MF Azampour**. Diffusion as sound propagation: Physics-inspired model for ultrasound image generation. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2024
- Y Velikova*, **MF Azampour***, W Simson, M Esposito, and N Navab. Implicit neural representations for breathing-compensated volume reconstruction in robotic ultrasound. In *2024 IEEE International Conference on Robotics and Automation (ICRA)*, 2024
- B Jian, **MF Azampour**, F De Benetti, J Oberreuter, C Bukas, AS Gersing, et al. Weakly-supervised biomechanically-constrained ct/mri registration of the spine. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2022
- A Bitarafan, **MF Azampour**, K Bakhtari, M Soleymani Baghshah, et al. Vol2flow: Segment 3d volumes using a sequence of registration flows. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2022
- Y Velikova, **MF Azampour**, W Simson, V Gonzalez Duque, and N Navab. Lotus: Learning to optimize task-based us representations. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2023
- M Fehrentz, **MF Azampour**, R Dorent, H Rasheed, C Galvin, A Golby, et al. Intraoperative registration by cross-modal inverse neural rendering. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2024
- M Mozafari, A Bitarafan, **MF Azampour**, A Farshad, et al. Visa-fss: A volume-informed self supervised approach for few-shot 3d segmentation. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2023
- LD Reyes Vargas, MJ Menten, JC Paetzold, N Navab, and **MF Azampour**. Skelite: Compact neural networks for efficient iterative skeletonization. In *International Conference on Information Processing in Medical Imaging (IPMI)*, 2025
- **MF Azampour**, A Ghaffari, A Hamidinekoo, and E Fatemizadeh. Manifold learning based registration algorithms applied to multimodal images. In *2014 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2014
- F Duelmer, **MF Azampour**, M Wysocki, and N Navab. Ultraray: Introducing full-path ray tracing in physics-based ultrasound simulation. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2025
- D Grzech, LL Folgoc, **MF Azampour**, A Vlontzos, B Glocker, N Navab, et al. Unsupervised similarity learning for image registration with energy-based models. In *International Workshop on Biomedical Image Registration*, 2024
- MA Gafencu, Y Velikova, N Navab, and **MF Azampour**. Us-x complete: A multi-modal approach to anatomical 3d shape recovery. In *International Workshop on Shape in Medical Imaging*, 2025
- J Janelidze, L Folle, N Navab, and **MF Azampour**. Tubular anatomy-aware 3d semantically conditioned image synthesis. In

MICCAI Workshop on Deep Generative Models, 2025

- M Wysocki, F Duelmer, A Bal, N Navab, and **MF Azampour**. Ultron: Ultrasound occupancy networks. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2025
- S Joutard, M Stollenga, M Balle Sanchez, **MF Azampour**, and R Prevost. Hypersort: Self-organising robust training with hypernetworks. In *International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, 2025
- F Duelmer, **MF Azampour**, and N Navab. Ultrascatter: Ray-based simulation of ultrasound scattering. In *2025 IEEE International Ultrasonics Symposium (IUS)*, 2025
- VB Yesilkaynak, VG Duque, M Wysocki, **MF Azampour**, N Navab, et al. Ultranba: Neural bundle adjustment for pose refinement in 3d freehand ultrasound. In *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*, 2025
- MB Sanchez, S Joutard, **MF Azampour**, and R Prevost. Why is patch size important? dealing with context variability in segmentation networks. In *Medical Imaging with Deep Learning – Short Papers*, 2025
- **MF Azampour**, Y Velikova, E Fatemizadeh, SP Dakua, and N Navab. Self-supervised probe pose regression via optimized ultrasound representations for us-ct fusion. In *International Conference on Medical Imaging and Computer-Aided Diagnosis*, 2023
- Z Zhang, B Zhang, **MF Azampour**, S Faghihroohi, A Tomczak, et al. Self-supervised vessel segmentation from x-ray images using digitally reconstructed radiographs. In *BVM Workshop*, 2024
- F Duelmer, W Simson, **MF Azampour**, M Wysocki, A Karlas, and N Navab. Phocus: Physics-based deconvolution for ultrasound resolution enhancement. In *International Workshop on Advances in Simplifying Medical Ultrasound*, 2024

Summary of Research Contributions

1. Physics-Aware Generative Ultrasound Modeling (Ray Tracing, Diffusion, NeRF). I introduced a family of physics-integrated generative models for ultrasound simulation, domain translation, and volumetric reconstruction. *UltraRay* provides fast, full-path acoustic ray tracing for realistic simulation; the *Physics-Inspired Diffusion (B-Maps)* scheduler incorporates depth-dependent noise to mimic ultrasound attenuation, yielding large gains in perceptual quality (e.g., Liver FID 73.4 $\rightarrow$ 0.86); and *UltraNeRF* is the first ultrasound-specific neural radiance field with physics-based volumetric rendering for view-dependent synthesis. Together, these works form a foundational stack for simulation, virtual re-scanning, and autonomous ultrasound systems.
References: Duelmer, Azampour et al., MICCAI 2025; Domínguez, Azampour et al., MICCAI 2024; Wysocki, Azampour et al., MIDL 2023.

2. Scalable Weakly Supervised MR–Ultrasound Registration. I developed *ProRegGAN*, the first multitask weakly supervised MR–US registration framework that requires no ultrasound annotations. A dual-path pseudo-US generator and a structure-preserving MaskNCE objective enable robust cross-modal alignment. The model achieves state-of-the-art prostate MR–US fusion on a 600-patient dataset and generalizes to external cohorts.
Reference: Azampour et al., IEEE TMI 2024.

3. Anatomy-Aware CT–Ultrasound Registration for Spinal Navigation. I introduced the first anatomy-aware CT–US registration framework for spinal imaging, combining a structural ultrasound representation (SUR) with an anatomically weighted similarity metric. The method achieves $\sim$2.4 mm TRE on robotic spine ultrasound acquisitions and outperforms both classical and learning-based baselines.
Reference: Azampour et al., Medical Physics 2024.

4. 3D Shape Completion and Anatomical Reconstruction from Sparse Ultrasound. I developed methods for ultrasound-first 3D anatomical reconstruction capable of recovering complete vertebral geometry from fragmentary and occluded ultrasound. *Implicit Morphometry Networks* reconstruct smooth, anatomically consistent vertebrae from sparse ultrasound observations, while *US-X Complete* fuses sparse ultrasound with a single X-ray via a coarse-to-fine variational completion pipeline, yielding major improvements in CD, EMD, and F1 scores (all $p < 10^{-6}$). These works enable low-radiation, CT-free 3D spine reconstruction suitable for navigation and robotics.
References: Gafencu, Azampour et al., IJCARS 2024; Gafencu, Velikova, Navab, Azampour et al., SMIMI 2025.

5. Task-Driven Ultrasound Representations and Autonomous Robotic Guidance. I advanced ultrasound toward autonomy through cross-modal representation learning and ultrasound-guided control. *CACTUSS* introduced a CT-informed intermediate representation for robust aortic segmentation (88–90% DSC across devices). *LOTUS*, introduced subsequently, is a differentiable ultrasound renderer whose parameters are optimized end-to-end for segmentation, achieving >89% DSC without ultrasound labels. Finally, *Ultrasound-Guided RL Navigation* demonstrated one of the first reinforcement-learning-driven robotic navigation systems using ultrasound alone, achieving $\sim$83% success on unseen trials.
References: Velikova, Simson, Azampour et al., IJCARS 2024; Velikova, Azampour et al., MICCAI 2023; Hase, Azampour et al., IROS 2020.

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