Sahar Almahfouz Nasser

PROFESSIONAL EXPERIENCE

Emory University (Madabhushi Lab) Feb 2024 – Present
Postdoctoral Researcher Atlanta, USA

- Designed agentic AI frameworks to develop prognostic and predictive biomarkers for ER+/HER2– breast cancer.
- Advanced federated learning approaches in computational pathology in collaboration with Rhino Health, leveraging multi-institutional data from Emory, Ichilov, and Assuta hospitals.
- Developed an explainable pipeline for HER2 expression quantification from IHC images and created the HAI-Signature to predict benefit from neoadjuvant chemotherapy (NACT) and T-DXd.
- Built equitable and generalizable mitosis detection models validated across multiple organs and diverse populations.
- Created a Fourier–Spatial Image Normalization (FSIN) tool to harmonize histopathology images across different modalities.
- Contributed to the ARPA-H funded "Margin Call" project, designing rapid intraoperative margin detection methods to improve surgical decision-making in breast cancer.

EDUCATION

Indian Institute of Technology Bombay 2019–2024
Ph.D., Electrical Engineering Mumbai, India
Thesis: *Cross-Domain Image Transformation and Matching* (Advisor: Prof. Amit Sethi)

Indian Institute of Technology Bombay 2017–2019
M.Tech., Biomedical Engineering Mumbai, India
Thesis: *Automated Machine Learning for Detecting Sickle Cell Disease* (Advisor: Prof. Debjani Paul)

Damascus University 2010–2015
B.S., Biomedical Engineering Damascus, Syria
Thesis: *Designing a Portable, Low-Cost Thromboelastometry Device for Surgical Settings*

RESEARCH INTERESTS

Deep Learning, Generative Agentic AI, Computational Pathology, Medical Image Analysis, Computer Vision, Survival Analysis

RESEARCH THESIS

Ph.D. Thesis Jul '19 – Jul '24
Title of Thesis: Cross-Domain Image Transformation and Matching

- Developed deep learning methods for multi-modal medical image translation (e.g., ultrasound ↔ mammogram/CT) to improve breast cancer diagnostics.
- Proposed domain homogenization techniques for histopathology images, enabling robust and generalizable mitosis detection (Best Paper, Bioimaging 2023).

- Designed reverse knowledge distillation–based retinal image matching and weakly supervised registration networks, validated on diverse benchmarks (OASIS, Learn2Reg, BraTSReg).

M.Tech. Thesis Jul '17 – Jun '19

Title of Thesis: Automated Machine Learning for Detecting Sickle Cell Disease

- Built a single-test-image–based AutoML system for distinguishing between trait and diseased blood samples using unstained, low-quality microscopic images.
- Combined random forest–based segmentation with SVM classification, achieving accuracy of 93%, sensitivity of 67%, and specificity of 96%.
- Designed workflows suitable for low-resource clinical and field settings.

RELEVANT PUBLICATIONS

- **Sahar Almahfouz Nasser** *et al.*, "HAI-score, an objective HER2 artificial intelligence method for accurate H-score estimation from IHC-stained breast cancer samples." June 2025.
- **Sahar Almahfouz Nasser** *et al.*, "Computational pathology-informed immune biomarker for trastuzumab benefit in HER2+ breast cancer: Validation in NSABP B-41 clinical trial." June 2025.
- Pandav KB, **Sahar Almahfouz Nasser** *et al.*, "Opportunities for Artificial Intelligence in Oncology: From the Lens of Clinicians and Patients." March 2025.
- **Sahar Almahfouz Nasser**, Pathak S, Singhal K, Meena M, Gupte N, Chinmaya A, Garg P, Sethi A. "Utilizing Radiomic Features for Automated MRI Keypoint Detection: Enhancing Graph Applications." Proc. 17th Int. Joint Conf. on Biomedical Engineering Systems and Technologies, 2024.
- **Sahar Almahfouz Nasser**, Sharma A, Saraf A, Parulekar AM, Haria P, Sethi A. "Transforming Breast Cancer Diagnosis: Towards Real-Time Ultrasound to Mammogram Conversion for Cost-Effective Diagnosis." arXiv preprint, 2023 (submitted to *Ultrasonics Journal*).
- **Sahar Almahfouz Nasser**, Gupte N, Sethi A. "Reverse Knowledge Distillation: Training a Large Model Using a Small One for Retinal Image Matching on Limited Data." Proc. IEEE/CVF Winter Conf. on Applications of Computer Vision (WACV), 2024.
- **Sahar Almahfouz Nasser**, Meena M, Sresth G, Sethi A. "Leveraging Segmentation to Improve Medical Image Registration." TechRxiv, 2023 (submitted to *IEEE J. Biomedical and Health Informatics*).
- **Sahar Almahfouz Nasser**, Kurian NC, Shamsi S, Meena M, Sethi A. "WSSAMNet: Weakly Supervised Semantic Attentive Medical Image Registration Network." MICCAI Challenge Proceedings, 2022.
- Chandra T, **Sahar Almahfouz Nasser**, Kurian N, Sethi A. "Improving Mitosis Detection via UNet-Based Adversarial Domain Homogenizer." Proc. 16th Int. Joint Conf. on Biomedical Engineering Systems and Technologies (BIOIMAGING), 2023.
- **Sahar Almahfouz Nasser**, Sethi A. "Simulating Ultrasound Images from CT Scans." Proc. 16th Int. Joint Conf. on Biomedical Engineering Systems and Technologies (BIOIMAGING), 2023.
- **Sahar Almahfouz Nasser**, Shamsi S, Bundele V, Garg B, Sethi A. "Perceptual cGAN for MRI Super-Resolution." IEEE EMBC, 2022.
- **Sahar Almahfouz Nasser**, Kurian NC, Sethi A. "Domain Generalisation for Mitosis Detection Exploiting Preprocessing Homogenizers." MICCAI, 2021.

- V. S, **Sahar Almahfouz Nasser**, Bala G, Kurian NC, Sethi A. "Multi-Modal Information Fusion for Classification of Kidney Abnormalities." IEEE ISBI Challenges, 2022.
- **Sahar Almahfouz Nasser**, Meena M, Kurian N, Shamsi S, Sethi A. "BraTS-Reg Meta Analysis Manuscript." Submitted to *Medical Image Analysis Journal*, 2024.
- **Sahar Almahfouz Nasser**, Paul D, Awate SP. "Single Test Image-Based Automated Machine Learning System for Distinguishing between Trait and Diseased Blood Samples." arXiv preprint, 2021.

RELEVANT PUBLICATIONS UNDER REVIEW

Sahar Almahfouz Nasser, Jilun Zhang, Tilak Bahadur Pathak, Geoffrey H. Smith, Landon C. Shoffeitt, Wei Yang, Zhuoyuan Alex Li, Huiyan Deng, Krunal Pandav, Lei Huo, Sunil Badve, Shridar Ganesan, Shipra Gandhi, Hannah Gilmore, Anant Madabhushi, Germán Corredor. "AI-Derived HAI-Signature HER2 H-Score Correlates with Response to Neoadjuvant Therapy and Trastuzumab Deruxtecan in Breast Cancer." *Modern Pathology*. (Under Review).

TALKS, PEDAGOGICAL & PROFESSIONAL ACTIVITIES

- **TEDx Nagpur Salon Talk**, Shared how AI tools are improving equitable breast cancer diagnosis.
- Finalist, IEEE ISBI Knight Challenge: Kidney Clinical Notes Imaging for Personalized Treatment Biomarker Discovery.
- Winner, Qualcomm Innovation Fellowship, 2021–2022.
- Ambassador Speaker, IEEEXtreme 16.0 Coding Competition (2022).
- Co-Instructor and Co-Organizer, SHALA 2020: Online summer school on Data Sciences and Machine Learning.
- Reviewer, IEEE ISBI, Asian Conference on Machine Learning for Medical Imaging, and Elsevier Journals.
- Teaching Assistant
  - Introduction to Machine Learning (EE769), IIT Bombay (Instructor: Prof. Amit Sethi), 2022.
  - Digital Signal Processing, Image Processing, Multimedia, Microprocessors, and Programming Languages (C++, MATLAB), Damascus University, 2015–2017.
- Collaborative Research with leading institutions and industry partners, including TATA Memorial Hospital, University Hospitals, Cleveland Clinic, Rhino Health, Qualcomm, and Whirlpool.

TECHNICAL SKILLS

- **Programming Languages:** C, C++, Python, MATLAB
- **Libraries:** PyTorch, PyTorch Geometric, OpenCV, MONAI, TorchIO, Wandb, QuPath, 3D Slicer, NiBabel
- **Medical Imaging:** OpenSlide, DICOM, SimpleITK
- **Data Science & Survival Analysis:** Lifelines, Scikit-learn, Pandas, NumPy
- **Version Control & Reproducibility:** Git, Docker, Singularity, Conda, Jupyter
- **Other:** Shell Scripting

HONORS AND AWARDS

- Best Student Paper Award, Bioimaging Conference (2023).
- Finalist, IEEE ISBI Knight Challenge: Kidney Clinical Notes and Imaging to Guide and Help Personalize Treatment and Biomarkers Discovery (2022).
- Qualcomm Innovation Fellowship (2021–2022).
- Certificate of Participation, IEEE EMBC Conference, UK (2022).
- Certificate of Participation, IEEE EMBC Summer Camp (2022).
- Certificate of Participation, OpenFOAM Workshop, IIT Bombay (2021).
- Certificate of Participation, 3rd Industrial Day, Wadhwani Research Center, IIT Bombay (2019).
- Honour Code Certificate, Technical Communication for Scientists and Engineers, IIT Bombay (2017).
- Five-time recipient of the Certificate of Martyr Bassel Alassad for Study Superiority (2011–2015).

RELEVANT COURSEWORK

- EE 678: Wavelets
- EE 610: Image Processing
- EE 601: Statistical Signal Analysis
- CS 663: Image Processing
- CS 736: Medical Image Computing
- EE 769: Introduction to Machine Learning
- EE 782: Advanced Machine Learning

CONTACT INFORMATION

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