Abubakr Shafique, Ph.D.

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I am a results-driven scientist with a Ph.D. from the University of Waterloo, Canada, specializing in Artificial Intelligence (AI) and Machine Learning (ML) with a focus on Medical Image Analysis and Representation Learning. My expertise spans the development and implementation of advanced algorithms for computational biology, integrating AI innovation with biomedical applications. Combining strong academic foundations with hands-on research experience, I excel at tackling complex interdisciplinary problems in AI and medicine, driving discoveries that bridge data science and clinical impact.

Work Experience

04/2024 – to date

Post-Doc Research Fellow
Department of Electrical, Computer and Biomedical Engineering
Toronto Metropolitan University, Toronto, ON, Canada

My primary responsibility involves conducting pioneering investigations within the realms of medical imaging and digital pathology.
Evaluate the Foundation Models in the domain. (Link)
Supervising and supporting the students in developing their research concepts, conducting experiments, and crafting scholarly articles.
Helping the PI with research grant applications, lectures, and other administrative tasks.

08/2024 – 02/2025

Digital Pathology Image Analyst (Internship)
Department of Computational Science & Informatics
Hoffmann-La Roche Limited, Mississauga, ON, Canada

Conduct research using Multimodal Large Language Models (MLLMs) with publicly available datasets.
Fine-tune and Evaluate Vision-Language Models on HPC GPU clusters with the LoRA framework.
Developed an automated pipeline for In-house data curation from existing learning modules related to PDL-1.
Synthetic data generation for Vision-Language models.

01/2023 – 01/2024

Visiting Graduate Scholar
Department of Artificial Intelligence & Informatics,
Mayo Clinic, Rochester, MN, USA

Proposed a novel ranking loss algorithm designed specifically to train representations for discerning intricate subtypes in the context of image search applications.
Engaged in multimodal image search by integrating representations from two different modalities, such as Tissue Images and Immunogenomic Data. (Link)
Introduced a new approach named "Selection of Distinct Morphologies" (SDM) to selectively pick a subset of Whole Slide Image (WSI) patches. The objective is to capture all inherent morphological variations present in the WSI, while minimizing the number of chosen patches. This ensures a concise yet thorough representation of variations within the selected patches for a given WSI. (Link)
Proposed a compact version of the Vision Transformer with five blocks, specifically tailored for Rotation-Agnostic Image Representation Learning in Digital Pathology. This addresses the overfitting issues and enhances overall representation. (Link)
Benchmarking various foundation models available in the literature for histopathology. (Link)
Benchmarking various histopathological search engines available in the literature. (Link)
Conducted a groundbreaking analysis on the 35 subtypes of breast cancer, utilizing data from the World Health Organization (WHO) to examine deep features and match morphological features among the most intricate subtypes of breast cancer. (Link)

09/2020 – 01/2024

Research Assistant
Kimia Lab, Systems Design Engineering,
University of Waterloo, Waterloo, ON, Canada

Engaged in addressing class-imbalanced unsupervised and semi-supervised domain adaptation challenges specifically tailored for histopathology images using deep learning. (Link)

Designed an advanced visualization technique known as “Composite Biomarker Image”, which consolidates information from various IHC biomarker images into a single image utilizing fuzzy inference systems, eliminating the need for pathologists to navigate between multiple images. (Link)

With the application of “Composite Biomarker Image”, I additionally proposed an Immunohistochemistry Biomarkers-Guided Image Search for the whole slide images in histopathology. (Link)

Developed an automated fine registration method for multiple-stain whole slide images within the field of histopathology. (Link)

08/2021 – 12/2022

Engineering Computing Consultant
Faculty of Engineering,
University of Waterloo, Waterloo, ON, Canada

Students were assisted in maintaining remote connectivity with the campus during the pandemic. Assistance was provided with various software installations and licenses, and any technical issues with their devices were resolved.

01/2021 – 12/2022

Teaching Assistant (TA)
Department of Systems Design Engineering,
University of Waterloo, Waterloo, ON, Canada

Supported students in conducting the experiments, provided tutorials on the usage of various software and tools, conducted simulation demonstrations, held office hours, assisted with term projects, and evaluated their reports and assignments.

02/2017 – 08/2020

Research Assistant
NTUST Center of Computer Vision and Medical Imaging,
National Taiwan University of Science and Technology, Taipei, Taiwan

Developed a real-time non-contact adaptive breathing monitoring system utilizing a smartphone's live camera feed to detect subtle breathing movements. (Link)

Commenced involvement in deep learning within the realm of digital pathology, focusing on tools to aid pathologists in faster and semi-automatic delineations.

02/2015 – 01/2016

Research Assistant
Medical Image Processing Research Group (MIPRG),
COMSATS Institute of Information Technology, Islamabad, Pakistan

Developed an ASIC architecture for real-time SENSE reconstruction in pMRI, achieving swift reconstruction, streamlined memory usage, and notable artifact power reduction. (Link)

Implemented the FPGA version of the ASIC architecture for real-time SENSE MRI image reconstruction, incorporating pre-scan and Eigenvalue sensitivity maps. (Link)

Education

09/2020 – 01/2024

Doctor of Philosophy (Ph.D.) in Systems Design Engineering
University of Waterloo, Waterloo, ON, Canada

Thesis: Representation Learning for Image Search in Histopathology

01/2023 – 01/2024

Visiting Graduate Student, Mayo Clinic Graduate School of Biomedical Sciences
Mayo Clinic, Rochester, MN, USA

02/2017 – 01/2019	**Masters of Science in Biomedical Engineering** **National Taiwan University of Science and Technology, Taipei, Taiwan** Thesis: A Real-time Non-contact based Adaptive Breathing Monitoring System
02/2012 – 01/2016	**Bachelor of Science in Electrical Computer Engineering** **COMSATS Institute of Information Technology, Islamabad, Pakistan** Thesis: Parameterized Architecture Design of SENSE MRI Reconstruction Algorithm
09/2014 – 02/2015	**Exchange Student, Bachelor of Science in Electrical Computer Engineering** **Düzce University, Düzce, Turkey**

Skills

Software

- Artificial Intelligence (Tensorflow, Pytorch)
- Deep learning algorithms & Data analysis
- Machine learning model evaluation (including Foundation Models)
- Multi-Modal AI
- Multimodal Large Language Models (MLLMs)
- Weights & Biases
- Data Science and Data Curation
- Computer Vision (OpenCV), ImageJ / Fiji
- Python, C, C++, C#, & CUDA
- MATLAB (Scripting & Simulink)
- HTML, CSS, Java, and JavaScript

Hardware

- OrCad, LTspice, Pspice (Circuit Designing, PCB Designing, and Simulation)
- FPGA (Verilog & VHDL-XILINX Spartan and Virtex Kit), Digital Logic Hardware
- ModelSim, XILINX (Simulation)
- Assembly, Microcontroller Programming
- Processor Architecture
- Proteus (PCB Design & Simulation)

Certifications

The University of Edinburgh Oct 2025	Data Science in Stratified Healthcare and Precision Medicine
The Johns Hopkins University Oct 2025	Cancer Biology
The Johns Hopkins University Oct 2025	Introduction to Neurohacking In R
deeplearning.ai Aug 2020	Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning
Intel Corporation Dec 2020	An Introduction to Practical Deep Learning
deeplearning.ai Aug 2020	Neural Networks and Deep Learning
The Johns Hopkins University July 2020	COVID-19 Contact Tracing

Honors & Awards

- Awarded Best Poster Presentation for MICCAI 2025 FAIMI Workshop.
- Accepted as a Visiting Graduate Scholar at Mayo Clinic, Rochester, MN, USA.
- International Doctoral Student Award (IDSA) from the University of Waterloo.
- Graduate Research Studentship (GRS) from the University of Waterloo.
- Awarded a Full Scholarship for a master's in biomedical engineering at the National Taiwan University of Science and Technology, Taiwan.
- Awarded scholarship from COMSATS Institute of Information Technology, Islamabad, Pakistan, to present research paper in European Society for Magnetic Resonance in Medicine and Biology (ESMRMB) 2015 conference in Edinburgh, United Kingdom.
- Awarded a scholarship to study the fall 2014 semester at Duzce University, Turkey, as a visiting scholar.