

Ali Hussain

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RESEARCH INTERESTS

Visual Representation Learning; Multimodal Learning; Efficient Foundation Models and Knowledge Distillation; Reinforcement Learning for Embodied Intelligence and Robotic Control; Reinforcement Learning for Task-Driven Image Generation; Robust Computer Vision; Document Intelligence and Handwriting Recognition.

PUBLICATIONS

Ali Hussain, Rafay Ahmad, Momina Moetesum, Adnan Ul-Hasan, and **Faisal Shafait**. *Online Urdu Text-Line Recognition by Bridging Stroke Dynamics and Offline Representations*. **ICDAR, 2026**.

Nauman Riaz*, **Ali Hussain***, Saifullah Saifullah*, Muhammad Imran Malik, Stefan Agne, **Andreas Dengel**, and **Sheraz Ahmed**. *Mistaking Periodicity for Manipulation: JPEG-Induced Structural Bias in Document Tampering Detection*. **BMVC, 2026 (accepted)**. *Equal contribution among the first three authors.

RESEARCH EXPERIENCE

Undergraduate Researcher - Handwriting Recognition

TUCL-NUST R&D Center, NUST

Sep 2024 - Present

Islamabad, Pakistan

- Led the **end-to-end research and manuscript preparation** for a first-author ICDAR 2026 paper under Prof. Dr. **Faisal Shafait** and the supervisory team, owning problem formulation, dataset development, model design, implementation, experiments and analysis.
- Built an online Urdu handwriting dataset of **2,400+ text-line samples from 240+ writers**, capturing coordinates, pressure, tilt and temporal stroke dynamics.
- Designed and implemented **multimodal fusion of online ink trajectories and offline visual representations**, and evaluated transfer learning and fine-tuning for low-resource recognition.
- Improved character error rate from **4.21% to 3.66%** in the handwriting-recognition study, supported by model implementation and experimental analysis.

Research Intern - Efficient Vision & Edge AI

RPTU Kaiserslautern-Landau

Jun 2026 - Sep 2026

Kaiserslautern, Germany

- Conducted FYP research under Dr. **Christian Weis**, establishing experimental baselines for foundation-model distillation and edge deployment.
- Implemented **YOLO baselines** and evaluated **teacher encoders with linear classification heads** for pest detection and classification.
- Executed inference on **Raspberry Pi hardware** and measured power consumption and deployment performance, connecting model evaluation with physical hardware constraints.

Research Intern - Document Image Forensics

German Research Center for Artificial Intelligence (DFKI)

Jun 2025 - Aug 2025

Kaiserslautern, Germany

- Led **benchmark design, dataset sourcing and experimental implementation** for the investigation of JPEG-induced structural bias in document-tampering detection, working with Prof. Dr. **Andreas Dengel** and Dr. **Sheraz Ahmed**.
- Designed controlled evaluations across detectors, datasets, JPEG compression settings and manipulation alignments using **PyTorch, OpenCV and Python**.
- Characterized localization failures associated with **JPEG 8x8 block alignment**, experimentally investigating a collaborator's initial observation; contributed experiments and analysis to the accepted equal-contribution **BMVC 2026** paper.

EDUCATION

B.S. Computer Science

National University of Sciences and Technology (NUST)

2023 - 2027 (Expected)

Islamabad, Pakistan

- **CGPA: 3.38/4.00**. Coursework: Algorithms, Artificial Intelligence, Probability & Statistics, Machine Learning, Deep Learning.

ONGOING RESEARCH

Foundation-Model Distillation for Edge Inference (Final Year Project). Investigating distillation from large vision encoders into compact models, with pest detection and classification as evaluation tasks. Completed work includes YOLO baselines, teacher-encoder classification and hardware measurements; student architecture and distillation methodology are under development. *With Prof. Dr. Faisal Shafait (NUST) and Dr. Christian Weis (RPTU).*

Offline-to-Online Handwriting Generation and Trajectory Recovery. Defining methods and evaluation for recovering stroke trajectories from offline text images, with the aim of supporting low-resource recognition and cross-language transfer. *With Prof. Dr. Faisal Shafait (NUST).*

Generative Document Forgery and Robustness Analysis. Investigating reinforcement learning to adapt image-generation foundation models to generate forged document images for downstream tasks, including tampering detection and robustness evaluation. *With Prof. Dr. Andreas Dengel and Dr. Sheraz Ahmed (DFKI).*

PROJECTS

rh: Reproducible Research Utility for HPC
Personal Project

In Development
Python / Slurm

- Building a research management tool to keep code, datasets, experiments and results organized across multiple projects on a local machine and HPC cluster.
- Started the project after spending too much time and too many model tokens rebuilding context and coordinating work across separate research projects.
- Currently **under development and being tested on my own research projects** to refine the workflow and identify practical limitations.

INDUSTRY EXPERIENCE

Computer Vision Engineer
CCRIPT Agency

Apr 2026 - Present
Remote

- Develop end-to-end **computer vision pipelines** for client applications, covering detection, recognition, tracking and visual analysis.
- Carry models from experimentation through deployment, optimizing inference performance, reliability and operation in resource-constrained environments.

Automation Engineer - E-Commerce Systems
BloxPlaza.com

2023 - Present
Remote

- Designed and maintained **commercial automation systems** integrating Shopify APIs, inventory services and GUI-driven agents for digital fulfillment.
- Engineered **vision-driven GUI automation** using OCR, screen parsing, pixel-level detection and state-based decision logic for systems without programmatic interfaces.
- Built asynchronous fulfillment workflows with **state validation, monitoring, retries and failure recovery** to handle UI changes, network failures and partial executions.

AWARDS & LEADERSHIP

Lead Organizer, Google Developer Groups on Campus - NUST | 2026-2027.

High School Gold Medalist and 100% Scholarship Holder, Beaconhouse College Program.

ADDITIONAL EDUCATION

GCE A-Levels | Beaconhouse College Program, Multan, Pakistan | 2021-2023.

TECHNICAL SKILLS

Programming: Python, C/C++, JavaScript.

ML Frameworks: PyTorch, Hugging Face Transformers, Scikit-learn; knowledge distillation, LoRA.

Vision & Multimodal: OpenCV, object detection, tracking, OCR, handwriting recognition, vision-language models, diffusion models.

Systems: Linux, Git, Slurm, Docker, REST APIs, GPU/HPC environments; Raspberry Pi inference and power measurement.