YUSUF HASAN

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Research Interests

Deep learning, Computer vision, Cyber Security and Autonomous/Remotely Operated Vehicles

Education

- **B.Tech Computer Engineering |** *Zakir Husain College of Engineering and Technology, AMU* *2021 - 2025*
  8.67 CPI

Skills

Languages – Python, C/C++,Java
Technologies/Frameworks – Keras, Numpy, TensorFlow, Pandas, Matplotlib, OpenCV, Open3D, Pytorch
Tools – Git, Github,VS code, Visual Studio, Google Colab, Latex, Docker.
Operating System – Linux, Windows.
IoT – Arduino, Node MCU, Raspberry pi, Jetson Xavier, Electronic Speed Controller (ESC), Intel realsense, Actuators.
Web Development– HTML, CSS, Javascript, NodeJs, MYSQL.
Soft Skills – Communication, Teamwork, Creative Thinking, Adaptable and Critical Thinking.

Research Publications

- **"MicroCrackAttentionNeXt: Advancing Microcrack Detection in Wave Field Analysis Using Deep Neural Networks through Feature Visualization"** 🔗
  2025 MDPI Sensors
  Yusuf Hasan, Fatahlla Moreh, Bilal Zahid Hussain, Mohammad Ammar, Frank Wuttke, and Sven Tomforde
  In this study, we introduced MicroCrackAttentionNeXt, The key novelty of this model lies in its Adaptive Feature Reuse Block, which significantly improves feature utilization across different crack sizes.
- **"Hybrid Neural Network method for Damage Localization in Structural Health Monitoring"** 🔗
  2025 Nature Scientific Reports
  Yusuf Hasan, Fatahlla Moreh, Zarghaam Haider Rizvi, Frank Wuttke, Sven Tomforde
  This study emphasizes the evaluation of hybrid RNN-CNN models in comparison to the pure CNN models previously utilized in related research. Our proposed model incorporates a single RNN layer, complemented by essential supporting layers, which contributes to a reduction in complexity and a decrease in the number of parameters.
- **"MCMN Deep Learning Model for Precise Microcrack Detection in Various Materials"**🔗
  2024 International Conference on Machine Learning and Applications (ICMLA) Florida, USA
  Yusuf Hasan, Fatahlla Moreh, Zarghaam Haider Rizvi, Frank Wuttke, Sven Tomforde
  This paper presents the MicroCracksMetaNet50E (MCMN) deep learning model, inspired by Meta's Segment Anything Model (SAM). MCMN model incorporates a novel decoder architecture that sets it apart from traditional approaches.
- "**Wave-Based Neural Network with Attention Mechanism for Damage Localization in Materials**" 🔗
  2024 International Conference on Machine Learning and Applications (ICMLA) Florida, USA
  Yusuf Hasan, Fatahlla Moreh, Zarghaam Haider Rizvi, Frank Wuttke, Sven Tomforde
  Our work demonstrates the effectiveness of attention mechanisms in reducing network complexity while maintaining robust performance and was able to detect micro cracks.
- "**Real-time underwater video feed enhancement for Autonomous Underwater Vehicles (AUV)**" 🔗
  Multimodal Image Exploitation and Learning 2024 (SPIE Defense + Commercial Sensing 2024)
  Yusuf Hasan and Dr. Athar Ali
  Our research enhanced AUV-based underwater object detection using computer vision and deep learning models. We addressed visibility challenges and optical distortion in real-time through a real time image enhancement and object detection system.

Projects/Research

- **Perception and Control stack for Remotely Operated Vehicle (ROV)🔗:**
  - Developed a custom machine learning and computer vision algorithms to identify and classify objects based on their size, shape, texture, and other features.
  - Trained the model on a large synthetically generated dataset.
- **Drone-Nav-Agent 🔗:**
  - The Drone-Nav-Agent is a Deep Deterministic Policy Gradient (DDPG) reinforcement learning framework designed for training agents to navigate in a 2D point particle environment.
  - The system provides a complete end-to-end pipeline for DDPG-based continuous control learning, including environment simulation, agent training, comprehensive data logging, and trajectory analysis
  - The Point Particle Environment provides a continuous 2D navigation simulation for reinforcement learning training.
- **Android Malware Detection**
  - Developed a Machine Learning-based Android Intrusion Detection Systems
  - successfully developed a Machine Learning-based Android Intrusion Detection System.
  - This system leverages advanced machine learning techniques to identify and mitigate potential threats and malicious activities on Android devices.
- **GitHub Webhook Receiver with Flask + MongoDB 🔗 :**
  - This project implements a Flask-based webhook receiver that listens to GitHub events (push, pull_request, merge) and stores them in MongoDB.
  - A minimal frontend UI displays these events in real-time, refreshing every 15 seconds.

Professional Experiences

1. **Intern at University of Kiel Germany** **(June 2023 - Feb 2025)**
   - Did a research internship on "Crack Detection Using Neural Networks."
   - I worked on spatiotemporal data of ultrasonic sensors and experimented with several methodologies, such as Transformers, and other state of the art models like SAM by Meta, in order to develop an effective crack detection system.
   - Developed hybrid CNN-GRU architecture with custom loss functions and optimized activation layers, creating lightweight microservices for both batch and real-time inference .

2. **Intern at The University of Buckingham-UK** **(March-May 2023)**
   - Did a research internship on "Enhancing Underwater imaging using GAN based image augmentation" at *School Computing University of Buckingham* .
   - Our proposed model is a significant step towards opening up large underwater datasets to powerful computer Vision and machine learning algorithms will help boost underwater research.

Achievements

March 2024	**First Prize** winner in **MTS Nanda Student Innovation Award** presented by MTS India Section.
March 2023	Selected among top 25 student projects to represent the university in **MTS Nanda Student Innovation Award** presented by MTS India Section.
February 2023	**Third Prize** in *AMUROVc 2.0* a national level Remotely Operated Underwater Vehicle Challenge *organized by Marine Technology Society AUV-ZHCET Club, AMU*.

MOOCs and Online Certifications

- *Completed* – AI for Everyone: Master the Basics A course of study offered by IBM on EDX.
- *Completed* – Python A course offered by Kaggle.
- *Completed* – Intro to Machine Learning A course offered by Kaggle.
- *Completed*— Deep Learning A-Z TM: Hands-On Artificial Neural Network

Volunteer Experience

1. **Computer Team Lead : Marine Technology Society (MTS) AUV-ZHCET** **(2023-2025)**
   MTS AUV-ZHCET Club, Aligarh Muslim University
   - Managing, conceptualizing and organizing various technical events and developing OpenCV Algorithms for smooth functioning of the Autonomous Underwater Vehicle.
2. **Team Captain AMUROVc : Marine Technology Society (MTS) AUV-ZHCET** **(Feb 2023)**