M. HANAN GANI

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SUMMARY

I am driven by a desire to achieve my goals and contribute to the development of society by using technology to solve pressing issues. I am passionate about leadership, collaboration, problem-solving, and innovation, and I strive to embody these virtues in all that I do.

EDUCATION

- **Mohamed Bin Zayed University of Artificial Intelligence (MBZUAI)** *Abu Dhabi, UAE*
  Master of Science (MSc.), Machine Learning 2022-Present
  1st semester GPA: 3.8/4.0
  Supervisor: Dr. Salman Khan, Associate Professor (✉ Salman.Khan@mbzuai.ac.ae)
  Research Topics: Open-World Semantic Segmentation Using Vision-Language Models ; 3D Image Segmentation

- **National Institute of Technology (NIT)** *Srinagar, India*
  Bachelor of Technology (B.Tech), Electronics and Communication Engineering 2014-2018
  Overall GPA: 8.561/10 (Among top 5 of the class)

- **Saint Joseph's Higher Secondary School** *Baramulla, J&K (India)*
  Higher Secondary Part II (Class XII), JKBOSE 2014
  Percentage: 96% | Major in Physics, Chemistry, Mathematics and English (Among top 10 of roughly 35k students in the entire J&K state)

WORK AND RESEARCH EXPERIENCE

- **Mohamed Bin Zayed University of Artificial Intelligence (MBZUAI)** *Masdar city, Abu Dhabi, UAE*
  Research Assistant - Full time Sep 2021 - Sep 2022
  Senior Advisor: Dr. Mohammad Yaqub, Assistant Professor at MBZUAI, (mohammad.yaqub@mbzuai.ac.ae)
  Research Collaborations: Dr. Muzammal Naseer, Research Associate in CV lab, MBZUAI (muzammal.naseer@mbzuai.ac.ae)
  Lab: BiomedIA AI Lab, Computer Vision Department
  Highlights of Research:
  ☐ ***Improving performance of Vision Transformers on small-scale datasets***: We propose a self-supervised weight learning scheme from low-resolution views created on small datasets. This serves as an effective weights initialization to successfully train ViTs from scratch, thus eliminating the need for large-scale pre-training.
  ☐ ***Meta-Contrastive Transfer learning*** : We propose a new meta-learning based transfer learning paradigm for Improving Transfer Learning in medical images by embedding the model architectures and dataset samples in a joint embedding space and using contrastive learning to select the best model-dataset pair irrespective of image modality, domain, organ, pathology [in process of submission to TMI journal] (Work done in collaboration with Shikhar Srivastava <Shikhar.Srivastava@mbzuai.ac.ae> and Dr. Ibrahim Almakky <Ibrahim.Almakky@mbzuai.ac.ae>).

- **Fatima Fellowship - One year Predoctoral Fellowship in Artificial Intelligence (fatimafellowship.com)** *U.S.A*
  Fatima Fellow April 2021 - Dec 2021
  Mentor: Dr. Abubakar Abid, Machine Learning Lead at Hugging Face Inc (USA), Founder at Gradio Inc, PhD at Stanford University (a12d@stanford.edu)
  Highlights of Research: ***Multi-Task learning (MTL)*** is a challenging research area in deep learning. Under Fatima Fellowship, I worked with Dr. Abubakar Abid in exploring new realms of doing smart Multi-Task learning (MTL) in order to make AI algorithms capable of doing multiple tasks at a time with limited computational cost. Our approach is based on exploiting the class-token and self-attention mechanism of Vision Transformers (ViT's) in order to train multiple tasks through a single ViT, more efficiently and with limited computational budget. (Project demo code: https://github.com/hananshafi/MTL-ViT).

- **Harman International - Connected Car R&D (Samsung)** *Bengaluru, India*
  Machine Learning Research Engineer Oct 2018 - September 2021
  Subdivision: Harman Connected Car R&D
  Subgroup: Global Test Automation (GTA) - Machine Learning R&D Team
  Projects and Research work:

  ☐ ***Screen Reliability - detecting anomalies on HMI screens***: The project is based on detecting anomalies in a continuous video stream (on HMI screen) using deep learning based anomaly detection. Our approach is based on using a convolutional Auto-encoder network and conditional Generative Adversarial Network inspired from the 'GANomaly' paper. (currently being used in production at Harman facilities)

  ☐ ***Test Case Recommender: Mapping contextually similar texts together using SBERT*** : The project has been integrated to fix the automation issues faced by the company on daily basis, which can be fixed by running the relevant test cases pertaining to the issues. In case of a software run failure / crash, our SBERT based machine learning model maps the prompt from the failure logs to the relevant test cases, thereby fixing the failure scenarios (currently being used in production at Harman facilities)

  ☐ ***Log Failure Categorization***: This project is based on extracting useful information regarding the cause of failure from plethora of error logs generated from various test executions. A machine learning pipeline is developed which classifies failure text logs into two categories depending on whether the failure was from software side or hardware side. (currently being used in production at Harman facilities)

  ☐ ***Hybrid Icon Detection Model***: Developed a Hybrid Deep Learning Icon Detection Model that can detect various icons on HMI screen images. The model is robust to any kind of changes like background variations, screen or icon scaling, resolution changes and icon shape changes.

The hybrid implementation combines the results from deep learning model and statistical machine learning model, and gives the final bounding box outputs. (currently being used in production at Harman facilities)

☐ ***Word to Vec similar Issue Recommender***. This project is based on recommending similar issue fixes in the past given a new issue. A software issue in the form of sentence prompt is fed as input and a Word2Vec model (trained on large corpus of data) converts this information into an embedding vector which is matched with the embedding vectors of previous records in the database. On the basis of cosine similarity score, the model recommends similar types of software issues that had been fixed in the past. It gives an idea to the user / developer as to what fix could be applied to the issue. (currently being used in production at Harman facilities)

- **Indian Institute of Science (IISc)** *Bengaluru, India*
  Deep Learning and Computer Vision Researcher Full time: Dec 2017 - Feb 2018 , Part time: March 2018 - June 2018
  Lab: Computational Intelligence & UAV Lab, Aerospace Engineering Department, IISc
  Highlights of Research: Carried out extensive research in Deep Learning and Computer Vision and worked on Project ***Disguised Facial Recognition using Deep Learning***. This research project presents a novel approach for disguised facial recognition using a novel Deep Convolutional Neural Network which detects 20 essential key-point features on face. These 20 key-point features are then utilized by an artificial neural network for recognition task. The performance achieved state of the art results. The system is also tested in real time on a UAV, working at 19 FPS, thus almost performing in real time.

- **National Institute of Technology (NIT)** *Srinagar, India*
  Student Researcher October 2017 - June 2018
  Supervisors: Dr. Shahid Mehraj Shah (Assistant Professor, NIT Srinagar, mail: shahidshah@nitsri.net), Dr. G. R. Begh (Associate Professor, NIT Srinagar, mail: grbegh@nitsri.ac.in)
  Project work: ☐ ***Machine learning based channel estimation***: Developed an efficient Machine Learning based method to estimate Channel Parameter 'H' in Wireless Communication System. 'H' parameter presents sum total of all the factors influencing the input signal when it travels from source to receiver and is represented as Gaussian Noise. The motive is to get the original sent input. To accomplish this, I exploited the Machine Learning technique of Least Squares Estimation to estimate 'H' parameter. (full Proficiency).
  ☐ Developed a ***Real time Emotion Recognition System*** that recognizes five types of emotions from facial expressions: sad, happy, angry, surprise and neutral. A standard (sequential) and inception style CNN architectures were deployed and separately trained on FER benchmark dataset. The test set results were used to compare the performance of the two architectures.

- **Independent and External Collaborations** March 2020 - May 2020
  ☐ ***Detecting Alzheimer's patient from linguistic cues: A case study involving performance comparison of various deep learning approaches***: (collaboration with a PhD student from SMVD University, India [18dcs006@smvdu.ac.in]). This research project is based on detecting Alzheimer's patients from their language pattern. The dataset used is the Dementia Bank dataset containing the audio transcripts of individuals on the task of "Recall Test". Three neural net models (LSTM, BiLSTM, CNN-LSTM) and two transformer based models (BERT & XLNET) were separately trained with same set of data and the performance comparison was done on the basis of test set accuracy, F1 and ROC/AUC scores. BERT and XLNET were found to be outperforming all the other models. The model and related metrics are available in my GitHub repository (github.com/hananshafi/Alzheimer-s-Detection).
  ☐ ***Detection of Novel Corona Virus (COVID-19) from Chest X-Rays***: Developed a Deep Learning model that can detect COVID-19 from chest X-Rays. The model is trained on limited publicly available dataset and can predict two classes: COVID-19 and NON-COVID-19 (Pneumonia Viral, Pneumonia Bacterial and Normal). This work got featured in "COVID-19 Open Innovation Challenge" workshop organized by the Innovation, Incubation and Entrepreneurship Development (IIED) center at NIT Srinagar. It was one of the earliest works globally in detecting COVID-19 done at the onset of April 2020.

PUBLICATIONS

- **Hanan Gani**[*], Muzammal Naseer, Mohammad Yaqub. *"How To Train Vision Transformer On Small-scale Datasets?"*. In proceedings of **33rd British Machine Vision Conference (BMVC)**, UK, 2022. **arXiv:2210.07240 [cs.CV]**
- S. Kumaar, A. Majeedi, A. Dogra, **H. Gani**, R. M. Vishwanath and S N Omkar. *"Disguised Facial Recognition using Neural Networks"*. **IEEE 3rd International Conference on Signal and Image Processing (ICSIP)**, Shenzhen, China, 2018, pp. 28-32. doi: 10.1109/SIPROCESS.2018.8600440
- Saumya Kumaar, Abrar Majeedi, **Hanan Gani**, Abhinandan Dogra, Ravi M. Vishwanath and S N Omkar. *"A Supervised learning Methodology for Real time Disguised Facial Recognition in Wild"*. Published on **arXiv:1809.02875[cs.CV]**. Accepted to **2018 ACM International Conference on Robotics and Computer Vision (ICRCV)**, Nov 17-18, Thailand.

PATENTS

- Hanan Gani, Muzammal Naseer, Mohammad Yaqub. *"System and Method of Training Vision Transformer on Small-Scale Datasets"*. USPTO application no.: 18089107. Passed all three stages of assessment. **US Patent** filed (in process).

REVIEW ARTICLES (BLOG POSTS)

- Aminul Huq, Mohammad Hanan Gani, Ammar Sherif, Abubakar Abid, "How to Do Multi-Task Learning Intelligently", The Gradient, 2021 How to Do Multi-Task Learning Intelligently

RESEARCH INTERESTS

☐ Vision-Language Models ☐ Self-supervised learning ☐ Open-World Semantic Segmentation ☐ Multi-Task Learning ☐ Data-Efficient Vision Transformers ☐ Causal Inference in Machine Learning ☐ 3D Computer Vision ☐ 3D Medical imaging

TECHNICAL AND PROGRAMMING SKILLS

☐ ML and deep learning Libraries & Frameworks: Keras, Tensorflow, Pytorch, OpenCV, Scikit-learn ☐ Python programming, Python for Machine learning and Data Science ☐ MATLAB, SciLab (Limited proficiency) ☐ C Programming, HTML, Databases: {MySql,NoSql MongoDB}, WebAPI Hosting, C#, Flask.

RELEVANT UNIVERSITY COURSEWORK AND MOOC'S TAKEN

☐ Machine Learning (ML-701), Foundations of Artificial Intelligence (AI-701), Mathematics (MTH-701) - MSc. Credit Courses
☐ Random Processes (ECE-505), Image Processing (ECE-019E), Mathematics (MTH-101, 201, 306, 403) - B.Tech Credit Courses
☐ Build Generative Adversarial Networks course via coursera.org & deeplearning.ai
☐ AI for medical diagnosis course via coursera.org & deeplearning.ai
☐ Deep Learning - 5 courses (16 weeks) Specialization by Andrew Ng via coursera.org & deeplearning.ai
☐ Machine learning - 4 courses (24 weeks) Specialization | University of Washington via coursera.org
☐ Machine Learning | Stanford University via coursera.org
☐ A crash course in Data Science | Johns Hopkins University via coursera.org
☐ Python programming and Python data Structures: 10 weeks course | University of Michigan via coursera.org

AWARDS, SCHOLARSHIPS, ACHIEVEMENTS AND INVOLVEMENTS

☐ Selected as one of the few candidates to participate in the Google India Research Week 2022. *Jan 2022*
☐ Recipient of the Fatima Fellowship, a one year predoctoral research fellowship in Machine Learning. *March 2021*
☐ Received Harman Star Excellence award from the Harman International (Global Test Automation) India (Regional) Head for developing two machine learning solutions which are currently helping the Automation teams in India to save a time effort of 2 hours daily *September 2020*
☐ Presented a talk on the "Role of AI in Education" at the Arifeen School of Excellence (ASE) Orientation program held in Baramulla (Kashmir, India) *May 2020*
☐ Participation in COVID-19 Open innovation challenge workshop by IIED centre NIT Srinagar, where my independent project "Detection of COVID-19 from chest X-Rays using Deep learning" got featured in the creative and innovative section. *May 2020*
☐ Merit Based Scholarship granted for undergraduate studies by Ministry of Minority Affairs, India. *August 2016 - April 2018*
☐ Certificate of Appreciation for teaching at Super 50 - A Government institute for preparing deserving underprivileged students for professional engineering examinations.
☐ Organizing member and Participant of workshop 'AI powered UAV's (drones) for agricultural purposes' organized at Department of Aerospace Engineering and Shockwave Research, Indian Institute of Science (IISC), Bengaluru. *Jan 2018*
☐ Secured 80th state rank in IIT-JEE Mains 2014 (among top 1% of 1.5 million students across the country). *June 2014*
☐ Best Outgoing student of the school. *November 2013*

SOCIAL CAUSE AND VOLUNTEERSHIP

- **'Rivero'** - An initiative for Social Change *Baramulla, Kashmir, India*
  Co-Founder Dec 2016 - Present
  Highlights: Rivero is an NGO based in Kashmir which aims at counseling students for various career options and conducting events and workshops for expressing ideas to bring about a social change. Rivero is pretty successful in conducting numerous educational events and workshops and counsel up-to 2000 students till now with majority being underprivileged and conflict affected students of Kashmir.

EXTRACURRICULAR ACTIVITIES & HOBBIES

☐ Active participation in trekking, camps, and sports activities such as cricket, table tennis, football, badminton etc.
☐ Social Networking and Communication
☐ Watching sports activities
☐ Reading technological stuff

REFERENCES

1. **Dr. Salman Khan**, Associate Professor, Mohamed Bin Zayed University of Artificial Intelligence, Abu Dhabi, UAE
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2. **Dr. Muzammal Naseer**, Research Scientist, Mohamed Bin Zayed University of Artificial Intelligence, Abu Dhabi, UAE
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3. **Dr. Abubakar Abid**, Machine Learning Lead, Hugging Face Inc, USA
   ✉ a12d@stanford.edu Homepage
4. **Dr. Mohammad Yaqub**, Assistant Professor, Mohamed Bin Zayed University of Artificial Intelligence, Abu Dhabi, UAE
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