Mohamed Afham

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"A self-motivated individual equipped with the strong fundamental knowledge and passionate in solving real-world problems with open source cutting edge research contributions in Computer Vision and Machine Learning."

Research Interests

- Computer Vision
- Self-Supervised Learning
- Video Modeling
- 3D Vision

Experience

Meta AI, New York, USA July 2022 - Present
AI Resident
Advisors: Dr. Penchuan Zhang, Dr. Omid Poursaseed, Dr. Satya Narayan Shukla

- Initiating and leading the research project on video-modeling.
- Investigating to improve long-range video processing techniques' efficiency (accuracy and speed).
- Survey on the existing self-supervised video models and analyzing the drawbacks of them when applied to long-form videos.

Machine Vision Research Group, University of Moratuwa, Sri Lanka Apr 2021 - May 2022
Undergraduate Thesis Research Student
Advisor: Dr. Ranga Rodrigo

- Research on leveraging self-supervised contrastive learning for 3D point cloud understanding.
- Exploring the possibility of Few-Shot Learning, Meta-Learning settings in 3D point clouds.

VeracityAI, Colombo, Sri Lanka Jun 2021 - Feb 2022
Associate Machine Learning Engineer - Part time

- Research and development of state-of-the-art algorithms for vehicle damage detection system
- Experimenting with real-world dataset of vehicle damages with the developed algorithms
- Development of algorithms for PDR pattern recognition in car to facilitate better damage detection.

MBZUAI, Abu Dhabi, UAE Oct 2020 - Apr 2021
Research Assistant - Internship
Advisor: Dr. Salman Khan

- Worked as a research assistant for the computer vision department in the university research division.
- Experimentation on available Vision + Language models to facilitate few-shot image classification.
- Research on Few Shot Learning with focus on leveraging natural language descriptions to improve few-shot image classification.

Education

University of Moratuwa, Sri Lanka Aug 2017 - June 2022
CGPA: 3.84 (First Class Honours)
B.Sc (Hons) - Electronics and Telecommunication Engineering Dean's List: Semester 1,2,4,6,7,8

St. Joseph's College, Trincomalee, Sri Lanka Grad: Aug 2016
GCE Advanced Level Z - Score: 2.78
High Distinctions for Combined Mathematics, Chemistry, Physics and General English
District Rank : 2, National Rank : 11 (out of $\sim$ 35, 000 candidates)

MOOCs
Python for Data Science and Machine Learning Bootcamp (on Udemy) Certificate earned - June 2019
Deep Learning: 5-course specialization (on Coursera) Certificate earned - May 2020
Mathematics for Machine Learning Specialization (on Coursera) Certificate earned - Dec 2019

Publications

Mohamed Afham, Isuru Dissanayake, Dinithi Dissanayake, Amaya Dharmasiri, Kanchana Thilakarathna and Ranga Rodrigo, **CrossPoint: Self-Supervised Cross-Modal Contrastive Learning for 3D Point Cloud Understanding** *(CVPR 2022)*

Mohamed Afham and Ranga Rodrigo, **Visual-Semantic Contrastive Alignment for Few-Shot Image Classification** *(ECCV 2022, Workshop on Computer Vision in the Wild)*

Amaya Dharmasiri, Dinithi Dissanayake, **Mohamed Afham**, Isuru Dissanayake, Ranga Rodrigo and Kanchana Thilakarathna, **3DLatNav: Navigating generative latent spaces for semantic aware 3D object manipulation** *(ECCV 2022, Workshop on Learning to Generate 3D Shapes and Scenes)*

Mohamed Afham, Udith Haputhanthri, Jathurshan Pradeepkumar, Mithunjha Anandakumar, Ashwin De Silva and Chamira Edussooriya, **Towards Accurate Cross-Domain In-Bed Human Pose Estimation** *(ICASSP 2022)*

Mohamed Afham, Salman Khan, Muhammad Haris Khan, Muzammal Naseer and Fahad Shahbaz Khan, **Rich Semantics Improve Few-Shot Learning** *(BMVC 2021)*

Research Projects

Long-range Video Representation Learning Jul 2022 - Present
AI Residency Program at Meta AI

- Comparing the discrepancy in computational cost of video modeling by analyzing different frame-sampling techniques.
- Evaluating the performance of various feature aggregation mechanisms to fuse the frame-level features for efficient video-modeling.

3D Point Cloud Understanding May 2021 - Apr 2022
Final Year Thesis Project

- Investigation on leveraging self-supervised, contrastive learning for better point cloud understanding.
- Developing a novel self-supervised architecture involving 3D-2D correspondence for better 3D point cloud representation learning.
- Exploring non-linear transformation of 3D point cloud objects using an 3D autoencoder.
- Outcome: `https://arxiv.org/abs/2203.00680`

Few-Shot Learning Oct 2020 - June 2022

- Research and experimentation on state-of-the-art few-shot image classification methods
- Analysis on integrating natural language descriptions to improve few-shot image-classification
- Exploring the contribution of contrastive vision + language learning setting for few-shot image classification.
- Outcome: `https://arxiv.org/abs/2104.12709`, `https://arxiv.org/abs/2210.11000`

In bed Human Pose Estimation June 2021 - Oct 2021

- Research and experimentation with state-of-the-art methods for domain adaptation in in-bed pose estimation
- Analysis on various domain adaptation techniques for pose estimation
- Implementing a cycle-GAN based data augmentation technique with knowledge distillation to perform in-bed pose estimation in unseen domain.
- Outcome: `https://arxiv.org/abs/2110.03578`

Selected Undergraduate Projects

Few-Shot Image Classification using Memory Augmented Neural Networks 2020

- 10 way 1-shot classification was implemented using Meta Learning Approach.
- Memory Augmented Neural Network cell was implemented from the scratch using tensorflow and keras.
- Accuracy of 99% was obtained by using 128 units LSTM layer as the controller network.

Github Link, *Blog Article*

Deep Neural Network for ECoG Handpose Detection 2020

- Implemented a single layer LSTM to decode pre-processed ECoG signals.
- Performed Multi-Class classification and obtained 84% accuracy in the given dataset.

Customer Churn Prediction 2020

- Based on the purchase pattern of a customer for the past 36 months, he/she has to be predicted whether is a churn customer or not for the following 2 months.
- A new Data Set was formed from the given raw data of 36 months (Jan 2017 - Dec 2019) to feed to LightGBM model.
- An Accuracy of 83 % was obtained and emerged as the Runners Up of the competition.

COVID-19 patients detection in crowd using cough samples 2020

- Aim of the project is to deploy a model which differentiate COVID-19 likely people in crowd using the cough sounds.
- A simple CNN based architecture is employed over the spectrogram of the training samples.

Github Link

Twitter Sentiment Analysis 2019

- Developed a supervised learning model classifiy the user tweets as positve and negative.
- Used NLP libraries such as NLTK and TextBlob for text preprocessing and scikit-learn for ML modelling.
- Accuracy of 93% was obtained using naive bayes classifier model.

Github Link, *Blog Article*

American Sign Language Gestures Classification 2019

- Aim of the project is to classify American Sign Language Gestures in real-time using the data obtained from Myo Armband.

Github Link

Selected Awards / Hackathons

Student Spotlight - Electronic Club, University of Moratuwa 2022

- Featured as the student spotlight in the October 2022 issue of E-carrier magazine

SPS Travel Grant - IEEE Signal Processing Society 2022

- Awarded with a travel grant to attend IEEE ICASSP 2022 and present the accepted paper.

2nd Runner Up - Video and Image Processing Cup, IEEE ICIP, Alaska, USA (Virtual) 2021

- Proposed a novel solution leveraging cycle-GAN data augmentation and knowledge distillation to perform in-bed human pose estimation in unseen domain.

IEEE SMC Winners - BR41N.io hackathon, IEEE SMC Conference, Toronto 2020

- Proposed a deep learning based solution leveraging LSTM model to classify ECoG signals depicting 3 types of hand poses.

Runner Up - DataStorm v1.0, Organized by Rotaract Club of University of Moratuwa 2020

- Implemented LigthGBM model to forecast customer churn based on their previous purchasing history.

Ranked 191st in the world - IEEExtreme 13.0 2019

- 24-hour algorithmic programming competition took part by more than 4000 teams worldwide. We ranked 9th in the country.

Champions - Intellihack v1.0, Organized by University of Colombo School of Computing 2019

- Developed an End-to-End machine learning solution for the problem of American sign language classification.

Bronze Medalist - International Mathematics Competition for University Students, Blagoevgrad, Bulgaria 2018

- A mathematics problem solving competition taken part by over 350 undergraduates from 70+ Universities around the world.

Participant - Asian Physics Olympiad, Yakutsk, Russia 2017

Honorable Mention - International Mathematics Olympiad (IMO), Chiang Mai, Thailand 2015

- A mathematics problem solving competition for high school students taken part by over 600 participants from 100+ countries.

Merit Award - International Mathematics Competition, Daejeon, Korea 2014

Gold Medalist - Sri Lanka Physics Olympiad 2016

- A nation-wide physics problem solving competition

Talks / Presentations

CrossPoint Presentation - CVPR, New Orleans, USA 2022

Towards Accurate Cross-Domain In-Bed Pose Estiamtion Oral Presentation - ICASSP, Singapore 2022

Rich Semantics Improve Few-Shot Learning Presentation - BMVC, Virtual 2021

- Video Presentation

Invited talk on What is Machine Learning - Virtual 2022

- Youtube Link

Invited talk on stepping into ENTC - Virtual 2022

- Link

Skills

Languages: Python, MATLAB

Frameworks: PyTorch, Tensorflow, Keras

Cloud Computing: AWS (EC2, S3), Microsoft Azure (VM)

Utilities: PyCharm, VSCode, Git

Relevant Courseworks

Computer Vision: EN2550 Fundamentals of Image Processing and Machine Vision **(A)**, EN4553 Machine Vision (**A**), EN4583 Advances in Machine Vision **(A+)**
Mathematics: MA2023 Calculus **(A+)**, MA 2033 Linear Algebra **(A+)**, MA4043 Neural Network and Fuzzy Logic (**A**), MA4033 Time Series and Stochastic Processes **(A-)**
Miscellaneous: EN1060 Signals and Systems **(A)**, EN2570 Digital Signal Processing **(A)**, CS2022 Data Structures and Algorithms **(A-)**, EN2040 Random Signals and Processes **(A-)**

Volunteering and Professional Services

Co - Supervisor 2022

- Advising a final year thesis group working on few-shot learning along with Dr. Ranga Rodrigo.

Invited Reviewer 2021 - 2022

- CVPR 2022 (h5-index: 356)
- ECCV 2022 (h5-index: 197)
- IROS 2022 (h5-index: 73)
- IET Computer Vision (IF: 0.38)

Student Representative 2021 - 2022

- Department of Electronic and Telecommunication Engineering, Batch of 2017

Overall Coordiantor - Career Fair organized by Electronic Club, University of Moratuwa 2022

Global Volunteer - AIESEC in Hungary 2019

- Worked as a volunteer to teach english language to Hungarian high school students for 6 weeks. Obtained inter-cultural experience, working with similar volunteers from over 10 countries.

President - Majlis-Ul-Islam, University of Moratuwa 2021

Project Chair - YES YOU CAN, Majlis-Ul-Islam, University of Moratuwa 2018