

# MOHAMED AFHAM

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"A self-motivated individual equipped with 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
- Machine Learning
- 3D Vision
- Self-Supervised Learning

## EDUCATION

**University of Moratuwa, Sri Lanka** Aug 2017 - Present (Expected Graduation: May 2022)  
**CGPA: 3.79** (First Class Honours)  
B.Sc (Hons) - Electronics and Telecommunication Engineering Dean's List: Semester 1,2,4,6

**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 ~ 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

## EXPERIENCE

**Machine Vision Research Group, University of Moratuwa, Sri Lanka** Apr 2021 - Present  
*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.

**Syntax Genie, Colombo, Sri Lanka** Feb 2022 - Present  
*Machine Learning Engineer - Part time*

- Analysis on self-supervised learning algorithms for anomaly recognition in a real-world dataset.
- Implementation of state-of-the-art one class classification algorithms for outlier detection.

**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.

## PUBLICATIONS / PREPRINTS

**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**, 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

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### 3D Point Cloud Understanding

May 2021 - Present

*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 a 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>

### 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>

### Few-Shot Learning

Oct 2020 - June 2021

- 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>

## SELECTED UNDERGRADUATE PROJECTS

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### 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.
- The model was able to achieve around 90 % accuracy in detecting the patients.

*Github Link*

### Twitter Sentiment Analysis

2019

- Developed a supervised learning model classify the user tweets as positive 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.

- An SVM based classifier is used to train the model.

*Github Link*

## SELECTED AWARDS / HACKATHONS

<b>SPS Travel Grant</b> - IEEE Signal Processing Society	2022
<ul style="list-style-type: none"> <li>• Awarded with a travel grant to attend IEEE ICASSP 2022 and present the accepted paper.</li> </ul>	
<b>2nd Runner Up</b> - Video and Image Processing Cup, IEEE ICIP, Alaska, USA (Virtual)	2021
<ul style="list-style-type: none"> <li>• Proposed a novel solution leveraging cycle-GAN data augmentation and knowledge distillation to perform in-bed human pose estimation in unseen domain.</li> </ul>	
<b>IEEE SMC Winners</b> - BR41N.io hackathon, IEEE SMC Conference, Toronto	2020
<ul style="list-style-type: none"> <li>• Proposed a deep learning based solution leveraging LSTM model to classify ECoG signals depicting 3 types of hand poses.</li> </ul>	
<b>Runner Up</b> - DataStorm v1.0, Organized by Rotaract Club of University of Moratuwa	2020
<ul style="list-style-type: none"> <li>• Implemented LighGBM model to forecast customer churn based on their previous purchasing history.</li> </ul>	
<b>Ranked 191<sup>st</sup> in the world</b> - IEEEExtreme 13.0	2019
<ul style="list-style-type: none"> <li>• 24-hour algorithmic programming competition took part by more than 4000 teams worldwide. We ranked 9th in the country.</li> </ul>	
<b>Champions</b> - Intellihack v1.0, Organized by University of Colombo School of Computing	2019
<ul style="list-style-type: none"> <li>• Developed an End-to-End machine learning solution for the problem of American sign language classification.</li> </ul>	
<b>Bronze Medalist</b> - International Mathematics Competition for University Students, Blagoevgrad, Bulgaria	2018
<ul style="list-style-type: none"> <li>• A mathematics problem solving competition taken part by over 350 undergraduates from 70+ Universities around the world.</li> </ul>	
<b>Participant</b> - Asian Physics Olympiad, Yakutsk, Russia	2017
<b>Honorable Mention</b> - International Mathematics Olympiad (IMO), Chiang Mai, Thailand	2015
<ul style="list-style-type: none"> <li>• A mathematics problem solving competition for high school students taken part by over 600 participants from 100+ countries.</li> </ul>	
<b>Merit Award</b> - International Mathematics Competition, Daejeon, Korea	2014
<b>Gold Medalist</b> - Sri Lanka Physics Olympiad	2016
<ul style="list-style-type: none"> <li>• A nation-wide physics problem solving competition</li> </ul>	

## RELEVANT COURSEWORKS

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

## SKILLS

<b>Languages:</b> Python, MATLAB	<b>Cloud Computing:</b> AWS (EC2, S3), Microsoft Azure (VM)
<b>Frameworks:</b> PyTorch, Tensorflow, Keras	<b>Utilities:</b> PyCharm, VSCode, Git

## VOLUNTEERING AND PROFESSIONAL SERVICES

<b>Invited Reviewer</b>	2021 - 2022
<ul style="list-style-type: none"> <li>• CVPR 2022 (h5-index: 356)</li> <li>• ECCV 2022 (h5-index: 197)</li> <li>• IET Computer Vision (IF: 0.38)</li> </ul>	
<b>Student Representative</b>	2021 - 2022
<ul style="list-style-type: none"> <li>• Department of Electronic and Telecommunication Engineering, Batch of 2017</li> </ul>	
<b>Overall Coordinantor</b> - Career Fair organized by Electronic Club, University of Moratuwa	2022
<b>Global Volunteer</b> - AIESEC in Hungary	2019
<ul style="list-style-type: none"> <li>• 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.</li> </ul>	

<b>President</b> - Majlis-UI-Islam, University of Moratuwa	2021
<b>Project Chair</b> - YES YOU CAN, Majlis-UI-Islam, University of Moratuwa	2018
<ul style="list-style-type: none"> <li>• Series of Mathematics Seminars based on GCE(O/L) curriculum in Sri Lanka</li> </ul>	
<b>Participant</b> - Sakura Science Exchange Program in Science, Japan	2017
<ul style="list-style-type: none"> <li>• A science tour to Japan experiencing the culture and education there, sponsored by the Institute of Science and Technology, Japan for the outstanding students at the GCE (A/L) examination 2016.</li> </ul>	

## REFERENCES

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*Available Upon Request.*