K.T. Yasas Mahima

Colombo,Sri Lanka

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RESEARCH INTEREST

Machine Learning, Deep Learning, Computer Vision, Robotics, Robust & Trustworthy AI, Multi-spectral Image Processing, Autonomous & Unmanned Vehicular Systems

EDUCATION

University of New South Wales (UNSW) **Canberra ACT, Australia**
PhD in Computer Science & Electrical Engineering *2023-2027*

Major Research Areas: Computer Vision, Robust Intelligent Systems, Autonomous Vehicles
Supervisors:
1. Prof. Matthew Adam Barry Garratt
2. Dr. Sreenatha Gopalarao Anavatti
3. Dr. Godagama Vidana A G Asanka Perera

University of Westminster **London, United Kingdom**
B.Eng (Hons) in Software Engineering *2018-2022*

Grade: First Class Honours (Average - 87%).
Awards:
1. Dr. Gamini Wickramasinghe Gold Medal for Academic Excellence (Batch Top).
2. Best Final Year Research Project Award by Circles.Life Singapore.
Studied at: Informatics Institute of Technology, Sri Lanka.

RESEARCH & TEACHING EXPERIENCE

Research Assistant **Colombo, Sri Lanka**
University of Colombo School of Computing *January 2022 - present*

- **Research** - Autonomous Visual Detection of Bio-hazards Locations with Aerial Drones.
- **Responsibilities** - Investigating a solution to identify if the water indeed is a potential breeding place and whether or not it contains mosquito larvae using Computer Vision, Image Processing, Geographical Information Processing and Signal Processing with Unmanned Ariel Vehicles (UAVs).
- **Collaborators** - Digital Futures by KTH Royal Institute of Technology, Uppsala University and RISE Sweden.
- **Supervisors** -
  - Prof. Markus Markus Flierl : mflierl@kth.se
  - Dr. Kasun De Zoysa : kasun@ucsc.cmb.ac.lk

Visiting Lecturer **Colombo, Sri Lanka**
Informatics Institute of Technology (IIT) *November 2022 - present*

- **Responsibilities** - Conducting lectures and tutorial sessions for the university of Westminster, software engineering and computer science students.
- **Subjects** -
  - Object Oriented Programming : 5COSC019C
  - Database Systems : 5COSC020C

Undergraduate Research Fellow (Remote) **Milton Keynes, United Kingdom**
SEAD Research Group, The Open University, United Kingdom *July 2021 - October 2022*

- **Research** - DroneBox: Automated Adaptive Collection of Unmanned Aerial Vehicle Flight Data.
- **Responsibilities** - Experiment and devise a solution for querying the blockchain data to effectively answer the forensic questions using the interactive simulation web application. Develop other necessary functionalities of the blockchain and the simulation application. Produce required documents of the research development process.
- **Supervisors** -
  - Prof. Arosha K. Bandara : arosha.bandara@open.ac.uk
  - Prof. Andrea Zisman : andrea.zisman@open.ac.uk

PUBLICATIONS

2023-Present

- Damitha Sandaruwan, Kodikara N.D., Piyumi Radeeshani, **Mahima, K.T.Yasas**, Chathura Suduwella, Sachintha Pitigala, Jayasundara Mangalika. "User Perceive Realism of Machine Learning-based Drone Dynamic Simulator." International Journal of Advanced Computer Science and Applications. 14. 884. 10.14569/IJACSA.2023.0140196 (2023).
  - **Summary** : Proposed a novel machine learning-based approach integrated with a virtual reality environment to dynamically simulate the custom-made drones. Research validations carried out using real-world drone manoeuvres and user tests demonstrate that proposed machine learning models are able to provide accurate simulations.

2022-2023

- **Mahima, K.T.Yasas**,Weerasekara, Malith, Kasun De Zoysa, Markus Flierl, Luca Mottola, and Thiemo Voigt. "MM4Drone - A Multispectral Image and MmWave Radar Approach for Identifying Mosquito Breeding Grounds via Aerial Drones." 16th EAI International Conference on Pervasive Computing Technologies for Healthcare (2022)
  - **Summary** : This paper introduced multi-spectral imagery and mmWave radar-based approach to detect water retention areas. In particular, this introduces Faster-RCNN-MSWD, an extended version of the Faster R-CNN object detection network to detect water retention areas via drone-acquired multi-spectral images.

- **Mahima, K.T.Yasas**, Weerasekara, Malith, Kasun De Zoysa, Markus Flierl, Luca Mottola, and Thiemo Voigt. "Fighting Dengue Fever with Aerial Drones" International Conference on Embedded Wireless Systems and Networks (EWSN) (2022)
  - **Summary** : This paper investigates the applicability of using multi-spectral images and mmWave radios to detect water retention areas. The multi-spectral indices and bathymetric log-ratio algorithms' adequacy are examined to detect shallow water and calculate the water depth via the images taken from a drone-based multi-spectral camera.

- **Mahima, K.T.Yasas**, Mohamed Ayoob and Guhanathan Poravi. "An Assessment of Robustness for Adversarial Attacks and Physical Distortions on Image Classification using Explainable AI." AI-Cybersec@SGAI (2022). : **PDF**
  - **Summary** : Using a set of Explainable AI algorithms, this study investigates deep learning networks' decision-making process and how it captures the pixel attributes for the predictions when the model inference gets adversarial inputs from man-made attacks or physical world corruptions. This demonstrates a connection between adversarial attacks and physical world adversarial conditions in order to introduce a generalized adversarial defense method.

2021-2022

- **Mahima, K.T.Yasas**, Mohamed Ayoob and Guhanathan Poravi. "Adversarial Attacks and Defense Technologies on Autonomous Vehicles: A Review." Applied Computer Systems 26 (2021): 96 - 106. : **PDF**
  - **Summary** : This article summarises the latest adversarial attacks and defense methodologies introduced on computer vision models in autonomous vehicles. Finally, it discusses the open research problems in autonomous vehicles and adversarial machine learning. In parallel to that, the importance of a generalized adversarial defense solution for adversarial attacks and physical world adversarial conditions is highlighted.
- **Mahima, K.T.Yasas** and T.N.D.S.Ginige. "An Emotion Recognition Based Assistant for Vehicles." 2021 International Conference on Computer Communication and Artificial Intelligence (CCAI) (2021): 1-5. : **PDF**
  - **Summary** : This paper introduces an assistant for vehicles which can react based on the drivers' emotions and drowsiness. In particular, one deep learning model to detect drivers' emotions and a mathematical model to detect drowsiness by examining the aspect ratio of the eye and yawning within a certain time period are proposed.
- **Mahima, K.T.Yasas**, T.N.D.S.Ginige and Kasun De Zoysa. "Evaluation of Sentiment Analysis based on AutoML and Traditional Approaches." International Journal of Advanced Computer Science and Applications 12 (2021): n. pag. : **PDF**
  - **Summary** : Using four datasets, this study evaluates the strengths and weaknesses of traditional machine learning and deep learning methods vs. automated approaches for sentiment analysis. Grounded on the results, it concludes that, utilizing the traditional approaches is preferable since they enable, hyperparameter tuning and pre-processing which have a significant influence on the final results.
- **Mahima, K.T.Yasas**, R. A. B. Abeygunawardana and T.N.D.S.Ginige. "Dynamic Traffic Light Controlling System Using Google Maps and IoT." 2020 From Innovation to Impact (FITI) 1 (2020): 1-5. : **PDF**
  - **Summary** : This study introduces an algorithm to dynamically adapt the vehicle movement time of a traffic light system in a 4-way junction based on the colour codes which represent the traffic condition in Google Maps. Here, the traffic condition of the junction is monitored via 8-pointers placed on Google Maps 300m away from the junction.

2020-2021

- **Mahima, K.T.Yasas** and T.N.D.S.Ginige. "Graph and Natural Language Processing Based Recommendation System for Choosing Machine Learning Algorithms." 2020 12th International Conference on Advanced Infocomm Technology (ICAIT) (2020): 119-123. : **PDF**
  - **Summary** : By utilising the RAKE algorithm to extract keywords from user-provided project descriptions and the Motifs finding in GraphFrames, this study provides a machine learning algorithm recommendation system. The proposed graph contains the contributors' prior machine learning project information, which is maintained in three nodes namely, projects, algorithms, and programming languages.
- **Mahima, K.T.Yasas** and T.N.D.S.Ginige. "A Secured Healthcare System Using Blockchain and Graph Theory." Proceedings of the 2020 4th International Symposium on Computer Science and Intelligent Control (2020): n. pag. : **PDF**
  - **Summary** : Security of both medical data sharing and storing components is essential. However, previous research mainly concentrated on one component. Hence, this paper presents an RSA encryption method-based blockchain and a graph database component to securely share and

store medical data. To implement the blockchain and graph database Scala, AKKA framework and Neo4J are proposed.

Manuscripts Under Review

- Qianyao Shen, **Mahima, K.T.Yasas**, Kasun De Zoysa, Markus Flierl, Luca Mottola, and Thiemo Voigt. "CNN-Based Estimation of Water Depth from Multispectral Drone Imagery for Mosquito Control." Submitted to the IEEE International Conference on Image Processing (ICIP) 2023
- Ashmari Pramodya, **Mahima, K.T.Yasas**, Randil Pushpananda, Ruvan Weerasinghe. "Exploring Low-resource Neural Machine Translation for Sinhala-Tamil Language Pair." Submitted to the s24th Annual Conference of The European Association for Machine Translation (EAMT) 2023

Manuscripts In Preparation

- Bandara, Arosha, Danny Barthaud, Jacob Blamey, **Mahima, K.T.Yasas**, Gavin Moir, Bashar Nuseibeh, Blaine Price, Anthony Rushton, Yijun Yu, and Andrea Zisman. An extended version of the paper entitled : "LiveBox: A Self-Adaptive Forensic-Ready Service for Drones". IEEE Computer (2022).

INDUSTRIAL EXPERIENCE

Trainee Associate Big Data And Data Science Engineer — **Colombo, Sri Lanka**
Zone 24x7 Inc (*Headquartered in San Jose, California, USA*) — *July 2020 - July 2021*

- **Responsibilities** - Contribute to implementing data ETL pipelines, maintaining data integrity, and verifying pipeline stability. Warehousing and orchestration of big data and data science models. Implementing an AutoML platform using Spark and Scala. Implementing a log monitoring and custom log mining script using ELK and GROK.

Trainee Associate Software Engineer — **Colombo, Sri Lanka**
RevportX — *July 2019 - March 2020*

- **Responsibilities** - Develop web and mobile applications. Architect the databases and the data flows of the applications.

HONOURS, AWARDS AND COMPETITIONS

- UNSW Tuition Fee Scholarship (TFS) with living expenses for the PhD degree : *November 2022*.
- Final year project got a merit award at the NBQSA National ICT Awards 2022: *November 2022*.
- Best final year project award by Circles.Life Singapore: *November 2022*.
- Dr. Gamini Wickramasinghe Gold Medal for Academic Excellence (Batch Top): *November 2022*.
- First class honours degree in Software Engineering: *November 2022*.
- Final year research was selected to present at the IIT Cutting-Edge 2022: *June 2022*.
- Merit award at the IIT Cutting-Edge 2020 innovation competition for the 2nd year group project: *June 2020*.
- 2nd year group project was selected for the NBQSA National ICT Awards 2020: *July 2020*.
- Google Hashcode 2020 4304th place from the World and 22th place from Sri Lanka : *February 2020*.
- Merit award at the LetMeHack hackathon by University of Sabaragamuwa Sri Lanka: *February 2020*.
- Merit award at the CODEFEST software competition by Sri Lanka Institute of Information Technology (SLIIT) and 99X Technologies Sri Lanka: *November 2019*.

KEY SKILLS

Programming Language	Python, Java, Scala, Java, Java Script, Bash
Machine Learning and Deep Learning	Keras, Tensorflow, PyTorch, Scikit Learn, Open CV, NLTK, Spark ML Lib
Data Engineering	Hadoop, Apache Spark, PySpark, Hive, Apache Hbase, Apache Airflow, Kafka
Databases	SQL, MongoDB, Neo4J
Other Skills	Git, LaTex, Blockchain Development

SELECTED ACADEMIC PROJECTS

A general defense framework for defending against adversarial attacks and physical world adversaries on autonomous driving. *May 2021-May 2022*

- Develop and evaluate a model training pipeline that is able to make the existing image classification models in autonomous vehicles robust for both man-made adversarial attacks and physical world adversaries without using auxiliary tools in the inference.
- Submitted in fulfilment of the undergraduate research project of the degree program.
- **Supervisor -** Mr. Guhanathan Poravi : guhanathan.p@iit.ac.lk
- **Thesis - PDF**

A semantic segmentation based approach for human count estimation in aerial images. *December 2020 – June 2021*

- A research project by ScoreLab from the School of Computing, University of Colombo, Sri Lanka to estimate the number of humans in an outdoor meeting using drone-based aerial images.
- **Supervisors -**
  - Dr. Kasun De Zoysa : kasun@ucsc.cmb.ac.lk
  - Mr T.N.D.S. Ginige : thepul@ucl.lk

INFERNO - A forest fire and spread prediction tool for Australia. *August 2019 – May 2020*

- Predicting future forest fires based on global weather statistics using time series analysis via long short-term memory (LSTM) networks.
- Predicting spread of the potential forest fires using machine learning algorithms.
- **Awards -**
  - Got a merit award at IIT Cutting Edge 2020.
  - Selected for semi-finals at NBQSA 2020.

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PROFESSIONAL RECOGNITION

- Advanced Data Science with IBM - IBM Watson IoT Certified Data Scientist : Offered through Coursera
- DeepLearning.AI TensorFlow Developer : Offered through Coursera
- Big Data Specialisation by University of California San Diego : Offered through Coursera
- Big Data Analytics Specialisation by Yandex : Offered through Coursera

View More

VOLUNTARY ACTIVITIES

- Conducted a short talk with a demonstration on adversarial machine learning at the high school awareness session parallel to the UCSC 25th anniversary in 2022.
- Mentee at ScholarX 2021 by Sustainable Education Foundation (SEF) Sri Lanka.
- Software developer at ScoreLab, University of Colombo, School of Computing - 2020.

REFERENCES

- **Mr. Guhanathan Poravi**
  Senior Lecturer, Department of Computing
  Informatics Institute of Technology
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- **Prof. Thiemo Voigt**
  Professor, Department of Information Technology, Division of Computer Systems
  Uppsala University, Uppsala, Sweden.
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- **Prof. Markus Flierl**
  Professor, Department of Electrical Engineering and Computer Science
  KTH Royal Institute of Technology, Stockholm, Sweden.
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- **Prof. Arosha K. Bandara**
  Professor, Faculty of Science, Technology, Engineering & Mathematics
  The Open University, Milton Keynes, United Kingdom.
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