

Dr. M. Usman Maqbool Bhutta

POSTDOCTORAL ASSOCIATE · COMPUTER VISION AND SENSING SYSTEMS (COVISS), ABE, UNIVERSITY OF FLORIDA

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“Do it with passion or not at all!”

Summary

Dr. M. Usman Maqbool Bhutta is currently a Postdoctoral Associate at the Computer Vision and Sensing Systems (COVISS) lab, Department of Agricultural and Biological Engineering (ABE), at the University of Florida. His research focuses on long-term place recognition for autonomous systems and spatio-temporal detection and tracking. He received his B.Sc. degree in Mathematics and Physics from Bahauddin Zakariya University, Multan, Pakistan. He studied for his M.Phil. in image processing and communication and his M.Sc. in Electronics from the Department of Electronics, Quaid-i-Azam University, Islamabad, Pakistan. He received his Ph.D. in Electronic and Computer Engineering from the Robotics and Multi-perception Lab (RAM-LAB) at The Hong Kong University of Science and Technology (HKUST), which was ranked 18th in Engineering and Technology in the QS World University Rankings 2020. During his Ph.D. studies, he worked on projects related to place recognition at ETH Zurich. He has published five journal papers in top-tier journals with a combined impact factor of 31.2, as well as numerous conference papers in venues such as ICRA, IROS, CYBER, IDITR, IST, and ICALIP. He received the Best Student Paper Finalist Award at IEEE CYBER 2018 (IEEE Int. Conf. on CYBER Technology in Automation, Control, and Intelligent Systems) in Tianjin, China, in July 2018. He is passionate about research and development and enjoys turning ideas into reality. He has extensive experience in startup ventures and has received several awards. His research interests lie in robotics and AI. As an entrepreneur, he previously served as the co-founder and Chief Operating Officer of Lisee Technology Corporation Limited in Hong Kong, a startup that provided indoor navigation services using visible light communication technology. In May 2018, he won the Best Proposal Audience Award in the Campus Challenge - Transportation at HKUST. His full profile can be visited at: <https://usmanmaqbool.github.io>.

Work Experience

Research (Computer Vision Technologies and Robotics System)

Computer Vision and Sensing Systems (COVISS) Lab, UF/IFAS, ABE

UF, US.

Postdoctoral Associate

Aug. 2023 - Present

- Supervisor: [Prof. Henry Medeiros](#), Director of Computer Vision and Sensing Systems (COVISS) Lab, University of Florida UF, United States.
- Research Projects**
 - Long-term Visual Place Recognition:** Worked on a graph-based image feature representation to address the dynamic nature of regions. Utilized semantic information for enhanced place recognition.
 - Calibration-free Multi-view Detection and Association:** Focused on the importance of occlusion in improving MODA and MODP in multi-view object detection. Implemented attention networks to enable calibration-free optimization of multi-view detection.
 - End-to-End Detection, Segmentation, and Tracking:** Aiming to surpass state-of-the-art (SOTA) methods for the MOTs challenge through this project.
- Co-supervised the ABE Robotics team participating in the ASABE Robotics Student Design Competition, 2024, in Anaheim, California.
- Managed project documentation and code versioning, with all projects being trained on the UF HiPerGator.

C3 Robotics Laboratory (C3RL), Department of Mechanical and Automation Engineering

CUHK, Hong Kong.

Postdoctoral Research Fellow

May 2021 - Jun. 2023

- Supervisor: [Prof. Darwin Lau](#), Director of C3 Robotics Laboratory (C3RL), The Chinese University of Hong Kong CUHK, Hong Kong.
- Research** in place recognition, AR/VR and inspection robotics for construction
 - Place Recognition:** Working on the light-weight representation of images and making better use of previously trained models.
 - AR/VR:** Research in AR/VR Platform design, multi-agent mixed reality, assistive prosthetics for the handicapped persons, teleoperated robots, human-robot interaction.
 - Inspection:** Deep learning based research for the robotic presurface inspection for the construction.
- Multi-agent collaboration:** For indoor vegetation and painting robotics application.

Autonomous Systems Lab (ASL)

ETH Zürich, Switzerland.

Academic Guest

Oct. 2019 - Mar. 2020

- Supervisor: [Prof. Roland Siegwart](#), Director of Autonomous Systems Lab (ASL), ETH Zürich, Switzerland.
- Co-Supervisor: [Dr. Cesar Dario Cadena Lerma](#), Senior Researcher at ASL, ETH Zürich, Switzerland.
- Research in Place Recognition:** I've worked for making the better place recognition for the better scene understanding. Furthermore, I've also introduced light weight representation of key-frames for better channel utilization.

Robotics and Multi-Perception Lab, Robotics Institute

HKUST, HK

PhD

Sep 2016 - Feb 2021

- PhD Supervisor: [Prof Ming Liu](#), Director of Robotics and Multi-Perception Lab (RAM-LAB)
- Research Contributions as First Author**
 - Place Recognition:** Our work makes a leap towards hierarchical deep learning-based place recognition for multiagent SLAM systems.

We introduce a probabilistic layer to constrain the local representation along with the global representation of images. The global description of the pre-trained model and the local consistency introduced in our work enables the system to yield good performance at large-scale.

Development Using: MATLAB, Python, Jupyter, Nvidia CUDA, Docker, Deep learning, Matconvnet

Multi-Agent SLAM: I've produced Loop-box for the multi-Agent Direct SLAM Triggered by Single Loop Closure for Large scale semi dense 3D reconstruction /large-scale structure from motion. This work is accepted for publication in IEEE Transactions on Cybernetics (IF= 11+)..

Development using: C++ 11, ROS, OpenCV, OpenGV, Paraview, EVO, UGV, LSD-SLAM, Monocular Camera.

SLAM: I've worked mainly for the multi-agent SLAM system. To find the scale difference and excellent relative transformation between difference agents. I've produced [PCR-Pro](#) work. This work got best student paper finalist award at IEEE-CYBER 2018.

Development using: C++ 11, ROS, OpenCV, OpenGV, Paraview, EVO, Monocular Camera, Plotly

Automation (Inspection): For smartphone glass inspection, I've introduced [Smart-Inspect](#) work. This work is accepted in IROS 2020. The patent is also under-review in the US.

Development using: Python, Jupyter, Nvidia CUDA, K-Means, Docker, Machine learning (ML)

Department of Electronics

QAU, Pakistan

MPhil

Mar. 2010 - Jun. 2012

- M.Phil. Supervisor: [Prof Hasan Mahmood](#), Department of Electronics, QAU.
- **Research in Image Processing (CNN):** I've introduced CNN-based license plate recognition of Pakistani's Cars. This work has been published in IEEE-ICALIP 2014.

Industry and Entrepreneurship

Lisee Technology Corporation Limited

Central, HK

COO

Jan 2018 - Jan 2021

- Won funding support for company | TSSSU Support HK\$ 300,000 (Jun 19 - May 20).
- Indoor Navigation for Libray using Lisee Technology | PCF Support HK\$ 160,000 (Jun 18 - May 19).

Friends Corporate Technologies

Islamabad, PK

CEO

Feb 2013 - Aug 2015

50+ Projects | Electronics/ Electrical Engineering, R&D, image processing, Web Applications Development, MVC Applications

Federal Government of Pakistan

Islamabad, PK

Scientific Officer

May 2012 - Feb 2013

Electronics/ Electrical Engineering, R&D, image processing

Server4Sale, LLC

Islamabad, PK

PHP Developer

Dec 2009 - Mar 2010

Php web application development for Joomla and Zend frameworks.

Academic (Teaching)

Department of Computer Science

BZU-Sahiwal, Pakistan

Lecturer (Visiting)

Feb 2016 - Jun 2016

Teaching MCS and BS-CS courses

Department of Physics

GPGC Sahiwal, Pakistan

CTI

Oct. 2015 - May. 2016

Teaching BS physics (Electronics related courses + Labs + Projects)

Department of Electronics

QAU, Pakistan

Instructor

Aug. 2010 - Dec. 2010

'PHP Web Development' (a short course) offered in Department of Electronics, Quaid-i-Azam University, Islamabad, Pakistan.

Education

Ph.D. in Robotics and AI at [RAM-LAB, Robotics Institute](#)

HKUST, Hong Kong

Department of Electronic & Computer Engineering, The Hong Kong University of Science and Technology

Sep 2016 - Jun 2021

- **Thesis:** "Towards A Swift Multiagent SLAM System For Large-scale Robotics Applications", June 17, 2021
- PhD Supervisor: [Prof Ming Liu](#), Director of Robotics and Multi-Perception Lab ([RAM-LAB](#))
- Exchange Supervisor: [Prof. Roland Siegwart](#), Director of Autonomous Systems Lab ([ASL](#)), [ETH Zürich](#), Switzerland.
- Exchange Co-Supervisor: [Dr. Cesar Dario Cadena Lerma](#), Senior Researcher at ASL, [ETH Zürich](#), Switzerland.
- Got PEEF CCMS PhD scholarship from Pakistan and overseas research award (ORA).
- Research: Multi-Agent SLAM System, Place Recognition, Autonomous Car and Deep Learning for automation industry. Hand on experience on RGB-D 3D reconstruction, Multi-view stereo, python and C++ development experience, multi-threaded coding, 3D mesh registration, paraview and parameterizations. Moreover, I've deep understanding of data structures and algorithms. Experience with software development on Linux open-source stack. Calculus, linear algebra and geometry related courses have been taken.

M.Phil. in Electronics

Department of Electronics, Quaid-i-Azam University, Islamabad, Pakistan.

QAU, Pakistan

Mar 2010 - Jun 2012

- **Thesis:** "A Feature Based Algorithm for Automobile License Plate Detection and Recognition in Pakistan", Mar, 2012
- M.Phil. Supervisor: **Prof Hasan Mahmood**, Department of Electronics, QAU.
- Research: Signal and Image Processing

M.Sc. in Electronics

Department of Electronics, Quaid-i-Azam University, Islamabad, Pakistan.

QAU, Pakistan

Sep 2007 - Jun 2010

- **2nd position** in batch
- Projects: completed 9+ projects related to C++, Verilog/HDL and Micro-controller programming.

B.Sc. in Mathematics and Physics

Bahauddin Zakariya University, Multan Pakistan

BZU, Pakistan

Sep. 2005 - Aug. 2007

- Grade: 1st Division

Honors & Awards

July, 2021	Educational Technology Innovation: Gold Award , The Teaching and Learning Innovation Expo, CUHK	CUHK, Hong Kong
July, 2021	Pedagogical Innovation: Silver Award , The Teaching and Learning Innovation Expo, CUHK	CUHK, Hong Kong
July, 2018	Best Student Paper Finalist Award , IEEE Int. Conf. on CYBER Technology in Automation, Control, and Intelligent Systems	Tianjin, China
May, 2018	Audience Award , Campus Challenge - Transportation, HKUST	HKUST, HK
Nov, 2017	Best Mapper Award , Robotics and Multi-Perception Lab, HKUST	Shenzhen, China
May, 2017	Completion Award , The Graduate Teaching Assistant Training, HKUST	HKUST, HK
Dec, 2016	Best External Award , Robotics and Multi-Perception Lab, HKUST	Shenzhen, China
Nov, 2016	Completion Award , Author Workshop, Elsevier Publishing Campus	HKUST, HK
Sep 2016	CCMS PhD Scholarship , Won Chief Minister Marit Scholarship (CCMS) scholarship award by Punjab Government (PEEF), Pakistan for pursuing my PhD studies at HKUST, HK	Lahore, PK
Sep 2013	Participant , Painting for peace (Pakistan-India-Afghanistan) event, a part of the Harmony initiative	Islamabad, PK
Apr 2013	Participant , Case Spark in business plan competition	Islamabad, PK
Apr 2013	Participant , Case EPICA	Islamabad, PK
Apr 2013	Participant , How to be a Better Playwright Workshop by PNCA and US Embassy Pakistan	Islamabad, PK
Oct 2012	Participant , Punjab Youth Festival	Lahore, PK
Oct 2011	Participant , Int'l Youth Conference and Festival	Islamabad, PK
Sep 2011	Participant , Asian Youth Conference and Peace Festival	Lahore, PK
Apr 2011	Completion Award , Acting and Directing Theater Workshop by PNCA and US Embassy Pakistan	Islamabad, PK
Dec 2011	Participant , National Drama Festival	Islamabad, PK
Dec 2010	Instuctor of short Course , PHP Web Development' at the Department of Electronics, QAU	Islamabad, PK
Apr 2013	Completion Award , Running River Rafting course by Adventure Foundation of Pakistan	Mansehra, PK
Apr 2013	Completion Award , Paragliding course by QAU Adventure Club	Islamabad, PK
Dec 2008	Award of Honor , Finance Secretary of Electronics Student Society (ESS) at QAU	Islamabad, PK

Presentation

Navigating Academia Research & Industry, ITCN Asia 2023

Pak-China Friendship Centre,
Islamabad

Panelist

Feb. 2023

- 'I emphasize taking the voluntary initiative by the tech industry first. Companies should realize that they need academic involvement to grow at a swift pace. Most VPs of big companies belong to academia.
- 'In return, companies would at least solve their quality hiring problems. Usually, universities need more funding for R&D and IP filings, etc. In a broader view, both could get huge benefits.

Teaching and Learning Innovation Expo 2021

CUHK, Hong Kong

Posters Presentation

Jul. 2021

- 'Mixed Reality in Hands-On Learning of Robotics' by Xinyan Zhao, Sabrina Lam, M. Usman M. Bhutta, Darwin Lau and Jimmy Lee.
- 'Online Robotics Laboratory Framework for Interactive and Group Hands-On Learning' by Ken Hui, Ken Kwok, M. Usman M. Bhutta, Darwin Lau and Jimmy Lee.

IEEE/RSJ International Conference on Intelligent Robots and Systems [IROS, 2020]

Las Vegas, USA

Presenter as author

Oct. 2020

- Introduced **Smart-Inspect** for the micro scale localization and classification of smartphone glass defects for industrial automation.

Technology Start-up Support Scheme for Universities (TSSSU)

HKUST, Hong Kong

Presenter as COO Lisee Technology Corporation Company Limited, Hong Kong.

Jan. 2019

- Introduced Lisee technology in front of selection committee panel and won TSSSU 2019-20 funding of the amount of HK\$300,000.

IEEE Int. Conf. on CYBER Technology in Automation, Control, and Intelligent Systems [IEEE-CYBER 2018]

Tianjin, China

Presenter as author

Jul. 2018

- Introduced **PCR-Pro** for the estimation of information matrix and scale difference for pose graph SLAM.

IET-Young Professionals Exhibition and Competition (IET-YPEC) 2018

CityU, Hong Kong

Presenter as COO Lisee Technology Corporation Company Limited, Hong Kong.

Jul. 2018

- Introduced Lisee technology at IET-YPEC 2018.

Campus Challenge @ HKUST Transportation

HKUST, Hong Kong

Presenter as participant

May 2018

- HKUST got 80+ proposals for this competitions, and arranged a roadshow. My proposal got selected for the audience award after getting maximum votes.

High Tech Innovation and Entrepreneurship

HKUST, Hong Kong

Presenter as Entrepreneur

Dec. 2017

- Introduced my study related to the flying cars.

World First Youth Robotics Development Forum 2017

Shangri-La Shenzhen, China.

Presenter as author.

Nov. 2017

- Introduced my work related to multi-agent SLAM system.

Scientific Review Services and Academic Services

Journal Referee Services

TJS	Peer Reviewer , The Journal of Supercomputing	2024
RA-L	Peer Reviewer , IEEE Robotics and Automation Letter	2024, -23, -22
TC	Peer Reviewer , IEEE Transactions on Cybernetics	2022

Conference Referee Services

IROS	Peer Reviewer , IEEE/RSJ RA-L and International Conference on Intelligent Robots and Systems	2024, 23, 21, 20, 18
ICRA	Peer Reviewer , IEEE/RSJ International Conference on Robotics and Automation	2024, 23, 22, 21, 20
UF, US	Poster Judge , UF/IFAS Agricultural and Biological Engineering Engineering Poster Symposium	2024

Teaching Assistant Positions

HKUST, HK	Teaching Assistant , EESM 5547 - Multimedia Signal Processing	S 20, S 19, S 18
HKUST, HK	Teaching Assistant , ELEC4820 - Medical Imaging	F 18
HKUST, HK	Teaching Assistant , ELEC 1010 - Electronic and Information Technology	S 17

Skills

Robotics and Computer Vision	Ubuntu, ROS, PCL, Docker, Catkin, OpenCV, OpenGV, Ceres Solver, g2o, Libpointmatcher
Machine Learning / Deep Learning	Jupyter, Pytorch, Tensorflow, Keras, CUDA, Cluster (Hipergator)
Programming	Python, C/C++, Matlab, git, LaTeX, FPGA, Verilog, Slurm
Web	mkdocs, Hugo, Jekyll, PHP, MYSQL
Languages	English, Urdu

Research

G: [Google Scholar](#) | [ORCID iD: 0000-0002-3512-4279](#)

Journal Publications

In-Sensor Visual Perception and Inference

Journal

Yanan Liu and Rui Fan and Jianglong Guo and Hepeng Ni and M. Usman Maqbool Bhutta

Jul 2023

2023 Intelligent Computing

Robust mobile robot navigation in cluttered environments based on hybrid adaptive neuro-fuzzy inference and sensor fusion Muhammad Husnain Haider, Zhonglai Wanga, Abdullah Aman Khan, Hub Ali, Hao Zheng, Shaban Usman, Rajesh Kumar, M. Usman Maqbool Bhutta, Pengpeng Zhi 2022 Journal of King Saud University-Computer and Information Sciences.	<i>Journal (IF: 8.8+)</i> Aug 2022
MAFNet: Segmentation of Road Potholes with Multi-modal Attention Fusion Network for Autonomous Vehicles Zhen Feng, Yanning Guo, Qing Liang, M. Usman Maqbool Bhutta, Hengli Wang, Ming Liu, and Yuxiang Sun 2022 IEEE Transactions on Instrumentation & Measurement	<i>Journal (IF: 5.3+)</i> Aug 2022
Why-So-Deep: Towards Boosting Previously Trained Models for Visual Place Recognition M Usman Maqbool Bhutta*, Yuxiang Sun, Darwin Lau and Ming Liu IEEE Robotics and Automation Letters (RA-L)/ICRA, 2022	<i>Journal (IF: 5.4+)</i> Jan 2022
Loop-box: Multi-Agent Direct SLAM Triggered by Single Loop Closure for Large Scale Mapping M Usman Maqbool Bhutta*, Manohar Kuse, Rui Fan, Yanan Liu and Ming Liu 2022 IEEE Transactions on Cybernetics	<i>Journal (IF: 11.7+)</i> Oct 2020
Efficient Reset Design Techniques Qamar, Zoha, Bushra Yaseen, and Usman Maqbool Published in Science International Lahore	<i>Journal Paper</i> 2015
Conference Proceedings	
CaMuViD: Calibration-Free Multi-View Detection Amir Etefaghi Daryani, M Usman Maqbool Bhutta, Byron Hernandez, Henry Medeiros Conference on Computer Vision and Pattern Recognition (CVPR), 2025	<i>Conference Paper</i> Under Review
Autonomous Mobile Robot Navigation using Adaptive Neuro Fuzzy Inference System Muhammad Husnain Haider and Hub Ali and Abdullah Aman Khan and Hao Zheng and M. Usman Maqbool Bhutta and Shaban Usman and Pengpeng Zhi and Zhonglai Wang 2022 International Conference On Innovations And Development Of Information Technologies And Robotics (IDITR), 2022	<i>Conference Paper</i> May 2022
Scale-Adaptive Pothole Detection and Tracking from 3-D Road Point Clouds Wu, Rigen and Fan, Jiahe and Guo, Libo and Qiao, Lei and Bhutta, M. Usman Maqbool and Hosking, Brett and Vityazev, Sergey and Fan, Rui 2021 IEEE International Conference on Imaging Systems and Techniques (IST), 2021	<i>Conference Paper</i> Aug 2021
Smart-Inspect: Micro Scale Localization and Classification of Smart Phone Glass Defects for Industrial Automation M Usman Maqbool Bhutta*, Shoaib Aslam, Peng Yun, Jianhao JIAO and Ming Liu IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2020)	<i>Conference Paper</i> Oct 2020
Multiple Lane Detection Algorithm Based on Optimised Dense Disparity Map Estimation Han Ma, Yixin Ma, Jianhao Jiao, M Usman Maqbool Bhutta, Mohammud Junaid Bocus, Lujia Wang, Ming Liu and Rui Fan Accepted in IEEE International Conference on Imaging Systems and Techniques (IST 2018)	<i>Conference Paper</i> Dec 2018
PCR-Pro: 3D Sparse and Different Scale Point Clouds Registration and Robust Estimation of Information Matrix For Pose Graph SLAM M Usman Maqbool Bhutta* and Ming Liu Presented in IEEE Int. Conf. on CYBER Technology in Automation, Control, and Intelligent Systems (IEEE-CYBER 2018), and won Best Student Paper Finalist Award .	<i>Conference Paper</i> Jul 2018
An intelligent approach for robust detection and recognition of multiple color and font styles automobiles license plates: A feature-based algorithm M Usman Maqbool Bhutta*, Hasan Mahmood, and Haroon Malik Published in IEEE International Conference on Audio, Language and Image Processing (ICALIP 2014).	<i>Conference Paper</i> Jan 2015

Patent

Semi-Supervised Learning Approach for Smart Phone Glasses Defect Inspection Muhammad Usman Maqbool Bhutta, Jianhao Jiao, Peng Yun, Yuan Wang, Xuebin Sun, Ming Liu U.S. Provisional Patent Application No. 62/974,937, Filing Date 01/06/2020.	<i>US Patent</i> Jan 2020
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Automatic Surface Defect Detection System for Smart Phone Glass Based on Deep Learning

US Patent

Yuan Wang, Jianhao Jiao, Peng Yun, Muhammad Usman Maqbool Bhutta, Xuebin Sun, Ming Liu

Jan 2020

U.S. Provisional Patent Application No. 62/974,938, Filing Date 01/06/2020.

References

Prof. Hafiz Malik

Professor · Director of Information Systems, Security, and Forensics (ISSF), Electrical and Computer Engineering, University of Michigan-Dearborn, MI, USA.

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Research Supervisor

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Prof. Henry Medeiros

Associate Professor · Director of Computer Vision and Sensing Systems (COVSS) Lab, Department of Agricultural and Biological Engineering University of Florida, FL, USA

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Postdoc Supervisor

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PhD Co-Supervisor

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Associate Professor · Director of C3 Robotics Lab (C3RL), Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, HK.

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Postdoc Supervisor

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