M Usman Maqbool **Bhutta**

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"Be so good they can't ignore you."

Summary

This is M Usman Maqbool Bhutta. I'm PhD candidate at (Robotics and Multi-Perception Lab) HKUST. My PhD primary research is on multi-agent SLAM system and the expected graduation (∼ Mar. 2021). I developed multi-agent direct SLAM systems triggered by first loop-closure matching (see my publication section). Furthermore, I'm currently working for a better and lightweight place recognition techniques using machine learning. I'm Interested in devising a better problem-solving method for challenging tasks and learning new technologies and tools if the need arises. I've 7+ years of experience specializing in robotics R&D and project management. I previously owned an IT company, and I've part of several startups since 2011. My full profile can view here (https://usmanmaqbool.github.io/).

Work Experience [7+ Years]

RESEARCH (Computer Vision technologies and System)

Robotics and Multi-Perception Lab, Robotics Institute — *HKUST, HK*

PhD Candidate — *Sep 2016 - Present*

- PhD Supervisor: **Prof Ming Liu**, Director of Robotics and Multi-Perception Lab (**RAM-LAB**)
- **Research in Place Recognition In-Progress**: I'm currently working for making the better place recognition for the robotic state estimation by better scene understanding compared to the relocalization technologies. This work evaluation is done on the Pittsburge and Tokyo 247 Datasets compared to NetVLAD and APANet.
  - **Development Using:** MATLAB, Python, Jupyter, PIP, Nvidia CUDA, Docker, Deep learning, Matconvnet
- **Research in 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 got accepted in IEEE Transactions on Cybernetics..
  - **Development using:** C++ 11, ROS, OpenCV, OpenGV, Paraview, EVO, UGV, LSD-SLAM, Monocular Camera.
- **Research in 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
- **Research in Automation**: 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, PIP, Nvidia CUDA, K-Means, Docker, Machine learning (ML)

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.
  - **Development using:** MATLAB, Python, Jupyter, PIP, Nvidia CUDA, Docker, Deep learning, Matconvnet

Department of Electronics — *QAU, Pakistan*

MPhil Candidate — *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 - Present*

- 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

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 — *Aug. 2015 - Apr. 2016*
   Teaching BS physics (Electronics related courses + Labs + Projects)

Department of Electronics — *QAU, Pakistan*
Instructer — *Aug. 2010 - Dec. 2010*
   'PHP Web Development' (a short course) offered in Department of Electronics, Quaid-i-Azam University, Islamabad, Pakistan.

Education

Ph.D. Candidate in Robotics at RAM-LAB, Robotics Institute — *HKUST, Hong Kong*
Department of Electronic & Computer Engineering, The Hong Kong University of Science and Technology — *Sep. 2016 - ∼Feb. 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.

M.Phil. in Electronics — *QAU, Pakistan*
Department of Electronics, Quaid-i-Azam University, Islamabad, Pakistan. — *Mar. 2010 - Jun. 2012*
- M.Phil. Supervisor: **Prof Hasan Mahmood**, Department of Electronics, QAU.
- Research: Signal and Image Processing
- Grade: A

M.Sc. in Electronics — *QAU, Pakistan*
Department of Electronics, Quaid-i-Azam University, Islamabad, Pakistan. — *Mar. 2010 - Jun. 2012*
- **2nd position** in batch
- Projects: completed 9+ projects related to C++, Verilog/HDL and Micro-controller programming.

B.Sc. in Mathematics and Physics — *BZU, Pakistan*
Bahauddin Zakariya University, Multan Pakistan — *Mar. 2010 - Jun. 2012*
- Grade: 1st Division

Presentation

IEEE/RSJ International Conference on Intelligent Robots and Systems [IROS, 2020] — *Las Vegas, USA*
Presentor 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*
Presentor 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 PARTICIPENT   *May 2018*

- HKUST got 80+ proposals for this compeitions, and arranged a roadshow. My proposal got selected for the audiance 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 Developemnt Forum 2017   *Shangri-La Shenzhen, China.*

PRESENTER AS AUTHOR.   *Nov. 2017*

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

Honors & Awards

INTERNATIONAL

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*

DOMESTIC

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 Embassay 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 Embassay 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*

Academic Activities

IROS	**Referee Service**, IEEE/RSJ RA-L and International Conference on Robotics and Automation	*2020*
Spr 2020	**Teaching Assistant**, EESM 5547 - Multimedia Signal Processing	*HKUST, HK*
ICRA	**Referee Service**, IEEE/RSJ International Conference on Robotics and Automation	*2020*
Spr 2019	**Teaching Assistant**, EESM 5547 - Multimedia Signal Processing	*HKUST, HK*
CASE	**Referee Service**, IEEE International Conference on Automation Science and Engineering	*2019*
IROS	**Referee Service**, IEEE/RSJ International Conference on Intelligent Robots and Systems	*2019, 2018*
Fall 2018	**Teaching Assistant**, ELEC4820 - Medical Imaging	*HKUST, HK*
Spr 2018	**Teaching Assistant**, EESM 5547 - Multimedia Signal Processing	*HKUST, HK*
Spr 2017	**Teaching Assistant**, ELEC 1010 - Electronic and Information Technology	*HKUST, HK*

Research Publications

Loop-box: Multi-Agent Direct SLAM Triggered by Single Loop Closure for Large Scale Mapping

Journal Paper

M Usman Maqbool Bhutta*, Manohar Kuse, Rui Fan, Yanan Liu, Ming Liu

Oct 2020

   IEEE Transactions on Cybernetics (**IF: 11+**)

Smart-Inspect: Micro Scale Localization and Classification of Smart Phone Glass Defects for Industrial Automation

Conference Paper

M Usman Maqbool Bhutta*, Shoaib Aslam, Peng Yun, Jianhao JIAO, Ming Liu

Oct 2020

   IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS 2020**)

Multiple Lane Detection Algorithm Based on Optimised Dense Disparity Map Estimation

Conference Paper

Han Ma, Yixin Ma, Jianhao Jiao, M Usman Maqbool Bhutta, Mohammud Junaid Bocus, Lujia Wang, Ming Liu, Rui Fan

Oct 2018

   Accepted in IEEE International Conference on Imaging Systems and Techniques (**IST 2018**)

PCR-Pro: 3D Sparse and Different Scale Point Clouds Registration and Robust Estimation of Information Matrix For Pose Graph SLAM

Conference Paper

M Usman Maqbool Bhutta*, Ming Liu

Jul 2018

   Presented in IEEE Int. Conf. on CYBER Technology in Automation, Control, and Intelligent Systems (**IEEE-CYBER 2018**), and won **Best Student Paper Finalist Award.**

An intelligent approach for robust detection and recognition of multiple color and font styles automobiles license plates: A feature-based algorithm

Conference Paper

M Usman Maqbool Bhutta*, Hasan Mahmood, and Haroon Malik

Jul 2014

   Published in IEEE International Conference on Audio, Language and Image Processing (**ICALIP 2014**).

Efficient Reset Design Techniques

Journal Paper

Qamar, Zoha, Bushra Yaseen, and Usman Maqbool

2015

   Published in Science International Lahore

Skills

Robotics and Computer Vision	Ubuntu, ROS, Docker, Catkin, Jupyter, Pytorch, Tensorflow, Keras, CUDA
Programming	Python, C/C++, Matlab, git, LaTeX
Web	Hugo, Jekyll, PHP, MYSQL
Languages	English, Urdu

References

Prof Ming Liu

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