Dr. M. Usman Maqbool **Bhutta**

Postdoctoral Associate · Horticultural Sciences Department, University of Florida

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"Do it with passion or not at all!"

Summary

Dr. M. Usman Maqbool Bhutta is an experienced researcher and entrepreneur with over **9+ years of specialization in robotics R&D and AI.** Currently, he holds a Postdoctoral Associate position at the University of Florida, where his research focuses on fruit phenomics using cutting-edge robotics and AI technology for blueberry plants, with a particular emphasis on multi-agent spatio-temporal detection and tracking. Bhutta is passionate about research and development, and he enjoys translating ideas into concrete solutions. He has extensive experience in startup ventures and has received multiple awards. Previously, he **co-founded** and served as the **Chief Operating Officer** of Lisee Technology Corporation Limited in Hong Kong, a startup that provided indoor navigation services using visible light communication technology. Additionally, I held a **Chief Executive Officer** position at Friends Corporate Technologies, where I introduced Dalocation.com, a dynamic real estate mapping platform. 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. Bhutta earned his **Ph.D. in Electronic and Computer Engineering** from the Robotics and Multi-perception Lab at The Hong Kong University of Science and Technology, which was **ranked 18th in Engineering and Technology** in the QS World University Rankings 2020. During his doctoral studies, he worked on projects related to place recognition at **ETH Zurich**. Bhutta has published five journal papers in top-tier journals, with a combined **impact factor of 31.2**, and numerous conference papers in prestigious venues such as **CVPR**, **ICRA**, **IROS**, **CYBER**, **IDITR**, **IST**, and **ICALIP**. He received the **Best Student Paper Finalist Award** at IEEE CYBER 2018 in Tianjin, China, and the **Best Proposal Audience Award** in the Campus Challenge - Transportation at HKUST, Hong Kong, in 2018. His full profile can be accessed at: https://usmanmaqbool.github.io.

Work Experience

Research (Computer Vision Technologies and Robotics System)

Fruit Phenomics Team (FPT), UF/IFAS Horticultural Sciences Department — *UF, US.*

Postdoctoral Associate — *Feb. 2025 - Present*

- Supervisor: **Prof. Patricio R. Muñoz**, Director of Blueberry breeding and Genomics Lab, University of Florida **UF**, United States.
- Collaborating with Dr. Bruno Leme on saveral fruits phenomics-related projects, focusing on innovative solutions for agricultural productivity.
- **Research Projects**

  Farm-ng Rover Development for Blueberry Fields: Developed and improved farm-ng rover for data collection in blueberry fields, focusing on machine learning model enhancement and computer vision techniques.

  Computer Vision Team Mentorship: Mentored computer vision team in improving machine learning models for multimodal feature extraction, yield estimation, acoustic analysis, and color-based image segmentation.

  3D Plant Reconstruction Collaborated on 3D reconstruction of plants in the field for robot simulation and yield estimation improvement.

  Rabid Breeding Champions Project Assisted engineering team in the Rabid Breeding Champions project, contributing to the overall goal of establishing a robust phenomics team to support growers and companies nationwide.

Computer Vision and Sensing Systems (COVISS), Agricultural and Biological Engineering — *UF, US.*

Postdoctoral Associate — *Aug. 2023 - Feb. 2025*

- 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. This work has been accepted in CVPR 2025.

  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.

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

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*

- Lisee helps in the precise localization of (10 cm) and navigation in the indoor environment.
- Our Lisee's project demo can view in this video.
- 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*

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. 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.
- Won 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 recontruction, 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 — *QAU, Pakistan*

Department of Electronics, Quaid-i-Azam University, Islamabad, 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 — *QAU, Pakistan*

Department of Electronics, Quaid-i-Azam University, Islamabad, 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 — *BZU, Pakistan*

Bahauddin Zakariya University, Multan Pakistan — *Sep. 2005 - Aug. 2007*

- Grade: 1st Division

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*

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

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 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*

Scientific Review Services and Academic Services

Journal Referee Services

RA-L	**Peer Reviewer**, IEEE Robotics and Automation Letter	*2025, -24, -23, -22*
TJS	**Peer Reviewer**, The Journal of Supercomputing	*2024*
TC	**Peer Reviewer**, IEEE Transactions on Cybernetics	*2022*

Conference Referee Services

IROS	**Peer Reviewer**, IEEE/RSJ RA-L and International Conference on 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 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*, *Jul 2023*
Yanan Liu and Rui Fan and Jianglong Guo and Hepeng Ni and M. Usman Maqbool Bhutta
2023 Intelligent Computing

Robust mobile robot navigation in cluttered environments based on hybrid adaptive neuro-fuzzy inference and sensor fusion — *Journal (**IF: 8.8+**)*, *Aug 2022*
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.

MAFNet: Segmentation of Road Potholes with Multi-modal Attention Fusion Network for Autonomous Vehicles — *Journal (**IF: 5.3+**)*, *Aug 2022*
Zhen Feng, Yanning Guo, Qing Liang, M. Usman Maqbool Bhutta, Hengli Wang, Ming Liu, and Yuxiang Sun
2022 IEEE Transactions on Instrumentation & Measurement

Why-So-Deep: Towards Boosting Previously Trained Models for Visual Place Recognition — *Journal (**IF: 5.4+**)*, *Jan 2022*
M Usman Maqbool Bhutta*, Yuxiang Sun, Darwin Lau and Ming Liu
IEEE Robotics and Automation Letters **(RA-L)/ICRA**, 2022

Loop-box: Multi-Agent Direct SLAM Triggered by Single Loop Closure for Large Scale Mapping — *Journal (**IF: 11.7+**)*, *Oct 2020*
M Usman Maqbool Bhutta*, Manohar Kuse, Rui Fan, Yanan Liu and Ming Liu
2022 IEEE Transactions on Cybernetics

Efficient Reset Design Techniques — *Journal Paper*, *2015*
Qamar, Zoha, Bushra Yaseen, and Usman Maqbool
Published in Science International Lahore

Conference Proceedings

CaMuViD: Calibration-Free Multi-View Detection — *Conference Paper*, *June 2025*
Amir Etefaghi Daryani, M Usman Maqbool Bhutta, Byron Hernandez, Henry Medeiros
Conference on Computer Vision and Pattern Recognition **(CVPR), 2025**

Autonomous Mobile Robot Navigation using Adaptive Neuro Fuzzy Inference System — *Conference Paper*, *May 2022*
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**

Scale-Adaptive Pothole Detection and Tracking from 3-D Road Point Clouds — *Conference Paper*, *Aug 2021*
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**

Smart-Inspect: Micro Scale Localization and Classification of Smart Phone Glass Defects for Industrial Automation — *Conference Paper*, *Oct 2020*
M Usman Maqbool Bhutta*, Shoaib Aslam, Peng Yun, Jianhao JIAO and Ming Liu
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 and Rui Fan *Dec 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* and 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 *Jan 2015*

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

Patent

Semi-Supervised Learning Approach for Smart Phone Glasses Defect Inspection *US Patent*

Muhammad Usman Maqbool Bhutta, Jianhao Jiao, Peng Yun, Yuan Wang, Xuebin Sun, Ming Liu *Jan 2020*

U.S. Provisional Patent Application No. 62/974,937, Filing Date 01/06/2020.

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 *Research Supervisor*

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Associate Professor · Director of Blueberry Breeding and Genomics, Horticultural Sciences Department, University of Florida, Gainesville, FL, USA *p.munoz@ufl.edu*

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Associate Professor · Director of Computer Vision and Sensing Systems (COVISS) Lab, Department of Agricultural and Biological Engineering University of Florida, FL, USA *hmedeiros@ufl.edu*

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