Muhammad Ishfaq Hussain, Ph.D.

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Summary

- Ph.D. in Computer Science and Electrical Engineering (GIST), including GIST–MIT joint research collaboration.
- Research focus: Artificial Intelligence (AI), Machine Learning, Computer Vision, Robotics and Automation, Multi-spectral sensor fusion, Digital twins, and Vision-Language models.
- Published in major venues including IEEE Transactions (e.g., IEEE TNSRE, IEEE TVT, IEEE T-ITS) and authored 30+ peer-reviewed papers; holder of a Korean patent.
- Strong software engineering background; currently conducting research in an AI group at GIST. Permanent residency in the Republic of Korea.

Education

Ph.D., Machine Learning & Computer Vision — 2018 – Aug 2023
Gwangju Institute of Science and Technology GIST (Rep. of Korea)
- Thesis: Predictive Modelling Through Data Fusion for Autonomous Driving Systems
- Collaboration: GIST–MIT joint research collaboration

M.S., Computer Software Engineering — 2014 – 2016
National Institute of Science and Technology NUST (Pakistan)
- Thesis: LSTM Neural Nodes for Spatio-temporal Analysis

Professional Experience

Postdoctoral Research Fellow — AI Convergence Department, GIST (Gwangju, Republic of Korea) — Aug 2025 – Present

Postdoctoral Research Fellow — Large-Scale AI Research Group, KISTI (Republic of Korea) — Jul 2024 – Aug 2025
- Division of National Science & Technology Data
- Situation awareness and decision support algorithms using large-scale AI (Visual LLM/VLM)

Postdoctoral Research Fellow — School of EECS, GIST (Gwangju, Republic of Korea) — Sep 2023 – Jul 2024

Research Assistant — GIST (Gwangju, Republic of Korea) — 2018 – Aug 2023

Software Developer — Gumption Technologies (Pakistan) — 2013 – 2014

Teaching Experience

Teaching Assistant — GIST (Gwangju, Republic of Korea) — 2019 – 2021

Research Publications

Journal Articles

[J9] M. I. Hussain, M. Van Linh, Z. Naz, U. Fatima, Y. Ko, and M. Jeon, "Swir-lightfusion: Multi-spectral semantic fusion of synthetic SWIR with thermal IR (LWIR/MWIR) and RGB," Cluster Computing, 2026. (IF: 4.1).

[J8] M. I. Hussain, Z. Naz, M. A. Rafique, and M. Jeon, "Advancing autonomous driving: DepthSense with radar and spatial attention," IEEE Sensors Journal, 2025. (IF: 4.5). DOI: 10.1109/JSEN.2024.3493196.

[J7] Y. L. Jae, M. I. Hussain, K. Lee, H. S. Shim, S. Han, and Y. Donghun, "Transfer learning-based super-resolution

for high-precision medical imaging," IEEE Access, 2025. (IF: 3.6). DOI: 10.1109/ACCESS.2025.3587263.

[J6] M. I. Hussain, M. A. Rafique, W.-G. Jung, B.-J. Kim, and M. Jeon, "Segmentation and morphology computation of a spiky nanoparticle using the hourglass neural network," ACS Omega, 2023. (IF: 4.2). DOI: 10.1021/acsomega.3c00732.

[J5] M. I. Hussain, M. A. Rafique, J. Kim, M. Jeon, and W. Pedrycz, "Artificial proprioceptive reflex warning using EMG in advanced driving assistance system," IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2023. (IF: 5.2). DOI: 10.1109/TNSRE.2023.3153120.

[J4] M. I. Hussain, S. Azam, M. A. Rafique, A. M. Sheri, and M. Jeon, "Drivable region estimation for self-driving vehicles using radar," IEEE Transactions on Vehicular Technology, 2022. (IF: 7.1). DOI: 10.1109/TVT.2022.3074450.

[J3] S. Azam, F. Munir, M. A. Rafique, A. M. Sheri, M. I. Hussain, and M. Jeon, "N2C: Neural network controller design using behavioral cloning," IEEE Transactions on Intelligent Transportation Systems, 2021. (IF: 8.5). DOI: 10.1109/TITS.2020.2973682.

[J2] M. I. Hussain, M. A. Rafique, H. Jang, M. Jeon, and D. Shim, "Camera-radar extrinsic calibration for autonomous driving," KIISE Transactions on Computing Practices, 2021.

[J1] Z. Khan, M. I. Hussain, N. Iltaf, J. Kim, and M. Jeon, "Contextual recommender system for e-commerce applications," Applied Soft Computing, 2021. (IF: 8.263). DOI: 10.1016/j.asoc.2021.107552.

Conference Proceedings

[C22] Z. Naz, F. Asghar, M. I. Hussain, et al., "Regional attention-enhanced Swin Transformer for clinically relevant medical image captioning," arXiv preprint arXiv:2511.09893, 2025.

[C21] M. I. Hussain, Z. Naz, L. M. A. Van, and M. Jeon, "A light gradient residual encoder-decoder network for multimodal image fusion," IEEE ICCNS, Dubrovnik, Croatia, Sep. 2024.

[C20] L. V. Ma, M. I. Hussain, K.-C. Yow, and M. Jeon, "3D multi-object tracking employing MS-GLMB filter for autonomous driving," IEEE ICCAIS, Hanoi, Vietnam, Nov. 2024.

[C19] Z. Naz, M. I. Hussain, S. Kim, and M. Jeon, "Biomedical image captioning with fine-tuned LLM: A GIT–Swin Transformer approach," KDBC, Jeju, Republic of Korea, Nov. 2024.

[C18] M. I. Hussain, M. A. Rafique, S. Khurbaev, et al., "Deployment of digital twin in robotics and autonomous driving using ROS architecture," ARCI, Chamonix, France, Feb. 2023.

[C17] M. I. Hussain, M. A. Rafique, A. M. Sheri, and M. Jeon, "Drivable region estimation for self-driving vehicles using radar," IEEE Intelligent Vehicles Symposium (IV), Anchorage, Alaska, USA, Jun. 2023. (Journal paper presentation)

[C16] M. I. Hussain, M. A. Rafique, K. Yeongmin, et al., "ESDNet: An encoder–sequencer–decoder network for lane detection to facilitate autonomous driving," IEEE ICCAS, Yeosu, Republic of Korea, Oct. 2023.

[C15] Z. Khan, U. Fatima, M. I. Hussain, R. Khalimjanov, and M. Jeon, "An implementation study of drivable region predictions," 2023, pp. 1300–1302.

[C14] M. Linh Van, M. I. Hussain, J. Park, J. Kim, and M. Jeon, "Adaptive confidence threshold for ByteTrack in multi-object tracking," ICCAIS, Hanoi, Vietnam, Nov. 2023.

[C13] M. A. Rafique, M. I. Hussain, B.-G. Lee, H. K. Kim, and M. Jeon, "Vehicle CAN bus data prediction using transformers with auxiliary decoder loss," IEEE ICCE, Las Vegas, USA, Jan. 2023.

[C12] M. I. Hussain, M. Rafique, Z. Khan, S. Khurbaev, R. Khalimjanov, and M. Jeon, "Monocular vision-based autonomous driving and PID controller," Korea Software Congress (KSC), Jeju, Republic of Korea, Dec. 2022.

[C11] M. I. Hussain, M. A. Rafique, S. Khurbaev, and M. Jeon, "Exploring data variance challenges in fusion of radar and camera for robotics and autonomous driving," ICCMA, Nov. 2022.

[C10] M. Rafique, M. I. Hussain, S. Dubey, S. Khurbaev, and M. Jeon, "A monocular camera bird-eye-view generation using lane markers prior," ICCAS, Busan, Republic of Korea, Nov. 2022.

[C9] M. A. Rafique, M. I. Hussain, M. A. Hassan, W.-G. Jung, B.-J. Kim, and M. Jeon, "Automated single particle growth measurement using segmentation," IEEE AVSS, Madrid, Spain, Nov. 2022.

[C8] M. I. Hussain, M. Rafique, H. Su, and M. Jeon, "Camera-radar external parameter calibration for autonomous driving," Korea Software Congress (KSC), 2021. (Outstanding Paper Presentation Award)

[C7] Z. Khan, M. I. Hussain, F. Munir, U. Fatima, S. Azam, and M. Jeon, "Modified RC car for uni-modal autonomous parking," Korea Software Congress (KSC), 2021.

[C6] M. I. Hussain, S. Azam, F. Munir, Z. Khan, and M. Jeon, "Multiple objects tracking using radar for autonomous driving," IEEE IEMTRONICS, 2020.

[C5] M. I. Hussain, Z. Khan, H. Akram, Y. Ko, and M. Jeon, "Comparative analysis of simultaneous localization and mapping (SLAM)," Korea Software Congress (KSC), 2020.

[C4] S. Azam, F. Munir, A. M. Sheri, M. I. Hussain, Y. Ko, and M. Jeon, "Data fusion of LiDAR and thermal camera for autonomous driving," Applied Industrial Optics Meeting, Washington DC, USA, 2019.

[C3] M. I. Hussain, J. JiWon, Y. Jongmin, A. M. Sheri, and M. Jeon, "Long short-term memory (LSTM) neural nodes for spatio-temporal analysis," Korea Software Congress (KSC), 2019.

[C2] F. Munir, S. Azam, M. I. Hussain, A. M. Sheri, and M. Jeon, "Autonomous vehicle: The architectural aspect of self driving car," SSIP, Prague, Czech Republic, 2018.

Patent

- M. I. Hussain, K. Yeongmin, and M. Jeon, Apparatus and method for enhancing monocular camera depth estimation performance through vehicle radar information fusion. Korean Patent 10-2022-0160456, 2023.

Research Project Participation

- Aug 2025 – Dec 2029: Advanced AI modelling & decision-making; safe/reliable AI — DGIST, InnoCORE
- Jul 2024 – Aug 2025: Computer vision for 3D medical imaging models (CT/MRI/Ultrasound); virtual human body representation — KISTI
- Jul 2024 – Aug 2025: Situation awareness and decision support with large-scale AI models (Visual LLM/VLM) — KISTI
- Mar 2018 – Feb 2024: Real-time video analytics for global multi-target detection/tracking and event prediction (DeepView) — GIST
- Sep 2021 – Jul 2024: GIST–MIT collaboration: contrastive learning for new modalities and resource-limited devices — GIST
- May 2022 – Jul 2024: AI service robot and reading-activity support content for children — GIST
- Jan 2023 – Jul 2024: Mobile-environment multi-target tracking via sensor fusion (RGB/MWIR/SWIR) — GIST
- Mar 2018 – Jul 2024: Autonomous driving and ADAS platform using LiDAR/Camera/Radar/GPS/IMU — GIST

Awards / Scholarship / Invited Speaker

- 2025: Keynote Speaker — "AI for Fire and Investigation with recent trends," Busan Fire and Investigation, Republic of Korea
- 2024: Excellence Paper Award — Korea Next Generation Computing Society
- 2022: EECS Outstanding Research Performance (1st Prize) — GIST
- 2021: Outstanding Paper Award — Korea Software Congress (KSC)
- 2021: Research Assistant Scholarship — GIST
- 2018: Korean Government Scholarship (Ph.D.) — GIST

References

- Moongu Jeon, Professor, GIST (Republic of Korea) — mgjeon@gist.ac.kr
- Witold Pedrycz, Professor, University of Alberta (Canada) — wpedrycz@ualberta.ca
- Aamir Saeed Malik, Professor, Brno University of Technology (Czech Republic) — malik@fit.vut.cz