

Bilal Hussain
Division of Science, Engineering and Health Studies (SEHS)
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Research interests

My research sits at the intersection of artificial intelligence, wireless communications, and cybersecurity for 5G/6G networks and cyber-physical systems (CPS). I develop generative and efficient AI methods — including diffusion models, mixture-of-generative-AI-experts architectures, and adversarial generative training — to synthesize realistic, distribution-preserving network and attack data where labelled data are scarce, and to build robust, lightweight detectors deployable at the mobile edge. Complementary interests span physical-layer security, federated and transfer learning, and AI-native closed-loop security architectures for next-generation cellular networks.

Current work centers on generative AI for cyber-physical security, cross-scenario adaptation in 6G wireless networks, and agentic-AI-driven wireless systems, with active collaborations spanning Hong Kong, mainland China, the UK, Ireland, and France. This has produced publications in IEEE Transactions on Industrial Informatics (including an ESI Highly-Cited Paper), IEEE Access, China Communications, and IEEE GLOBECOM/ICCC, along with three filed patents and manuscripts currently under review at several top-tier IEEE journals and flagship conferences.

Qualifications

Doctorate, Information and Communications Engineering, Xi'an Jiaotong University
1 Sept 2017 → 1 Sept 2022
Award Date: 1 Sept 2022

Doctorate, Information and Communications Engineering, The Hong Kong Polytechnic University
1 Sept 2019 → 1 Sept 2021
Award Date: 1 Sept 2021

Master, Information and Communications Engineering, University of Leicester
1 Sept 2010 → 1 Sept 2011
Award Date: 1 Jan 2012

Bachelor of Electrical Engineering (BEE), Bahria University
1 Sept 2006 → 1 Jul 2010
Award Date: 1 Nov 2010

Employment

Division of Science, Engineering and Health Studies (SEHS)
College of Professional and Continuing Education (CPCE)
20 Mar 2023 → present

Postdoctoral Fellow

Centre for Advances in Reliability and Safety (CAiRS)
Hong Kong
1 Apr 2022 → 31 Mar 2023

Lecturer, Department of Electrical Engineering

DHA Suffa University
Pakistan
1 Sept 2014 → 31 Aug 2016

Lecturer, Department of Electrical Engineering

Sukkur IBA University
Pakistan
1 Jan 2012 → 30 Aug 2014

Research outputs

A Time-Reversal Enhanced Dynamic Response Framework for Secure UWB Ranging

Luo, W., Tang, X., Du, Q., Hussain, B. & Song, H., 16 Oct 2026, (Accepted/In press) In: IEEE Transactions on Vehicular Technology.

Diffusion-Based Stress Testing of Overload Monitoring for Resilient Emergency Cellular Networks Using Internet CDR Proxies

Hussain, B., Tang, X., Tan, L., Azhar, M., Khan, D. & Ahmad, F., 3 Oct 2026, (Accepted/In press) *2026 IEEE Globecom Workshops (GC Wkshps): 5th Workshop on Next Generation Intelligent Wireless Emergency Communications*. Macau S.A.R., China: IEEE Communications Society

AI-Native Closed-Loop Security for 6G-Enabled Cyber-Physical Systems: From Edge Detection to Network-Wide Mitigation

Hussain, B., Bilal, M., Tan, L., Pervaiz, H., Tang, X., Du, Q., Ahmad, F., Azhar, M. & Zhang, J., 1 Oct 2026, (Submitted) In: Computer Science Review.

Diff-DDoS: Realistic Cyber-Physical Attack Synthesis and Robust Detection for 5G-Enabled CPS Using Tabular Diffusion Models

Hussain, B., Tang, X., Du, Q., Tan, L., Azhar, M. & Khan, D., 10 Sept 2026, In: IEEE Transactions on Industrial Informatics. p. 1-11 11 p.

Generative Stress-Testing of MEC CDR Fault Detectors for Emergency Communications Readiness

Hussain, B., Tang, X., Du, Q. & Bilal, M., 26 Aug 2026, (Submitted).

Do Efficiency Scores Improve Financial Distress Prediction? Cross-Market Evidence

Hussain, A., Jingchun, S., Hussain, B. & Shaique, M., Aug 2026, In: Finance Research Letters. p. 110695

A Theory-Driven Framework of Digital Resilience across Institutional Contexts

Hussain, A., Jingchun, S., Hussain, B. & Shaique, M., 17 Jul 2026, *2026 AOM Annual Meeting*. 1 ed. Philadelphia, PA, USA, Vol. 2026. (Academy of Management Proceedings).

Green Innovation and Institutional Resilience in China's Firms under the COVID-19 Shock

Hussain, A., Jingchun, S., Shaique, M. & Hussain, B., 17 Jul 2026, *2026 AOM Annual Meeting*. 1 ed. Philadelphia, PA, USA, Vol. 2026. (Academy of Management Proceedings).

Detection of Anxiety and Depression from Social Media Text Using Natural Language Processing

Azhar, M., Amjad, A., Hussain, B., Ling, C. K., Niaz, T. & Akbar, M. H., 23 May 2026, (Accepted/In press). 8 p.

Cross-Market Bankruptcy Prediction: An Interpretable Ensemble Learning Framework Using SHAP Analysis

Bilal Hussain, A., SUN, J., Hussain, B., Shaique, M., Ur Rehman, A. & Kamran Bhatti, M., 14 Feb 2026, In: Computational Economics.

Trade-off Theory and Machine Learning: A Unified Framework for Organizational Survival

Hussain, A., Jingchun, S., Hussain, B., Rehman, A. U. & Shaique, M., 25 Mar 2025, (Accepted/In press).

Image Recognition of Computer programming Flowcharts Using Pre-Trained Image Models on a Small Dataset

Wong, K. L., Wong, T. L., Hussain, B. & Chiu, H. S., 2025, (Submitted) In: RUSC Universities and Knowledge Society Journal.

Using Image Analytics and Natural Language Processing to Support Teachers in Promoting Active Learning in Computer Programming

Wong, K. L., Hussain, B., Chiu, H. S. & Wong, T. L., 2025.

Deep Learning-Based DDoS-Attack Detection for Cyber-Physical System over 5G Network

Hussain, B., Du, Q., Sun, B. & Han, Z., Feb 2021, In: IEEE Transactions on Industrial Informatics. 17, 2, p. 860-870 11 p., 9000893.

Artificial Intelligence-Powered Mobile Edge Computing-Based Anomaly Detection in Cellular Networks

Hussain, B., Du, Q., Imran, A. & Imran, M. A., Aug 2020, In: IEEE Transactions on Industrial Informatics. 16, 8, p. 4986-4996 11 p., 8896997.

Mobile Edge Computing-Based Data-Driven Deep Learning Framework for Anomaly Detection

Hussain, B., Du, Q., Zhang, S., Imran, A. & Imran, M. A., 19 Sept 2019, In: IEEE Access. p. 137656 - 137667

Big data-driven anomaly detection in cellular networks (Invited Paper)

Hussain, B., Du, Q. & Ren, P., 5 Apr 2018, *2017 IEEE/CIC International Conference on Communications in China (ICCC)*. IEEE Communications Society, p. 1-6 6 p. (2017 IEEE/CIC International Conference on Communications in China, ICC 2017; vol. 2018-January).

Semi-supervised learning based big data-driven anomaly detection in mobile wireless networks

Hussain, B., Du, Q. & Ren, P., Apr 2018, In: China Communications. 15, 4, p. 41 - 57

Deep Learning-Based Big Data-Assisted Anomaly Detection in Cellular Networks

Hussain, B., Du, Q. & Ren, P., 2018, In: Proceedings - IEEE Global Communications Conference, GLOBECOM. 8647366.

Activities**ACM Conference on Trustworthy and Responsible AI and Computing Systems (TRUST 2027)**

Rezazadeh, F. (Chair), Du, Q. (Chair), Kantarci, B. (Chair) & Hussain, B. (Chair)

7 Mar 2027 → 9 Mar 2027

2026 IEEE Global Communications Conference

Hussain, B. (Member of programme committee)

7 Dec 2026 → 11 Dec 2026

Sensors (Switzerland) (Journal)

Hussain, B. (Editor)

30 Sept 2026

Electronics (Journal)

Hussain, B. (Editor)

15 Sept 2026

Level-6 Subject development of SEHS6xxx Research Methodology (as Reviewer)

Hussain, B. (Consultant)

15 Sept 2026 → 16 Oct 2026

Level-6 Subject development of SEHS6xxx Special Topics in Doctor of Engineering I/II/III (as Proposer)

Hussain, B. (Consultant)

15 Sept 2026 → 16 Oct 2026

IEEE Communications Society — Public Safety Communications Technical Working Group (External organisation)

Hussain, B. (Member)

11 Sept 2026 → ...

Communications and Intelligent Networked Computing (Journal)

Hussain, B. (Reviewer)

26 Aug 2026 → ...

20th International Symposium on Wireless Communication Systems

Hussain, B. (Organiser)

24 Aug 2026 → 26 Aug 2026

IEEE Communications Society (ComSoc) (External organisation)

Hussain, B. (Member)

22 Jun 2026

2026 IEEE 103rd Vehicular Technology Conference

Hussain, B. (Member of programme committee)

9 Jun 2026 → 12 Jun 2026

The 22nd International Wireless Communications & Mobile Computing Conference

Hussain, B. (Chair)

1 Jun 2026 → 6 Jun 2026

CPCECPR Facility Development Sub-Committee Workshop - Enhancing Student Engagement through Padlet: A Qualitative Exploration of Digital Collaboration in Higher Education

Lo, N. (Chair) & Hussain, B. (Moderator)

15 Dec 2025

Academic Publishing in the Mathematical Sciences: An Editor's Point of View (EDC, PolyU's workshop)

Hussain, B. (Participant)

3 Jun 2025

Level-5 Subject development of BHMS5XXXX AI, Analytics, and Digital Transformation for Talent Management (as Proposer)

Hussain, B. (Consultant)

28 May 2025 → 20 Jun 2025

IEEE 101st Vehicular Technology Conference: VTC2025-Spring

Hussain, B. (Member of programme committee)

8 Apr 2025 → 20 Jun 2025

IEEE Global Communications Conference (GLOBECOM) 2024

Hussain, B. (Member of programme committee)

8 Dec 2024 → 12 Dec 2024

IEEE Global Communications Conference (GLOBECOM) 2024

Hussain, B. (Member of programme committee)

8 Dec 2024 → 12 Dec 2024

CPCECPR Conference 2024 – Transforming Education to Build a Future-Ready Workforce

Hussain, B. (Moderator)

19 Apr 2024 → 20 Apr 2024

The Flipped Classroom: Getting Started

Hussain, B. (Participant)

13 Mar 2024

CLP Power Hong Kong Limited

Hussain, B. (Visiting lecturer)

11 Mar 2024

Member, Board of Examiners (BoE) of BEng (Hons) in Electrical Engineering for Semester Two 2023/24

Hussain, B. (Examiner)

Jan 2024 → Jun 2024

Ali Kashif Bashir

Hussain, B. (Host)

24 Oct 2023 → 25 Oct 2023

2023 IEEE 98th Vehicular Technology Conference (VTC2023-Fall)

Hussain, B. (Member of programme committee)

10 Oct 2023 → 13 Oct 2023

Subject development of SEHS5011 IT & Web 3.0 (as Proposer)

Hussain, B. (Academic Advisor)

10 Aug 2023 → 10 Oct 2023

CPCE Centre for Pedagogic Research (CPCECPR) (Organisational unit)

Hussain, B. (Member)

20 Apr 2023 → 31 Mar 2025

AI-Enabled Anomaly Detection for Self-Healing Cellular Networks

Hussain, B. (Speaker)

9 Dec 2019

The Institute of Electrical and Electronics Engineers (IEEE) (External organisation)

Hussain, B. (Member)

1 Jan 2011 → 31 Dec 2026

The Institution of Engineering & Technology (IET) (External organisation)

Hussain, B. (Member)

1 Jan 2011

Projects

AI-SELA: AI-assisted Self-diagnostic English Literacy Assessment System for Sub-degree & Degree Students | Quality Enhancement Support Scheme | HK\$2,400,000

Wong, F. C. F. (PI), Chan, K. L. Z. (CoPI), Chan, J. K. Y. (Col), Tong, K. M. E. (Col), Lui, E. (Col), Lo, P. K. N. (Col), Leung, C. S. Y. (Col), Lai, W. W. S. (Col), Young, A. (Col), Hussain, B. (Col) & Ho, A. (Col)

1/09/24 → 31/08/27

Proactive Anomaly Detection using a Prescriptive Analytics-Based Light Modular Framework in Mobile Networks | CPCE-funded Research Project (Ref: SEHS-2023-295(I)) | HK\$ 36,098

Hussain, B. (PI)

8/11/23 → 17/04/26

Using image analytics and natural language processing to support teacher to promote active learning in computer programming | CPCE-funded Research Project (Ref: SEHS-2022-278 (J)) | HK\$ 16,440

Wong, K. L. A. (PI) & Hussain, B. (Col)

8/06/23 → 30/06/25