

RIPAN KUMAR KUNDU

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RESEARCH INTEREST

- Trustworthy and explainable AI for safe, secure, and privacy-preserving AI-XR.
- XR security and usable privacy to enhance trust and usability.
- Human-centered AI and multitask learning for adaptive and immersive XR.

EDUCATION

2022–2025 (Expected)	Ph.D. in Electrical & Computer Engineering University of Missouri, Columbia, MO <i>Dissertation: Towards Safe and Trustworthy Artificial Intelligence (AI) for Extended Reality (XR) Applications.</i> Advisor: Prof. Khaza Anuarul Hoque
2017–2022	M.Sc. in Electrical Engineering University of Rostock, Rostock, Germany <i>Thesis: Investigating Events and Anomaly Detection for Cyber-Physical Power System using Artificial Intelligence.</i> Advisor: Prof. Dr.-Ing. Lijun Cai (University of Rostock, Germany) & Dr. Shuva Paul (Georgia Institute of Technology, USA)
2012–2016	B.Sc. in Electrical and Electronic Engineering American International University-Bangladesh, Dhaka, Bangladesh <i>Project: Micro-Controller-based Smart Water Pump Control System</i> Advisor: Prof. Rinku Basak

RESEARCH & PROFESSIONAL EXPERIENCE

2022 — present	Graduate Research Assistant , Dependable Cyber-Physical Systems Laboratory Research focus: Trustworthy and explainable AI to build safe, secure, and privacy-aware XR Applications. Department of Electrical and Computer Engineering, University of Missouri, Columbia, MO
2020 — 2021	Master Thesis Research Student , Institute for Electrical Power Engineering, University of Rostock Research focus: AI for Events and Anomaly Detection in Cyber-Physical Power Systems. University of Rostock, Rostock, Germany
2020 — 2020	R & D Intern , ROKIN GmbH, Munich, Germany Research focus: Developed NLP methods for Industry 4.0 digital white papers, including model training and content management.
2018 — 2019	Student Research Assistant , Institute of Applied Microelectronics and Computer Engineering, University of Rostock Research focus: Sensor Fusion and AI methods for XR Sensor Technology. University of Rostock, Rostock, Germany

INVENTIONS & INTELLECTUAL PROPERTY

[P4] Ripan Kumar Kundu, Istiak Ahmed, Khurram Khalil, Khaza Anuarul Hoque, "*An Adaptive System for Cybersickness Mitigation in Virtual Reality Using Reinforcement Learning and an Interactive Dialogue Engine.*" Invention Disclosure Filed, University of Missouri Technology Advancement Office, Disclosure No. 26UMC033. (Sep 2025). (Under review for **U.S. Patent**).

[P3] Khurram Khalil, Ripan Kumar Kundu, Khaza Anuarul Hoque, "*A Universal, Tokenizer-Free Language Architecture with Continuous Interaction Fields*." Invention Disclosure Filed, University of Missouri Technology Advancement Office, Disclosure No. 26UMC039. (Sep 2025). (Under review for **U.S. Patent**).

[P2] Khurram Khalil, Ripan Kumar Kundu, Khaza Anuarul Hoque, "*An Efficient Attention Mechanism for Transformers Using Geometric Clustering.*" Invention Disclosure Filed, University of Missouri Technology Advancement Office, Disclosure No. 26UMC027. (Sep 2025). (Under review for **U.S. Patent**).

[P1] Khurram Khalil, Ripan Kumar Kundu, Khaza Anuarul Hoque, "*An Attention Mechanism with Orthogonal Subspace Projections for Transformer Models.*" Invention Disclosure Filed, University of Missouri Technology Advancement Office, Disclosure No. 26UMC031. (Sep 2025). (Under review for **U.S. Patent**).

PEER-REVIEWED JOURNAL ARTICLES

[J7] Ripan Kumar Kundu, Istiak Ahmed, Mark Dennison, Khaza Anuarul Hoque, "*Leveraging Pre-Trained Large Foundation Models for Enhancing VR Cybersickness Prediction.*" IEEE Transactions on Human-Machine Systems (2025), (**Impact factor: 4.4**) (under review)

[J6] Istiak Ahmed, Ripan Kumar Kundu, Khaza Anuarul Hoque, "*AdaptVR: Leveraging Reinforcement Learning and LLMs for Personalized Cybersickness Mitigation and Reasoning in VR.*" IEEE Transactions on Systems, Man and Cybernetics: Systems (2025), (**Impact factor: 8.7**) (under review)

[J5] Ripan Kumar Kundu, Matthew Denton, Genova Mongalo, Prasad Calyam, Khaza Anuarul Hoque, "*Securing Virtual Reality Experiences: Unveiling and Tackling Cybersickness Attacks with Explainable AI.*" IEEE Transactions on Dependable and Secure Computing (2025): 1- 18, (**Impact factor: 7.3**)

[J4] Ripan Kumar Kundu, Khaza Anuarul Hoque, "*RelaxVR: Cybersickness Reduction in Immersive Virtual Reality Through Explainable AI and Large Language Models.*" IEEE Access 13 (2025): 84689 - 84712, (**Impact factor: 3.4**)

[J3] Jyotirmay Nag Setu, Joshua M Le, Ripan Kumar Kundu, Barry Giesbrecht, Tobias Höllerer, Khaza Anuarul Hoque, Kevin Desai, John Quarles, "*Predicting and Explaining Cognitive Load, Attention, and Working Memory in Virtual Multitasking.*" IEEE Transactions on Visualization and Computer Graphics 31.5 (2025): 3014 - 3024, (**Impact factor: 4.579**)

[J2] Ripan Kumar Kundu, Khurram Khalil, Eric Garcia, Ethan Grassia, Prasad Calyam, Khaza Anuarul Hoque, "*PEARL: An Adaptive and Explainable Hardware Trojan Detection Using Open Source and Enterprise Large Language Models*", IEEE Access 13 (2025): 133755 - 133772, (**Impact factor: 3.4**)

[J1] Ripan Kumar Kundu, Akhlaqur Rahman, Shuva Paul "A study on sensor system latency in VR motion sickness." Journal of Sensor and Actuator Networks 10:3 (2021): 53, (**Impact factor: 4.2**).

PEER-REVIEWED CONFERENCE PAPERS

[C30] Ripan Kumar Kundu, Abhinav Goswami, Khaza Anuarul Hoque, "*Eyes Tell More Than You Think: Chain of Privacy Attacks and Defense in AI-based XR Gaze Prediction*", International Conference on Embedded Artificial Intelligence and Sensing Systems (SenSys), 2026, (**Core Rank: A***) (under review).

[C29] Ripan Kumar Kundu, Khurram Khalil, Istiak Ahmed, Khaza Anuarul Hoque, "*In-Sensor Privacy-Preserving Encoding for Real-Time Gaze Prediction in Extended Reality*", International Conference on Embedded Artificial Intelligence and Sensing Systems (SenSys), 2026, (**Core Rank: A***) (under review).

[C28] Ripan Kumar Kundu, Brendan David-John, Khaza Anuarul Hoque, "*Breaking Anonymity in XR through a Novel and Cost-effective Chain of Privacy Attacks and Differential Privacy-Based Defenses*", IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR), 2026, (**Core Rank: A***) (under review).

- [C27] Ripan Kumar Kundu, Istiak Ahmed, M Rasel Mahmud, Jyotirmay Nag Setu, John Quarles, Khaza Anuarul Hoque, "*MUIXVR: Multitask Learning-Enabled Intelligent User Interface for Enhancing VR Multitasking Experiences*", IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR), 2026, (**Core Rank: A***) (under review).
- [C26] Ripan Kumar Kundu, M Rasel Mahmud, Khaza Anuarul Hoque, "*Multitasking in VR: A Novel Dataset and The Impact of Cognitive Load, Working Memory, and Attention on Cybersickness During Navigation*", IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR), 2026, (**Core Rank: A***) (under review).
- [C25] Ripan Kumar Kundu, Istiak Ahmed, Khaza Anuarul Hoque, "*Unveiling Cognitive Attacks on Multimodal LLM-based XR Cognitive Assistants.*", IEEE Symposium on Security and Privacy, 2026 IEEE S&P, (**Core Rank: A***) (under review).
- [C24] Istiak Ahmed, Ripan Kumar Kundu, Khaza Anuarul Hoque, "*InvisXR: Invisible Runtime Hijacking in OpenXR-based Extended Reality*", IEEE Symposium on Security and Privacy, 2026 IEEE S&P, (**Core Rank: A***) (under review).
- [C23] Ripan Kumar Kundu, Khurram Khalil, Khaza Anuarul Hoque, "*Resolving Disagreement Problems in Explainable Artificial Intelligence Through Multi-Criteria Decision Analysis*", AAAI Conference on Artificial Intelligence, 2026 AAAI, (**Core Rank: A***) (under review).
- [C22] Khurram Khalil, Ripan Kumar Kundu, Khaza Anuarul Hoque, "*The Dynamic Interaction Field Transformer: A Universal, Tokenizer-Free Language Architecture*", International Conference on Learning Representations, 2026 ICLR, (**Core Rank: A***) (under review).
- [C21] Khurram Khalil, Ripan Kumar Kundu, Khaza Anuarul Hoque, "*On the Geometric Selection of Landmarks for Low-Rank Self-Attention Approximation*", International Conference on Learning Representations, 2026 ICLR, (**Core Rank: A***) (under review).
- [C20] Khurram Khalil, Ripan Kumar Kundu, Khaza Anuarul Hoque, "*Why Soft Constraints Work: A Theoretical Analysis of Momentum Corruption in Neural Network Optimization*", International Conference on Learning Representations, 2026 ICLR, (**Core Rank: A***) (under review).
- [C19] Ripan Kumar Kundu, Istiak Ahmed, Khaza Anuarul Hoque, "*Enhancing Immersive Virtual Reality Experiences with Multiple Tasks Prediction Using Pre-Trained Large Foundation Models*", ACM Symposium on Virtual Reality Software and Technology, 2025 VRST. (**Core Rank: A**)
- [C18] Ripan Kumar Kundu, Istiak Ahmed, Khaza Anuarul Hoque, "*PrivateXR: Defending Privacy Attacks in Extended Reality Through Explainable AI-Guided Differential Privacy*", IEEE International Symposium on Mixed and Augmented Reality, 2025 ISMAR. (**Core Rank: A***)
- [C17] Ripan Kumar Kundu, Istiak Ahmed, John Quarles, Khaza Anuarul Hoque, "*ExciteVR: Effective Cybersickness Mitigation in Virtual Reality using Explainable Artificial Intelligence and Large Language Models*", IEEE International Symposium on Mixed and Augmented Reality, 2025 ISMAR-Adjunct. (**Core Rank: A***)
- [C16] Ripan Kumar Kundu, Istiak Ahmed, Khaza Anuarul Hoque, "*PILAR: Personalizing Augmented Reality Interactions with LLM-based Human-Centric and Trustworthy Explanations for Daily Use Cases*", IEEE International Symposium on Mixed and Augmented Reality, 2025 ISMAR-Adjunct. (**Core Rank: A***)
- [C15] Istiak Ahmed, Ripan Kumar Kundu, Khaza Anuarul Hoque, "*Adversarial VR: An Open-Source Testbed for Evaluating Adversarial Robustness of VR Cybersickness Detection and Mitigation*", IEEE International Symposium on Mixed and Augmented Reality, 2025 ISMAR-Adjunct. (**Core Rank: A***)
- [C14] Ripan Kumar Kundu, Khaza Anuarul Hoque, "*Advancing Cybersickness Prediction in Immersive Virtual Reality Using Pre-Trained Large Foundation Models*", IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops, 2025 VRW: 1244-1245 (**Core Rank: A***)

- [C13] Ripan Kumar Kundu, Khaza Anuarul Hoque, "*SecretVR: Differential Privacy Defense Against Membership Inference Privacy Attacks in Virtual Reality*", IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops, 2025 VRW: 1266-1267 (**Core Rank: A***)
- [C12] Ripan Kumar Kundu, Khaza Anuarul Hoque, "*Preserving Personal Space: Differentially Private Cybersickness Detection in Immersive Virtual Reality Environments*", IEEE International Symposium on Mixed and Augmented Reality, 2024 ISMAR : 11-20 (**Core Rank: A***)
- [C11] Jyotirmay Nag Setu, Joshua M Le, Ripan Kumar Kundu, Barry Giesbrecht, Tobias Höllerer, Khaza Anuarul Hoque, Kevin Desai, John Quarles, "*Mazed and Confused: A Dataset of Cybersickness, Working Memory, Mental Load, Physical Load, and Attention During a Real Walking Task in VR*", IEEE International Symposium on Mixed and Augmented Reality, 2024 ISMAR : 11-20 (**Core Rank: A***)
- [C10] Ripan Kumar Kundu, Khaza Anuarul Hoque, "*Explainable Predictive Maintenance is Not Enough: Quantifying Trust in Remaining Useful Life Estimation*", Annual Conference of the Prognostics and Health Management Society, 2023 PHM : 15(1) (**Acceptance rate 30%**).
- [C9] Ripan Kumar Kundu, Rifatul Islam, John Quarles, Khaza Anuarul Hoque "*LiteVR: Interpretable and Lightweight Cybersickness Detection using Explainable AI*", IEEE Conference on Virtual Reality and 3D User Interfaces, 2023 IEEE VR : 609-619 (**Core Rank: A***)
- [C8] Ripan Kumar Kundu, Osama Yahia Elsaid, Prasad Calyam, Khaza Anuarul Hoque, "*VR-LENS: Super Learning-based Cybersickness Detection and Explainable AI-Guided Deployment in Virtual Reality*", ACM annual meeting of the intelligent user interfaces, 2023 ACM IUI : 819-834 (**Core Rank: A**)
- [C7] Ripan Kumar Kundu, Rifatul Islam, Prasad Calyam, Khaza Anuarul Hoque, "*TruVR: Trustworthy Cybersickness Detection using Explainable Machine Learning*", IEEE International Symposium on Mixed and Augmented Reality, 2022 ISMAR : 777-786 (**Core Rank: A***)
- [C6] Shuva Paul, Ripan Kumar Kundu, "*A Bagging MLP-based Autoencoder for Detection of False Data Injection Attack in Smart Grid*", IEEE Power & Energy Society Innovative Smart Grid Technologies Conference, 2022 ISGT : 1-5 (**Acceptance rate 30%**)
- [C5] Ripan Kumar Kundu, Kazi Md Jubyer, Abdullahil Fawaz, Sathi Rani Das, Mohammad Moniruzaman, "*An economical analysis of charging electric three wheelers using solar biogas hybrid energy system*", Innovations in Power and Advanced Computing Technologies, 2017 i-PACT : 1-5
- [C4] Ikram Ilyas, Shuva Paul, Akhlaqur Rahman, Ripan Kumar Kundu, "*Comparative evaluation of cyclostationary detection based cognitive spectrum sensing*", IEEE 7th annual ubiquitous computing, electronics & mobile communication conference, 2016 UEMCON : 1-7 (**Acceptance rate 33%**)
- [C3] Md Kamrul Alam Khan, Shuva Paul, Md Siddikur Rahman, Ripan Kumar Kundu, Md Mahmudul Hasan, Mohammad Moniruzzaman, Mohammad Al Mamun, "*A Study of Performance Analysis of PKL Electricity generation Parameters (An experimental analysis on Voltage Regulation, Capacity and Energy Efficiency of Pathor Kuchi Leaf (PKL) Electricity Cell)*", IEEE 7th Power India International Conference (PIICON), 2016 : 1-6
- [C2] Shuva Paul, Md Sajed Rabbani, Ripan Kumar Kundu, Sikdar Mohammad Raihan Zaman, "*A review of smart technology (Smart Grid) and its features*", IEEE International Conference on Non Conventional Energy, 2014 ICONCE : 200-203.
- [C1] Shuva Paul, Md Kamrul Alam Khan, Md Rashed Azad, Ripan Kumar Kundu, "*Performance studies of Mono-Crystal Silicon Solar Photovoltaic Module with booster reflector under Bangladeshi Climatic Condition*", IEEE Energytech, 2013: 1-6

TEACHING EXPERIENCE

Fall 2024	Graduate Teaching Assistant , Dept. of EECS
	Course: Computer-Aided Formal Verification (CS/ECE 8001)
	Number of students: 5
	Responsibilities: Assisting with teaching, grading and administering exams.
Summer 2024	Graduate Student Mentor , Dept. of EECS and supported by NSF
	Course: Research Experiences for Undergraduates (REU) programme
	Number of students mentored: 2
	Responsibilities: To guide students in conducting research and supporting them in writing research papers for conference and journal publication.
Summer 2023	Graduate Student Mentor , Dept. of EECS and supported by NSF
	Course: Research Experiences for Undergraduates (REU) programme
	Number of students mentored: 2
	Responsibilities: To guide students in conducting research and supporting them in writing research papers for conference and journal publication.
Summer 2022	Graduate Student Mentor , Dept. of EECS and supported by NSF
	Course: Research Experiences for Undergraduates (REU) programme
	Number of students mentored: 2
	Responsibilities: To guide students in conducting research and supporting them in writing research papers for conference and journal publication.
Summer 2019	Lab Assistant , Dept. of EE
	Course: Selected Topics in VLSI Design
	Number of students: 35
	Responsibilities: Assisting with lab sessions, grading and administering exams.

HONORS AND AWARDS

October. 2025	Best Poster Award from conference papers for Publication [C17], 24th IEEE International Symposium on Mixed and Augmented Reality, (ISMAR 2025).
October. 2025	John D. Bies International Travel Award by University of Missouri
February 2024	Outstanding PhD Student Award by College of Engineering of the University of Missouri-Columbia.
February 2024	Outstanding PhD Student Award by Department of EECS of the University of Missouri-Columbia.
February. 2023	National Science Foundation (NSF) Travel Award
October. 2023	Electrical Engineering and Computer Science (EECS) Travel Award by Department of EECS of the University of Missouri-Columbia.
May. 2024	Travel Grant by Cornell University for the XR Access Symposium
October. 2024	EECS Travel Award by Department of EECS of the University of Missouri-Columbia.
May. 2025	Travel Grant by Cornell University for the XR Access Symposium
August. 2025	EECS Travel Award by Department of EECS of the University of Missouri-Columbia

TECHNICAL SKILLS

- **Programming Languages:** C/C++, Java, C#, CUDA, MySQL
- **Scripting Languages:** Python, MATLAB
- **System Design:** Windows, Linux, Mac, Anaconda, Jupyter Notebook, Google Colab, Unity3D, Unreal Engine, TensorFlow Extended (TFX), AWS SageMaker, Android Studio, Docker, and Kubernetes,
- **Libraries & Others:** Scikit-Learn, TensorFlow, Pytorch, Keras, Seaborn, Git, Pandas, OpenCV, Foun-

dation Models, Deep Learning, Explainable AI, Large Language Models (LLMs), , Multi-Modal AI, Time series analysis, Differential Privacy, Diffusion models, Reinforcement Learning (RL)

- **Hardware:** Raspberry Pi, Arduino Portenta H7, NVIDIA Jetson Series, Google Coral Dev Board

PROFESSIONAL ACTIVITIES

Organizer – 1st International Workshop on Trustworthy, Secure, and Privacy-Aware Artificial Intelligence for Extended Reality Applications (TRUST-XR).

Reviewer – IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR)

Reviewer – IEEE International Symposium on Mixed and Augmented Reality (ISMAR)

Reviewer – ACM Conference on Computer-Supported Cooperative Work & Social Computing (CSCW)

Reviewer – ACM Symposium on Virtual Reality Software and Technology (VRST)

Reviewer – AAAI Conference on Artificial Intelligence (AAAI)

Reviewer – IEEE Transactions on Visualization and Computer Graphics (TVCG)

Reviewer – IEEE Transactions on Human-Machine Systems (THMS)

Reviewer – Annual Conference on Neural Information Processing Systems (NeurIPS)

Reviewer – Elsevier Displays

Reviewer – Elsevier Computer Methods and Programs in Biomedicine

Student Member – Institute of Electrical and Electronics Engineers (IEEE)

Member – Association for Computing Machinery (ACM)

SEMINAR TALKS, WORKSHOPS, PRESENTATIONS

Conferences Attended:

November. 2025	<i>31st ACM Symposium on Virtual Reality Software and Technology (VRST) Montreal, Canada</i>
October. 2025	<i>24th IEEE International Symposium on Mixed and Augmented Reality (ISMAR) Daejeon, South Korea</i>
June. 2025	<i>The Seventh Annual XR Access Symposium, New York City, USA</i>
Mar. 2025	<i>23rd IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR) , Saint-Malo, France</i>
Oct. 2024	<i>23rd IEEE International Symposium on Mixed and Augmented Reality (ISMAR), Seattle, USA</i>
June. 2024	<i>The Sixth Annual XR Access Symposium, New York City, USA</i>
Oct. 2023	<i>15th Annual Conference of the Prognostics and Health Management Society (PHM), Salt Lake City, Utah, USA</i>
Mar. 2023	<i>30th IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR), Shanghai, China</i>
Mar. 2023	<i>28th ACM International Conference on Intelligent User Interfaces (IUI) , Sydney, Australia</i>
Oct. 2022	<i>21st IEEE International Symposium on Mixed and Augmented Reality (ISMAR), Singapore</i>
Apr. 2022	<i>IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT), New Orleans, USA</i>
Apr. 2017	<i>Innovations in Power and Advanced Computing Technologies (i-PACT), Vellore, India</i>
Jan. 2014	<i>1st International Conference on Non Conventional Energy (ICONCE 2014), Kalyani, India</i>

Workshops:

- May. 2024 *REU Workshop and Training Program, at* University of Missouri-Columbia, MO
- May. 2023 *REU Workshop and Training Program, at* University of Missouri-Columbia, MO
- May. 2022 *REU Workshop and Training Program, at* University of Missouri-Columbia, MO