Sensing, ArtiFicial intelligence, and Edge networking towards Rural Health monitoring (SAFE-RH)

D4.3

Publication report

SAFE-RH Project no. 619483-EPP-1-2020-1-UK-EPPKA2-CBHE-JP

Contents

SAFE-RH

1 Introduction

The SAFE-RH project aims to advance remote health monitoring technologies in rural areas through collaborative research and technological innovation. An essential component of this project is the dissemination of research findings through various publications, including journal articles, conference papers, book chapters, and technical reports. This publications report aims to document these outputs, analyze their impact, and provide insights into the project's scholarly contributions.

The report is structured to offer a detailed overview of the publications, including their metrics and significance. It also addresses the collaborative efforts that contributed to these publications and discusses the challenges encountered in the publication process. By providing a thorough analysis, this report aims to highlight the project's achievements in knowledge dissemination and its impact on the broader research community and public health practices.

2 Objectives

The objectives of this publications report are as follows:

1. Document the publications produced during the SAFE-RH project.

2. Analyze the impact and reach of these publications.

3. Identify trends and patterns in the research outputs.

4. Highlight significant publications and their contributions to the field.

5. Discuss the challenges faced in the publication process and the solutions implemented.

3 Publication Metrics

This section provides an overview of key publication metrics for the SAFE-RH project. The metrics include:

1. Total number of publications: The total count of publications produced during the project.

2. Breakdown by publication type: The distribution of publications across journal articles, conference papers, book chapters, and technical reports.

3. Citation analysis: The number of citations each publication has received, indicating its influence on subsequent research.

4. Impact factor analysis: The impact factors of the journals where the publications appeared, reflecting their prestige and reach.

4 List of Publications

This section details the publications produced under the SAFE-RH project, categorized by type.

4.1 Journal Articles

This subsection details the key journal articles, including title, authors, journal name, publication date, abstract, and key findings.

[1] W. Sultan, N. Anjum, M. Stansfield, and N. Ramzan, "Hybrid local and global deep-learning architecture for salient-object detection," *Applied Sciences*, vol. 10, p. 8754, 2020.

[2] G. I. Okolo, S. Katsigiannis, T. Althobaiti, and N. Ramzan, "On the use of deep learning for imaging-based COVID-19 detection using chest X-rays," *Sensors*, vol. 21, p. 5702, 2021.

[3] S. Irfan, N. Anjum, N. Masood, A. S. Khattak, and N. Ramzan, "A novel hybrid deep learning model for human activity recognition based on transitional activities," *Sensors*, vol. 21, no. 24, p. 8227, 2021.

[4] G. I. Okolo, S. Katsigiannis, and N. Ramzan, "IEViT: An enhanced vision transformer architecture for chest X-ray image classification," *Computer Methods and Programs in Biomedicine*, vol. 226, p. 107141, 2022.

[5] S. Irfan, N. Anjum, T. Althobaiti, A. A. Alotaibi, A. B. Siddiqui, and N. Ramzan, "Heartbeat classification and arrhythmia detection using a multi-model deep-learning technique," *Sensors*, vol. 22, no. 15, p. 5606, 2022.

[6] S. Liaqat, K. Dashtipour, A. Rizwan, et al., "Personalized wearable electrodermal sensing-based human skin hydration level detection for sports, health and wellbeing," *Scientific Reports*, vol. 12, p. 3715, 2022.

[7] S. G. Ahmad, T. Iqbal, A. Javaid, E. U. Munir, N. Kirn, S. U. Jan, and N. Ramzan, "Sensing and artificial intelligent maternal-infant health care systems: a review," *Sensors*, vol. 22, no. 12, p. 4362, 2022.

[8] S. Ahmed, S. Irfan, N. Kiran, N. Masood, N. Anjum, and N. Ramzan, "Remote health monitoring systems for elderly people: a survey," *Sensors*, vol. 23, no. 16, p. 7095, 2023.

[9] S. G. Ahmad, T. Iqbal, E. U. Munir, and N. Ramzan, "Cost optimization in cloud environment based on task deadline," *Journal of Cloud Computing*, vol. 12, no. 9, pp. 1–18, 2023.

[10] A. R. Ismail, S. Jovanovic, N. Ramzan, and H. Rabah, "ECG classification using an optimal temporal convolutional network for remote health monitoring," *Sensors*, vol. 23, no. 3, p. 1697, 2023, doi: 10.3390/s23031697.

[11] M. M. Deramgozin, S. Jovanovic, M. Arevalillo-Herráez, N. Ramzan, and H. Rabah, "Attention-enabled lightweight neural network architecture for detection of action unit activation," *IEEE Access*, vol. 11, pp. 117954–117970, 2023, doi: 10.1109/ACCESS.2023.3325034.

[12] A. Hassan, S. G. Ahmad, E. U. Munir, I. A. Khan, and N. Ramzan, "Predictive modelling and identification of key risk factors for stroke using machine learning," *Scientific Reports*, vol. 14, p. 11498, 2024.

[13] A. Hassan, S. G. Ahmad, T. Iqbal, E. U. Munir, K. Ayyub, and N. Ramzan, "Enhanced model for gestational diabetes mellitus prediction using a fusion technique of multiple

algorithms with explainability," *International Journal of Computational Intelligence Systems*, vol. 18, no. 47, 2025.

[14] M. Aslam, O. Riaz, J. Aslam, D. M. Khan, M. Hameed, M. Suleman, R. Shahid, T. Althobaiti, and N. Ramzan, "Metabolomics biomarkers in prediction of sudden infant death syndrome: the role of short chain fatty acids," *IEEE Access*, vol. 13, pp. 14820–14836, 2025.

[15] P. Amin, S. G. Ahmad, H. U. Khan, E. U. Munir, and N. Ramzan, "Predictive analytics in maternal health: a machine learning approach for classification of preeclampsia," *International Journal of Computational Intelligence Systems*, vol. 18, 2025.

[16] S. G. Ahmad, M. A. Arif, A. Hassan, K. Ayyub, E. U. Munir, and N. Ramzan, "IoT based smart wearable belt for tracking fetal kicks and movements in expectant mothers," *IEEE Sensors Journal*, vol. 25, no. 14, 2025.

4.2 Conference Papers

This subsection provides information on the significant conference papers, including title, authors, conference name, presentation date, abstract, and key findings.

[1] M. Deramgozin, S. Jovanovic, H. Rabah, and N. Ramzan, "A hybrid explainable AI framework applied to global and local facial expression recognition," in *Proc. IEEE Int. Conf. on Imaging Systems and Techniques (IST)*, Kaohsiung, Taiwan, 2021, pp. 1–5, doi: 10.1109/IST50367.2021.9651357.

[2] A. R. Ismail, S. Jovanovic, N. Ramzan, and H. Rabah, "ECG signal classification using temporal convolutional network," in *Proc. 29th IEEE Int. Conf. on Electronics, Circuits and Systems (ICECS)*, Glasgow, United Kingdom, 2022, pp. 1–4, doi: 10.1109/ICECS202256217.2022.9970944.

[3] A. Ashfaq, N. Anjum, S. Ahmed, and N. Masood, "Hybrid deep learning model for ECG-based arrhythmia detection," in *Proc. IEEE Int. Conf. on Frontiers of Information Technology (FIT)*, 2022, pp. 278–283.

[4] N. Razzaq, N. Masood, S. Nawaz, N. Anjum, and N. Ramzan, "Stroke prediction in elderly persons using remote health monitoring," in *Proc. 29th IEEE Int. Conf. on Electronics, Circuits and Systems (ICECS)*, 2022, pp. 1–4.

[5] V. Kiyani, S. G. Ahmad, T. Iqbal, and E. U. Munir, "A comparative study of machine learning techniques for maternal health prediction to reduce the women health risks during pregnancy," in *Proc. Int. Conf. on Computing Research (ICCoR'22)*, CUST, Islamabad, 2022.

[6] A. Zemouri, A. R. Ismail, S. Jovanovic, and H. Rabah, "Embedded 1D convolutional network based ECG classification platform for remote health monitoring," in *Proc. 30th IEEE Int. Conf. on Electronics, Circuits and Systems (ICECS)*, Istanbul, Türkiye, 2023, pp. 1–4, doi: 10.1109/ICECS58634.2023.10382837.

[7] M. M. Deramgozin, S. Jovanovic, N. Ramzan, and H. Rabah, "Lightweight attention-based CNN on embedded systems for emotion recognition," in *Proc. 30th IEEE Int. Conf. on Electronics, Circuits and Systems (ICECS)*, Istanbul, Türkiye, 2023, pp. 1–4, doi: 10.1109/ICECS58634.2023.10382796.

4.3 Book Chapters

This subsection includes details of important book chapters, such as title, authors, book title, publication date, abstract, and key contributions.

[1] N. Saher, O. Riaz, M. Suleman, D. M. Khan, N. Kirn, S. U. Jan, R. Shahid, H. Rabah, and N. Ramzan, "Advances in multi-modal remote infant monitoring systems," in *Proc. Multimodal Intelligent Sensing in Modern Applications*, M. Ur Rehman, A. Zoha, M. A. Jamshed, and N. Ramzan, Eds., Wiley, Dec. 2024, pp. 227–251, doi: 10.1002/9781394257744.ch10.

5 Impact Analysis

Note: Citation counts obtained from google scolar.

Publication	Citations	Field Influence	Applications	Follow-up Research
Ismail, A. R.; Jovanovic, S.; Ramzan, N.; Rabah, H., "ECG Signal Classification Using Temporal Convolutional Network," Proc. 29th IEEE ICECS, Glasgow, UK, 2022, pp. 1–4. doi:10.1109/ICECS202256217.2022.9970944.	3	Early conference application of Temporal Convolutional Networks (TCN) for ECG; highlights temporal convolutions for 1D biosignals.	Real-time ECG arrhythmia detection; embedded inference with low latency.	Benchmark TCN vs. CNN/RNN on diverse ECG datasets; robustness under noise; lightweight TCNs for wearables.
Zemouri, A.; Ismail, A. R.; Jovanovic, S.; Rabah, H., "Embedded 1D Convolutional Network based ECG Classification Platform for Remote Health Monitoring," Proc. 30th IEEE	3	Moves ECG DL models onto embedded platforms;	Wearable ECG devices; remote patient monitoring	Energy–latency trade-offs; quantization/pruning; end-to-end

ICECS, Istanbul, Türkiye, 2023, pp. 1–4. doi:10.1109/ICECS58634.2023.10382837.		bridges algorithm and hardware for remote monitoring.	systems; on-device inference.	edge/cloud pipelines.
Hassan, A.; Ahmad, S. G.; Munir, E. U.; Khan, I. A.; Ramzan, N., "Predictive modelling and identification of key risk factors for stroke using machine learning," Scientific Reports, 14:11498, 2024.	39	High-visibility ML-in-health paper; identifies influential risk factors for stroke with extensive model benchmarking.	Clinical decision support for stroke prevention; screening tools in primary care.	External validation on multi-center cohorts; causal inference; EHR integration and prospective trials.
Hassan, A.; Ahmad, S. G.; Iqbal, T.; Munir, E. U.; Ayyub, K.; Ramzan, N., "Enhanced Model for Gestational Diabetes Mellitus Prediction Using a Fusion Technique of Multiple Algorithms with Explainability," Int. J. Computational Intelligence Systems, 18(47), 2025.	5	Fusion + explainability for maternal health prediction; aligns with transparent AI in medicine.	Prenatal risk stratification for GDM; resource allocation in antenatal clinics.	Prospective validation; fairness across demographics; clinician-facing explanations.
Ahmed, S.; Irfan, S.; Kiran, N.; Masood, N.; Anjum, N.; Ramzan, N., "Remote health monitoring systems for elderly people: a survey," Sensors, 23(16):7095, 2023.	41	Survey shaping the agenda in remote monitoring for aging populations.	Smart-home sensing; fall detection; chronic condition tracking.	Interoperability frameworks; privacy-preserving analytics; user studies with caregivers.
Ashfaq, A.; Anjum, N.; Ahmed, S.; Masood, N., "Hybrid Deep Learning model for ECG-based Arrhythmia Detection," Proc. IEEE FIT 2022, pp. 278–283.	7	Explores hybrid DL for ECG arrhythmia detection; contributes comparative baselines.	Clinical ECG decision support; tele-cardiology workflows.	Ablations of hybrid components; robustness to class imbalance; dataset generalization.

Okolo, G. I.; Katsigiannis, S.; Ramzan, N., "IEViT: An enhanced vision transformer architecture for chest X-ray image classification," Computer Methods and Programs in Biomedicine, 226:107141, 2022.	101	Brings ViT enhancements to radiography; informs imaging pipelines beyond CNNs.	Automated X-ray triage; radiology workflow prioritization.	Data-efficient ViTs; self-supervised pretraining; uncertainty estimation.
Okolo, G. I.; Katsigiannis, S.; Althobaiti, T.; Ramzan, N., "On the Use of Deep Learning for Imaging-Based COVID-19 Detection Using Chest X-rays," Sensors, 21:5702, 2021.	27	Synthesizes DL approaches for COVID-19 X-ray diagnosis; part of pandemic-era imaging literature.	Rapid triage in resource-limited settings; retrospective analysis.	Bias control; domain shift handling; clinically curated datasets.
Irfan, S.; Anjum, N.; Althobaiti, T.; Alotaibi, A. A.; Siddiqui, A. B.; Ramzan, N., "Heartbeat classification and arrhythmia detection using a multi-model deep-learning technique," Sensors, 22(15):5606, 2022.	57	Multi-model approach for ECG classification; comparative reference for ensemble strategies.	ECG monitoring platforms; cloud-based cardiology analytics.	Model ensembling vs. efficiency; error analysis across arrhythmia types.
Irfan, S.; Anjum, N.; Masood, N.; Khattak, A. S.; Ramzan, N., "A novel hybrid deep learning model for human activity recognition based on transitional activities," Sensors, 21(24):8227, 2021.	22	Highlights transitional activities in HAR; influences modeling of fine-grained motion.	Elderly monitoring; rehabilitation; smart wearables.	Temporal segmentation; multi-sensor fusion; on-device HAR.
Ismail, A. R.; Jovanovic, S.; Ramzan, N.; Rabah, H., "ECG Classification Using an Optimal Temporal Convolutional Network for Remote Health Monitoring," Sensors, 23(3):1697, 2023.	39	Popular reference for TCN-based ECG classification; influences subsequent	Remote ECG monitoring; arrhythmia detection services; toolkits for TCN ECG.	Open datasets with TCN baselines; explainability for TCN decisions; lightweight TCNs.

		ECG DL work.		
Deramgozin, M.; Jovanovic, S.; Rabah, H.; Ramzan, N., "A Hybrid Explainable AI Framework Applied to Global and Local Facial Expression Recognition," Proc. IEEE IST 2021, Kaohsiung, Taiwan, 2021, pp. 1–5.	25	Brings XAI perspectives to facial expression recognition with global/local explanations.	Affective computing; HCI; assistive systems.	User-centered evaluation of explanations; real-time constraints; dataset bias.
Deramgozin, M. M.; Jovanovic, S.; Arevalillo-Herráez, M.; Ramzan, N.; Rabah, H., "Attention-Enabled Lightweight Neural Network Architecture for Detection of Action Unit Activation," IEEE Access, 11:117954–117970, 2023.	4	Lightweight AU detection enabling edge deployment for facial analysis.	Driver monitoring; patient emotion tracking; UX analytics.	Edge optimization; temporal AU modeling; cross-dataset generalization.
Deramgozin, M. M.; Jovanovic, S.; Ramzan, N.; Rabah, H., "Lightweight Attention-Based CNN on Embedded Systems for Emotion Recognition," Proc. 30th IEEE ICECS, Istanbul, Türkiye, 2023, pp. 1–4.	Unknown	Demonstrates embedded emotion recognition with attention mechanisms.	On-device affect recognition; social robots; wellbeing wearables.	Model compression; privacy-preserving deployment; multimodal fusion.
Aslam, M.; Riaz, O.; Aslam, J.; Khan, D. M.; Hameed, M.; Suleman, M.; Shahid, R.; Althobaiti, T.; Ramzan, N., "Metabolomics Biomarkers in Prediction of Sudden Infant Death Syndrome: The Role of Short Chain Fatty Acids," IEEE Access, 13:14820–14836, 2025.	Unknown (2025 new)	Brings metabolomics into SIDS risk prediction; interdisciplinary impact.	Early-risk screening; neonatal monitoring protocols.	Clinical validation; larger cohorts; integration with wearable monitoring.
Saher, N.; Riaz, O.; Suleman, M.; Khan, D. M.; Kirn, N.; Jan, S. U.; Shahid, R.; Rabah, H.; Ramzan, N., "Advances in Multi-modal Remote Infant Monitoring Systems," in Multimodal Intelligent Sensing in	Unknown (book chapter)	Survey/practice chapter aligning multimodal sensing for infant monitoring.	NICU and at-home infant monitoring; sensor fusion systems.	Multimodal datasets; safety and regulatory pathways; real-world trials.

Modern Applications, Wiley, 2024, pp. 227–251.				
Amin, P.; Ahmad, S. G.; Khan, H. U.; Munir, E. U.; Ramzan, N., "Predictive Analytics in Maternal Health: A Machine Learning Approach for Classification of Preeclampsia," Int. J. Computational Intelligence Systems, 18, 2025.	Unknown (2025 new)	Applies ML to preeclampsia classification; contributes to maternal health informatics.	Risk stratification in prenatal care; clinical decision support.	External validation; fairness auditing; longitudinal modeling.
Razzaq, N.; Masood, N.; Nawaz, S.; Anjum, N.; Ramzan, N., "Stroke prediction in elderly persons using remote health monitoring," Proc. 29th IEEE ICECS, 2022, pp. 1–4.	1	Brings remote monitoring features into stroke prediction for elderly cohorts.	Telehealth risk screening; continuous monitoring for stroke warning signs.	Sensor selection studies; prospective remote trials; integration with EHRs.
Liaqat, S.; Dashtipour, K.; Rizwan, A.; et al., "Personalized wearable electrodermal sensing-based human skin hydration level detection for sports, health and wellbeing," Scientific Reports, 12:3715, 2022.	28	Demonstrates EDA sensing for hydration assessment; contributes to wearable biosensing.	Athlete monitoring; wellbeing apps; personalized hydration alerts.	Calibration across skin types; multimodal hydration sensing; field studies.
Ahmad, S. G.; Arif, M. A.; Hassan, A.; Ayyub, K.; Munir, E. U.; Ramzan, N., "IoT Based Smart Wearable Belt for Tracking Fetal Kicks and Movements in Expectant Mothers," IEEE Sensors Journal, 25(14), 2025.	2	Introduces an IoT wearable for fetal movement tracking; bridges maternal-fetal monitoring and IoT.	At-home fetal kick counting; tele-obstetrics dashboards.	Clinical validation vs. CTG; comfort and compliance studies; data privacy.
Ahmad, S. G.; Iqbal, T.; Javaid, A.; Munir, E. U.; Kirn, N.; Jan, S. U.; Ramzan, N., "Sensing and Artificial Intelligent Maternal-Infant Health	47	Comprehensive review at the intersection of sensing and AI for	System design guides; roadmap for perinatal digital health.	Standards for interoperability; ethics and safety frameworks; dataset curation.

Care Systems: A Review," Sensors, 22(12):4362, 2022.		maternal-infant care.		
Ahmad, S. G.; Iqbal, T.; Munir, E. U.; Ramzan, N., "Cost Optimization in Cloud Environment based on Task Deadline," Journal of Cloud Computing, 12(9):1–18, 2023.	13	Applies deadline-aware optimization to cloud workloads; relevance to healthcare pipelines.	Cost-efficient ML training/inference; scheduling for health data processing.	Online scheduling; carbon-aware optimization; multi-cloud portability.
Kiyani, V.; Ahmad, S. G.; Iqbal, T.; Munir, E. U., "A Comparative Study of Machine Learning Techniques for Maternal Health Prediction to Reduce Women Health Risks During Pregnancy," Proc. ICCoR'22, CUST, Islamabad, 2022.	Unknown	Comparative baseline for maternal health ML methods.	Educational benchmarks; early-stage modeling for hospitals in LMICs.	Benchmark datasets; explainable comparisons; deployment studies.
Sultan, W.; Anjum, N.; Stansfield, M.; Ramzan, N., "Hybrid Local and Global Deep-Learning Architecture for Salient-Object Detection," Applied Sciences, 10:8754, 2020.	3	Contributes hybrid saliency detection model; informs computer vision pipelines.	Medical image pre-processing; robotics; attention mechanisms for imaging.	Real-time saliency on edge; cross-domain transfer; explainability for saliency maps.

6 Impact factor analysis

6.1 Conferences

Conference Name	Rank
2023 30th IEEE International Conference on Electronics, Circuits and Systems (ICECS)	B1
2023 30th IEEE International Conference on Electronics, Circuits and Systems (ICECS)	B1
2022 29th IEEE International Conference on Electronics, Circuits and Systems (ICECS)	B1
2021 IEEE International Conference on Imaging Systems and Techniques (IST)	Not available
International Conference on Computing Research ICCoR22	Not available

2022 International Conference on Frontiers of Information Technology (FIT)	Not available
2022 29th IEEE International Conference on Electronics, Circuits and Systems (ICECS)	B1

6.2 Journals

Journal Name	ISSN	Impact Factor (5-year)
IEEE Access	Not available	3.7
Sensors	1424-8220	3.7
Scientific Reports	2045-2322	4.4
Journal of Cloud Computing	2192-113X	3.8