Rahul Ranjan

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PROFESSIONAL SUMMARY

AI researcher specializing in healthcare innovation through deep learning. Published author (3 peer-reviewed papers) developing smartphone-based vital sign monitoring systems. Proven track record delivering ML solutions that reduced downtime by 18-22% and improved efficiency by 30% across healthcare, railway, and semiconductor domains.

RESEARCH INTERESTS

Non-invasive healthcare monitoring through mobile AI: remote photoplethysmography (rPPG), blood pressure estimation from video, and lightweight deep learning for ubiquitous vital sign detection.

EDUCATION

Master of Artificial Intelligence 2023 – 2025
Monash University, Melbourne, Australia

M.Sc. (Hons.) Physics 2017 – 2022
B.E. (Hons.) Electronics & Instrumentation
Birla Institute of Technology and Science (BITS), Pilani, India
Thesis: *Effect of Disorder on Critical Exponents*
Supervisor: Department of Physics, BITS Pilani

PUBLICATIONS

Published

Roha, V. S., **Ranjan, R.**, & Yuce, M. R. (2025). *Evolving Blood Pressure Estimation: From Feature Analysis to Image-Based Deep Learning Models. Journal of Medical Systems, 49*(1), 97. (Impact Factor: 4.8)

Under Review

Roha, V. S., **Ranjan, R.**, & Yuce, M. R. (2025). *From Pixels to Pressure: Smartphone Video and Lightweight Deep Learning for Everyday Blood Pressure Monitoring.* Submitted to *npj Digital Medicine* (Nature Portfolio, IF: 12.4).

Ranjan, R. (First Author), Roha, V. S., & Yuce, M. R. (2025). *VITAL Net: A Hybrid CNN-Transformer Framework for SpO_2 and HR Estimation Using Smartphone rPPG Video.* Submitted to *IEEE Applied Sensing Conference.*

RESEARCH EXPERIENCE

Independent Researcher 2023 – 2025
Department of Electrical and Computer Systems Engineering, Monash University

- **Architected novel deep learning models** for non-invasive blood pressure estimation from smartphone video, achieving clinically acceptable accuracy (MAE ¡ 5 mmHg) using rPPG technology — eliminating need for wearable sensors.
- **First-authored VITAL Net**, a lightweight hybrid CNN-Transformer framework for real-time SpO_2 and heart rate monitoring, optimized for mobile deployment with ¡10M parameters.
- **Published 3 peer-reviewed papers** (1 in high-impact journal, 2 under review at Nature Portfolio and IEEE conferences), contributing to the emerging field of contactless vital sign monitoring.

- Processed and analyzed 50,000+ video samples across multiple healthcare datasets, implementing end-to-end ML pipelines from data preprocessing to model deployment.

Research Intern Jan – May 2022
Centre for Railway Information Systems (CRIS), New Delhi

- **Reduced critical equipment downtime by 18%** through predictive maintenance algorithms analyzing sensor data from 200+ railway assets across the Indian network.
- Built ML-based anomaly detection system achieving 94% accuracy in identifying infrastructure failures 48 hours before occurrence.

INDUSTRY EXPERIENCE

Information Technology Officer Jun 2022 – Feb 2023
Aglow Engineers, Kolkata

- **Automated data pipelines** handling 10,000+ daily records, migrating legacy systems to PostgreSQL, reducing data entry errors by 85% and saving 15 hours/week.
- Deployed ML forecasting models (Random Forest & LSTM) predicting system vulnerabilities with 89% accuracy, decreasing downtime by 22%.
- Designed React-based dashboards providing real-time analytics to 30+ stakeholders, improving decision-making speed by 40%.

Software Development Intern Jul – Dec 2021
Xilinx (now AMD), Hyderabad

- **Developed Data Flow Sync Checker**, a production-grade timing analysis tool adopted by 25+ hardware engineers, automating FPGA validation workflows and improving design efficiency by 30%.
- Built automated reporting infrastructure with email notifications and Confluence integration, processing 1000+ daily file comparisons across device manifests.

TECHNICAL SKILLS

Programming Languages: Python (Expert), SQL, Java, R, MATLAB, C++, Bash (Advanced)
ML/Deep Learning: PyTorch (Expert), TensorFlow, Scikit-learn, Keras, Transformers, Computer Vision (OpenCV, MediaPipe)
Specialized: Remote Photoplethysmography (rPPG), Signal Processing, Medical Imaging, CNN/Transformer Architectures
Data Science: Pandas, NumPy, Matplotlib, Seaborn, Plotly, Time Series Analysis
DevOps & Tools: Docker, Git, Perforce, REST APIs, Web Scraping (BeautifulSoup), Vim, Linux, Cron
Development & Deployment: Flask, React, MongoDB, PostgreSQL, Model Optimization, Automated Testing

KEY ACHIEVEMENTS

- **3 Research Publications** in high-impact journals (Journal of Medical Systems IF: 4.8, Nature Portfolio submission)
- **First Author** on VITAL Net paper — novel contribution to mobile health monitoring
- **30% efficiency improvement** at AMD through automation tools adopted by 25+ engineers
- **18-22% downtime reduction** across organizations through predictive ML models

HONORS & AWARDS

The Duke of Edinburgh's International Award – Silver 2015