Rahul Ranjan

rahulrkm0038@gmail.com | +91 7997193400
LinkedIn | GitHub | Portfolio

RESEARCH INTERESTS

Biomedical signal processing, machine learning, and computer vision for mobile health sensing. Remote photoplethysmography (rPPG), cuffless blood pressure estimation, and smartphone-based vital sign measurement (SpO_2, HR).

EDUCATION

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

M.Sc. (Hons.) Physics, B.E. (Hons.) Electronics & Instrumentation 2017 – 2022
Birla Institute of Technology and Science (BITS), Pilani, India
Thesis: Monte Carlo Simulations of Phase Transitions in Ising Models

PUBLICATIONS

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.

[Under review] **Ranjan, R.**, Roha, V. S., & Yuce, M. R. (2025). VITAL Net: A Hybrid Framework for SpO_2 and HR Estimation Using Smartphone rPPG Video. Submitted to *IEEE Applied Sensing Conference*.

RESEARCH EXPERIENCE

Graduate Researcher (AI & Mobile Health) 2023 – 2025
Monash University, Melbourne, Australia

- Built end-to-end smartphone video vital-sign pipeline (face ROI, rPPG, preprocessing) and trained **CNN/Transfor models** for HR/SpO_2/BP estimation achieving **95%+ accuracy**.
- Enhanced rPPG robustness via color transforms, bandpass filtering, and **self-attention mechanisms**; designed cross-subject evaluation with ablations; emphasized reproducibility.
- Processed and analyzed **50,000+ video samples** across multiple datasets for contactless blood pressure estimation (MAE < 5 mmHg).

Master's Thesis (Computational Physics) 2021 – 2022
Department of Physics, BITS Pilani

- Conducted Monte Carlo simulations on 2D/3D Ising models; achieved **40% runtime reduction** via vectorization/multiprocessing; validated against theoretical predictions.

INDUSTRY EXPERIENCE

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

- **SQL** used to architect the company's first centralized data infrastructure by migrating manual entry systems, resulting in a robust, queryable database for all operational logs.
- **Python Automation** used to write scripts that run data comparisons ("diffs") and automatically email plain-English summaries to stakeholders, resulting in immediate visibility into system discrepancies without needing technical interpretation.
- **Machine Learning** used to build proactive forecasting models (Random Forest & LSTM) for vulnerability detection, resulting in an 89% accuracy rate and a 22% reduction in system downtime.

Software Intern 2022
Centre for Railway Information Systems (CRIS), New Delhi

- **SQL** used to execute complex queries against the WISE database to extract rolling stock maintenance history, resulting in a structured dataset necessary for training predictive models.
- **Anomaly Detection** used within WISE modules using Python and XGBoost, resulting in 94% accuracy in predicting asset failures 48 hours in advance.

- **Predictive Maintenance** used to deploy models across 200+ railway assets, resulting in an 18% reduction in workshop downtime.

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

- **Python Automation** used to build the "Data Flow Synchronicity Checker," resulting in the automated verification of file hashes between Head and Artifactory directories for the Device Capture Team.
- **Bash Scripting** used to set up nightly cron jobs for the wrapper scripts, resulting in fully automated daily reporting of mismatches and errors.

HONORS & AWARDS

- The Duke of Edinburgh's International Award – Silver 2015

TECHNICAL SKILLS

Programming & Data: Python, C++, MATLAB, R, Java, SQL, Bash; NumPy, Pandas, Matplotlib, Seaborn, Plotly; PostgreSQL, MongoDB
ML/CV/Signal: PyTorch, TensorFlow, Scikit-learn, Keras, OpenCV, XGBoost, Random Forest, LSTM; rPPG, Self-Attention, Spectral/Signal Filtering, Anomaly Detection
Tools: Docker, Git, Flask, LaTeX, Cron