Rita van der Walt, PhD.

Technical Project Engineer | Industrial IoT and Data Systems

Curriculum Vitae

Personal details

Western Cape, South Africa | +27 71 153 8744 | rietsvdw@gmail.com

Links: Github | LinkedIn | ORCID | YouTube: PhD presentation

Executive summary

Electronic engineer and data systems architect (PhD) specialising in industrial and low-power IoT, embedded systems, and data reliability. Architects end-to-end data-driven hardware ecosystems, bridging the gaps among custom PCB/firmware design, cloud data pipelines, and advanced statistical modelling. Managed multi-site sensor fleets over 36 months of continuous operation, processing 2.8M+ data points with strict statistical rigour. Python expert in data processing and sensitivity analysis (open source contributor). Proven ability to translate complex technical diagnostics to strategic stakeholder decision-making, with cross-domain skills in hardware, firmware, and data analytics. Expertise in deriving actionable user insights from raw sensor telemetry using rigorous statistical frameworks (SALib, Python).

Professional experience

Doctoral researcher (Data systems and policy) — 2024-2026

Stellenbosch University

- **Statistical engineering and data analytics:** Established a robust data-to-policy framework to quantify infrastructure risk, using Python (SALib) to run Global Sensitivity Analysis (GSA) on a 2.8M+ vector longitudinal dataset and identify key drivers of climate vulnerability.
- **Stakeholder management and technical communication:** Translated technical diagnostics into actionable guidelines for the City of Cape Town (Environmental Health Dept.) and national media, managing the interface with non-technical decision-makers.
- **Infrastructure optimisation and project outputs:** Developed a cost-benefit framework for building retrofits to reduce climate-vulnerability of infrastructure. This directly justified and resulted in capital upgrades (roof retrofitting) in public sector school buildings.
- **Regulatory compliance:** Benchmarked indoor environmental quality and sensing device performance against local and international standards (ISO, ASHRAE, WHO, SANS).

Lead telemetry and embedded engineer — 2026-Present

Stroom Cargo

- **E-bike telemetry architecture:** Directed the ground-up conceptualisation and stakeholder management for a custom cargo e-bike tracking and battery health management system.
- **Full-stack IoT implementation:** Designing complete PCB architectures in Altium for GPS logging and motor control, and engineering the device-to-cloud communication pipeline via 1NCE, AWS, and Grafana for mass fleet monitoring and management.
- **Project management:** Managing timeline and budget constraints, stakeholder expectations, and cross-functional delivery for the different vehicles.

Lead embedded hardware engineer **2026-Present**

Fibertime

- **Scalable security infrastructure:** Leading the end-to-end productisation of a home alarm system for mass residential rollout in townships.
- **Hardware and firmware design:** Executing comprehensive hardware development (component selection, PCB design, prototyping, debugging) and writing embedded firmware with MQTT cloud integration to enable remote state management via WhatsApp.

Specialised sensing consultant **2023-2024**

Stellenbosch University [Project basis, custom IoT solutions]

- **Mining sector (Saldanha):** Designed and deployed custom SD-card based particulate matter (PM) sensors for air quality compliance monitoring in Saldanha active mining zones.
- **Environmental research (Forestry):** Developed and manufactured custom solar-powered LoRaWAN anemometers to monitor canopy wind dynamics in Coetzenburg Forest.
- **Residential air monitoring:** Designed a LoRaWAN household air pollution sensing network and deployed in households to quantify health risks from amenity fireplace usage in winter.

Visiting research collaborator (EU Horizon project) **May-Jul 2023**

University of Alicante, Spain

- **Project REMARKABLE:** Rural Environmental Monitoring via Ultra-wide-area Networks. Coordinated technical alignment on ultra-wide area networks between African and European research teams as the South African representative for Work Packages 3 and 4. WP3: secure and frugal distributed data analytics for rural IoT. WP4: demonstrating, validating, and assessing REMARKABLE solutions.
- **System validation (Resource-constrained environments):** Validated “frugal” IoT sensor solutions designed for harsh operating conditions, ensuring performance met contextual, specific constraint criteria.
- **Knowledge integration and output:** Worked to bridge the contextual gap between African and European sensing applications, resulting in the co-authorship of a conference paper.

Postgraduate researcher (MEng) **2022-2023**

Stellenbosch University

- **Full-stack IoT development:** Designed, developed, and deployed a proprietary LoRaWAN sensor node from concept to mass production. Executed RF matching, custom PCB design, and mechanical enclosure modelling for high-reliability deployment.
- **Manufacturing lifecycle:** Managed the transition from in-house prototyping (SMD soldering, PCB milling) to outsourced volume manufacturing for at-scale deployment.
- **Network operations:** Directed the physical deployment and maintenance of the sensor fleet across multiple sites, optimising gateway uptime and power management for a 24-month data collection period.
- **Dataset engineering:** Engineered data pipelines for the cleaning, validation, and metadata mapping of high-frequency telemetry. Produced a verified, longitudinal dataset encompassing 24 months of environmental observations across diverse building types with extensive static and time-series metadata.
- **Observational analysis:** Provided an evidence base of indoor air environmental exposures in different infrastructure buildings, quantifying exposure levels and severity.
- **Compliance benchmarking:** Conducted baseline environmental auditing, quantifying health, comfort, and cognition risks in educational infrastructure by benchmarking real-world sensor data against building and environmental standards (SANS, WHO, ASHRAE, ISO), forming the basis for subsequent retrofitting strategies.

Assistant lecturer (Analogue electronics) **2022**

Stellenbosch University

- **Module:** Design (E) 344 (Analogue design)
- **Technical leadership:** Managed curriculum delivery and practical assessments for 110+ undergraduate students, focusing on the design of object-avoiding autonomous vehicles.
- **Mentorship and debugging:** Provided support for circuit debugging, designed PCBs for the project, and designed and built test benches for the analogue control systems and circuitry.
- **Team management:** Coordinated a team of student assistants (‘demis’) to manage workload distribution, assessment design, and semester planning.

Space weather apprentice **Jun-Jul 2022**

South African National Space Agency (SANSA)

- **International collaboration:** Selected for the International Space Weather Camp 2022, with lectures from space agencies from USA, Germany, and South Africa, gaining practical insight into satellite communications and space weather physics. Completed the practical leg of the space weather camp at the South African National Space Agency (SANSA), with international legs cancelled due to Covid-19 restrictions on international travel.
- **SDR development:** Collaborated with team to build a Software Defined Radio (SDR) capable of capturing live image data from NOAA satellites.

Graduate hardware EMC engineer — Dec 2021-Jan 2022

Divigraph (Pty) Ltd. [8-week internship]

- **Compliance and verification:** Executed hardware unit testing and EMC standards compliance testing, ensuring regulatory adherence for industrial-grade hardware.
- **Hardware development:** Contributed to the iteration of existing hardware designs, focusing on reliability improvements and signal noise reduction.

Student hardware engineer — Jan-Mar 2021

Divigraph (Pty) Ltd. [10-week internship]

- **PCB design and component selection:** Assisted in hardware design, including schematic capture, component selection, and PCB layout.
- **Performance recognition:** Awarded a full final-year bursary based on technical work delivery during this internship.

Education

PhD. Electronic Engineering — 2024-2026

Stellenbosch University [Conferred March 2026]

- **Title:** *"Diagnostics of indoor air environmental exposures and climate-infrastructure vulnerability in South African schools."*

MEng. Electronic Engineering — 2022-2023

Stellenbosch University [Upgraded to PhD]

- **Focus:** Engineering of the LoRaWAN indoor air quality sensing network used for subsequent doctoral study.

BEng. Electrical and Electronic Engineering — 2018-2021

Stellenbosch University [Conferred December 2021]

- **Specialisation:** Robotics and electromagnetics.
- **Capstone project (Distinction, 85%):** Designed and deployed a P2P LoRa-based water level monitoring system solution for low-resource farms. Delivered a full-stack solution encompassing circuit/RF design, custom PCB assembly, firmware, and a local monitoring dashboard. System operated independently of electricity or network coverage.

Contributions and impact

Open-source software: SALib (Python) — 2025

Core contribution: Enhanced the DMIM algorithm in SALib, the Python library for sensitivity analysis, refactoring bootstrap implementations to enable processing of real-world, non-uniform empirical data.

Dataset publication: Mendeley Data — 2025

Verified telemetry: Published a 24-month longitudinal dataset (T, RH, CO2, PM) across six infrastructure types, with extensive static and time-series metadata, establishing a verified high-frequency benchmark for indoor air environments.

Policy and stakeholder engagement — 2025

City of Cape Town, Department of Environmental Health: Invited as expert speaker for World Environmental Health Day 2025. Directly advised municipal stakeholders on indoor air quality standards, influencing local environmental health strategy discussions.

Strategic communication and stakeholder engagement — 2024

Technical translation (eNCA, RSG, Cape Talk): Featured subject matter expert on national platforms (live TV, radio, other media). Synthesised complex combustion health risk data into accessible public safety messaging, demonstrating the ability to translate technical nuance for non-technical audiences.

Skills and competencies

Hardware and embedded engineering

Altium Designer (schematics, PCB, RF matching)
Firmware (C/C++, STM32, ESP32, low-power optimisation)
SPICE simulation
Mechanical design (Autodesk Inventor)
Prototyping (3D-printing, hardware iterations)

Data science and analytics

Python (Pandas, NumPy, SciPy, Matplotlib) (VS Code)
SALib (library contributor) (algorithm development, sensitivity analysis)
Statistical analysis (causality, hypothesis testing)
Feature engineering and metadata integration
Time-series analysis (metric derivation, KPI definition)

IoT infrastructure and cloud services

LoRaWAN (device provisioning, gateway management, TTN)
Data pipelines (APIs, webhooks, automated ingestion, JavaScript)
IoT fleet maintenance

Development tools and standards

Git/Version control and CI/CD
Automated testing (Pytest, Black, Ruff, Flake8)
LaTeX (Beamer, Tikz, PGFPlots, automated reporting)

Regulatory compliance and standards

EMC/EMI compliance testing
Industrial, environmental standards (ISO, SANS, ASHRAE)
Risk auditing and benchmarking

Operations and leadership

Technical project management
Cross-functional team coordination
Stakeholder engagement, technical translation

Selected research: Environmental sensing and data reliability

Indoor temperature and CO2 in South African primary school classrooms: Inspecting brick, container, and prefab structures. *Journal of Cleaner Production, 2024*

Strategic benchmarking: Quantified environmental exposures of diverse infrastructures, benchmarked results against ISO, ASHRAE standards to formulate managerial guidelines for school learning environments.

Time-series distribution-based global sensitivity analysis of weather impacts on classroom indoor temperatures: measurement-driven RC characterisation and retrofit insights. *Publication preprint: SSRN, 2025*

Novel statistical framework: Developed a measurement-based framework to derive infrastructure characteristics, eliminating the need for physical modelling or metadata dependencies.

Dataset of indoor air parameter measurements on indoor air quality and thermal comfort in South African primary school classrooms of various building infrastructure types. *Data in Brief, 2024*

Data collection methodology: Documented the experimental design, sensor validation protocols, and data collection methodology for a multi-site deployment.

Lifting the unseen smokescreen on indoor air quality due to amenity indoor fireplaces in South African homes. *Energy Research & Social Science, 2024*

Risk assessment: Benchmarked particulate matter (PM) exposure against WHO guidelines, quantifying critical health risks associated with wood combustion to inform public safety strategies.

References

Prof. Thinus Booysen
Main supervisor, MEng and PhD studies, 2022-2026.
Professor in electronic engineering.
Contact details by request.

Prof. Sara Grobbelaar
Co-supervisor, MEng and PhD studies, 2022-2026.
Professor in industrial engineering.
Contact details by request.