Raphael Garcia da Costa

AI & software engineering leader · Inventor · Co-founder & CTO, Sentinel AI and SensusAir

Johannesburg, South Africa · me@raphaelcosta.com · raphaelcosta.com · linkedin.com/in/raphacosta

Profile

Software engineer, inventor and entrepreneur building software since 2006, across fintech, mining, healthcare, environmental intelligence and critical infrastructure. Builds mission-critical software and AI platforms that turn complex operational and scientific problems into real-time intelligence, regulatory evidence and risk reduction. Architect of a transaction ledger used by 20M+ customers in 70+ countries; named inventor on a granted South African patent for environmental management technology; creator of The Ledger Method. Currently completing an MSc in Artificial Intelligence at the University of Hull.

Highlights

- Engineering and architecture lead for the ledger and wallet domain of a pan-African FinTech (remittance & wallet platform, 20M+ customers, 70+ countries).
- Co-founder and CTO of SensusAir and Sentinel AI: AI-enabled environmental intelligence for healthcare, mining, occupational exposure and ESG reporting.
- Named inventor: South African patent 2021/10088 (granted 2023) and international filing WO 2020/250007.
- Sentinel AI's R&D recognised by the Government of South Africa under the Section 11D R&D Tax Incentive; Sentinel AI is a member of the NVIDIA Inception Program.
- Four SSRN white papers on AI, indoor air quality and mine dust suppression; invited to present in South Africa, the USA, Canada and the Philippines.

Experience

Co-founder & CTO · Sentinel AI

Mar 2019 – Present

Industrial AI for mining and heavy industry · Johannesburg, with Australian expansion

- Founded and led development of an industrial AI platform for real-time dust, silica risk, air quality, road-condition intelligence and regulatory compliance.
- Designed DustScout, a mobile environmental-intelligence system using edge sensing, geospatial analytics and cloud dashboards to identify dust exposure patterns, haul-road risk and suppression opportunities.
- Developed SilicaSense, an AI layer that infers respirable crystalline silica risk from DustScout particulate signatures without additional hardware.
- Authored the company's patent and technical research. Partners include Anglo American, Rio Tinto, Fortescue and Whitehaven.
- Extended the platform into occupational health, ESG reporting, water reduction, compliance automation and AI-assisted operational decision support.

Co-founder & CTO · SensusAir

Nov 2020 – Present

AI-enabled environmental intelligence · Atlanta, USA / Johannesburg, South Africa

- Built platforms that turn continuous sensing of CO_2, particulate matter, VOCs, NOx, temperature, humidity and pressure into risk indicators for healthcare, schools, homes and government.
- Developed AI and machine-learning models for air quality, infection risk, mould risk, exposure profiling and environmental early warning.
- Led full-stack product development across IoT firmware, wireless provisioning, data pipelines, cloud architecture, AI reporting, dashboards and mobile apps.
- Deployments in the USA, South Africa, the UK, Australia and the Philippines; represents SensusAir as an invited speaker on AI, healthcare innovation and environmental intelligence.

Engineering Leader, Ledger & Wallet Domain · Pan-African FinTech

Nov 2015 – Present

Remittance & wallet platform, 20M+ customers, 70+ countries · Johannesburg

- Architected the ledger platform from the ground up: a highly available, fault-tolerant system underpinning every transaction flow across digital and cash services in Africa, Europe and Asia.
- Led the move from monolith to microservices and event-driven design; directed engineering governance, observability, incident reduction and secure development practice.
- Led distributed engineering teams across several countries and helped build the engineering foundations of the company's growth into a multinational financial-services organisation.

Founder · Hashtag AI Labs

2010 – Present

AI and software engineering lab · Johannesburg

- Led the software engineering practice of an AI and software consultancy serving banking, telecommunications, industrial, government and international clients.
- Delivered 75+ enterprise software platforms and digital products for organisations including Four Seasons, Halliburton, BMW, Hyundai, Barclays, ABSA and the African Union.
- Architected GreenModel®, a universal sub-ledger platform later operational in a South African Big 5 bank and a SWIFT Innotribe Semi-Finalist in 2015.
- Led the technology platform for the African Union's Africa Against Ebola campaign.

Senior Developer · FoneWorx

Jan 2009 – Dec 2011

Johannesburg

- Led development of identity, document-management, fax, SMS, IVR and digital-communication platforms; built and scaled FaxWorx/FaxEmail to more than 500,000 users across South Africa, Kenya, Zambia and Nigeria.

Software Developer · Fundação Oswaldo Cruz (Fiocruz) and Majestic Interactive

Early career

Rio de Janeiro, Brazil / South Africa

- Built CRM, database, web, reporting and Linux infrastructure solutions; at Fiocruz, Brazil's public-health research institution, supported institutional web systems, databases and open-source infrastructure.

Patents

2023	**South African patent 2021/10088**, *Environmental Management System*, granted 22 February 2023. Inventors: Raphael Garcia da Costa and Ian Neil Clarke.
2020	**WO 2020/250007** (PCT/IB2019/054841), published 17 December 2020: computer-implemented environmental management and monitoring system for mines, plants, hospitals and schools.

Publications (SSRN)

Dec 2021	Sodium Lignosulphonate as Dust Suppressant for Dust Control in Mines. doi 10.2139/ssrn.5312135
Jun 2023	AI-Enabled Indoor Air Quality Monitoring for Fungi Energy. doi 10.2139/ssrn.5288135
Feb 2025	AI-Driven Air Quality Assessment Report for an Industrial Vacant Warehouse. doi 10.2139/ssrn.5288524
Jun 2025	AI-Enabled Indoor Air Quality Monitoring: A Comprehensive Trial Test Study. doi 10.2139/ssrn.5288143

Speaking & research engagements

2026	APIC 2026 Annual Conference, USA: attended as a thought leader in AI for infection prevention.
2026	Le Bonheur Children's Hospital, Memphis, USA: invited to present SensusAir's environmental intelligence platform and join research discussions on infection prevention.
2026	University of Guelph, Controlled Environment Systems Research Facility, Canada: invited by Professor Mike Dixon to discuss AI for growing food in space and controlled-environment agriculture.

2026	St. Luke's Medical Center, Philippines: invited to present advances in AI for healthcare and environmental intelligence.
2025	Healthcare Innovation Summit Africa: invited talk *When Air Becomes Data*.
2025	APIC 2025 Annual Conference, Nashville, USA: breakout-room sessions on AI and environmental sensing for infection prevention.
2025	African Mining Week, South Africa: invited to present on AI-powered environmental intelligence, mining innovation and ESG technology.
2024	APIC Conference, Baptist Memorial Hospital, Memphis, USA: presented *Utilization of an AI-Based Environmental Sensing Solution in Infection Prevention*.

Awards & recognition

2026	Innovation Excellence Award 2026
2025	GHP Innovation Excellence Award: SensusAir
2025	Best Environmental Risk Management & Disease Prevention Specialists, USA: SensusAir
2025	Best Air Quality Solutions Provider, South Africa: SensusAir
2025	Leading Innovators in Environmental Intelligence for Mining: Sentinel AI
2025	Outstanding Contribution to Industrial ESG Innovation: Sentinel AI
2015	SWIFT Innotribe Semi-Finalist (Growth Stage): GreenModel®
—	Section 11D R&D recognition, Government of South Africa (Sentinel AI) · NVIDIA Inception Program member (Sentinel AI)

Education

In progress	**MSc Artificial Intelligence**, University of Hull, United Kingdom
2025	**Executive Education: AI in Healthcare**, Harvard Medical School
2025	**Machine Learning Specialization**, Stanford University · DeepLearning.AI
2020 – 2021	**Data Science with Python**, University of Cape Town
Certifications	Microsoft Certified: Azure AI Engineer Associate · Microsoft Certified Professional · Udacity Nanodegree, Machine Learning

Mentoring & community

Ongoing	Founder, AI4DFuture: non-profit mentorship and AI labs for young founders
2013 –	Mentor, VC4Africa and Founder Institute (Johannesburg)
2017 –	Mentor, National Mentorship Movement
Ongoing	Mentor, Greater Tygerberg Partnership
2012 –	Member, Johannesburg Centre for Software Engineering (JCSE), Wits University
Member	South African Artificial Intelligence Association

Languages: English and Portuguese. References available on request.