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Summary

Innovative data science leader with over 10 years' experience architecting and scaling AI organisations, specialising in distributed machine learning, probabilistic modelling, and large-scale data engineering. I design and operationalise end-to-end ML systems—from streaming architectures to governance frameworks—ensuring reliability, scalability, and measurable business impact.

Across telecoms, banking, education, and research, I've delivered mission-critical AI platforms including Vodacom's Smart Generator Optimisation engine, IBM's Environmental Intelligence Suite components, and ABSA's Databricks-centred ML transformation. My leadership experience spans modernising legacy environments, introducing MLOps and cloud-native workflows, and stabilising high-value production scoring systems.

As founder of the Ubunye AI ecosystem, I build open-source tools that standardise ML workflows and accelerate capability development across teams. I bring deep technical authority combined with the strategic leadership needed to scale data science functions and drive enterprise AI adoption.

Education

University of the Witwatersrand

Johannesburg, South Africa

PHD IN COMPUTER SCIENCE (IN PROGRESS)

2024 – Present

- Research focus on advancing **self-supervised learning**, **probabilistic modelling**, and **distributed ML systems** to reduce dependency on labelled datasets and enable scalable AI adoption in real-world, low-resource environments.
- Application domains include **environmental risk modelling**, **sensor fusion**, and **real-time decisioning systems**.

University of the Witwatersrand

Johannesburg, South Africa

MSC IN COMPUTER SCIENCE (DISTINCTION)

2018 – 2019

- **Thesis: Learning Level Set Method by Echo State Network for Image Segmentation**
- Developed a novel recurrent neural network approach using **Echo State Networks (ESNs)** for iterative image segmentation, enabling computationally efficient training and improved boundary detection.
- Research demonstrated potential applications in **medical imaging**, **remote sensing**, and **autonomous navigation** through enhanced segmentation performance.

University of the Witwatersrand

Johannesburg, South Africa

BSc HONOURS IN COMPUTER SCIENCE

2017

- **Project: Wildfire Estimation Using Kernel Density Estimators**
- Applied Spatial KDE and unsupervised learning techniques to model wildfire occurrence patterns across South Africa, contributing insights for **disaster management** and **early-warning systems**.

University of the Witwatersrand

Johannesburg, South Africa

BSc IN COMPUTATIONAL & APPLIED MATHEMATICS AND ASTRONOMY & ASTROPHYSICS

2014 – 2016

- Completed dual majors with emphasis on **mathematical modelling**, **numerical methods**, and **astrophysical simulation**, forming the foundation for later work in machine learning and probabilistic systems.

Experience

ABSA Insurance

Johannesburg, South Africa

LEAD DATA SCIENTIST (ACTING HEAD OF DATA SCIENCE)

Mar. 2024 – Present

- Built and led the **Data Science and Engineering function** from the ground up, setting strategy, operating models, and delivery standards for a team of **3 Lead Data Scientists, 1 Data Scientist and 1 Data Engineer** to advance data-driven risk mitigation across short-term insurance.
- Advise senior leadership on **AI strategy, roadmap, and capability scaling**, aligning technical delivery with business outcomes and long-term organisational goals.
- Architected and operationalized **enterprise ML pipelines on Databricks and AWS**, cutting model training/scoring latency by **80–90%** and enabling reliable real-time Telematics and Risk scoring.
- Designed and deployed **geospatial flood, lightning, and storm peril models** for property insurance significantly improving underwriting accuracy and geographic risk visibility by **80%**.
- Introduced **AI governance, monitoring, and model versioning**, strengthening reliability, regulatory compliance, and production ML performance.
- Stabilised and modernised the **Telematics driving-behaviour scoring ecosystem** used across vehicle finance and insurance products, eliminating multi-month backlogs, improving data quality, and enabling proactive digital engagement.
- Introduced enterprise **ETL/ML standards** through the [**Ubunye-AI-Ecosystems \(UAIE\)**](#), my open-source initiative, establishing consistent data pipelines and accelerating model development across the organisation by creating reusable patterns and supporting capability uplift.

Vodacom

Johannesburg, South Africa

SENIOR DATA SCIENTIST (MLOPS, STREAMING AI, AND OPTIMISATION)

Nov. 2021 – Mar. 2024

- Developed and deployed **machine learning solutions** to optimise network and operational performance across Vodacom's national infrastructure, spanning predictive maintenance, anomaly detection, and capacity planning.
- Provided technical leadership across data science, engineering, and IoT teams—driving platform adoption, defining delivery standards, and mentoring **8 Data Scientists and 2 ML Engineers**.
- Partnered with senior leadership to align AI initiatives with operational KPIs, embedding data-driven optimisation into Vodacom's national resilience strategy.
- Architected Vodacom's **real-time ML and optimisation platform** for network operations, integrating streaming analytics, optimisation models, and IoT telemetry to enhance maintenance decisions and strengthen network reliability during load-shedding.
- Developed a [**smart-generator-monitoring optimization engine**](#) for national smart-generator allocation, improving fuel efficiency, maintenance scheduling, and site-level prioritisation—contributing to an estimated **R1 billion in annual OPEX savings** through reduced generator expenditure and improved network uptime.
- Designed scalable **MLOps and streaming pipelines** using Apache Flink, PySpark, Kafka, and Kubernetes, enabling reliable real-time analytics and reducing model deployment cycles by **40%**.
- Recognized with the **Vodacom Star Award** for driving innovation and advancing the company's big data and AI capabilities.

IBM Research

Johannesburg, South Africa

MACHINE LEARNING RESEARCH SCIENTIST

Apr. 2020 – Nov. 2021

- Collaborated with global IBM teams to design and operationalise **large-scale geospatial and meteorological analytics**, contributing to enterprise solutions for climate, environmental intelligence, and disaster resilience.
- Developed **state-of-the-art predictive models** using **TensorFlow**, improving seasonal climate forecast accuracy by **15%** and enabling more reliable decision-making for enterprise clients.
- Integrated advanced ML workflows into the [**IBM PAIRS Geospatial Platform**](#), enhancing real-time geospatial data access for strategic planning across multiple industries.
- Developed and deployed the [**COVID-19 Analytics Dashboard**](#) for Gauteng public health authorities, supporting operational response with real-time epidemiological insights.
- Led a cohort of **3 PhD and 2 MSc research interns**, fostering technical excellence, research rigor, and collaborative innovation across multiple machine learning projects.
- Served as team lead for an international cross-functional group, aligning research objectives, coordinating development across regions, and ensuring high-impact project delivery.
- Co-authored and published peer-reviewed research at [**NeurIPS**](#), advancing state-of-the-art machine learning methods and strengthening IBM's global research presence.

Business Intelligence Service (University of the Witwatersrand)

JHB, South Africa

DATA SCIENTIST

Jun. 2018 - Apr. 2020

- Contributed to a central analytics division that integrated and operationalised institutional data, providing government subsidizing leadership with insights for strategic planning, performance management, and university-wide decision-making.
- Collaborated with BI Analysts and Engineers to design and operationalise **end-to-end machine learning pipelines**, improving model accuracy and streamlining analytics workflows that supported the university's student success strategy.
- Developed a **course recommendation system** using K-modes clustering, achieving a **90% silhouette score** and generating over **R2 million annually** of government subsidy through improved enrolment and pass rates alignment. [**Git repository**](#)
- Introduced and implemented feature engineering and machine learning model training pipelines.
- Led and facilitated over **50 workshops**, training staff and students in advanced data science and engineering practices, significantly enhancing institutional analytics capability and fostering a data-driven culture.

CSIR

DATA SCIENTIST AND SOFTWARE ENGINEER INTERN

Pretoria, South Africa

Nov. 2017 – Jan. 2018

- Collaborated in a team of 3 to design and develop **predictive profiling models using Python and Scikit-learn** for South African municipalities, achieving **75% accuracy** and identifying operational bottlenecks that improved service delivery planning.
- Developed and deployed a **Django-based decision-support web application** for municipal managers in Cape Town, enabling real-time data access and improving operational efficiency.
- Featured for innovation in predictive modelling and digital public-sector solutions by [✉ Mail & Guardian](#), [✉ CSIR](#), and [✉ DST](#).

ZAR X

Johannesburg, South Africa

SYSTEMS ANALYST AND SUPPORT

Jun. 2017 – Oct. 2017

- Collaborated with the IT and engineering teams to enhance trading platform reliability, resolving critical system issues and implementing performance improvements that reduced downtime by **20%**.
- Improved reporting accuracy and operational visibility by refining data workflows and strengthening integration across trading and analytics systems.
- Provided technical support to internal stakeholders, ensuring rapid resolution of system-related issues and minimising disruptions to trading operations.

Wits Astronomy Club (WAC)

Johannesburg, South Africa

CO-FOUNDER AND EXECUTIVE

Jan. 2014 – Feb. 2017

- Co-founded the [✉ Wits Astronomy Club](#) as a public engagement initiative aligned with the **Square Kilometre Array (SKA)** vision, promoting astronomy awareness among students and the broader community.
- Organised public lectures, stargazing events, and workshops that strengthened collaboration between students, researchers, and industry partners, contributing to science outreach in South Africa.
- Secured partnerships and funding to support club operations, enabling sustained growth, expanded outreach, and increased participation.
- Featured in media interviews with the **SKA** and **SABC NEWS, ETV**, highlighting the club's role in advancing astronomy outreach.
[✉ Crazy-TV](#) [✉ SABC News](#)

Skills

Technical Leadership

AI/ML strategy, Data science capability building, Cross-functional leadership, Technical roadmaps, Mentorship, Agile delivery, Enterprise AI governance.

Programming

Python, C/C++, MATLAB, R, CUDA, Shell Scripting, SQL, JavaScript.

Data Engineering

Databricks, Apache Spark, Hadoop, Kafka, Flink, ETL/ELT pipelines, Feature stores, Data lakes, Serverless architectures

MLOps & Architecture

Model deployment, CI/CD (Jenkins, GitLab), Docker, Kubernetes, Infrastructure-as-Code (Terraform), MLflow, Monitoring, Versioning, Real-time ML systems.

Machine Learning & AI

PyTorch, TensorFlow, Probabilistic ML, Distributed ML (Dask, Ray, Spark), Deep Learning, NLP, Computer Vision, Explainable AI, Optimization.

Software Engineering

Microservices, REST APIs, High-performance computing, Systems design, Git-based workflows, Production-grade ML systems.

Analytics & Visualization

Power BI, React, HTML/CSS, Dash, Interactive dashboards, Data storytelling.

Domains & Expertise

Scalable ML Platforms, Real-time Decisioning Systems, AI Innovation, Telecom ML, Insurance Risk Models, Geospatial Intelligence, AI Security & Ethics.

Languages

English (C2), Sesotho (C2), Setswana (C2), Sepedi (C2), isiZulu (C2)

Publications

ML-based Probabilistic Prediction of 2m Temperature and Total Precipitation

MOHAMED AKRAM ZAYTAR, BIANCA ZADROZNY, CAMPBELL WATSON, DANIEL SALLES CIVITARESE, ETIENNE EBEN

2022

VOS, THABANG MICHAEL MATHONSI, [THABANG LUKHETHO MASHININI](#)

- [✉ paper](#)

Long-Range Seasonal Forecasting of 2m-Temperature with Machine Learning

ETIENNE E. VOS, [THABANG MASHININI](#), ASHLEY GRITZMA, SIBUSISIWE MAKHANYA AND CAMPBELL WATSON

2020

- 34th Conference on Neural Information Processing Systems [NeurIPS 2020].

- [✉ paper](#) [✉ poster](#)

Mine Worker Threshold Shift Estimation via Optimization Algorithms for Deep Recurrent Neural Network

MILKA C.I.MADAHANA, JOHN E.D.EKORU, THABANG L.MASHININI, OTIS T.C.NYANDORO

2019

- 18th IFAC Symposium on Control, Optimization and Automation in Mining, Mineral and Metal Processing [MMM 2019]
- [paper](#)

Noise Level Policy Advising System for Mine Workers

MILKA C.I.MADAHANA, JOHN E.D.EKORU, THABANG L.MASHININI, OTIS T.C.NYANDORO

2019

- 18th IFAC Symposium on Control, Optimization and Automation in Mining, Mineral and Metal Processing [MMM 2019]
- [paper](#)

Selected Projects

Smart Generators Optimisation

Vodacom, South Africa

SENIOR DATA SCIENTIST

Nov. 2021 – Mar. 2024

- Addressed the need for resilient network operations during national loadshedding by developing a **constrained optimisation and graph-search framework** for intelligent generator prioritisation.
- Built real-time data pipelines using **Kafka** (stream ingestion), **PyFlink/Flink** (stream processing), and **PySpark** (batch analytics) to unify IoT telemetry, site metadata, and network alarms.
- Implemented optimisation models using **CVXPY**, operationalised with the **Analytics Engine**, and automated through **GitLab CI/CD** on **Docker + OpenShift**.
- Reduced generator fuel use by **10%**, cut operational costs by **30%**, improved network uptime by **5%**, and contributed to **R1 billion annual OPEX savings**.
- [smart-generator-monitoring](#)

Tfilterspy – Bayesian Filtering Python Library

South Africa

CREATOR & PRINCIPAL DEVELOPER

2023 – Present

- Developed to address real-world challenges with **noisy IoT and sensor data** encountered at Vodacom (generator telemetry) and ABSA Insurance (telematics and risk signals), providing a reliable framework for state estimation and signal smoothing.
- Designed a scalable **Bayesian filtering library** supporting Kalman, Particle, and custom filters, with a **Dask** backend enabling distributed and large-scale time-series computation.
- Packaged and published on **PyPI** with full documentation, examples, and high-performance compute support for robotics, IoT analytics, and probabilistic modelling.
- [tfilterspy](#)

Ubunye AI Ecosystem (UAIE)

South Africa

FOUNDER & ARCHITECT

2024 – Present

- Developed after joining ABSA to address the organisation's lack of **standardised ETL/ML processes**, fragmented capability, and limited engineering resources—creating a unified framework to uplift data science and engineering maturity.
- Designed modular components including **Ubunye Engines** for declarative ETL orchestration and **Ubunye ML** for probabilistic and distributed machine learning.
- Implemented **YAML-driven specifications**, pluggable compute backends (Pandas, Dask, Spark), and reusable transformation and model templates to ensure reproducible and scalable ML workflows.
- Adopted within ABSA to establish **organisation-wide ML standards**, datamarts, and feature stores, significantly improving consistency, reliability, and delivery efficiency across teams.
- [Ubunye-AI-Ecosystems](#)

Kasi'Lam Digital Platforms

South Africa

CO-FOUNDER

2022 – Present

- Founded to enable township businesses to establish a **digital footprint at zero hosting cost**, addressing barriers faced by SMEs that lack access to affordable technology and online infrastructure.
- Developed scalable and user-friendly web platforms using **HTML, CSS, JavaScript**, and **React**, with deployment via **GitHub Pages** to ensure a completely cost-free hosting model.
- Empowered local entrepreneurs to expand their reach, improve customer engagement, and build stronger brand identities through accessible digital solutions.
- [View Projects](#)

COVID-19 Visual Analytics Tool

IBM Research, South Africa

MACHINE LEARNING RESEARCH SCIENTIST

Apr. 2020 – Nov. 2021

- Built to support Gauteng public health decision-making during the pandemic.
- Developed a real-time visual analytics tool using **Python, Dash**, and **Plotly**, deployed on **IBM Cloud**.
- Enabled rapid monitoring of infections, hospital utilisation, and hotspot trends.
- [View Dashboard](#)

Geospatial Analytics — IBM Environmental Intelligence Suite

IBM Research (USA, Brazil, South Africa)

MACHINE LEARNING RESEARCH SCIENTIST

Apr. 2020 – Nov. 2021

- Developed to meet the need for scalable environmental and climate-risk monitoring across global industries.
- Built **geospatial analytics workflows** using **IBM PAIRS, Python/Tensorflow, Hadoop, and Apache Airflow** to process and orchestrate multi-terabyte spatiotemporal datasets.
- Contributed to core analytical components powering the **IBM Environmental Intelligence Suite**, enhancing environmental risk prediction and enterprise-scale monitoring capabilities.

[Environmental Intelligence Suite](#)

Wits Course Recommendation System

University of the Witwatersrand, South Africa

JUNIOR DATA SCIENTIST

Jun. 2018 – Apr. 2020

- Addressed the need for personalised course guidance for first-year students.
- Developed a **K-modes recommendation system** using **Python, Scikit-learn, and Pandas**, achieving **90% silhouette score**.
- Integrated outputs into **PowerBI**, generating **R2M+ annual revenue** through improved enrolment alignment.

[View Recommendation Engine](#)

Honors & Awards

2022	Vodacom Star Award , Recognised for innovation, impact, and engineering excellence in developing the national Smart Generator Optimisation system.	South Africa
2019	MSc Computer Science (Distinction) , Awarded for outstanding academic performance and significant contribution to research in machine learning and big data systems.	University of the Witwatersrand
2014–2017	Wits Astronomy Club — Co-Founder & Executive , Led public STEM engagement initiatives aligned with the SKA project, promoting astronomy outreach across the university and broader community.	South Africa

References

PhD	Dr. Etienne Vos — IBM Research Manager , Etienne.vos@ibm.com	IBM Research
PhD	Dr. Jacobus du Toit — Machine Learning Lead , jacoDutoit@vodacom.co.za	Vodacom
PhD	Dr. Akram Zaytar — Senior Research Scientist , akramzaytar@microsoft.com	Microsoft
BSc	Mr. Malachy Morrow — Principal Solution Architect , mal@malmorrow.com	Altron & Vodacom
MSC	Mrs Harshila Dulabh — Team Lead , Harshila.Dulabh@wits.ac.za	Wits University (BIS)