

NHLAYISEKO VHUMA

AI/ML Engineer | Backend Systems Architect

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PROFESSIONAL SUMMARY

Applied Machine Learning Engineer with strong foundations in classical machine learning, statistical modeling, and neural networks. Experienced in building end-to-end ML pipelines including data preprocessing, feature engineering, model training, evaluation, and optimization across supervised, unsupervised, and reinforcement learning paradigms. Solid understanding of how traditional ML systems integrate with modern AI stacks and LLM-driven workflows. Comfortable working with Python-based ML ecosystems and translating business problems into production-ready models.

CORE COMPETENCIES

- AI & Machine Learning:** LLM Integration • Prompt Engineering • Supervised/Unsupervised Learning • Neural Networks (ANN, CNN) • NLP • Reinforcement Learning • Model Evaluation & Optimization
- Backend Engineering:** RESTful API Architecture • ASP.NET Core (.NET 8) • Microservices • JWT Authentication • Entity Framework Core • Real-time Data Synchronization
- Data & Infrastructure:** SQL Server Optimization • Scalable Data Architecture • Cloud Integration • Feature Engineering • Statistical Analysis
- Technical Stack:** C# • Python • JavaScript • TensorFlow/Keras • NumPy/Pandas/Scikit-learn • React • Git • Swagger/OpenAPI

PROFESSIONAL EXPERIENCE

Software Engineer | Singular Systems | South Africa

2019 – Present

AI-Enhanced Educational Platform Development:

- Architected intelligent backend systems for EdTech client serving 5,000+ students, implementing ML-driven personalized learning pathways that improved user engagement by 35%
- Built context-aware data infrastructure processing 100K+ daily interactions, enabling real-time content personalization with 99.7% uptime

- Developed supervised learning models (Logistic Regression, Decision Trees) achieving 78% accuracy in predicting optimal content difficulty levels

Scalable API & Data Architecture:

- Designed RESTful APIs with JWT authentication supporting 2,000+ concurrent users, documented with OpenAPI specifications
- Optimized SQL queries and database schemas reducing execution time by 60%, implementing efficient data structures for ML model training
- Engineered real-time data synchronization pipelines ensuring data consistency across distributed systems

Cross-Functional Technical Leadership:

- Collaborated with product managers, data scientists, and subject matter experts to translate business requirements into scalable technical solutions
 - Mentored junior developers on clean code practices, design patterns, and modern development workflows
 - Led code reviews and architectural discussions, establishing engineering standards across teams
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AI/ML PROJECT PORTFOLIO

Intelligent Learning Assistant Platform

Tech: ASP.NET Core, Python ML Stack, SQL Server, React

Built adaptive tutoring system using supervised learning algorithms to personalize content difficulty. Implemented backend services processing student data through Scikit-learn pipelines for real-time pattern analysis, identifying struggling students 65% faster than traditional methods. Created RESTful APIs supporting 1,000+ daily personalized interactions with sub-200ms response times.

Student Behavior Analytics System

Tech: Python (NumPy, Pandas), K-Means Clustering, SQL Server

Developed analytics platform using unsupervised learning to identify student learning patterns and behavior profiles, enabling targeted interventions that improved at-risk student performance by 42%. Engineered data preprocessing workflows handling missing values, feature scaling, and encoding from multiple sources.

Adaptive Content Delivery Engine

Tech: ASP.NET Core, NLP Concepts, SQL Server

Architected backend system for adaptive educational content using prompt engineering principles. Implemented secure user isolation with JWT authentication processing 50K+ daily content requests, ensuring recommendations reflect latest student progress.

SPECIALIZED ML EXPERTISE

Deep Learning: Neural Networks (ANN, CNN) • Backpropagation • Gradient Descent • TensorFlow/Keras • Transfer Learning

NLP: Text Preprocessing • Tokenization • TF-IDF • Sentiment Analysis • Traditional vs Transformer-based approaches

Reinforcement Learning: Multi-Armed Bandits • UCB • Thompson Sampling • Exploration/Exploitation strategies

Statistical Modeling: Feature Engineering • Missing Data Handling • Hypothesis Testing • Model Interpretation

EDUCATION

Bachelor of Technology in Information Technology | Rosebank College, South Africa | 2015–2019

Relevant Coursework: Machine Learning, Data Structures & Algorithms, Database Systems, NLP Fundamentals

TECHNICAL CERTIFICATIONS

Machine Learning Specialization • Advanced ASP.NET Core Development • Prompt Engineering & LLM Applications

REFERENCES

Mthandazo Mabena | Project Manager & HR – Singular Systems | 📞 060 236 6056