You are cordially invited to attend a SASA-Forecasting Interest Group Talk by John O. Ajeigbe

John O. Ajeigbe

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Biography: John O. Ajeigbe is a highly accomplished senior software engineer and researcher with a strong background in computer science and statistics. With extensive experience in the tech industry, he has made significant contributions to the ecosystem through innovative solutions, mentorship, and collaborative research. Holding a Diploma in Computer Science from The Polytechnic, Ibadan, and a Degree in Statistics from the University of Ibadan, John leverages his technical expertise and analytical skills to drive impactful projects. As a co-organiser of the Google Developer Groups, Ibadan Chapter, he also dedicates his time to fostering a vibrant community of developers, promoting knowledge sharing, and empowering the next generation of tech innovators.

VENUE: **Microsoft Teams**

DATE: **Friday 15 August, 2025**

TIME: **14:00-14:50 (South African Time – First Presentation)**

15:00-15:50 (South African Time – Second Presentation)

FIRST PRESENTATION

Title: Medical image analysis assistant: AI-powered analysis using advanced CNN and LLM technology

ABSTRACT

Medical imaging interpretation remains a bottleneck in healthcare delivery, particularly in settings with limited radiological expertise. Current diagnostic workflows require specialised knowledge and extensive training, creating barriers to timely patient care. The lack of accessible, real-time analysis tools compounds these challenges in resource-constrained environments. This study presents a web-based solution that bridges the gap between complex medical image analysis and clinical accessibility by combining computer vision with natural language processing capabilities. We developed a modular web application using Next.js 14, TypeScript, and React 18, implementing specialised Convolutional Neural Network architectures through TensorFlow.js for client-side processing. The system supports four medical imaging modalities: MRI, CT, X-ray, and ultrasound, with tailored CNN configurations optimised for each modality's unique characteristics. The application processes images locally in the browser and then transmits structured feature data to Google Gemini and OpenAI's GPT models for comprehensive report generation. The architecture incorporates interactive visualisation components, custom React hooks for state management, and responsive design principles ensuring cross-platform compatibility. The application successfully processes medical images across all supported modalities while maintaining user privacy through local computation. The system generates structured reports containing anatomical observations, potential pathological findings, and clinical recommendations. Performance testing demonstrates efficient browser-based processing with real-time analysis capabilities and intuitive user interaction through zoom, rotation, and pan functionalities. This implementation demonstrates the feasibility of deploying sophisticated medical image analysis tools through standard web browsers, offering scalable solutions for healthcare systems seeking to enhance diagnostic capabilities without requiring specialised hardware or extensive infrastructure investments.

SECOND PRESENTATION

Title: Statistical convolutional neural network modelling for brain tumour magnetic resonance imaging

ABSTRACT

Brain tumour diagnosis requires specialised radiological expertise that remains limited in many healthcare systems globally. Current diagnostic workflows depend heavily on the manual interpretation of MRI scans, leading to delayed diagnoses and potential misclassification, particularly in resource-constrained environments. This study addresses the critical gap between diagnostic demand and available expertise by developing a statistical framework for automated brain tumour detection. The primary objective focuses on creating a robust classification system that can distinguish between tumour and non-tumour cases with high statistical reliability. We implemented a Statistical Convolutional Neural Network architecture trained on 4,600 annotated MRI scans from publicly available repositories. The dataset underwent stratified partitioning into training (70%), validation (20%), and testing (10%) subsets. Preprocessing procedures included standardisation, normalisation, and augmentation techniques to ensure statistical consistency across samples. Hyperparameter optimisation utilised grid search methodology to determine the optimal batch size, learning rate, and network depth. Model performance was evaluated using multiple statistical metrics, including accuracy, precision, recall, F1-score, and Matthews Correlation Coefficient. The classification model demonstrated exceptional performance with 98.21% accuracy, 97.51% precision, 99.16% recall, and 98.33% F1 score. ROC analysis yielded an AUC value of 0.99999, indicating near-perfect discrimination capability. Five-fold cross-validation confirmed consistent performance across different data partitions, while the Matthews Correlation Coefficient of 0.974 validated statistical balance in classification outcomes. These findings demonstrate the feasibility of deploying statistical deep learning methods for clinical decision support in brain tumour diagnosis, offering potential solutions for healthcare systems facing radiological workforce shortages while maintaining diagnostic accuracy standards.