Contribution ID: **33**   Type: **Oral Presentation**

Proactive Equipment Monitoring Using Vanilla LSTM for Predictive Maintenance at iThemba LABS

iThemba LABS operates complex scientific equipment including particle accelerators where unexpected failures can disrupt critical experiments for extended periods. We present a predictive maintenance framework based on Vanilla LSTM networks that analyzes multivariate time-series sensor data to anticipate equipment failures. The model was trained on operational data from 2021-2024, monitoring key parameters like voltage, vibration, and pressure across various systems. Our approach demonstrates significant improvements over traditional methods, achieving a 75% F1-score in failure prediction with up to 72 hours warning time. The framework includes an interpretable failure scoring system that helps technicians prioritize maintenance interventions. Practical implementation challenges at iThemba LABS, such as handling noisy sensor data in high-vibration environments, were addressed through careful feature engineering and model optimization. The methods developed are particularly relevant for physics laboratories and other facilities operating sensitive, high-value equipment.

Apply for student award at which level:

None

Consent on use of personal information: Abstract Submission

Yes, I ACCEPT

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