WHITEPAPER

AI-Driven Temperature Fault Prediction

to enhance Telecom Network Performance and Availability

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Abstract

This white paper presents a comprehensive solution to address the challenges faced by telecom networks due to high temperatures in critical system modules, leading to reduced cell availability and network performance. Leveraging cutting-edge AI algorithms and automation, our proposed use case offers real-time temperature fault prediction, site monitoring, and ticket generation. The successful implementation of this solution with a major tier 1 telecom operator has demonstrated significant benefits, including more than a 50% reduction in ticket volume for the sites monitored, and enhanced network optimization. This paper details the context, problem statement, solution approach, customer actions, achieved benefits, and future potential of the AI-based temperature fault prediction use case.

Introduction

The telecommunications industry continues to witness exponential growth in data usage, increasing the burden on network infrastructure. With a network comprising over 25,000 sites, it became challenging for our telecom operator customer to efficiently monitor and predict temperature faults in system modules. High temperatures can lead to service disruptions, reduced cell availability, and negatively impact overall network performance. To tackle this problem, Avanseus developed an AI-driven temperature fault prediction module that revolutionizes how temperature-related issues are managed in telecom networks.

Problem Statement

Telecom networks face a twofold problem due to high device temperatures and low cell availability. First, rising temperatures in system modules, baseband modules, and radio modules can degrade network performance and cause disruptions, leading to increased downtime and customer dissatisfaction. Second, low cell availability exacerbates network issues, affecting user experience and overall network reliability. Traditional manual monitoring and handling of these temperature faults are labor-intensive, time-consuming, and often prone to human error, making it imperative to find a more efficient and automated solution.

Our Innovative Solution: AI-Based Temperature Fault Prediction

Avanseus developed an advanced AI module to predict temperature faults in telecom network modules, enabling proactive actions to prevent potential disruptions. This module seamlessly integrates with the customer's KPI performance system, collecting vital information from over 25,000 sites, including site ID, 4G cell name, 4G cell availability, 4G traffic volume, and temperatures of system, baseband, and radio modules. The predictive algorithms analyze this data and monitor the temperature trends over a 60-day period.

Solution Implementation and Actions Taken

A correlation is established across the average 4G cell availability over a period of time using 4G traffic data with telecom operator defined threshold and temperatures that consistently increase beyond a pre-set threshold in the system, baseband, and radio modules. This advanced analysis ensures that only sites consistently breaching all parameters over a significant period are flagged for further checks.

Subsequently, these flagged sites are correlated with ticket data to verify if any ongoing investigation is already underway. In the absence of open tickets, our module automatically raises a ticket and schedules a site visit for the field technician to address the issues promptly. Before generating tickets, the AI module further correlates the breached sites and 4G cells with alarms, topology, and predictions, ensuring accurate and prioritized actions.

Additionally, the telecom operator took the necessary steps to arrange for air conditioning and to provide shelter for shade at identified sites. They collaborated with the infra planning and design team to optimize the arrangement of critical devices on site, ensuring the best cell availability and network performance for the telecom network.

Benefits Achieved

The telecom operator found the AI-driven temperature fault prediction module highly beneficial, automating the monitoring of sites for temperature issues that were previously impossible to manage manually. By taking timely and proactive actions based on the AI predictions, the operator achieved a more than 50% reduction in the total number of tickets on the sites acted, significantly improving operational efficiency.

Moreover, the insights from the AI module empowered the operator to collaborate effectively with the field team to investigate and understand the root causes of increased temperature issues. Subsequently, they implemented necessary measures such as air conditioning, providing adequate shelter, and optimizing infra planning and design to prevent future temperature-related problems. This approach not only solved existing issues but also future-proofed the network for optimal performance and enhanced cell availability.

Conclusions and Future Potential

The AI-based temperature fault prediction use case has demonstrated its ability to revolutionize telecom network monitoring and optimization. By employing advanced AI algorithms and automation, the solution addresses the critical challenge of temperature anomalies in system modules, baseband modules, and radio modules. The benefits achieved, including reduced ticket volume, optimized network performance, enhanced customer experience, and reduced operational overheads, are further complemented by its ability to optimize spare part inventory management. This is achieved by preventing the decrease in the lifespans of active and passive components due to ambient temperature.

As the operations are still in the initial stages, there exists significant potential for further improvement and optimization. By enhancing correlation algorithms and integrating with additional data sources, the solution can provide even greater benefits. We are confident that this use case can be replicated and proposed to other telecom operators worldwide, enabling them to proactively tackle temperature faults, ensure network reliability, and elevate customer experience.