The Practical Benefits of Applying Analytics and Automation to Network Management

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Traditional telecommunications systems rely primarily on hardware for network functions, but modern virtualized, software-driven network functions are more complex to manage due to diverse vendor-specific platforms and tools. The growing demand for services like personalized and context-aware solutions adds to these challenges.[1] Managing these networks requires handling tasks like service design, network design, resource allocation, performance monitoring, and failure recovery, which involve analyzing massive amounts of data from various network components. Human operators often struggle to process this data quickly enough to meet real-time operational demands. To address this, advanced analytics techniques such as machine learning (ML), a subbranch of artificial intelligence (AI) technology, are being used to improve network management and control.[2,3]

Automation, including ML-based automation, is rapidly becoming the new norm in the telecommunications industry for tasks such as network design, capacity forecasting, intelligent alarming, anomaly detection, self-healing of the network, and automated performance monitoring. UScellular has deployed over 200 automations across network engineering and operations to gain operational efficiency, and there are several use cases that highlight how advanced analytics and automation transform day-to-day telecommunications operations.

- A typical Telco's network operations center (NOC) gets millions of alarms daily from multiple technologies and network elements. It is almost impossible to know which of these are essential and which are noise. Under these conditions, it is vital to reduce alarms using an ML-based model for correlation, clustering, and classification, enabling operators to prioritize issues that could negatively impact customers. The output of these ML models can be leveraged to fully automate root cause identification and resolution of the issue. These self-healing types of solutions are prevalent at the UScellular NOC, which leverages automation for many network issues as well as ticket creation/dispatch and alerting teams when automation cannot resolve the issue. The future of NOC operations also can be imagined as a fully automated operations center where the human's role is mainly supervisory.
- Network assurance activities in telecommunications require a comprehensive understanding of the protocols involved in various network services, including voice, data, video, and SMS. This expertise is challenging to transfer and replicate, making troubleshooting complex and labor-intensive for network operations teams. Typically, network engineers gather protocol logs for specific scenarios, which are then decoded and analyzed using specialized software and manual diagnosis. Recent advancements in Generative AI techniques, particularly large language models (LLMs), have shown remarkable abilities in handling regular text and documents. However, their potential extends to specialized telecommunications data as well. Open-source LLMs are great at learning the context of packet capture logs if trained correctly and are now assisting engineers in automating the analysis of network logs to identify the root cause of issues/failures.
- Personalization of customer experience is another area in which big data and ML play an essential role. In the hypercompetitive telecommunications market, big data and ML are becoming pivotal technologies that give a competitive edge through churn prediction, personalized offers, and targeted promotions of service plans and solutions. These approaches can help operators improve customer satisfaction and offer customized services.

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Continued advancement of AI technologies has the potential to deliver autonomous wireless communications networks that provide a more reliable, personalized, and even better experience to customers in the future. cca

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