6G-RIC
Research and Innovation Cluster

GEFÖRDERT VOM
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XAInomaly: Explainable, Interpretable and Trustworthy AI for xURLLC in 6G Open-RAN

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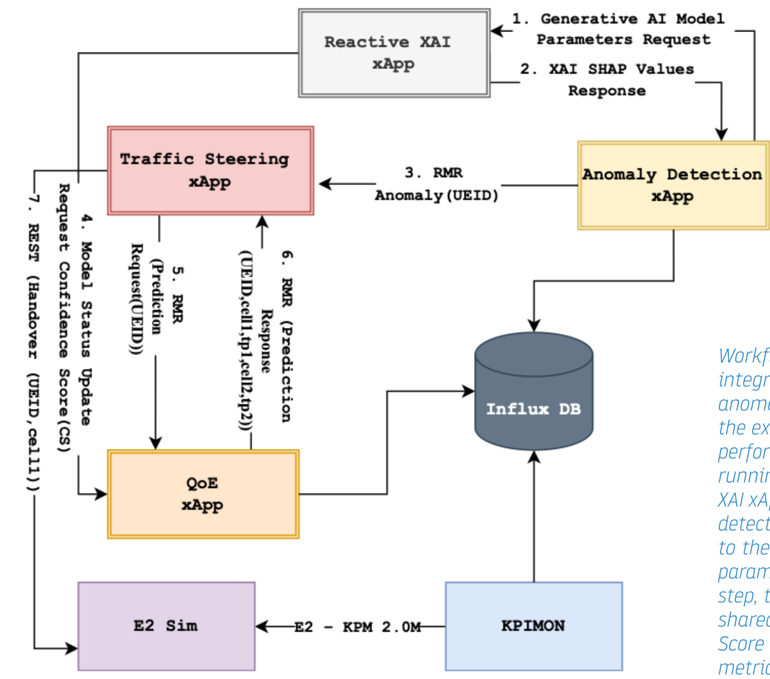
Why is the integration of Explainable AI (XAI) critical for the reliability and trustworthiness of 6G networks? What specific challenges do xURLLC use cases pose for AI/ML algorithms, and how does the XAI design address these challenges? How can the trustworthiness of AI-driven decisions be ensured in high-stakes xURLLC scenarios where latency and reliability are critical?



Workflow of the XAInomaly framework integrated top of the existing O-RAN anomaly detection use case. In addition to the existing anomaly detection use case, the performance of the deep autoencoder model running in AD xApp is checked via Reactive XAI xApp. The confidence level of the anomaly detection classification is determined thanks to the SHAP Values calculated by the model parameters coming from AD xApp. In the next step, the model status update information is shared with QoE xApp. After the Confidence Score (CS) is calculated through the XAI metrics, then CS is fed to QoE Predictor xApp.

KEY FINDINGS

The performance trade-off between fastSHAP-C and other customized SHAP algorithms kernelSHAP, fastSHAP lies in their computational efficiency and accuracy. When performance esults are examined, exclusion and inclusion metrics are calculated based on log-odds. Exclusion and inclusion AUC metrics provide nuanced insights into the performance of XAI framework by evaluating their discriminatory power across specific subsets of data. Considering metrics, it is clearly seen that fastSHAP-C outperformed existing kernelSHAP and fastSHAP models. Moreover, the results in Table IV have very novel results in terms of the reliability of 6G xURLLC scenario. When the runtime results are examined, it is seen that fastSHAP-C reduces the computational burden of Shapley value estimation, making it practical for large-scale datasets and complex ML/DL models while considering CS and EM metrics. Its computational efficiency allows for on-the-fly explanation generation, facilitating dynamic adaptation to changing network conditions and user requirements.

fastSHAP-C's accuracy, albeit slightly compromised compared to conventional methods, remains sufficient for providing actionable insights into model behavior, aiding in network optimization, fault diagnosis, and resource allocation.

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