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Benchmarking machine learning models for cloudresource forecasting: LSTM vs. SVR, Random Forest, XGBoost, and Prophet

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Abstract
Effective cloud resource forecasting is essential for optimizing virtual machine (VM) provisioning in increasingly dynamic and resource-constrained environments, especially now as next-generation mobile systems (5G/6G) continue to emerge. This study examines a selection of learning-based forecasting approaches, including LSTM, SVM, Random Forest, XGBoost, and Prophet, for VM workload prediction using real-world data. The analysis emphasizes the balance that must be maintained between predictive performance and computational demand, two critical aspects for real-time and scalable deployment. Results show that while LSTM achieves superior accuracy, it incurs significant training overhead. Random Forest provides a more balanced trade-off, maintaining competitive accuracy with lower computational cost. These findings inform model selection in contexts like 5G/6G base station association, network slicing orchestration, multi-access edge computing, intelligent handover decisions, and dynamic service function chaining, where both efficiency and precision are vital for maintaining service-level guarantees under constrained resources.