Intelligent Caching Strategies for 5G Edge Networks using Machine Learning

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Abstract:
To reduce latency and improve the user experience, content caching solutions at the network periphery will become increasingly important as 5G networks and data-intensive applications. In this proposed work, the deployment of a caching architecture for 5G periphery networks using machine learning is done. Utilizing information on user behavior, network conditions, and content prominence enables more accurate forecasts and cache management decisions. This trains the prediction models using a wide range of machine-learning techniques to accommodate the ever-changing needs of both networks and content. To evaluate the efficiency of the proposed architecture by measuring its ability to increase cache hit rates and decrease latency. These techniques significantly outperform the standard caching methods. With the intelligent caching architecture of 5G periphery networks, throughput is increased, latency is reduced, and congestion is alleviated. The findings of this study contribute to the growing corpus of literature on AI-driven optimization in 5G networks and shed light on how such solutions could be enhanced for future networks. Neural Networks achieved 96% accuracy than SVM which is 93%.

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Contents

I. Introduction

The introduction of 5G networks and the proliferation of data-intensive applications have presented both new opportunities and challenges for content delivery. In light of the exponential increase in data consumption and the rising demand for low-latency services, effective content caching solutions are crucial for augmenting the user experience and reducing network congestion [1]. Many individuals are interested in 5G peripheral networks due to their ability to relocate data processing and storage closer to end consumers, thereby enhancing service quality and decreasing latency. Due to their reliance on single, centralized data centers, traditional content distribution strategies frequently experience latency and network constraints [2]. Caching the network's boundaries is a viable strategy for overcoming these constraints. Caching frequently requested content at the edge, or close to where it will be viewed, can potentially reduce retrieval times and network connections [3]. It may be difficult to manage content caching at the periphery of 5G networks due to user behavior, network conditions, and content preferences. Using machine learning approaches to optimize content caching decisions in 5G periphery networks has made promising strides over the past few years. By analyzing data on user behavior, network conditions, and popular content, machine-learning algorithms could potentially anticipate future requirements and proactively store relevant information. By evaluating data and making informed decisions, these algorithms may increase cache find rates and reduce latency [4].

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