

Network Traffic Optimizer using AI

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Abstract Network performance plays a crucial role in ensuring smooth communication, fast data transfer, and reliable connectivity in modern digital systems. However, many networks face issues such as slow speed, congestion, and inefficient bandwidth usage due to increasing data traffic and limited optimization techniques. Traditional network management methods often fail to dynamically adapt to changing network conditions. This study focuses on the development of a **Network Optimizer using Artificial Intelligence (AI)** to monitor, analyze, and improve network performance. The system collects network data such as speed, latency, and bandwidth usage, and applies AI techniques to identify performance issues and optimize network parameters automatically. Artificial Intelligence helps predict network congestion, recommend optimal configurations, and enhance overall network efficiency. By integrating AI-based analysis with network monitoring tools, the system improves reliability, speed, and

resource utilization in network environments. The proposed solution supports efficient network management, reduces downtime, and ensures better connectivity for users.

Keywords: Network Optimization, Artificial Intelligence, Network Performance.

1.INTRODUCTION

Artificial Intelligence (AI) has become an important technology in modern networking systems by enabling intelligent decision-making based on large volumes of network data. In recent years, AI has been widely used in various industries to improve system efficiency and performance monitoring. Network management can greatly benefit from the integration of Artificial Intelligence technologies. Many networks face challenges such as congestion, slow data transmission, and inefficient bandwidth utilization due to increasing internet traffic and dynamic network conditions. A Network Optimizer using

Artificial Intelligence can help address these challenges by creating an intelligent system that monitors, analyzes, and optimizes network performance automatically. The system collects important network parameters such as speed, latency, and bandwidth usage, and uses AI algorithms to analyze network conditions and detect performance issues. Through intelligent data analysis, the system can identify network bottlenecks, monitor real-time performance, and provide recommendations to improve connectivity and stability. AI-driven optimization systems enhance network reliability by ensuring efficient bandwidth usage and supporting better decision-making for network administrators.

2. SCOPE OF THE STUDY

Artificial Intelligence is transforming many industries by improving efficiency, automation, and decision-making processes. In computer networking, the integration of Artificial Intelligence can help improve network performance and management. Modern networks handle large amounts of data and multiple connected devices, which often leads to problems such as network congestion, slow speed, and inefficient bandwidth utilization. A **Network Optimizer using Artificial Intelligence** can help address these challenges by providing an intelligent system that monitors and analyzes network performance. The proposed system uses AI techniques to study network parameters such as speed, latency, and bandwidth usage to detect issues and improve network efficiency. By analyzing network data, the system can identify performance problems and provide recommendations for better resource utilization. The scope of this study focuses on developing an AI-based network optimization system that improves monitoring, enhances network performance, and supports efficient network management. By using intelligent data analysis, the system aims to ensure reliable connectivity, reduce network delays, and improve overall network efficiency in modern digital environments.

TABLE 1-System developed Technologies

Component	Technology Used
Frontend Interface	HTML, CSS, JavaScript
Backend Framework	Flask (Python)
Database	SQLite
API System	Flask REST API
Data Visualization	Interactive Charts and Dashboards
Development Type	Web-Based Platform

TABLE II – Network Performance Metrics

Metric	Description
Download Speed	Measures how fast data is received from the internet
Upload Speed	Measures how fast data is sent to the internet
Latency	Time taken for data packets to travel across the network
Bandwidth	Maximum data transfer capacity of the network
Signal Strength	Quality and stability of the network connection
Jitter	Variation in packet transmission delay

TABLE III – System Modules

Module	Function
User Module	Allows users to run speed tests and view results
Admin Module	Manages system data and monitors network performance
Speed Test Module	Measures download, upload, and latency values
Data Analysis Module	Processes network data and calculates performance scores
Visualization Module	Displays results using charts and dashboards

TABLE IV – Network Service Providers

Provider	Service Type
Jio	Mobile and Broadband Internet Service
Airtel	Mobile and Fiber Internet Service
BSNL	Government Broadband and Mobile Service
Vi (Vodafone Idea)	Mobile Internet Service

TABLE V – System Architecture Layers

Layer	Description
Client Layer	User interface where speed tests are executed
Application Layer	Handles processing, analysis, and API communication
Data Layer	Stores network performance data in the database
Analytics Layer	Performs provider ranking and comparison
Visualization Layer	Presents results through dashboards and charts

3. RESEARCH METHODOLOGY

3.1 Research Design

This study uses a descriptive and system development approach to create a web-based platform that analyzes and optimizes internet network performance across different regions of Tamil Nadu. The system focuses on evaluating network quality and comparing the performance of various internet service providers.

3.2 Data Collection

The study uses both **primary and secondary data**.

Primary Data:

Primary data were collected through network speed tests performed by users in different regions of Tamil Nadu. These tests measured key performance parameters such as download speed, upload speed, latency, bandwidth, signal strength, and jitter. The collected data helped in understanding the actual network performance experienced by users.

Secondary Data:

Secondary data were collected from research articles, technical journals, online resources, and reports related to network performance analysis, internet service providers, and artificial intelligence applications in network management. These sources helped in understanding the importance of intelligent network monitoring systems.

3.3 System Development Process

The development of the platform was carried out in the following steps:

Requirement Analysis – Understanding the need for monitoring and comparing network performance across regions.

System Design – Designing the system architecture including the user interface, data processing modules, and database structure.

Platform Development – Developing the web application using appropriate web technologies and integrating the speed testing mechanism.

Testing – Verifying that all system features function correctly and provide accurate network performance results.

Implementation – Deploying the platform to allow users to perform network tests and view analytical results.

3.4 Tools and Technologies Used

The platform was developed using the following technologies:

Frontend: HTML, CSS, and JavaScript for building the user interface

Backend: Flask framework for server-side processing and API management

Database: SQLite for storing network performance data

Data Visualization: Interactive charts and dashboards for presenting results

Analysis System: Weighted scoring algorithm for ranking internet service providers based on performance metrics

3.5 Scope of the Study

This study focuses on developing a web-based network traffic optimization and analysis platform for evaluating internet service provider performance across different regions of Tamil Nadu. The platform enables users to test network speed, analyze performance metrics, and compare service providers such as Jio, Airtel, BSNL, and Vi. The system helps users make informed decisions when selecting internet services and promotes transparency in network performance evaluation.

4. SOCIAL IMPACT OF PLATFORM

The developed Network Traffic Optimizer Using AI platform not only helps users analyze internet performance but also creates positive benefits for society, especially for internet users, service providers, and digital communities. The system improves transparency in network performance and supports better decision-making when selecting internet services.

1. Improves Network Awareness Among Users

The platform helps users understand the actual performance of their internet connection. Many users depend only on advertised speeds provided by service providers. By using this system, users can test their real network speed and become more aware of network quality in their area.

2. Helps Users Choose Better Internet Services

Internet users often find it difficult to compare the performance of different service providers. The platform provides a clear comparison of providers based on network metrics such as download speed, upload speed, latency, bandwidth, signal strength, and jitter. This helps users choose the most suitable internet service for their location.

3. Encourages Data-Driven Decision Making

The platform provides analytical results and historical performance data. This allows users to make decisions based on actual network performance rather than assumptions or advertisements. It encourages the use of data for selecting reliable internet services.

4. Supports Transparency in Network Performance

The system collects network data from different locations and provides region-wise performance analysis. This increases transparency in network services and helps users understand how different providers perform in specific areas.

5. RESULTS AND DISCUSSION

The developed platform was tested to understand how effectively it analyzes and compares network performance across different regions. The results show that the system helps improve network monitoring, provider comparison, and user awareness about internet performance.

4.1 Network Speed Testing

The platform allows users to perform network speed tests to measure their internet connection performance. The system records parameters such as download speed, upload speed, latency, bandwidth, signal strength, and jitter. Once the test is completed, the information is stored in the system database for further analysis.

4.2 Area-Wise Network Performance Analysis

Users can view network performance based on different locations. The platform analyzes collected data and displays the average performance of internet service providers in specific regions. This helps users understand which provider offers better service in their area.

4.3 Network Data Storage and Analysis

The system stores network performance data in a centralized database. This data is processed using analytical methods and a weighted scoring algorithm to evaluate overall provider performance. Storing historical data helps in long-term monitoring of network quality.

4.4 Provider Comparison and Ranking

The platform compares the performance of internet service providers such as Jio, Airtel, BSNL, and Vi based on multiple network parameters. The system calculates a performance score and ranks providers according to their network quality. This feature helps users identify the best network provider for their location.

4.5 Platform Benefits

The testing results show several advantages of the developed platform. It improves transparency in network performance evaluation and provides users with an easier way to analyze internet quality. The system also reduces dependency on assumptions when choosing internet providers. Overall, the platform supports better understanding of network performance and helps users make informed decisions about internet services.

5. System Performance

The developed AI-based Network Optimizer was tested to evaluate its performance and reliability. The system successfully analyzes network data and provides optimization suggestions efficiently. The integration of AI algorithms and network monitoring tools improves the accuracy and speed of network performance analysis.

6. STATEMENT OF THE PROBLEM

The internet service industry includes many network providers that offer broadband and mobile data services to users. However, many users face difficulties in identifying the actual performance of these network services due to the lack of reliable and transparent performance information. Most internet users depend on advertised network speeds provided by service providers, which may not accurately represent the real network performance experienced in different locations.

At the same time, traditional network speed testing tools provide only instant measurements and do not offer meaningful comparisons between different internet service providers. The absence of a centralized platform for collecting, analyzing, and comparing network performance data creates a gap in understanding the quality of internet services across different regions.

This situation makes it difficult for users to make informed decisions when selecting internet service providers. The lack of a comprehensive network analysis system limits transparency in network performance evaluation and reduces the ability to identify the best network provider for specific locations. Therefore, there is a need for an intelligent digital platform that can monitor, analyze, and compare network performance using multiple parameters to help users better understand and choose reliable internet services.

8. FUTURE ENHANCEMENTS

The developed **Network Traffic Optimizer Using AI platform** provides a basic system to analyze and compare network performance across different regions. However, several improvements can be made in the future to enhance the functionality and user experience.

1. Mobile Application Development

In the future, the platform can be developed as a mobile application so that users can easily perform network speed tests and access network performance analysis through smartphones.

2. Real-Time Network Monitoring

A real-time monitoring feature can be added to continuously track network performance and provide instant updates about network conditions in different locations.

3. Advanced AI-Based Analysis

More advanced Artificial Intelligence and machine learning techniques can be introduced to predict network congestion, identify performance trends, and provide intelligent recommendations for selecting the best network provider.

4. User Feedback and Rating System

A feedback and rating system can be added to allow users

to share their experiences with different internet service providers. This information can help other users evaluate network quality before choosing a service provider.

7. Region-Wise Network Performance Reports

The system can include detailed region-wise network performance reports that show long-term trends and comparisons of different service providers across multiple locations.

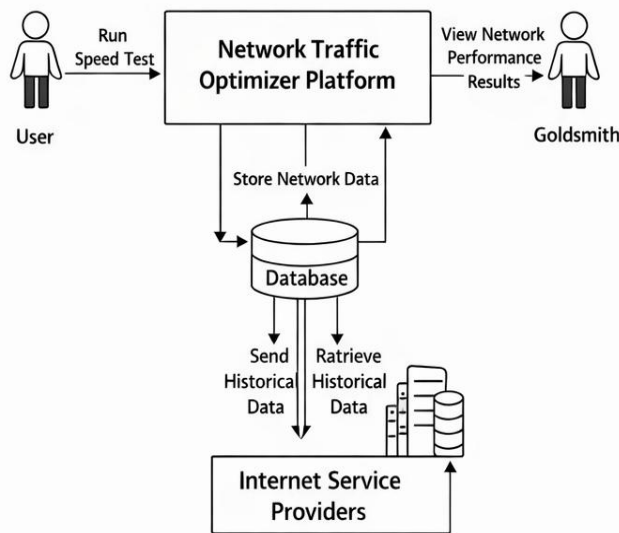
Integration with Internet Service Provider Data

In the future, the platform can be integrated with internet service provider systems to obtain more accurate network data and improve the reliability of performance analysis.

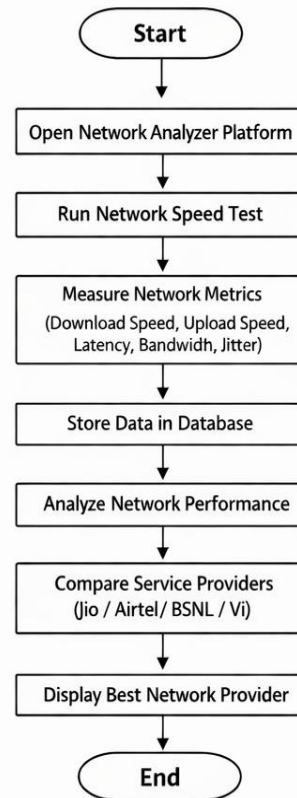
9.FLOW DIADRAMS AND CHARTS

Data Flow Diagram (DFD) of the Network Traffic Optimizer

System Flowchart of the Network Traffic Optimizer



A) Data Flow Diagram (DFD)



B) System Flowchart

AI-BASED NETWORK TRAFFIC MONITORING DASHBOARD



10. CONCLUSION

The integration of Artificial Intelligence (AI) and digital technology in network performance analysis creates new opportunities to improve how users understand and evaluate internet services. The developed Network Traffic Optimizer Using AI platform helps users easily analyze network performance, monitor internet speed, and compare different internet service providers through an intelligent online system. This approach improves user

awareness and reduces the time required to identify reliable network services.

The system also improves network performance evaluation by providing a structured platform where users can perform speed tests, analyze multiple network metrics, and compare provider performance based on real-time and historical data. By simplifying the process of network analysis and improving accessibility to performance information, the platform supports users in making better decisions when selecting internet services.

Another important advantage of the platform is that it provides greater transparency in network performance across different regions. Many users rely only on advertised speeds from service providers without understanding the actual network quality experienced in their area. Through this platform, users can view real network performance data and compare providers such as

Jio, Airtel, BSNL, and Vi, helping them choose the most suitable internet service. Overall, the system provides an intelligent, scalable, and user-friendly solution for monitoring, analyzing, and optimizing network traffic performance.

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