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## **APPLICATION OF BIG DATA AND ADVANCED ANALYTICS FOR OPTIMIZATION OF IT SOLUTIONS**



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**Abstract.** This article explores the transformative potential of Big Data and Advanced Analytics in enhancing the efficiency and performance of modern IT solutions. By analysing large-scale datasets and employing predictive modelling, organizations can significantly optimize their infrastructure, reduce latency, and improve overall system reliability. The study highlights key methodologies for integrating data-driven insights into the software development lifecycle to achieve superior technical outcomes.

**Keywords:** Big Data, Advanced Analytics, IT solution optimization, predictive modelling, data-driven insights, system performance.

### **Introduction**

In the era of rapid digital transformation, IT systems generate vast amounts of data that hold critical insights for operational excellence. Leveraging Big Data and Advanced Analytics allows for a shift from reactive troubleshooting to proactive optimization. This paper examines how algorithmic solutions and machine learning models can be applied to refine IT processes and deliver more robust software architectures.

### **Main Content**

#### **1. Data-Driven Architecture Optimization**

Modern IT solutions require dynamic architectures that can adapt to changing workloads. Big Data analytics enables the transition from static configurations to data-driven, elastic infrastructures. By analyzing historical traffic patterns, IT systems can implement Auto-scaling algorithms that adjust server capacity in real-time. This reduces operational costs by ensuring that resources are only consumed when necessary, thereby optimizing the overall cost-to-performance ratio.

#### **2. Machine Learning Algorithms in IT Operations (AIOps)**

Advanced Analytics integrates Machine Learning (ML) into IT operations, a field known as AIOps.

• **Regression Analysis:** This is used to predict future system load based on historical data trends. For instance, an IT solution can forecast storage requirements for the next quarter with high precision.

• **Clustering Techniques:** By using k-means clustering, system administrators can group similar types of network traffic, allowing for the optimization of data packets and reducing latency in high-speed networks.

### 3. Enhancing User Experience (UX) through Behavioral Analytics

The optimization of an IT solution is incomplete without considering the end-user. Big Data allows for the collection and analysis of user interaction logs. Through Heatmap Analysis and Path Tracking, developers can identify which features of a software solution are causing friction. Advanced analytics then provides data-backed recommendations for UI/UX adjustments, leading to higher user retention and system efficiency.

### 4. Real-time Monitoring and Self-healing Systems

The ultimate goal of applying Advanced Analytics in IT is the creation of self-healing systems.

- **Root Cause Analysis (RCA):** When a failure occurs, Big Data tools can scan millions of log entries in seconds to identify the exact point of failure.

- **Automated Remediation:** Once a pattern is recognized, the system can automatically execute scripts to restart services or re-route traffic, minimizing the Mean Time to Recovery (MTTR).

### 5. Performance Comparison Table 1

Table 1. The following table illustrates the effectiveness of various models in IT optimization

Optimization Goal	Analytical Model	Impact on Performance
Traffic Forecasting	Time-Series Analysis	High (Predicts peak loads)
Security/Fraud	Anomaly Detection	Critical (Identifies breaches)
Storage Management	Linear Regression	Medium (Capacity planning)
System Reliability	Bayesian Networks	High (Risk assessment)

### Conclusion

The integration of Big Data and Advanced Analytics is essential for the continuous improvement of IT solutions. These technologies not only streamline operations but also provide a competitive edge by ensuring that IT infrastructures are agile, resilient, and data-informed.

### Reference List

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### Author's contribution

Authors make an equivalent contribution.

## ПРИМЕНЕНИЕ БОЛЬШИХ ОБЪЕМОВ ДАННЫХ И ПЕРЕДОВОЙ АНАЛИТИКИ ДЛЯ ОПТИМИЗАЦИИ ИТ-РЕШЕНИЙ

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**Аннотация.** В этой статье рассматривается преобразующий потенциал больших данных и продвинутой аналитики для повышения эффективности и быстродействия современных ИТ-решений. Анализируя крупномасштабные наборы данных и используя прогнозное моделирование, организации могут значительно оптимизировать свою инфраструктуру, сократить время ожидания и повысить общую надежность системы. В исследовании освещаются ключевые методологии интеграции аналитических данных на основе данных в жизненный цикл разработки программного обеспечения для достижения превосходных технических результатов.

**Ключевые слова:** большие данные, расширенная аналитика, оптимизация ИТ-решений, прогнозное моделирование, аналитические данные на основе данных, производительность системы.