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(71)**Name of Applicant :**
1)SWETA SAHA
Address of Applicant :RESEARCH SCHOLAR, COMPUTER SCIENCE AND ENGINEERING, NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR, JHARKHAND-831014, INDIA West Singhbhum Jharkhand India
2)Dr. BINOD KUMAR SINGH
3)Dr. SANDIP KUMAR CHAURASIYA
4)Dr. ARINDAM BISWAS

(72)**Name of Inventor :**
1)SWETA SAHA
2)Dr. BINOD KUMAR SINGH
3)Dr. SANDIP KUMAR CHAURASIYA
4)Dr. ARINDAM BISWAS

(57) Abstract :
ABSTRACT QOS-AWARE RESOURCE OPTIMIZATION IN IOV USING MACHINE LEARNING AND MULTI-OBJECTIVE METAHEURISTICS The Internet of Vehicles (IoV) represents an advanced intelligent transportation paradigm where vehicles, roadside infrastructure, and cloud services communicate in real time to improve traffic management, safety, and mobility efficiency. However, the large volume of data generated by connected vehicles creates significant challenges in resource allocation, network latency, bandwidth utilization, and service reliability. Ensuring Quality of Service (QoS) in such highly dynamic vehicular networks requires intelligent optimization strategies capable of adapting to rapidly changing network conditions. This study proposes a QoS-aware resource optimization framework for IoV using machine learning and multi-objective metaheuristic algorithms. The framework integrates predictive machine learning models for traffic and network behavior analysis with metaheuristic optimization techniques such as Genetic Algorithms (GA), Particle Swarm Optimization (PSO), and Ant Colony Optimization (ACO). These techniques collectively optimize network resources including bandwidth allocation, computing capacity, and communication channels while minimizing latency, packet loss, and energy consumption. The proposed system dynamically adjusts resource allocation strategies based on vehicle mobility patterns, network congestion levels, and service priorities. The results demonstrate that combining machine learning with multi-objective optimization improves QoS performance, enhances network reliability, and supports efficient vehicular communication in smart transportation environments.

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