

PREFACE

The growing need for sustainable energy management in commercial buildings has led to the exploration of advanced technologies such as the Internet of Things (IoT). This thesis investigates the application of IoT-based systems to optimize energy consumption in commercial buildings, with a particular focus on integrating occupant behavior analysis through computer vision techniques and sensor data. The study begins by highlighting the significance of energy management in commercial buildings, emphasizing the economic, environmental, and regulatory benefits. It also explores the potential of IoT in enhancing energy efficiency through real-time monitoring, automated control systems, and predictive maintenance.

The research methodology involves a mixed-methods approach, combining quantitative data from temperature, light sensors, and electric meters with qualitative insights from CCTV footage analysis. The study also considers the role of occupant behavior in energy consumption and the potential for IoT systems to provide personalized feedback to encourage energy-saving practices.

The findings indicate that IoT-enabled systems can significantly reduce energy consumption by optimizing HVAC and lighting operations based on real-time data and occupancy patterns. Moreover, the integration of computer vision techniques for occupant behavior analysis provides a novel approach to energy management, offering personalized feedback that can drive long-term behavior change. The thesis also addresses key challenges, including data privacy concerns and the need for robust cybersecurity measures to protect IoT systems.

This research contributes to the field of energy management by demonstrating the effectiveness of IoT technologies in commercial buildings and offering practical solutions for overcoming the challenges associated with their implementation. The results have implications for both the design of future IoT-based energy management systems and the development of policies to promote their adoption in commercial buildings.