Chapter 5
Edge Computing and Machine Learning Integration for Autonomous Electrical Vehicles

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ABSTRACT

The growth of autonomous small aircraft and drones has significantly impacted the aviation industry. This chapter provides a comprehensive guide for researchers, engineers, and enthusiasts interested in developing intelligent aerial systems. It also covers the fundamentals of edge computing and machine learning, the evolution

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of autonomous systems, and the design and implementation of edge computing architectures in small aircraft. The machine learning algorithms' applications in navigation, path planning, obstacle avoidance, and decision-making have also been discussed. The security and privacy of autonomous systems and ethical considerations in flight control have been illustrated. The project's future trends and emerging technologies are also elaborated.

INTRODUCTION

Drones and small aircraft are being impacted by the integration of cutting-edge technology like edge computing and machine learning, which is changing the transportation scene. The possibilities and difficulties of intelligent computing and autonomous systems in the context of transportation are examined in this introduction (Q. Yang et al., 2021). Autonomous cars, aircraft, and drones are transforming transportation through the use of sensor technologies, processing, and communication protocols. The full potential of autonomy is made possible by edge computing and machine learning, which process data closer to the source. As these systems transition from concept to reality, robust and astute responses are required (F. Wang et al., 2020).

Decentralized edge computing may improve real-time processing, lessen reliance on centralized cloud infrastructure, and cut latency—all important factors in autonomous systems that need to make decisions quickly, such as drones, miniature airplanes, and driverless automobiles (J. Tang et al., 2020). An area of artificial intelligence called machine learning gives autonomous systems the ability to learn from their mistakes and come to intelligent conclusions. Because of its versatility, it is perfect for dynamic environments like as autonomous vehicles and drones. Machine learning algorithms provide more advanced navigation, obstacle avoidance, and decision-making than rule-based systems. The fundamental concepts and possible applications of machine learning in autonomous cars are covered in this section (Sonmez et al., 2020).

The FAA is essential to the safe integration of autonomous systems into the present transportation ecosystems because the development of driverless automobiles, drones, and small planes requires a strong regulatory framework (X. Song et al., 2021). The integration of edge computing and machine learning for autonomous cars, light aircraft, and drones is explored in this book. It looks at case studies, talks about security and privacy issues, and forecasts trends for the future. The goal is to promote and instruct autonomous car innovation, emphasizing how these technologies work together to power transportation in the future (Ndikumana et al., 2020).