Chapter 6
Integrating Visual Intelligence With Federated Learning and IoT in Healthcare

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ABSTRACT

This chapter discusses how visual intelligence can be integrated with federated learning and IoT technologies in the healthcare segment. Health care continues to

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rely on advanced data analytics more and more, making visual intelligence a key player in interpreting complex medical images and data. Federated learning then strengthens this by facilitating collaborative model training across decentralized devices while preserving patient privacy and data security. This enables the use of a combination of data from various sources without compromising confidential information. Multiple applications are discussed, including remote patient monitoring and diagnostic imaging, which highlight exactly how the use of these technologies can improve patient outcomes, make treatment more personalized, and streamline health care flow management. This integration leverages the strengths of visual intelligence, federated learning, and IoT to address pertinent challenges in today's healthcare environment.

INTRODUCTION

The convergence of visual intelligence, federated learning, and the Internet of Things (IoT) has been one of the most transformative paradigm shifts in health care due to the innovations they bring forth in terms of improving patient care, enhancing accuracy in diagnosis, and the overall efficiency of operations. As healthcare systems struggle with vast volumes of data coming from heterogeneous sources—including medical images and wearable devices to electronic health records—the use of advanced technologies has become essential. A part of this chapter discusses how visual intelligence can be harmonized with federated learning and IoT in order to create intelligent health solutions that not only improve the outputs of patient care but also ensure the sensitivity of information(Liu et al., 2020).

Visual intelligence is the understanding and processing of a machine towards visual information like pictures or video, and graphics. It is very significant in the medical world where making processes on diagnostic accuracy can be more automatic through image analysis. Moreover, the advanced algorithms in AI and ML are incredibly capable of processing large amounts of imaging data like X-rays, MRIs, or CT scans even more than skills of physicians. For instance, a detection system based on a computer can find outliers in an imaging study to enable a radiologist to make the appropriate choices. In the interests of visual intelligence having a growing reliance on it, big diversified datasets continue to be necessary to properly train these algorithms(Yang et al., 2021).

Federated learning thus appears to be very promising in addressing this problem of data scarcity and privacy issues perpetuated by traditional machine learning. In traditional settings, training algorithms inherently need a centralized access to data of patients, raising a lot of ethical and legal concerns. Federated learning sidesteps all these issues simply by allowing multiple health-care institutions to collaborate