



Energy-Efficient Communication Frameworks for AI-Driven Healthcare Networks

Kwang Min Seo*

Department of Medical Education and Communication Systems, Hanyang University College of Medicine, Seoul, South Korea

DESCRIPTION

Healthcare networks powered by Artificial Intelligence are expanding rapidly, leading to increased demand for continuous data exchange among medical devices, cloud platforms, diagnostic tools, and clinical information systems. As this expansion continues, attention has shifted toward reducing energy consumption within communication infrastructures that support these systems. A green communication system in Artificial Intelligence-based healthcare networks focuses on minimizing power usage while maintaining efficient data transfer, computational performance, and service reliability across healthcare environments.

One important element of energy-efficient communication design involves adaptive data transmission. In traditional systems, data is often transmitted at fixed intervals regardless of urgency or relevance. In contrast, optimized systems adjust transmission frequency based on patient condition, data priority, and network load. For instance, stable patient readings may be transmitted less frequently, while abnormal readings are sent immediately for analysis. This selective transmission approach reduces unnecessary network traffic and lowers overall energy consumption.

Energy-aware routing protocols are also used to enhance sustainability in healthcare networks. These protocols select communication paths based not only on speed and reliability but also on energy consumption levels of network nodes. Devices with lower energy reserves may be assigned fewer communication tasks, while more efficient nodes handle greater data loads. This balanced distribution helps extend the operational lifespan of network components while reducing overall power demand.

Wireless communication technologies used in healthcare environments are being optimized for lower power consumption as well. Sensor networks and wearable devices are designed to operate using minimal energy while maintaining reliable connectivity. Low-power communication protocols reduce battery usage, extending device operational time and reducing the need for frequent recharging or replacement. This is particularly important for continuous patient monitoring systems where uninterrupted operation is required.

Scheduling algorithms are used to manage communication timing in a way that reduces peak energy demand. Instead of transmitting all data simultaneously, systems schedule transmissions during periods of lower network activity. This approach balances energy consumption across time, reducing pressure on infrastructure during high-demand periods. It also improves network stability by avoiding congestion-related inefficiencies.

As Artificial Intelligence continues to expand within healthcare, the demand for communication resources will continue to grow. Green communication systems provide a structured approach to managing this growth while maintaining environmental responsibility. Through adaptive transmission, edge computing, intelligent routing, data optimization, and energy-aware system design, healthcare networks can reduce their environmental impact without compromising service quality.

Sustainable communication design in Artificial Intelligence-based healthcare networks represents a necessary step toward balancing technological advancement with environmental considerations. By integrating energy-efficient methods across all layers of communication infrastructure,

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Corresponding author: Kwang Min Seo, Department of Medical Education and Communication Systems, Hanyang University College of Medicine, Seoul, South Korea; E-mail: seomin.kwang.scs@gri.fi

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healthcare systems can support advanced digital services while reducing resource consumption and long-term operational costs. Continued development in this area will contribute to more efficient and environmentally responsible healthcare communication systems in the future.