The Integration of Edge Impulse Platform and Orthopedic Medicine: A Knee Joint Disease Monitoring System Based on Artificial Intelligence

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Approximately 350 million people worldwide suffer from osteoarthritis, with 80% of the population aged 65 and above suffering from joint diseases, particularly knee osteoarthritis, which brings enormous pain and economic burden to patients. This project has developed an advanced monitoring system based on artificial intelligence, which solves the problem of insufficient accuracy caused by subjective judgments of doctors in traditional knee joint disease diagnosis, as well as the problem of inconvenient instrument use and high resource consumption. Raw data is collected through acceleration sensors, gyroscope sensors, and compasses, and through spatial calculations, combined with traditional medical diagnostic methods such as the Lachman test, high-precision monitoring and analysis of knee joint motion are carried out to ultimately obtain diagnostic results for knee joint diseases. The embedded recurrent neural network algorithm based on Edge Impulse platform repeatedly learns the diagnosis of knee joint diseases, and its diagnostic accuracy reaches 93.7%. Patients and doctors can view raw exercise data and diagnostic results on the data reading and analysis interface of the terminal. In summary, the system integrates the Edge Impulse platform with traditional orthopedic medicine, with relatively accurate diagnosis, low cost, and convenient doctor-patient interaction, which will have good application prospects and provide effective and humanistic solutions for the medical field of human knee joint diseases.

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