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# Unlocking the potential of convolutional neural networks for precise classification of finger pulse waves in diabetic patients and healthy individuals

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Pulse wave analysis (PWA) is a valuable technique for assessing the cardiovascular health of diabetic patients. However, it encounters several challenges, including the complexity of pulse wave signals and the need for standardization and validation of measurement methods. Convolutional Neural Networks (CNNs) play a crucial role in addressing these challenges by offering a robust and accurate approach to classifying pulse wave images. Pulse wave analysis offers a cost-effective, time-efficient, highly accurate, and non-invasive method for diagnosing diabetes-related cardiovascular issues. This study aims to investigate the effectiveness of CNN in classifying finger pulse wave images to accurately distinguish between diabetic and non-diabetic subjects, thus enabling non-invasive diabetes diagnosis. The study's methodology comprises four main steps: data collection, data preprocessing, CNN model development, and model evaluation. Primary data, including finger pulse waves, blood pressure, mean arterial pressure, oxygen saturation, and pulse rate, were acquired from the multipara patient monitor. Subsequently, single pulse wave cycles from 50 healthy individuals and 50 diabetes patients were subjected to preprocessing. The CNN model was developed through data collection, preprocessing, and the creation of its architecture, followed by compilation, training, and evaluation, ultimately achieving a 92% accuracy in classifying pulse wave images for non-invasive diabetes diagnosis. Descriptive statistics were used to summarize participants' demographic and clinical data, revealing no significant differences in age, gender, or body mass index between the two groups. The model's ability to discriminate based on pulse wave images highlights its potential for non-invasive diabetes diagnosis. In order to improve accuracy in future work, increasing the dataset size and conducting hyperparameter tuning will be essential for optimizing the CNN model.

**Keywords:** Convolutional neural network (CNN), Diabetes diagnosis, Non-invasive screening, Pulse wave analysis (PWA)

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