Chapter 17
Fine-Grained Independent Approach for Workout Classification Using Integrated Metric Transfer Learning

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ABSTRACT

Physical activity helps manage weight and stay healthy. It becomes more critical during a pandemic since outside activities are restricted. Using tiny wearable sensors and cutting-edge machine intelligence to track physical activity can help fight obesity. This study introduces machine learning and wearable sensor methods to track physical activity. Daily physical activities are typically unstructured and unplanned, and sitting or standing may be more common than others (walking stairs upstairs down). No activity categorization system has examined how class imbalance affects machine learning classifier performance. Fitness can boost cardiovascular capacity, focus, obesity prevention, and life expectancy. Dumbbells, yoga mats, and horizontal bars are used for home fitness. Home gym-goers utilise social media to learn fitness, but its effectiveness is limited.

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1. INTRODUCTION

"Fine-grained Independent Approach for Workout Classification using Integrated Metric Transfer Learning" is a machine learning technique aiming to classify workouts accurately based on subtle differences. This approach is "fine-grained" because it can identify specific exercises being performed, and it is "independent" because it does not rely on external data or pre-existing models (Anand et al., 2023). The approach involves integrating metric transfer learning, which means that knowledge learned from one type of workout is transferred to another to improve accuracy. Multiple metrics or measures are used to improve the accuracy of the model (Abdullahi et al., 2023).

Overall, this technique has the potential to be useful in fitness tracking, as it can provide more detailed information on the types of exercises being performed during a workout (Aziz & Sarwar, 2023). This project aims to develop a machine learning model to accurately classify different workouts, focusing on identifying subtle differences between exercises (Angeline et al., 2023). The ultimate goal is to improve fitness tracking by providing more detailed information on the exercise types performed during a workout (Bhanushali, 2023). This can help individuals track their progress more effectively and provide personalized recommendations for future workouts (Farooq & Khan, 2022). Additionally, this approach has the potential to be useful in research settings, such as in sports science, where detailed analysis of specific exercises can provide valuable insights (Cirillo et al., 2023).

The paper focuses on two main aspects of sports fitness detection: (1) the use of digital image processing to track and analyze sports activities and (2) the use of intelligent image processing to analyze body movements during physical exercise (Devi & Rajasekaran, 2023). The authors argue that combining these two approaches makes it possible to create a more accurate and comprehensive picture of an individual's fitness level and track their progress over time (Farooq & Khan, 2023). The paper also discusses the use of IoT technology in sports fitness detection, particularly in the context of wearable devices and sensors (Bhardwaj et al., 2023). These devices can collect data on an individual's physical activity and transmit it to a central database, which can be analyzed using digital and intelligent image processing techniques (Cui et al., 2023). The chapter proposes a comprehensive approach to sports fitness detection that combines digital and intelligent image processing with IoT technology to provide a more accurate and detailed picture of an individual's fitness level (Gaayathri et al., 2023). This approach can potentially revolutionize how we track and monitor our physical activity and could have more significant implications for sports science and healthcare.

2. LITERATURE REVIEW

Ding, & Ren, (2019) proposed algorithm aims to improve the accuracy of medical exercise rehabilitation image segmentation by using the HFCNN to learn and extract the features of the image and IoT technology to integrate real-time data from sensors and wearable devices, such as heart rate monitors and motion trackers, to provide additional information for the segmentation process. The authors demonstrate the effectiveness of the proposed algorithm through experiments on a dataset of medical exercise rehabilitation images. The results show that the HFCNN-based segmentation algorithm outperforms traditional methods and that the addition of IoT data further improves the accuracy of the segmentation.

A convolutional neural network (CNN) architecture is suggested by Gupta (2021) as a means to learn and extract features from the raw sensor data acquired by the wearable device. In order to categorise the