


Chapter 9

Explainable Artificial Intelligence for Trustworthy Decision-Making in Smart Wearable Textiles

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ABSTRACT

Due to the black-box nature of AI models, they face significant critical challenges, particularly in safety domains such as healthcare, banking, and autonomous vehicles. Explainable Artificial Intelligence (XAI) technology aims to address these challenges by providing explanations that enable informed predictive decisions, while

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ensuring a transparent, fair and accountable system. This research paper presents a comprehensive study on how XAI enhances the quality of smart wearable textiles for patient care, providing greater efficiency and enabling trustworthy decisions that ultimately benefit patient health. Due to significant advancements in artificial intelligence (AI), the use of AI-based smart wearable devices, particularly in the healthcare sector, has increased substantially. These real-time, AI-based wearable devices continuously monitor medical health of patients information, enabling physicians to detect diseases early and track patients during their recovery.

INTRODUCTION

Since the advent of the digital health revolution in the healthcare sector, researchers and scientists have been working to improve methods for making informed decisions by providing the best early predictions and predictive decision models, enhancing the quality of smart wearable devices, and more. Various AI-based Machine Learning (ML) and Deep Learning (DL) algorithms are widely used for early detection and prediction of diseases, enabling doctors to make informed and appropriate predictive decisions that improve patient health and increase life expectancy. Although AI-based model is itself an efficient model to handle various tasks better than human being and performance of all AI-based models was excellent and well-received in the healthcare sector, some significant challenges remain regarding trust and the output of all desired ML and DL algorithms, as the inner architecture and logic of these models are obscured by their design and the efficiency of the available dataset. Since AI models are solving many difficult and complex problems, the methodologies used behind these models are also increasingly complex. AI-based models utilise black-box technology, where the input is well-defined and the output is generated. This AI-based process is not transparent and is not easily understood by humans because an AI-based system does not provide any helpful information about the complete process from the initial step to the final decision step. The complete decision-making process and system are often complex and contain uncertainty in their operation. So it is essential and an emerging need to understand the inner structure of the decision-making process. A lack of understanding of inner decision-making is hindering people from adopting this advanced and powerful technology, making it challenging to implement in healthcare, banking, and many other industries, because it should be fairer for the survival of the species (Abernethy et al., 2022).

The black-box characteristics of AI models raise significant concerns among the public, underscoring the need to incorporate explainability, accountability, safety, interpretability, and transparency into AI-based models. All of these features or aspects are crucial for building trust among the public, including scientists, re-

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