

Application of Artificial Intelligence in Prosthetics: A Review

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Abstract

This review paper explores the application of Artificial Intelligence (AI) in advanced prosthetic devices, including limbs, retinal prosthetics, hearing prosthetics, and orthodontic prosthetics, with the aim of enhancing functionality and customization. The research problem centers around understanding AI's forthcoming impact on prosthetic advancements. The study has two objectives: to identify current AI applications in prosthetics and to project future possibilities. The paper uses qualitative secondary analysis to review existing research leveraging AI algorithms can help prosthetic limbs interpret nerve signals derived from the patient's muscles, resulting in more precise control and operation. AI-driven advancements include myoelectric prostheses that utilize electromyography signals, bionic legs that adapt to different environments based on user feedback, and prosthetic arms capable of executing actions using computer vision recognition. Additionally, AI improves retinal prosthetics by combining neural networks with computer vision techniques to refine facial features, enhance environmental representation, and ensure safety. In hearing prosthetics, AI, machine learning, and neural networks enable devices to adapt to individual hearing needs and background noise environments. AI-based object detection techniques streamline dental implant surgery in orthodontic prosthetics. The integration of AI in prosthetic devices holds the potential to enhance functionality, improve control and customization, and provide a more natural user experience, benefiting millions worldwide with limb amputations, vision and hearing impairments, and dental prosthetic needs.

Keywords: *Artificial Intelligence, Machine learning, Neural Networks, Limb prosthetics, Retinal prosthetics, Hearing prosthetics, Dental prosthetics*