Chapter 2
Enhancing Human Computer Interaction With AI:
A New Era of Collaboration

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ABSTRACT

Human-Computer Interaction (HCI) focuses on designing systems that align with human behavior and cognition to enhance usability, accessibility, and productivity. As digital reliance grows, HCI bridges the gap between user expectations and technology, driving innovations from interfaces to immersive environments. Artificial Intelligence (AI) is transforming

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HCI through intelligent, adaptive systems using NLP, personalization, and tools like speech-to-text, gesture control, and emotion-aware computing. These advancements improve accessibility and foster inclusivity. However, challenges remain—data privacy, algorithmic bias, and ethical concerns. Ensuring trust requires encryption, explainable AI, fairness, and compliance. Future directions include multimodal interfaces, ethical frameworks, and edge computing to reduce centralization and protect privacy. This chapter explores how AI enhances modern HCI, addresses its challenges, and supports a shift toward intelligent, inclusive, and secure human-computer interactions.

1. INTRODUCTION

Human-Computer Interaction (HCI) is no longer confined to optimizing keyboard layouts or refining graphical interfaces. It has evolved into a dynamic, interdisciplinary domain that intersects psychology, design, artificial intelligence (AI), and ubiquitous computing. At its core, HCI seeks to humanize technology—designing systems that not only function efficiently but also align with the cognitive, emotional, and social realities of users. This involves studying and enhancing the ways humans interact with machines, with a persistent focus on intuitiveness, usability, and user satisfaction (Xu, 2019).

In an era where digital interactions permeate nearly every aspect of daily life—from virtual classrooms to smart homes, telehealth platforms to wearable devices—the importance of effective HCI has grown exponentially (Hasyim & Bakri, 2024). The field has shifted from a device-centered design paradigm, where technical functionality was the primary concern, to a human-centered design philosophy that emphasizes accessibility, inclusivity, and ethical responsibility. This paradigm shift highlights the necessity for systems that are not only operationally robust but also culturally aware, emotionally intelligent, and universally usable (Rame, Purwanto, & Sudarno, 2024; Usmani, Happonen, & Watada, 2023).

Building upon this shift, artificial intelligence has emerged as a transformative force in HCI. With its ability to learn from data, infer intent, adapt behavior, and simulate elements of cognition, AI is no longer