Chapter 10
Emotional Intelligence in AI-Driven Interactions

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ABSTRACT

Emotional intelligence (EI), traditionally defined as the capacity to recognize, understand, manage, and influence emotions in oneself and others, has become a pivotal concept in the design of advanced artificial intelligence (AI) systems. At its core, EI encompasses several domains: self-awareness, self-regulation, motivation, empathy, and social skills, all of which underpin human interactions, decision-making, and adaptive behavior. Translating these human-centered capabilities into computational frameworks involves bridging cognitive psychology, neuroscience, linguistics, and machine learning, thereby creating AI systems capable of perceiving, interpreting, and responding to emotional cues in dynamic and context-sensitive ways. The foundational layer of emotionally intelligent AI begins with affective computing, a

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INTRODUCTION

Emotional intelligence (EI), traditionally defined as the capacity to recognize, understand, manage, and influence emotions in oneself and others, has become a pivotal concept in the design of advanced artificial intelligence (AI) systems. At its core, EI encompasses several domains: self-awareness, self-regulation, motivation, empathy, and social skills, all of which underpin human interactions, decision-making, and adaptive behavior. Translating these human-centered capabilities into computational frameworks involves bridging cognitive psychology, neuroscience, linguistics, and machine learning, thereby creating AI systems capable of perceiving, interpreting, and responding to emotional cues in dynamic and context-sensitive ways. The foundational layer of emotionally intelligent AI begins with affective computing, a discipline introduced by Rosalind Picard, which focuses on enabling machines to detect and interpret human emotions through multiple modalities, including facial expressions, vocal tonality, physiological signals, text, and behavioral patterns. Multimodal data integration is critical because human emotions are inherently complex, context-dependent, and often subtle; AI systems must synthesize inputs across channels to generate accurate affective assessments. Advanced computer vision techniques, for instance, employ convolutional neural networks (CNNs) and attention mechanisms to detect microexpressions and subtle changes in facial musculature. Simultaneously, natural language processing (NLP) models analyze linguistic features, sentiment polarity, and semantic nuances in speech or text to infer emotional states, while physiological sensors provide continuous feedback on heart rate variability, skin conductance, or voice pitch, offering objective signals of affective arousal and stress.

Building on perception, emotion modeling and representation are essential to creating actionable AI responses. Early approaches relied on categorical emotion models, such as Ekman's six basic emotions, or dimensional models, including valence-arousal frameworks, to quantify affective states. Contemporary AI systems, however, adopt hybrid or probabilistic models, recognizing that emotions are fluid, overlapping, and influenced by individual differences, cultural context, and situational factors. Deep learning architectures, particularly recurrent neural networks (RNNs), long short-term memory (LSTM) networks, and transformer-based models, facilitate temporal modeling of emotional trajectories, enabling AI to understand not only the present state of emotion but also its evolution over time. These models