Chapter 5
Artificial Intelligence and Human-Robot Teaming: Challenges and Design Considerations

Xuefei (Nancy) Deng
California State University, Dominguez Hills, USA

ABSTRACT

Artificial Intelligence or AI is the theory and development of computer systems that can think and act humanly and rationally. AI is gradually transforming our work and life. Along with the increasing presence of robots in our lives arises the fear that AI may take away human jobs. Debates or worries notwithstanding, AI and robots are increasingly brought into the teams of human workers, but our understanding of this emerging human-robot teaming phenomenon remains limited. This chapter presents a brief overview of AI and discusses the relationship between AI and knowledge management. Moreover, it focuses on understanding key issues arising in the collaboration between human and intelligent agents (i.e. robots) in the team setting, and coping strategies and design considerations. This chapter also discusses the value sensitive design framework as a useful tool for incorporating the values of agent transparency and team trust into the design of human-robotic systems. The chapter concludes with the new perspective of augmented intelligence and promising avenues for future research.

DOI: 10.4018/978-1-7998-2355-1.ch005

INTRODUCTION

Artificial Intelligence or AI is the theory and development of computer systems that can think and act humanly and rationally (Russell et al., 2003). AI is gradually transforming our work and life. In businesses, AI has enhanced companies' interactions with their customers and affected the delivery of products and services. For example, intelligent agents such as Siri, Alexa, or Google Assistant have become a reliable source for mobile device users to locate information and purchase goods. In healthcare, AI assists radiologists with image interpretation by bringing the relevant information out of the electronic medical record and presenting it to them in a meaningful way to better inform their clinical judgment. Moreover, robots have been found to help or support humans in carrying daily, routine activities, from mopping floors to serving as an information guide. Widely used in a variety of settings, those robots play a supporting role in our daily activities, and examples of such robot assistants include rehabilitation robots, wheelchair robots and walking robots, companion robots, and educational robots that are found in hospitals, homes and schools.

According to the Oxford English Dictionary, a robot is "a machine capable of carrying out a complex series of actions automatically". Along with the increasing presence of robots in our lives arises the fear that AI and robots may take away human workers' jobs. Heated discussions have been reported on news media, which cover topics from the possibility of robot replacing human workers to the types of jobs (such as the job with high degree of automation) that are at risk of being replaced (e.g., Lepore, 2019; O'Brien, 2019). In contrast to the fear, a more positive view has been expressed, that is, robots can assist, not replace, human workers, as shown in the teamwork by human and robots. For example, a *Forbes* article explains why human workers should not worry about losing their jobs to robots (Arnold, 2018). One key point is that technology won't place the need for creative thinking, problem-solving, leadership, teamwork and initiative and humans can leverage technology to provide a better world for all of us.

Debates or worries notwithstanding, there is evidence that robots are increasing brought into the teams of human workers to work together and accomplish common goals. As highlighted in the *Forbes* article, humans and technology must work together, with humans in control and the technology providing what it is programmed to provide (Arnold, 2018). For instance, in search and rescue operations, human supervises robots such that human gives robot instructions to conduct search and remove heavy objects to rescue those in danger. Similarly, in military and police operations, humans act as commanders, and direct robots to complete tasks such as information acquisition and bomb demolition. Such human-robot teaming has been deployed in dangerous missions such as detonating a bomb to save lives. In this