Journal of Business Research 129 (2021) 961–974

Contents lists available at ScienceDirect

Journal of Business Research

journal homepage: www.elsevier.com/locate/jbusres

Paradoxes of artificial intelligence in consumer markets: Ethical challenges and opportunities

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ARTICLE INFO

Keywords:
Artificial intelligence
Moral significance of technology
Multi-functionality
Interactivity
Ethical issues
Corporate social responsibility

ABSTRACT

Products and services empowered by artificial intelligence (AI) are becoming widespread in today's marketplace. However, consumers have mixed feelings about AI technologies due to the numerous ethical challenges associated the development and deployment of AI. Drawing upon prior research on the moral significance of technology and the emerging literature on AI, we delineate three key dimensions of AI-enabled products (i.e., multi-functionality, interactivity, and AI intelligence stage) that have relevance for ethical implications and adopt a socio-technical approach to provide a multi-layered ethical analysis of AI products at the product-, consumer-, and society-levels. Some key ethical issues identified in the paper include AI biases, ethical design, consumer privacy, cybersecurity, individual autonomy and wellbeing, and unemployment. Companies need to engage in corporate social responsibility (CSR) to shape the future of ethical AI; drawing upon stakeholder theory and institutional theory, we develop a conceptual framework on AI-related CSR, highlighting the product-, company-, and institutional environment-specific factors that influence firms' socially responsible actions in the domain of AI and discussing the subsequent outcomes for firm, consumers, and the society. We include a section on future research agenda for AI ethics and firm CSR in this important domain.

1. Introduction

In today's economy, perhaps nothing has captured the public's imagination as much as artificial intelligence (AI), which is defined as the ability of machines to carry out tasks by displaying intelligent, human-like behavior (e.g., machine learning, computer vision, speech recognition, and natural language processing; Russell & Norvig, 2016). In 1956, a small group of scientists gathered at Dartmouth College for a six-week summer research workshop on AI, which is widely considered to be the beginning of the AI discipline. Since then, the field of AI has "been through periods of hype and high expectations alternating with periods of setback and disappointment" (Bostrom, 2014, p. 5). More recently, driven by factors such as rapid advances in computing power and processing speed, Internet-of-Things (IoT), and the increasing availability of big data, the field of AI has achieved a lot of breakthroughs in imitating, and in some cases, exceeding human intelligence. As a result, AI-enabled value creation is now acting as a powerful disruptive force that transforms, on a global scale, a wide range of industries such as manufacturing, transportation, communications, retail, healthcare, and financial services. The AI market was valued at $16.06 billion in 2017 and is expected to reach $190.61 billion by 2025 (Markets & Markets, 2018). AI-enabled products and services, such as vehicles with autonomous functions, digital personal assistants (e.g., Amazon's Alexa, Apple's Siri), virtual nurses, robo-advisors, AI-enabled personalized recommendation, have become increasingly popular.

Despite increasing enthusiasm, both practitioners and researchers hold divergent perspectives on AI and vehemently debate its value (Tegmark, 2017). Proponents think that AI is wonderous and useful, with its superior processing speed, limitless recall, and self-improving learning ability. Google CEO Sundar Pichai stated, "AI is one of the most important things humanity is working on. It is more profound than electricity or fire" (Clifford, 2018). On the other hand, some people have deep concerns about AI, believing it to be arrogant and dangerous – AI will render humans obsolete and useless and, in the worst-case scenario, destroy humans. Reflecting this view, SpaceX founder and CEO of Tesla Motors Elon Musk famously called AI "humanity's biggest existential threat" (Time, 2018). The famed physicist Stephen Hawking believes AI could be both miraculous and catastrophic, and he cautioned that it

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https://doi.org/10.1016/j.jbusres.2020.08.024
Received 1 February 2019; Received in revised form 10 August 2020; Accepted 13 August 2020
Available online 28 August 2020

could be "the last [event in our history], unless we learn how to avoid the risks" (Time, 2018). Thus, AI embodies paradoxes that promise scientific miracles, efficiency, and freedom on one hand, and foreshadow human dependence, passivity, and obsolescence on the other hand.

At the core of such paradoxes of AI are the numerous ethical challenges associated with value creation empowered by AI, such as AI biases, ethical/moral judgment and decision making, cybersecurity, unemployment due to automation, goal alignment between AI and human beings, and so on. These ethical challenges are even more significant and urgent due to the exponential growth and ubiquitous impact of AI technologies. Not surprisingly, there has been urgent call for research on AI ethics from leading professional organizations (e.g., Association of Computing Machinery; Association for the Advancement of Artificial Intelligence; www.aies-conference.com), the popular press (Ark, 2018; McKinsey, 2017), and forward-looking scholars (e.g., Kaplan & Haenlein, 2019; Vargo & Lusch, 2017). In particular, key research frontiers in the service-dominant (S-D) logic include issues related to big data, AI-enabled value creation, and stakeholder well-being (Vargo & Lusch, 2017). With its focus on intangible resources, value co-creation, and relationships, the S-D logic implicitly emphasizes ethical principles and value creation from the long-term and societal/institutional perspective (Vargo & Lusch, 2008, 2004). Examining the ethical challenges and opportunities of AI-enabled value creation would contribute to the research frontiers of the S-D logic.

This paper intends to evaluate the current status of prominent ethical issues surrounding AI-enabled value creation, as embedded in products and services in consumer markets, and discuss how companies can shape the future of ethical AI by engaging in socially responsible actions to address these issues. Drawing upon the emerging literature on AI (Howard & Borenstein, 2018; Tegmark, 2017) and the research on the moral significance of technology (Kroes & Verbeek, 2014; Wallach & Allen, 2008), this paper evaluates the ethical challenges related to AI-enabled products[1] in consumer markets and discusses opportunities for companies to build long-term competitive advantage by proactively addressing these ethical issues. Consumers hold paradoxical feelings toward AI; they embrace the superior capabilities of AI-enabled products, yet at the same time have fears about the dark side of such powerful technologies (Mick & Fournier, 1998). Consumer trust in AI-enabled products depends, to a large extent, on how the key ethical concerns (e.g., AI biases, cybersecurity, privacy, value alignment) are addressed. In turn, widespread adoption of AI-enabled products depends on consumer trust in these products. Therefore, it is imperative to examine the ethical challenges and opportunities of AI-enabled value creation. According to research on the moral significance of technology, in particular, the moral mediation theory of technology (Verbeek, 2014, 2011), technology is not value neutral; instead, it shapes human experiences and actions and plays an active role in ethics and morality. Verbeek (2014) argues that, in today's environment, technology exerts such a profound impact on society and human existence that we need to recognize the ethical implications in technology design, implementation, and use. Furthermore, the socio-technical perspective on the moral significance of technology emphasizes multi-level ethical analysis at the product-, consumer-, and society-level (van de Poel & Kroes, 2014; Wallach & Allen, 2008). To systematically delineate the ethical challenges and opportunities of AI in the consumer markets, this paper (1) identifies the key dimensions of AI-enabled products that have direct relevance for ethical implications, (2) engages in multi-layered ethical analysis of AI-enabled products at the product-, consumer-, and society-levels, and (3) proposes a conceptual framework for shaping the future of ethical AI, intended to spur future research on AI-related corporate social responsibility (CSR). It is worth noting that, given the nascent field of AI ethics, the conceptual analyses and linkages put forth in this paper need to be empirically tested and validated by future research. Furthermore, given the substantial variations in institutional environment and socio-cultural factors influencing AI development and utilization across the globe[2], this paper focuses primarily on the U.S. context. Future research should examine how and to what extent the AI-related ethical issues and linkages discussed here apply to other countries.

This paper contributes to the nascent literature at the intersection of AI, business ethics, and CSR in several ways. First, drawing upon research on the moral significance of technology (Kroes & Verbeek, 2014; Wallach & Allen, 2008), we adopt a multi-level socio-technical perspective on AI ethics to identify a series of prominent yet thorny AI-related ethical issues at the product-, consumer-, and society-levels (e.g., AI biases, ethical design, privacy, cybersecurity, human autonomy and wellbeing, and unemployment) and offer suggestions on how companies should tackle these issues. Such structured and detailed analysis of AI-related ethical issues helps companies better understand their role in shaping the future of ethical and socially responsible AI technologies. Second, prior research suggests that, when it comes to ethics, not all AI products are the same (Bostrom & Yudkowsky, 2014); however, prior research has been largely silent on what product characteristics are relevant for ethical analysis. This paper advances current understanding on the contingent nature of AI ethics on product characteristics by developing a rich, three-dimensional categorization of AI-enabled consumer products (i.e., multi-dimensionality, interactivity, and AI intelligence stage) and analyzing the ethical relevance of each dimension. This categorization allows firms and customers to appreciate the finer-grained differences among various AI-enabled products and the salience of various ethical issues in connection with the product dimensions. Third, this paper contributes to the literature on CSR (Ferrell, Harrison, Ferrell, & Hair, 2019; Baskentli, Sen, Du, & Bhattacharya, 2019; Xie, Bagozzi, & Grønhaug, 2019) by explicitly linking CSR to the domain of AI. The exponential growth of AI and its ubiquitous impact have important implications for CSR as companies integrate AI in their business operation and product offerings. Building upon stakeholder theory (Freeman, 1984; Donaldson & Preston, 1995) and institutional theory (Scott, 1987; Suchman, 1995), we propose a conceptual framework on AI-related CSR, highlighting the product-, firm-, institutional environment-specific factors influencing firms' CSR actions in this domain and discussing the subsequent outcomes of such actions for firm, consumers, and the society.

2. Ethical significance of AI-enabled consumer products

Before we discuss the ethics of AI-enabled products, a general overview on the ethics of technology is warranted. There has been a long-standing debate on whether technology is value neutral or not. Proponents of the value neutrality thesis argue that technologies do not contain or exhibit ethical values (Morrow, 2014). Technological instruments or products can be used for morally good or bad purposes, but that does not mean the products themselves are morally good or bad. To the extent that values can be associated with these technological products, it is through the human decision processes that bring them into being. This value neutrality thesis holds humans, or users of technology, solely responsible for any actions and outcomes, and disregards any potential facilitating or obstructing influences of technological instruments. In contrast, more and more people start to accept the view

[1] In this paper, we use the term "products" to broadly refer to value creation as embedded in both tangible goods and intangible services.

[2] One cross-country difference in the institutional environment relates to government policies and regulations. While the U.S. government engages in minimal regulation and maximum encouragement of AI growth and innovation, relying upon private-sector firms to voluntarily comply with internal standards and controls, the European Union (EU) is stricter in regulating AI, with a comprehensive data privacy and security law (i.e., GDPR) and official EU guidelines on ethics in AI.

that technologies do embed ethical values and exert a profound influence on ethical decision making of human beings (Gaggioli, Riva, Peters, & Calvo, 2017; Kroes & Verbeek, 2014; Wallach & Allen, 2008; Verbeek, 2011). Technological products actively influence their users, changing not only the way they perceive the world, but also the way they act in the world and interact with each other. Indeed, various studies have documented an array of negative effects of technological products on consumers, including aggressive behaviors, cyber addiction, techno-stress, and so on (Anderson & Dill, 2000; Roberts & David, 2016; Samaha & Hawi, 2016). Thus, technological products are not value-neutral, but do take on moral and ethical significance.

The moral mediation theory of technology (Verbeek, 2014, 2011) is particularly relevant for examining the ethical implications of AI-enabled products. The central idea of moral mediation theory is that technologies-in-use help to establish the relations between human beings and their environment, and ethical decisions are often co-production of humans and technologies. Verbeek (2014) argues that human beings and technological products have become so closely intertwined in everyday lives that individuals' moral perceptions and decisions have become technologically mediated. Due to technologies' mediating roles in human-world relations, it is imperative to acknowledge the moral and ethical significance of technologies and embed ethical principles and values in the design of technological products. Indeed, scholars and practitioners in the fields of positive technology and value-sensitive design (e.g., Friedman & Hendry, 2019; Riva, Banos, Botella, Wiederhold, & Gaggioli, 2012) have been advocating for active and mindful integration of ethical values and principles in technological products. Furthermore, several researchers (e.g., Gaggioli et al., 2017; van de Poel & Kroes, 2014; Wallach & Allen, 2008) adopt a socio-technical perspective on the moral significance of technology and emphasize the ethical implications not only at the product-level, but also at the user/consumer-level and the broader, society-level.

As compared to traditional technological products, the ethical challenges of AI technologies are even more profound and require more urgent attention due to their rapid growth and increasing capacities (Etzioni & Etzioni, 2017). According to the S-D logic (Vargo & Lusch, 2004, 2017), effectively addressing AI-related ethical challenges would not only provide opportunities for a firm to develop core competence in the emerging era of AI, but also enhance value co-creation processes between the firm and the central actors (e.g., customers). Bostrom and Yudkowsky (2014) identify several general ethical principles that AI technologies should follow, such as transparency, reliability, and fairness. A key point made by Bostrom and Yudkowsky (2014) is that, when it comes to ethics, not all AI-products are the same; rather, the characteristics and capacities of AI systems significantly influence what ethical issues are relevant and salient. Due to the contingent nature of ethical issues on AI product characteristics (Bostrom & Yudkowsky, 2014), it is important to identify relevant product dimensions for ethical analysis. Therefore, in the next section, we first provide an overview of AI-enabled consumer products and then identify three key product dimensions: multi-functionality, interactivity, and level of AI intelligence, which have direct implications for the ethical challenges that companies offering AI products have to address.

2.1. Overview of AI-enabled products in the consumer markets

An important pull factor for the dramatic growth of AI technologies is consumers' increasing acceptance and adoption of AI-enabled products. Prominent examples of AI-enabled value creation include autonomous vehicles, digital personal assistants, recommendation systems, and AI tools in the retail and e-commerce, financial services, and healthcare industries. Autonomous vehicles utilize AI technologies such as computer vision and deep learning models to make decisions in real-time and real-world. Many vehicles in the today's marketplace contain certain levels of autonomous functions (e.g., automatic braking, automatic acceleration and steering) but have not yet reached the stage of being fully autonomous. Digital personal assistants are another popular category of AI product in the consumer markets, with Amazon's Alexa, Google Home, and Apple's Siri being the leading brands. Driven in part by the advances in natural language processing and the increasing popularity of voice search and Internet of Things (IoT), digital personal assistants are a software-based service that uses AI to model human interaction to perform multiple tasks such as answering questions, playing music, managing schedule, home control, playing games, ordering products, and so on.

In the retail industry, AI technologies have been integrated in many of the recommendation systems such as those by Amazon and Netflix. AI plays an important role in Amazon's recommendation engine, which generates 35% of the company's revenue (Forbes, 2018). Similarly, AI-enabled recommendation system plays a critical role in Netflix. About 80% of hours streamed by consumers at Netflix is influenced by its recommendation system, and the company estimates that its AI-enabled system is valued at US$1billion per year (Gomez-Uribe & Hunt, 2016).

In the financial services and health care industries, AI-enabled products and services are also gaining traction. Robo-advisors such as Betterment use algorithms to help customers construct and manage their portfolios at a fraction of the cost of a human financial expert. New fintech companies, such as Upstart, leverage AI to price credit and automate the borrowing process. In the healthcare industry, AI-assisted robotic surgeries have been shown to significantly reduce complications and the length of a patient's hospital stay. Virtual nurse assistants (e.g., Care Angel) can collect patient-reported vitals and wellbeing measures, track, trend, and identify risks in real-time, and perform other important tasks including disease management, prevention, and medication adherence.

2.2. Key dimensions of AI-enabled consumer products and their ethical relevance

Despite the rapid and widespread growth of AI-enabled products in consumer markets, consumers as well as other stakeholders have uneasy feelings about AI technologies regarding various ethical issues (e.g., privacy, reliability, and safety), which hinders the future growth of AI-enabled products. Research on AI ethics (Bostrom & Yudkowsky, 2014; Wallach & Allen, 2008) and the moral significance of technology (Verbeek, 2014) both acknowledge the important role of product characteristics in influencing the relevant ethical issues at play. Accordingly, to delve deeper into the ethical analysis of AI in the consumer markets, we identify three key dimensions of AI-enabled products: multi-functionality, interactivity, and AI intelligence stage. The first two dimensions relate most closely to how consumers evaluate and interact with AI-enabled products and have direct implications for the ethical issues we discuss in the subsequent sections (Mick & Fournier, 1998; Nowlis & Simonson, 1996). The third dimension, intelligence stage of AI, relates to the technological development and power of AI technologies from weak, below-human level AI to strong, at- or above-human level AI. The ethical challenges generally become more serious as AI becomes more and more powerful. Fig. 1 presents a three-dimensional classification cube of AI-enabled products with illustrative examples. We also list the most relevant ethical issues for each combination of multi-functionality and interactivity.

2.2.1. Multi-functionality of AI-enabled products

Multi-functionality refers to the range of functions or tasks that a product can perform. Some AI-enabled products, such as digital personal assistants and smart wearable devices (e.g., Apple Watch, Fitbit), can fulfill various functions and rank high on multi-functionality. In contrast, recommendation systems as well as specialized AI-enabled products in healthcare and financial services tend to rank low on multi-functionality.

Multi-functionality is an important dimension because consumers are likely to assess the desirability and usefulness of an AI-enabled

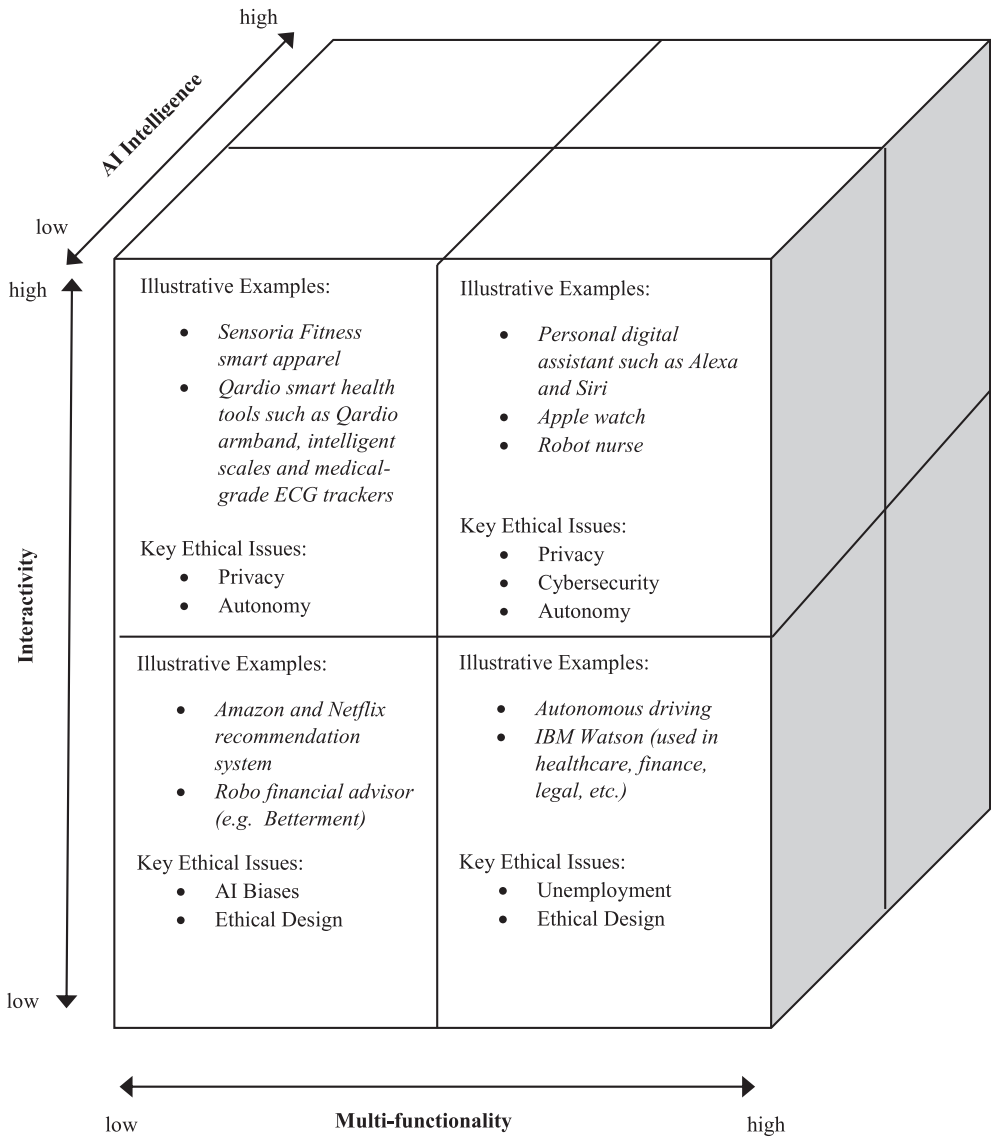


Fig. 1. A three-dimensional classification of AI-enabled products and related ethical challenges.

product based on this dimension. Adding new features and functionality is an effective strategy for positive differentiation and sales growth because consumers think new features enhance the overall value of a product (Noble & Kumar, 2008; Nowlis & Simonson, 1996). In electronics and information technology industries, achieving greater multi-functionality through adding new product features and functionalities to the base product has been a popular new product innovation strategy (Han, Chung, & Sohn, 2009). Such multifunctionality is exemplified by all-in-one office machines with the functions of a copier, printer, scanner, and fax, or smart phones with the functions of a music player, cell phone, camera/camcorder, personal digital assistant, internet browser, and so on. All else equal, consumers are likely to prefer products with greater multi-functionality and perceive them to be of greater value (Han et al., 2009; Sela & Berger, 2012). On the other hand, there are potential downsides to multifunctionality in products. Prior research suggests that increasing product multifunctionality could lead to greater perceptions of product complexity and product risks (Rijsdijk & Hultink, 2009). Similarly, Thompson, Hamilton, and Rust (2005) find that adding more product features reduces consumer perceptions of product usability and does not always lead to increased customer satisfaction.

Different levels of multi-functionality of AI-enabled products tend to trigger different types of ethical issues (see Fig. 1). For instance, AI products that are low on multifunctionality (e.g., recommendation system, robo-advisor) tend to get one-dimensional data input and are more prone to having partial and biased information about users, and as a result, these products often grapple with issues such as biases in AI algorithms and inadequate integration of user ethical values in the AI systems. For example, research finds that Google algorithms show more prestigious job postings to men, but not to women (Carpenter, 2015). On the other hand, AI products that are high on multi-functionality are less likely to experience algorithm biases due to richer, multi-dimensional data inputs and the triangulation of data to mitigate biases. However, with high multi-functionality, these AI products implicate ethical issues such as privacy, cybersecurity, and consumer autonomy, as well as greater likelihood to replace human labor and cause large-scale unemployment in the long term. Multi-functional AI products rely on big data from various sources to train and fine-tune their algorithms, thus issues of consumer privacy and cybersecurity become more prominent. Further, multi-functional AI products might lead to consumers' over reliance and excessive product usage, creating issues such as consumer addiction and potentially exerting a negative effect on consumer welfare.

2.2.2. Interactivity of AI-enabled products

Interactivity captures both the quality and quantity of consumer interaction with an AI-enabled product and is a critical feature of user-AI interface. An AI-enabled product can consult with consumers, respond to consumer needs, and explain to consumers what it is doing and how it arrives at a decision. Interactivity has direct and important influence on the value co-creation processes between the company and its consumers (Vargo & Lusch, 2004, 2017). Interactivity is a critical dimension of AI-enabled products because it influences the credibility, perceived trustworthiness, and user adoption of these products (Rijsdijk, Hultink, & Diamantopoulos, 2007) and has direct ethical implications. There are two aspects to interactivity, one related to the *nature* of interaction (e.g., interaction interface and modality), and the other related to the *scale* (e.g., quantity) of interaction.

Research on human–computer interaction (Burgoon et al., 2000) identifies several important factors affecting the nature and quality of interactivity; interactivity is high when the interaction format is contingent, synchronous, participative, modality-rich, and anthropomorphic. Specifically, interaction is contingent if the flow of discourse is path-dependent and coherently related. Synchronous interaction occurs in real time rather than being delayed or asynchronous. Participative interaction allows both parties to send and receive messages and engage in two-way communication. Modality-rich interaction utilizes a variety of information media, including textual, visual, audio, verbal, and other sensory information (Rice, 1992). Finally, anthropomorphic interaction occurs when the computer/device interface embodies certain human characteristics. AI-enabled products vary in terms of the nature and quality of interactivity. Personal digital assistants such as Alexa and Siri rank higher on interactivity as the consumer-AI interaction tends to be contingent, synchronous, participative, and anthropomorphic, whereas AI-enabled financial services such as robo-advisors (e.g., Betterment) tend to be low on interactivity as the interaction is often asynchronous, not modality-rich, and lacks anthropomorphic features.

The second aspect of interactivity relates to the scale or quantity of consumer interaction with AI-enabled products (Abowd & Mynatt, 2000). With the proliferation of inter-connected smart devices, many AI-enabled products interact continuously with consumers to gather data and improve their performance. For instance, the smart sport apparel producer Sensoria Fitness has several AI-enabled products that rank high on the scale of interactivity. Sensorial smart socks contain textile pressure sensors and microelectronics to continuously gather information about steps, speed, calories, altitude and distance, as well as cadence and foot landing technique; Sensoria virtual AI coach provides consumers with real-time actional, audio, and visual feedback on metrics that help users improve performance while decreasing likelihood of injuries.

AI-enabled products that are high on interactivity are more likely to face ethical challenges related to privacy, cybersecurity, and consumer autonomy/control. The continuous capturing of consumer information (e.g., activities, locational information, biometrics, and preferences), sometime without consumer consent or knowledge, is disconcerting and could lead to privacy violations. Further, the connectivity of captured consumer data via IoT makes the data more vulnerable to malicious attack and data breach, raising issues of cybersecurity. In addition, products high on interactivity tend to perform very well due to continuous data input, and fun to use if the user interface is modality-rich and anthropomorphic; consequently, these products may negatively affect consumer autonomy if consumers rely too much on these AI technologies. All else equal, products low on interactivity are less likely to face issues of privacy, cybersecurity, and consumer autonomy. On the other hand, products high on interactivity are less likely to face issues of AI biases and ethical design, as there are ample opportunities for AI technologies to incorporate consumer input and feedback, and continuously update AI algorithms to more accurately reflect consumer preferences and ethical values.

2.3. 3. Intelligence stage of AI-enabled products

Intelligence stage of AI-enabled products refers to the level of AI intelligence embedded in the products. The first two dimensions, multi-functionality and interactivity, capture the characteristics of AI-enabled products from a consumer-centric perspective as they relate to consumer perceptions of value and utility (e.g., multi-functionality) and the user experience (e.g., interactivity) of AI-enabled products; the third dimension, the intelligence stage, is more closely related to the firm perspective and more relevant to AI scientists and engineers. The literature on AI distinguishes between different levels of AI, ranging from artificial narrow intelligence, to artificial general intelligence, to artificial super intelligence (Husain, 2018; Tegmark, 2017). Artificial narrow intelligence is the current status of AI development, where AI is applied to perform specific tasks, outperforming human in a limited number of areas (e.g., AlphaGo defeats the world champion of Go). However, the range of current artificial intelligence is much narrower as compared to the intelligence of a human being. Artificial general intelligence will perhaps occur in a more distant future, when AI will be applied to perform multiple tasks, be able to solve problems autonomously, and outperform or equal human intelligence in multiple areas. Artificial super intelligence is the highest stage of AI, where AI systems are self-aware, conscious, and outperform humans in all areas; such AI systems will be capable of scientific and artistic creativity, social skills and general wisdom, potentially making humans redundant and powerless (Kaplan & Haenlein, 2019)[3]. Several scholars have tried to classify AI systems based on the types of intelligence involved. For example, Huang and Rust (2018) distinguish between mechanical, analytical, intuitive, and empathetic AI based on the four intelligences (mechanical, analytical, intuitive, and empathetic, respectively) that are developed and utilized in AI systems. Kaplan and Haenlein (2019) classify AI systems into analytical AI (demonstrating elements of cognitive intelligence), human inspired AI (demonstrating elements of both cognitive and emotional intelligence), and humanized AI (demonstrating cognitive, emotional, and social intelligence). In general, these classifications try to map AI intelligence onto human intelligence. In this research, we use the broad perspective of the intelligence stage of AI technologies from less powerful to more powerful as the field continues to grow and evolve (Tegmark, 2017). In this sense, the intelligence stage of AI coincides with the time dimension, with narrow, less powerful AI in the near future and general, more powerful AI in the distant future.

As the intelligence stage of AI products becomes more advanced, the ethical issues tend to get more urgent and complex. To illustrate, superior capabilities of AI products often require more consumer data, making privacy and cybersecurity issues more prominent. When AI products can autonomously perform a range of tasks for consumers, it becomes even more critical that these products accurately reflect consumers' ethical values and priorities (i.e., ethical design). Finally, as AI products become increasingly powerful in the long term, one macro-level negative effect is the potential large-scale unemployment due to the widespread utilization of autonomous technologies. The issue of unemployment due to AI is likely to occur in the longer term but requires urgent attention.

3. Current status of ethical issues facing AI-enabled products

A key tenet of the research on the moral significance of technology (Gaggioli et al., 2017; van de Poel & Kroes, 2014; Wallach & Allen, 2008) is that ethical issues of technology manifest at different levels. At the product level, AI products should satisfy certain basic principles, such as fairness and freedom from biases (Bostrom & Yudkowsky, 2014), and adequately incorporate the ethical values of product users (Etzioni

[3] However, most AI scientists disagree on whether and when artificial super intelligence will occur (Tegmark, 2017).

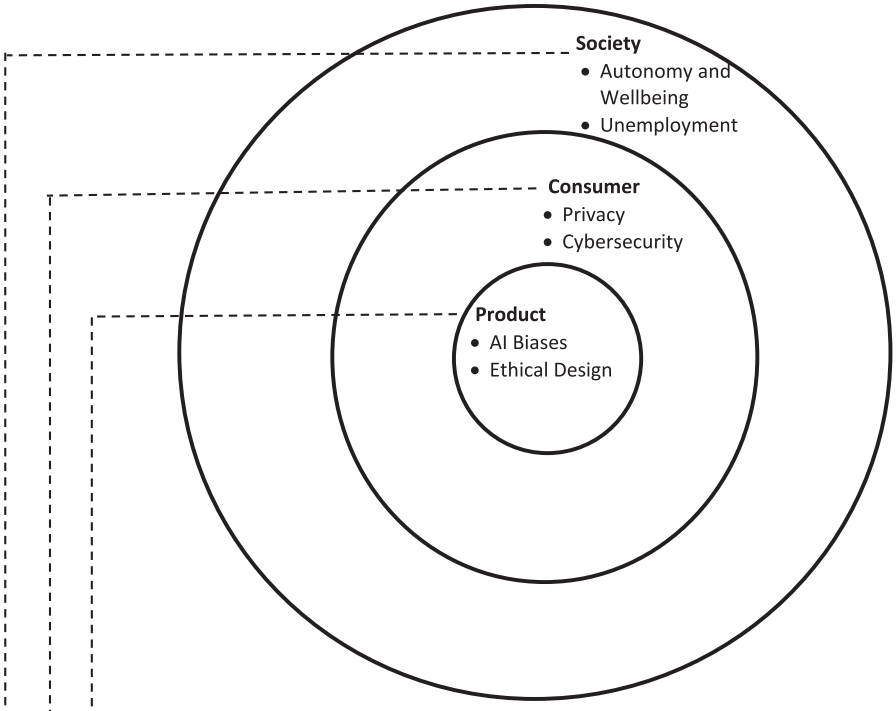
& Etzioni, 2017). Furthermore, several researchers take a socio-technical perspective and emphasize the ethical implications of technology at the consumer- and society-level (Gaggioli et al., 2017; Wallach & Allen, 2008). In the context of AI products, it is important to examine how consumers and our society as a whole are being affected by the proliferation of AI technologies. Issues such as consumer privacy, cybersecurity, and large-scale unemployment are intertwined with the rapid growth of AI technologies. Accordingly, we adopt a multi-level perspective in analyzing the ethical issues associated with AI-enabled products and delineate key ethical challenges and opportunities at the product-, consumer-, and society-levels (Fig. 2). We present ideas and suggestions on what socially responsible actions companies should undertake to address these ethical issues.

3.1. Product-level ethical issues

At the product-level, due to the superior computing power and the autonomous nature of AI-enabled products, individual decisions are increasingly mediated by technology. For example, consumer decisions to apply for a job, to watch a movie, and to seek medical services are often influenced by AI technologies (e.g., AI-empowered job postings, movie recommendations, and healthcare diagnosis). AI products need to satisfy certain principles of fairness and ethical value alignment (Anderson & Anderson, 2011; Bostrom & Yudkowsky, 2014). We discuss two prominent issues at the product level: AI biases and ethical design.

3.1.1. AI biases

Stereotypes and biased information processing occur in our daily life and generate unfairness and unethical behaviors (Bodenhausen, 1988). A common misconception is that machines and technological gadgets are more objective and less prone to biases than human beings. However, bias is AI's Achilles Heel, directly affecting the quality of AI-enabled products and user satisfaction. The issue of AI algorithmic bias has garnered increasing attention in the popular press, including concerns about biases in algorithms used in Google searches, Facebook feeds, and applications such as FaceApp. Amazon abandoned its project



Corporate Opportunities to Address these AI-related Ethical Challenges

Product- level

- Greater transparency about AI training data and AI algorithms
- Audit or quality control process of AI algorithms; embedded AI auditor or human-in-the-loop
- Top-down or bottom-up approaches to program ethical principles in AI products; ethics bot

Consumer-level

- Fair and transparent privacy policies to alleviate consumer privacy concerns
- Offer commensurate benefits to consumers for sharing their data (e.g., more effective personalization, financial compensation)
- Give consumers more control over data collection and data management
- Internalize the cost of cybersecurity and embed build-in security features in AI products; in the case of data breach, have a prompt response strategy to minimize damage

Society-level

- Support five pillars of human well-being (i.e., positive emotions, engagement, relationships, meaning, and accomplishment)
- Raise awareness of digital addiction and provide knowledge and tools to fight it
- Provide reskilling and continuous learning opportunities to employees

Fig. 2. Ethical challenges and opportunities of AI-enabled products.

to build an AI recruitment tool because it discriminates against female candidates (Hamilton, 2018). A commercial AI software, COMPAS, used by judges to help decide whether a person charged with a crime should be released from jail before the trial, demonstrates significant bias against black defendants (Courtland, 2018). AI biases exist in various applications ranging from face recognition, voice recognition, search engine, to self-driving cars and medical robots (Howard & Borenstein, 2018), and often reflect deep imbalances in institutional infrastructures and can reinforce societal unfairness (Zou & Schiebinger, 2018).

AI-enabled products and services rely on machine learning, which uses large training data sets as input to develop algorithms from those data. A major driver of AI bias is the unbalanced and biased training data. For example, computer vision programs are often trained on ImageNet, a set of more than 14 million labelled images. More than 45% of ImageNet data comes from the United States, home to only 4% of the world's population; by contrast, China and India, together representing 36% of the world's population, only contribute 3% of ImageNet data (Zou & Schiebinger, 2018). This lack of geodiversity partly explains the inferior performance of computer vision algorithm in labelling images involving Asian population. Similar imbalances in training data with regard to gender, race, ethnicity, geography, and other socio-economic variables (e.g., education, income, zip codes) could result in algorithmic biases in AI systems used in healthcare, financial services, law, consumer goods, and other industries.

Overcoming AI biases could result in fairer and more trustworthy AI products. What could companies do to mitigate AI algorithmic biases? First, companies should provide more transparency about the training data and AI algorithms. AI algorithmic biases can be subtle or hidden, as developers usually do not publicly disclose the detailed information about training data and AI algorithms often function as a "black box." Publicly disclosing metadata about training datasets for machine learning is a first step to unveil potential sources of AI biases and to ensure that such datasets are diverse and do not underrepresent certain segments of people. If training datasets are found to be biased (e.g., unrepresentative of the population that an AI system is supposed to make decisions about), efforts should be made to curate a training dataset that is balanced in key variables such as gender and ethnicity.

Second, AI systems should undergo an audit or quality control process. If problematic biases are identified, companies should find ways to intervene or de-bias the AI algorithm. Zou and Schiebinger (2018) proposes the notion of "AI audit" – using machine learning itself to identify and quantify bias in algorithm and data. Specifically, there should be an embedded AI auditor (i.e., an algorithm) that systematically probes the machine-learning model to detect biases in both the model and the training data. Sometimes, human-in-the-loop would be necessary to identify and intervene on problematic biases.

3.1.2. Ethical design of AI-enabled products

As AI-enabled products play an increasingly big role in consumers' daily life and influence consumer decision making, how to integrate ethical values in AI products becomes a key challenge for AI developers (Etzioni & Etzioni, 2017). Take a self-driving car for example, it needs to grapple with ethically fraught issues such as the famous "trolley problem." One version of the trolley problem is that the self-driving car is unable to brake in time and is forced to choose between continuing in its lane and hitting a pedestrian, or going into the opposite lane and clashing with oncoming traffic (Bonnefon, Shariff, & Rahwan, 2016). Tackling the trolley problem is one of the many ethical challenges in the design of self-driving cars. Reflecting this issue, the checklist for self-driving cars released by the U.S. government includes an item stating that ethical judgements and decisions should be made consciously and intentionally (Kang, 2016). Similarly, we need to consider the ethical principles for AI-enabled products such as robotic surgeons, robotic or virtual nurses, AI systems that approve mortgages, and those that deliver advertising and product recommendations. As Anderson and Anderson (2011, p.1) states, "ideally, we would like to be able to trust autonomous machines to make correct ethical decisions on their own, and this requires that we create an ethic for machines."

Effectively integrating ethical principles in AI-enabled products and ensuring proper alignment of ethical values between the product and the user are critical to cultivating consumer trust in and adoption of AI-enabled products. At the broad level, there are two general methods to program ethics into AI systems, the top-down or the bottom-up approach (Etzioni & Etzioni, 2017). In the top-down approach, ethical principles are programmed into the system. General ethics theories, such as consequentialist, deontological, and virtue ethics (Chakrabarty & Bass, 2015), as well as more specific ethics, such as professional code of ethics of leading professional organizations (e.g., IEEE and the Association for Computing Machinery), and Asimov's three laws of robotics, are useful for this approach. The top-down approach can be too rigid and does not allow for uncertainty, dynamism, and subjectivity. In contrast, the bottom-up approach involves AI systems learning ethical principles through observation of human behavior in real-world scenarios, without being taught any formal rules or moral philosophies. For instance, Etzioni and Etzioni (2017) proposes the idea of an ethics bot, which is an AI program that analyzes numerous items of information about the acts of a particular individual to derive that person's ethical preferences and later applies these preferences to the operation of that user's AI-enabled products. However, these are easier said than done; the actual implementation is often murky, ambiguous, and complicated. Future research should examine the effectiveness of top-down vs. bottom-up approaches and the feasibility of a hybrid method combining both approaches.

3.2. Consumer-level ethical issues

At the consumer-level, there are two ethical challenges caused by the heavy reliance of AI technologies on big data. AI products significantly increase a firm's collection, access, and use of consumer personal information (Kaplan & Haenlein, 2019), raising issues of privacy and cybersecurity. In the age of AI technologies and hyper-connected smart devices, firms have an ethical responsibility to protect consumer privacy and ensure the security of consumer personal data (Barocas & Nissenbaum, 2014; Gwebu, Wang, & Wang, 2018).

3.2.1. Privacy concerns related to AI-enabled products

Privacy is no doubt a central ethical issue in the age of AI due to the data-centric nature of AI technologies. We define privacy broadly as the right to control information about oneself (DesJardins, 2014); privacy violations occur whenever personal information is collected or used without the informed and voluntary consent of the person. Specifically, consumer privacy concerns have multiple dimensions, including information collection, unauthorized information use, and improper information access by third parties (Smith, Milberg, & Burke, 1996; Malhotra, Kim, & Agarwal, 2004).

AI-enabled products, particularly those high on interactivity, increase the volume and variety of consumer data that are collected, utilized, and transmitted, triggering new challenges for consumer privacy protection. For instance, AI-enabled products that rank high on interactivity (e.g., personal digital assistant, Apple watch, Sensorial smart socks) collect not only a large quantity, but also a great variety of consumer data (e.g., textual, visual, audio, verbal, and other sensory data). Much consumer sensory information can be collected by AI-enabled products without consumer awareness or informed consent. In addition to ubiquitous data collection, there are issues related to unanticipated uses of previously collected data (e.g., firms use consumer data in a materially different manner than claimed when data was collected), and unauthorized access to consumer data by third parties.

What can companies do to address consumer privacy concerns in the age of AI? Extant research on privacy offers several suggestions. First, companies need to provide clear and easy-to-understand communication about their privacy policies. Fair and transparent privacy policies alleviate consumer privacy concerns because they explain how

consumer information is captured, used, protected, and shared (Martin, Borah, & Palmatier, 2017; Wirtz & Lwin, 2009; Vail, Earp, & Antón, 2008). Such privacy policies reflect the procedural fairness of a firm in the context of data privacy (Vail et al., 2008). Second, companies should offer appropriate benefits to consumers for providing and sharing their personal information. These benefits can be personalized offerings, access to free services, streamlined customer-firm interactions, and financial compensations (Martin & Murphy, 2017). Providing consumer benefits in return for their data reflects the distributive fairness of a firm in the context of data privacy (Ashworth & Free, 2006). Third, companies should give consumers more control over data collection and management decisions. For instance, users of AI-enabled products should have more options on how data are collected, transmitted, and shared. Giving consumers more control can mitigate privacy concerns and increase consumer trust in the company (Martin et al., 2017).

It is worth noting, however, that the advent of AI brings unprecedented and complex challenges related to consumer privacy, which calls for more future research. With the large, diverse, complex, and longitudinal datasets collected from sensors, smart phone applications, internet transactions, emails, click streams, and other digital sources, it is increasingly difficult for companies to clearly communicate the whole scope of data collection and their privacy policies; and too often, consumers give consent without reading or fully understanding the details and implications of privacy policies (Strandburg, 2014). At the same time, big data and AI technologies render consumers more vulnerable than ever to privacy violations and the associated emotional stress, embarrassment, humiliation, and financial loss. One example is the loss of anonymity in the big data; even with anonymous data, companies can still identify individuals based on uniquely distinguishing information (e.g., rich location data, content of search history; Barocas & Nissenbaum, 2014) and treat individuals differently in the digital world.

3.2.2. Cyber security related to AI-enabled products

Cybersecurity is a notion closely related to privacy concerns. In recent years, there have been a flurry of data breaches involving social media companies (e.g., Facebook, LinkedIn, Twitter, Google, Yahoo), software developers (e.g., Adobe's more than 150 million username and password were compromised), banks (e.g., the U.S. Federal Reserve bank's website was hacked), retailers (e.g., Target store with over 40 million customers' credit and debit cards number stolen), and others (Udo, Bagchi, & Kirs, 2018). Data breaches expose sensitive and confidential personal information of stakeholders (e.g., consumers) to malicious parties who may use such data in unlawful ways. With the increased scale of consumer data collection via AI-enabled products, and the continued growth of social media, cloud services, IoT, and the mobile environment, the risk for potential cybercrime and data breach dramatically increases, heightening the need for cybersecurity.

It is critical to tackle the issue of cybersecurity head-on. Companies should be proactive and install routine, preventive measures to protect their data and information system. They should invest in state-of-art security technologies, such as those related to monitoring and assessment, data policies and control, firewalls, authentication/access, and encryption (Udo et al., 2018). Densham (2015) proposes two strategies to proactively manage cybersecurity challenges. First, companies should implement a holistic security strategy – putting the right controls in place, verifying data protection through routine testing and simulation, improving security governance, and engaging in continuous monitoring of the data systems. Second, companies could apply an avocado-like model of data protection, wherein they accept a level of risk in their internet-connected environment to enable less sensitive information to pass freely as needed within the company and with its business partners, but have a hardened core, reserved for their most precious/sensitive data, that is not connected to the open Internet. It would be interesting to examine best practices of cybersecurity related to AI-enabled products.

Data breaches can still happen despite companies' best efforts. When a breach occurs, the focal company needs to have a prompt response strategy to minimize damage to consumers and rebuild consumer trust. Gwebu et al. (2018) find that, during a data breach crisis, the company should engage in a forward-looking response strategy by reassuring stakeholders that it will take whatever steps necessary to avoid similar breach incidents in the future and that it will remain committed to its core values of protecting stakeholder wellbeing.

3.3. Society-level ethical issues

The socio-technical perspective on the moral significance of technology emphasizes the ethical ramifications of technology at the societal level (Mick & Fournier, 1998; Riva et al., 2012; Wallach & Allen, 2008). In the context of AI, we identify two society-level ethical issues, individual autonomy and wellbeing, and large-scale unemployment. AI could potentially threaten individual autonomy and could have a "dark side" effect on individual wellbeing. Unemployment due to job replacement by AI is already happening and will get worse in the long term, when AI becomes even more intelligent and possesses more diverse and powerful capabilities.

3.3.1. Individual autonomy and wellbeing

The advent of AI has far-reaching implications for individual autonomy and wellbeing. Autonomy, referring to one's ability to "be [one's] own person, and to be directed by considerations, desires, conditions, and characteristics that are not simply externally imposed upon one, but are part of what can somehow be considered one's authentic self" (Christman, 2015), is a key component of individual's authentic self, intrinsic motivation, and long-term wellbeing (Dworkin, 1988; Ryan & Deci, 2000). AI-enabled products can potentially have a negative impact on individual autonomy. Take advertising for example, most online ads are now being delivered by sophisticated AI-enabled algorithms. AI-enabled advertising integrates information from various platforms, websites, and services regarding visitor profile, browsing history, and social media activities to target consumers and deliver personalized ads, often with greater effectiveness. However, such highly targeted and personalized ads have a detrimental effect on individual autonomy by subtly manipulating preferences and depriving individuals of the opportunity to introspect about their preferences or to make tough tradeoffs (André et al., 2018). Another shortcoming of such AI-based advertising is that it often relies on past behavioral data and past preferences, but ignores meta-preferences (e.g., aspirational preferences that might differ from the current preferences), emotions, and moral judgements as these are not easily accessible to the AI algorithms (André et al., 2018). Such highly targeted and personalized advertisements diminish individuals' ability to make choices of their own free will.

The detrimental effect of AI-enabled products on autonomy and wellbeing is also manifested in various types of digital addiction, such as social media addiction and smart phone addiction (Samaha & Hawi, 2016; van den Eijnden, Lemmens, & Valkenburg, 2016). AI technologies are widely used in websites and social media platforms (e.g., Facebook, YouTube, Instagram) to filter news feeds, messages, and media content as well as to deliver targeted recommendations, often with the primary objective of maximizing time spent by consumers on the sites/apps. These websites and social media platforms become increasingly effective at attracting consumer attention, creating widespread compulsive or addictive behaviors. There is mounting evidence that compulsive social media use is a growing mental health problem, particularly among adolescent smartphone users (van den Eijnden et al., 2016). Various types of digital addiction are disturbingly widespread and have adverse impact on academic performance, relationship quality, and life satisfaction (Samaha & Hawi, 2016; Roberts & David, 2016).

What should companies do to address the negative effects of AI on autonomy and wellbeing? Companies should combine profit-related objectives with consumer wellbeing-related objectives when designing AI-enabled products. Research on positive psychology suggests that

there are five pillars of well-being: positive emotions, engagement, relationships, meaning, and accomplishment (Seligman, 2011). Socially responsible firms should consider how AI-enabled products could support consumers' autonomy and intrinsic aspirations, such as personal growth and promotion of goals and interests that consumers preferentially pursue and cultivate in their lives for the long term (Csikszentmihalyi & Beattie, 1979).

Furthermore, socially responsible companies should partner with relevant non-profit organizations (e.g., Center for Humane Technology) to raise awareness of digital addiction and provide tools and techniques to fight it. It is important to not only equip consumers with requisite knowledge and skills to prevent and cope with digital addiction, but also embed responsible product features in AI products to support long-term consumer wellbeing. Some companies are starting to embed design features to support consumer autonomy and wellbeing. For example, Apple's latest mobile operating system for iPhone has substantially enhanced parental control features, including tracking screen time and usage pattern, setting app limits, and scheduling downtime (i.e., shutting down the device). Such design features provide transparency about usage pattern and constrain children's usage of smart phones and tablets.

3.3.2. *Unemployment due to job replacement by AI*

The AI revolution will have a dramatic impact on the job landscape. According to a McKinsey report (2017), by 2030, 60% of occupations will have at least 30% of constituent work activities being replaced by automation. Similarly, a study by PWC (2018) focusing on 29 countries (27 OECD countries, plus Singapore and Russia) estimates that the share of jobs at high risk of automation will rise to around 20% by the late 2020s, and around 30% by the mid-2030s. Individuals rely on their jobs to fulfill a variety of essential needs (Du, Bhattacharya, & Sen, 2015); job not only is an individual's primary means for earning an income, but also provides important psychological (e.g., self-worth, achievement, and happiness) and social benefits (e.g., social status, respect, companionship, sense of belonging, and camaraderie; DesJardins, 2014; Du et al., 2015). Since job fulfills multi-faceted needs of individuals, the potential disruptive impact of AI on employment will go beyond economic ramifications to have far-reaching societal and political implications.

Companies have an ethical responsibility to protect the interests of their employees (Freeman, 1984) and therefore should engage in initiatives to address this issue of unemployment due to AI. Reskilling and life-long learning will be essential to survival in today's constantly evolving job market. It would be interesting to examine what corporate initiatives will be most effective in preparing employees to thrive in the current age of increasing automation and rapid technological change. For instance, companies could devote a portion of the profits derived from automation to establish a fund, or even a corporate learning academy, to systematically support employees in their efforts to acquire digital skills and become AI-savvy. AI revolution will also generate new kinds of job opportunities; companies could provide resources (e.g., workshops, AI training certificates) to help employees identify and prepare for job transition opportunities within the company and in the larger society.

Government has a big role to play in addressing the societal issue of unemployment due to job replacement by AI. Research should investigate what kinds of regulations and policies are needed to deal with the potential large-scale unemployment or underemployment, and to ensure that the benefits from AI technologies are shared as broadly as possible across the society. One timely research topic is whether and how robot workers should be taxed. The current tax system is designed to principally tax human workers and not robot workers. Abbott and Bogenschneider (2018) argue that tax should be levied on the use of robots to make the tax system neutral between robot and human workers, or even to create incentives for human rather than robot workers to incentivize employment. Such tax adjustment could also ensure the long-term fiscal solvency as more segments of labor forces being replaced by automation.

4. AI-related CSR: Shaping the future of ethical AI

Current AI technologies hold tremendous potential yet at the same time are fraught with numerous ethical issues. Whether and to what extent these ethical issues can be addressed would significantly influence consumers' trust in, and continued adoption of, AI-enabled products in consumer markets. Companies should engage in AI-related socially responsible actions to attain pragmatic and moral legitimacy for their AI-enabled value creation (Suchman, 1995). We draw upon stakeholder theory and institutional theory to develop a model of AI-related CSR (Fig. 3) that could offer guidance to companies seeking to build competitive advantage by tackling the ethical issues of AI.

According to stakeholder theory (Donaldson & Preston, 1995; Freeman, 1984; Freeman, Harrison, & Wicks, 2008), companies need to deal with the diverse and often contradictory demands of their various stakeholder groups, including primary stakeholders (i.e., those who are essential to the operation of the business, such as shareholders, consumers, and employees) and secondary stakeholders (i.e., those who can influence the firm's primary stakeholders, such as local community, government, non-governmental organizations, etc.). Stakeholder theory has been used to describe the nature of the firm and how firms are actually managed (i.e., to balance the conflicting claims of multiple stakeholders; Donaldson & Preston, 1995; Freeman et al., 2008). The instrumental view of stakeholder theory suggests that the adoption of stakeholder-oriented principles and practices leads to better financial performance, and in our specific context, greater success of AI technologies in terms of consumer adoption and loyalty. Underpinning the instrumental view of stakeholder theory is the premise that firms are morally obligated to take ethical issues into account and that actions serving the interests of multiple stakeholders enhance firm performance (Baskentli et al., 2019). Companies could use certain analytical tools (e.g., the model of stakeholder identification and salience; Mitchell, Agle, & Wood, 1997) to assess which stakeholder groups possess the power, legitimacy, and urgency, and use such analysis to identify, reconcile, and prioritize stakeholder demands they will address through socially responsible corporate policies and actions.

At the same time, a key insight from the institutional theory (e.g., Handelman & Arnold, 1999; Scott, 1987) is that institutional environment plays a big role in influencing a firm's CSR in the AI domain. Institutional environment contains both government regulations and taken-for-granted social and cultural norms that act as rules of proper social conduct to which firms must adhere (Scott, 1987). Firms that abide by government regulations and show cultural allegiance to institutional norms gain legitimation and are awarded with support from their constituencies. Legitimation is defined as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions (Suchman, 1995, p. 574). In our context, the societal expectations of proper behavior in the institutional environment would significantly influence the policies and practices of firm's AI-related CSR. When firms adopt institutionally appropriate practices in their AI development and deployment, they become legitimated and reap the benefits of legitimacy (e.g., greater consumer trust in, and adoption, of their AI-enabled products).

Drawing upon the moral significance of technology, stakeholder theory, and institutional theory, we discuss a range of product-, company-, and institutional environment-specific factors that influence a firm's AI-related CSR and the outcomes of such CSR actions.

4.1. *Product-specific factors in AI-related CSR*

The three dimensions of the AI-enabled products, multifunctionality, interactivity, and intelligence stage, have direct

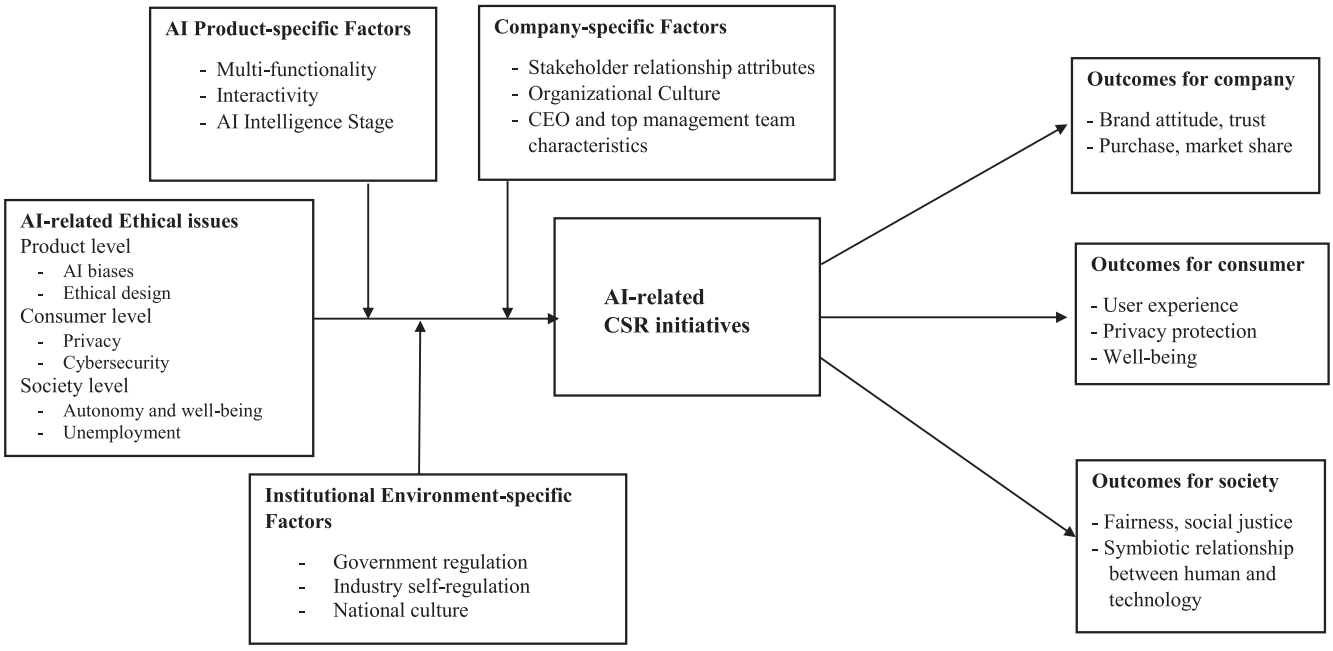


Fig. 3. A contingent view of AI-related CSR.

implications for the salience or importance of various ethical issues and thus would influence a firm's decision in terms of which ethical issue(s) to address through firm CSR initiatives. As discussed in Section 2, AI-enabled products low on multifunctionality are more susceptible to AI biases, whereas those high on multifunctionality and interactivity are more susceptible to privacy violations and cybersecurity concerns. Further, all else equal, the more advanced the intelligence stage of AI-enabled products, the more urgent it is to address the ethical issues embedded in these products. Insights from prior CSR research and the S-D logic suggest that social initiatives closely linked to a firm's core business and value creation are most effective in generating positive social and business outcomes (Becker-Olsen, Cudmore, & Hill, 2006; Vargo & Lusch, 2017). Thus, the three key dimensions of AI-enabled products are likely to exert a significant influence on a firm's CSR initiatives in the AI domain.

4.2. Company-specific factors in AI-related CSR

A firm's stakeholder relationship attributes would be a crucial consideration factor in its AI-related CSR policies and practices. According to stakeholder theory (Freeman et al., 2008), the very purpose of the firm is to serve as a vehicle for coordinating stakeholder interests and the management must balance the conflicting claims of multiple stakeholders. Each firm is unique in in terms of its stakeholder groups' relationship attributes – power, legitimacy, and urgency[4] – which shape the salience of different stakeholder groups and influence management priorities and actions in balancing the conflicting stakeholder claims (Mitchell et al., 1997). Therefore, the stakeholder relationship attributes facing a firm and its management will shape the firm's CSR initiatives in the AI domain (e.g., which stakeholder interests should a firm protect through its CSR initiative?). For instance, a retailer such as Target might want to prioritize consumer concerns for privacy and cybersecurity due to consumers' power to voice and exit and the urgency of such ethical issue given its prior data breach, whereas an automobile manufacturer might want to address the issue of unemployment through retraining and reskilling due to employee power (e.g., employee union) and employees' legitimate claim for job security.

Organizational culture is another firm-specific factor influencing a firm's AI-related CSR. Organizational culture, defined as the values and beliefs that provide norms of expected behaviors that employees might follow (Schein, 1992), influences employee attitudes, firm behaviors, and ultimately, firm performance (Hogan & Coote, 2014). In particular, corporate ethical values (Baker, Hunt, & Andrews, 2006), a major aspect of organizational culture, are likely to be a driver of a firm's commitment to engage in AI-related CSR. Additionally, a firm's competitive positioning on CSR (i.e., the extent to which a firm relies on CSR activities to position itself, relative to its competitors, in the minds of consumers; Du, Bhattacharya, & Sen, 2007) is also likely to exert some impact on the proactiveness of the firm's AI-related CSR. Finally, CEOs and top management team develop the key strategies of a firm (Hambrick & Mason, 1984; Lo & Fu, 2016), and therefore, their characteristics (e.g., age, tenure, social network, personal values) will naturally have a substantial influence on the firm's CSR policies and initiatives in the AI domain.

4.3. Institutional environment-specific factors in AI-related CSR

Government regulations, industrial self-regulation, and national culture are among the key institutional environment-specific factors in AI-related CSR. According to the institutional theory (Suchman, 1995), external institutions construct and interpenetrate the firm in every respect, influencing how the firm is structured, how it is run, and how it is evaluated. Government policies and regulations on information technology and data protection in general and AI technologies in particular will facilitate socially responsible behaviors in the domain of AI. In contrast to the European Union, the U.S. Government believes in minimal regulation to spur the innovation and growth of AI and uses a combination of regulatory and non-regulatory approaches to guide and monitor the development of AI (Whitehouse.gov, 2020). In addition to federal and state regulations, industry self-regulation is another regulatory mechanism to ensure ethical and socially responsible AI development and to facilitate increased CSR engagement in the AI domain through peer monitoring and peer pressure. Indeed, IEEE, the world's

[4] Power refers to the ability of those who possess power to bring about the outcomes they desire. Legitimacy is socially accepted and expected structures or behaviors. Urgency is defined as calling for immediate attention or pressing. For more detailed explanation of these three relationship attributes, see Mitchell et al. (1997).

largest technical professional organization for the advancement of technology, has launched a comprehensive crowd-sourced global treatise regarding the ethics of autonomous and intelligent systems (ethicsinaction.ieee.org). Similarly, there are an increasing number of non-profit organizations (e.g., the Partnership on AI, AI Now Institute, Human-centered Artificial Intelligence Institute) that are investigating and promulgating principles of socially responsible, ethical AI. These organizations are likely to have a positive impact on firms' likelihood to engage in AI-related CSR.

Culture exerts a broad and profound influence on many dimensions of human and firm behaviors and constitutes a major aspect of the external institutional environment (Scott, 1987). Hofstede's model of national cultures identifies six dimensions, namely, power distance, individualism vs. collectivism, masculinity vs. femininity, uncertainty avoidance, long-term orientation, indulgence vs. restraint (Hofstede-insights.com, 2020). Prior research has shown that national culture influences firm's CSR (Halkos & Skouloudis, 2017), thus it would be worthwhile to examine how and to what extent different dimensions of national culture influence a firm's CSR in the AI domain.

4.4. Outcomes of AI-related CSR

Through engagement in AI-related CSR, a firm can better manage its stakeholder relationships and conform to its institutional environment, and as a result, it is likely to gain pragmatic and moral legitimacy for its AI business and reap the benefits of increased stakeholder support (Suchman, 1995). In assessing the outcomes of AI-related CSR initiatives, firms should examine not only the external, behavioral outcomes (e.g., sales), but also the internal, attitudinal outcomes (e.g., brand attitudes, trust, product satisfaction; Baskentli et al., 2019; Xie et al., 2019). The latter ones are the longer-term, relationship outcomes that contribute to the company's sustained growth in the marketplace of AI products. Further, AI-related CSR initiatives are likely to have multi-faceted impact; beyond the business outcomes for the focal company, such initiatives also generate positive outcomes to consumers, in terms of enhanced user experience and autonomy, better privacy protection, and higher consumer well-being. At the societal level, such AI-related CSR initiatives will promote fairness and social justice, and the symbiotic relationship between human and AI technologies. We encourage future research to empirically document the outcomes of AI-related CSR initiatives and investigate potential levers that could strengthen the business and societal impact of such CSR activities.

5. General discussion

Given the dramatic growth of AI-enabled products in today's marketplace and the profound impact that these products have on individual and societal wellbeing, we urgently need a better understanding of ethical challenges and opportunities associated with AI-enabled value creation. To this end, this research evaluates the current state of affairs regarding AI-related ethical issues and discusses how companies could help shape the future of ethical AI. We identify three dimensions of AI-enabled products (i.e., multi-functionality, interactivity, and AI intelligence stage) and discuss their ethical relevance, and then delineate prominent AI ethical issues at the product-, consumer-, and society-levels. Finally, we develop a conceptual framework on AI-related CSR, highlighting AI product-, company-, and institutional environment-specific factors that influence a firm's socially responsible actions in the domain of AI.

5.1. Theoretical contributions

This paper contributes to the research at the intersection of AI, business ethics, and CSR. First, it advances knowledge on the burgeoning topic of AI ethics (Bostrom & Yudkowsky, 2014; Etzioni & Etzioni, 2017) by adopting a multiple-level socio-technical perspective to identify prominent AI-related ethical issues at the product-, consumer-, and society-levels (van de Poel & Kroes, 2014). Our detailed discussion on the central ethical challenges and opportunities at the product-, consumer-, and society-levels provides a good starting point for scholars to further explore AI ethics and the implications of such issues for different stakeholders and the society. While we provide a broad survey of the prominent AI-related ethical issues, we encourage future research to delve deeper into one or two issues, investigating unique factors that exacerbate or mitigate these ethical issues and the best practices to address them.

Second, this paper makes a novel contribution to the research on AI ethics by providing insights on the contingent nature of AI ethics on product characteristics (Bostrom & Yudkowsky, 2014; Wallach & Allen, 2008). We develop a three-dimensional categorization of AI-enabled consumer products (i.e., multi-functionality, interactivity, and AI intelligence stage) and address the ethical relevance of each dimension. By linking AI ethical issues to the characteristics of AI-enabled products, we stress the importance of differentiating ethical issues in connection with the specific characteristics of AI products along the three dimensions. For instance, all else equal, AI products low on multi-functionality are likely to implicate issues such as biases in AI algorithms and ethical design (i.e., ethical value alignment); those high on interactivity are likely to face ethical challenges such as privacy, cybersecurity, and consumer autonomy; and AI products based on more advanced stages of AI intelligence would trigger ethical issues that are more complex and urgent.

Third, this paper advances the research on CSR (Bhattacharya & Sen, 2004; Ferrell et al., 2019) by explicitly linking CSR to the domain of AI and developing a theoretical framework of AI-related CSR. Our theoretical model describes how a range of AI-enabled product-, company-, and institutional environment-specific factors would influence a firm's AI-related CSR activities and what are the outcomes of such CSR activities. More specifically, in light of multiple-level AI-related ethical challenges facing a firm, its decision on which ethical issues to address and how to address them will be contingent on various factors such as AI-enabled product characteristics, its stakeholder considerations, government regulation, and socio-cultural norms (Mitchell et al., 1997; Scott, 1987). In turn, AI-related CSR initiatives are likely to help a firm gain legitimacy for its AI business and have multi-faceted impact on the focal firm, the consumers, and the society (Suchman, 1995). To our knowledge, this is the first theoretical framework on AI-related CSR and has great potential in stimulating research on the important topic of shaping the future of ethical and socially responsible AI.

5.2. Managerial implications

This study offers several important managerial implications as companies grapple with AI-related ethical challenges and opportunities. First, managers could use the three-dimensional categorization of AI-enabled products (i.e., multifunctionality, interactivity, and AI intelligence stage) to analyze the salience or importance of various ethical issues associated with their AI-enabled value creation. It would provide guidance to managers in their efforts to pinpoint which ethical issue(s) they most likely will face based on the characteristics of AI-enabled products they offer. By addressing ethical issues that matter the most and that are closely linked to a firm's core competence, managers could enhance the value co-creation process involving their central stakeholders and build meaningful and long-term relationships with their consumers (Vargo & Lusch, 2017).

Next, managers could use our multi-level analysis of AI-related ethical issues as a toolbox for analyzing ethical issues as well as identifying possible corporate initiatives they could undertake. Fig. 2 provides a list of principles and/or actions companies could adopt to address various AI-related ethical challenges. Managers should hold discussions or brainstorm meetings within their companies to flesh out concrete steps and policies for effective execution of these actions. For

example, what are the metrics for measuring transparency of AI training data? What are the policies and procedures for auditing AI biases? What specific actions should firms take to alleviate consumer privacy concerns? Given the complexity of these ethical issues, it is important, as suggested by the S-D logic (Vargo & Lusch, 2017), to involve a cross-functional team of talented employees and external stakeholders (e.g., consumers) to tap into their heterogeneous knowledge and skills and, consequently, to co-create better value.

Third, the integrated theoretical framework of AI-related CSR would have great value for managers by offering them guidance on how to engage in CSR to effectively address the ethical challenges and build competitive advantage. Our model suggests that AI-related CSR is not one size fits all; instead, managers should consider a host of factors, such as characteristics of the firm's AI offerings, stakeholders relationship attributes, organizational culture, top management team, and institutional environment, when developing their CSR strategy and social initiatives in the domain of AI. Such CSR initiatives would be instrumental in developing a company's long-term competitive advantage. Our framework suggests that managers should regularly measure and monitor the outcomes of AI-related CSR initiatives to gauge whether these initiatives are effective and whether they generate desired outcomes for the company, consumers, and the society.

5.3. Future research

There are numerous future research opportunities in the areas of AI ethics and AI-related CSR. This paper delineates six prominent ethical issues, two each at the product-, consumer-, and society-level. Future research should identify and examine additional ethical issues, such as liability of AI-enabled products (e.g., who takes the responsibility for the failure/accidents of autonomous products, the manufacturer, software designer, or the consumer?). Future research should also examine characteristics of best practices in addressing various AI-related ethical issues. Below are examples of research questions concerning the product-level ethical issues:

- What is the most effective approach for reducing and eliminating AI biases and for incorporating appropriate ethical values in AI-enabled products? To what extent are inter-firm alliance, cross-sector partnership, or open innovation helpful in solving these complex ethical issues?
- How should companies accurately gauge the extent of AI biases in their products and use the level of AI biases as a key parameter of product quality control? Are consumers more or less likely to trust and purchase from companies/brands that are transparent about AI biases?
- Under what circumstances is a top-down or bottom-up approach to embed ethical values in AI-enabled products more effective? Under what circumstances is a hybrid method combining both approaches more effective?

At the consumer level, privacy and data security risks influence consumer attitudes toward, trust in, and purchase intention of AI-enabled products. Furthermore, there are likely to be individual characteristics and cross-cultural differences that influence consumer expectations of privacy and reactions to privacy violations. Below are several questions for future research:

- To what extent are consumer perceptions of privacy risks of AI-enabled products determined by product characteristics and consumer individual differences? How do consumers' AI product expertise and privacy risk awareness influence their evaluation and choice of AI-enabled products?
- Whether, when, and how do perceptions of privacy risks influence consumer attitudes toward, and evaluations of, AI-enabled products? How do consumers trade off increased privacy risks with enhanced functional utility of AI-enabled products?
- To what extent do cross-cultural variables (e.g., individualistic vs. collectivistic, uncertainty avoidance) affect consumer reactions to privacy risks associated AI-enabled products?
- In the era of big data and increasingly sophisticated data collection, use, and sharing, what are the characteristics of responsible data practices that effectively preserve the privacy and security of consumer personal data?

AI-enabled products should be evaluated based on their societal implications. Ethical, socially responsible AI should protect stakeholder interests and promote societal welfare. Future research can investigate the impact of wide-spread adoption of AI-enabled products on individual autonomy and well-being. For example,

- Under what circumstances do AI recommendation systems that incorporate consumer values, lifestyles, and higher-order preferences perform better than those based merely on past behaviors?
- What are the positive and negative effects of highly personalized advertising and content delivery (e.g., personalized news feed) on consumer well-being?
- What are the possible interventions by company, non-profits, and governments to combat digital addiction? How to protect vulnerable consumer segments (e.g., children) against digital addiction through corporate responsible initiatives (e.g., responsible design features, corporate social marketing campaigns to promote healthy digital behaviors)?

To shape the future of ethical and socially responsible AI, companies will play a critical role. Companies' CSR strategies and programs should evolve as the technological and business landscape rapidly changes. There are many promising avenues for future research regarding CSR in the age of AI. CSR scholars should utilize theoretical tools, such as stakeholder theory (Freeman et al., 2008) and institutional theory (Suchman, 1995), as well as theories that focus specifically on technology, such as the moral significance of technology (Kroes & Verbeek, 2014; Wallach & Allen, 2008) and value-sensitive design (Friedman & Hendry, 2019), to examine antecedents and outcomes of AI-related CSR and levers that could enhance the effectiveness of AI-related CSR initiatives. For example,

- How should firms revise their CSR strategies to address the unique ethical and social challenges associated with AI technologies? What are the key sub-domains of AI-related CSR initiatives?
- What are the best practices in combining short-term, company-centric metrics (e.g., sales, time spent on device/platform) with long-term, consumer-oriented metrics (e.g., consumer wellbeing) when developing AI-enabled products?
- What are the business and social returns for companies engaged in pioneering corporate social marketing initiatives such as AI literacy campaign, responsible digital behavior campaign? What are the effects of such AI-related CSR initiatives on brand equity, consumer trust, and market share? What is the efficacy of such initiatives in enhancing the society's AI literacy or in combating digital addiction?
- How do employees react to AI-related CSR initiatives in terms of job satisfaction and organizational commitment? How do employees react to corporate initiatives that help them cope with rapid technological changes and threat of unemployment (e.g., AI training certificates and AI workshops)?

5.4. Limitations

This paper is subject to several limitations. First, we attempt to study a diverse range of AI-related ethical issues in a limited space, which prevents us from addressing each individual issue in depth. Future

research should deepen the ethical analysis by focusing on a fewer number of ethical issues and running more in-depth analysis. On the other hand, however, our list of AI-related ethical issues is by no means exhaustive. Future research should explore other important and relevant ethical issues not covered in this paper, such as liability of AI-enabled products.

Second, our model of AI-related CSR might leave out certain factors that could influence a firm's CSR in the domain of AI. For instance, industry characteristics might affect the adoption of AI technologies as well as the relevance of certain AI ethical issues. The adoption of AI is more advanced in certain industries (e.g., information technology, financial services, automotive and assembly) that others (e.g., education, tourism). Consequently, firms in certain industries are more likely to face AI-related ethical challenges earlier and in a greater scope than others. It would be interesting to explore whether and to what extent our contingent model of AI-related CSR applies in various industries.

Relatedly, this research primarily focuses on the U.S. context. Institutional environment (e.g., government regulations, social-cultural norms) differs substantially in different geographic areas around the globe. As a result, AI-related ethical challenges as well as corporate actions to address these challenges might vary depending on the different political/regulatory, economic, and socio-cultural conditions. Therefore, there is a need to examine whether and to what extent our analysis of AI ethics and corporate actions to address these challenges would generalize to other countries with different institutional environments.

Finally, this paper seeks to provide conceptual frameworks on AI-related ethical issues and AI-related CSR. It is important for future research to provide empirical evidence for the proposed frameworks and linkages in this paper.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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