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Mapping the ethic-theoretical foundations of artificial intelligence research

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Abstract

The issue of artificial intelligence (AI) ethics is a prominent research subject. While there is a compendious literature that explores this area, surprisingly little of it makes explicit reference to the ethic-theoretical foundations upon which it is built. To address this matter, this study makes an examination of the AI ethics literature to identify its ethic-theoretical foundations. The study identifies the lack of AI ethics literature that draws upon seminal ethics works and the ensuing disconnectedness among the publications on this subject. It also uncovers numerous non-Western ethic-theoretical positions that can be adopted and may afford new insight into AI ethics research and practice. Employing these alternative lenses may obviate the tendency for Western worldviews to dominate the academic literature. The study provides some guidance for future AI ethics research which should endeavor to clearly articulate its chosen ethic-theoretical position, and for practice which could benefit from understanding and articulating the principles upon which AI systems are founded. It also provides some observations of, and guidance for, the utilization of Litmaps software in the conduct of Literature reviews.

KEYWORDS
artificial intelligence, ethics, non-western, western

1 | INTRODUCTION

Artificial intelligence (AI) technologies have been widely discussed for many decades (Allen et al., 2022; Nath & Sahu, 2020). While there is still much deliberation about their actual and potential uses (Gartner, 2023) one of the persistent issues is that of AI ethics (AI_E) (Etzioni & Etzioni, 2017; Larsson, 2020; Murphy et al., 2021; Nath & Sahu, 2020; Owe & Baum, 2021; Ryan, 2020; Vakkuri & Abrahamsson, 2018; Vakkuri et al., 2020). A substantial corpus of literature explores this subject: at the time of writing (October–December 2023) Google Scholar returns close to 1 million articles and even a cursory search of the academic repositories via university libraries returns over 4000 publications. Attempting to understand this collection of knowledge thereby presents logistical as well as intellectual challenges, not only for researchers but also for technology and management practitioners as well as policymakers. Much of this literature explores the types of ethical issues that surround AI (see e.g., Huang et al., 2023; Murphy et al., 2021; Vakkuri & Abrahamsson, 2018). However, little of it acknowledges the socio-historical context of ethics and the specific ethic-theoretical foundations of the discussions are rarely explored (Bench-Capon, 2020).

The lack of identification of the theoretical foundations of AI_E research is problematic, particularly for international business managers and scholars, since it has been argued that the entirety of academic knowledge is heavily skewed by a Western worldview (Banerjee, 2022; Jayawardena, 2022; Miike, 2006). This has manifested as a predilection for Western theories to pervade many disciplines at the expense of alternative perspectives in areas as diverse as journalism (McQuail, 2000), biomedicine (Chattopadhyay & De Vries, 2013), media and journalism (Rao & Wasserman, 2007), public relations (Fuse et al., 2010), social work (Udah, 2021), and communications (Ayish, 2003).

A great deal of research highlights the differences that exist between Western and non-Western ethical theories and perspectives (Chattopadhyay & De Vries, 2013; Fuse et al., 2010; McQuail, 2000; Rao & Wasserman, 2007; Tariq et al., 2019; Udah, 2021). Some of this work explores the consequences of adopting alternative ethical perspectives in practices that include engineering education (Zhu, 2018), work design (Sadler-Smith et al., 2003), and medicine (Christakis, 1992). A considerable amount of research in the business and management discipline also indicates the influence of adopting alternative ethic-theoretical lenses upon issues as diverse as the perception of Islamic financial practices (Redín et al., 2014), accounting (Tweedie et al., 2013), decision-making (Oumlil & Balloun, 2017), management practices (Al-Shaikh, 2002), and highlights how those viewpoints differ across regions (Rowley & Oh, 2016). Carlin and Strong (1995, p. 387) warn against the predominance of Western ethical perspectives, noting that Western ethics are "largely uninterpretable or unacceptable to non-Western populations," while Widdows (2007, p. 305) argued that "global ethics in any form is not global, but simply the imposition of one form of local ethics" and this is usually a Western ethic which has been argued to have been harmful (Kafaee & Taqavi, 2021).

Despite its inherent socio-historical complexities, Western ethics may be broadly regarded as comprising three distinct groups of philosophies and theories (Chakrabarty & Bass, 2013; Gibert, 2023; Taggart & Zenor, 2022): although differentiation can also be drawn between other subsets such as intuitionist, emotivist, subjectivist, and relativist ethical positions, as well as within the issues of rights, duties, and justice (McNaughton & Rawling, 1998; White & Taft, 2004). Utilitarian theories, alternatively termed "teleological" or "consequentialist," explain moral actions that are directed toward providing the greatest "good" for the majority (Gustafson, 2013; McGee, 2010; Starr, 1983). Deontological theories attempt to explain moral actions as a series of rules or codes of conduct: for example, these have given rise to Corporate Social Responsibilities (Frederiksen & Nielsen, 2013; Lin et al., 2022; Mazutis, 2014). Virtue theories describe actions in terms of them being the results of individuals behaving according to their internal "moral compass" (Grant & McGhee, 2022; Liu et al., 2023; Schlegelmilch, 2022; White et al., 2022).

In essence, utilitarians argue that the primary course of (ethical) human action should be to deliver the most universal "good" or "well-being" (Ellis, 2002), deontologists maintain that some actions are inherently "good" or "bad" regardless of the context or purpose of their conduct (Davis, 1993), and virtue ethicists maintain that the circumstances that surround an act that is performed greatly influences the judgment of its "goodness" or "badness" (McNaughton & Rawling, 1998). Each of these positions has its proponents and opponents (Norcross, 1999). For instance, Mazutis (2014) discusses the pro-social practices that cannot be fully explained by deontic frameworks, Gustafson (2013) recognizes that the total utility of any action cannot be determined, Vallentyne (2006) argues that a utilitarian ethic could potentially violate individual rights, and Slee and Tait (2022) highlight that the nature of virtuous agents is not static nor is virtue determined equally across different cultures.

Much less has been written about non-Western ethical theories in the academic literature and that which has been described is somewhat scattered among a variety of disciplines. For instance, Zhu's (2018) discussion of Confucian ethical leadership emphasizes the importance of "self-cultivation" in "meritocratic ethical leadership" (p. 169). Fuse et al. (2010) explore the "palaver-tree concept" from sub-Saharan Africa. They refer to Sopova (1999, p. 42) who describes "the palaver" as "an assembly where a variety of issues are freely debated and important decisions about the community are taken." These assemblies seek to resolve problems or decide courses of action by taking into account the views of all parties and reaching consensus: variations of which are found in Ethiopia (the "debo") and Madagascar (the "fokonolona"). Rao and Wasserman (2007) recount the ethical theories of ubuntu (South Africa) and ahimsa (India) in global media. They describe ubuntu as "another view of truth, justice and authority based on collective consciousness" (p. 40). This has implications for the practice of media meaning its "ethical principles would be conceived from within the community and not somehow outside of it" (p. 40). Ahimsa emanates from Buddhist, Jain, and Hindu philosophies, and essentially may be interpreted as "doing no harm" both in the sense of not permitting material harm to another and also in "not denying him or her the basic necessities of life" (p. 44). White and Taft (2004) provide an examination of ethical frameworks for global business management education and in addition to Western views also discuss Native American perspectives. These are based upon a number of characteristics, including moral virtues, continuity of relationships, connections with all living things, and notably a "preference for harmony over truth" and "peace over justice."

In contrast to this knowledge, much of the AI_E literature implies that "ethics" can be regarded as the pursuit of a single group of principles that may govern the acceptable use and outcome of AI: such as Anderson and Anderson's (2011, p. 1) assertion that we need to "*create an ethic for machines*" [emphasis added]. Hongladarom and Bandasak (2023) make some useful headway in their study of non-Western ethical guidelines for AI, but the general lack of recognition of the heterogeneity of "ethics" (Kucera, 2022; Premeaux, 2004; Premeaux & Mondy, 1993) may be responsible, at least in part, for what Vakkuri and Abrahamsson (2018, p. 2) identified as the issue of there being "no commonly shared definition of what AI ethics is or even how it should be named."

Researchers and practitioners need to be mindful that the achievement of a utopian set of universal ethical principles for diverse

global businesses and societies is probably beyond our capabilities (Vongkulbhisal, 2017). For instance, White and Taft (2004) provide an account of the plethora of different ethical codes that have been developed across individual organizations and global representative bodies. The pursuit or notion of a "single" concept of AI_E is therefore futile. Furthermore, the adoption of any particular ethic-theoretical position has profound implications for the conclusions that may be drawn and the courses of action that may result (Gustafson, 2013; Mazutis, 2014; Olanipekun & Jayeoba, 2022). Consequently, the field is in need of research that clarifies and advances its ethic-theoretical foundations.

In order to address this requirement, this study pursues the following research questions:

1. What Western ethic-theoretical foundations are used in AI ethics research?
2. What non-Western ethic-theoretical foundations are used in AI ethics research?

2 | STRUCTURED LITERATURE REVIEW

Following the approach of other research, this study engages in a systematic review and mapping of the extant literature (e.g., Huang et al., 2023; Murphy et al., 2021; Tranfield et al., 2003; Vakkuri & Abrahamsson, 2018). The following keyword combinations were developed to explore the ethic-theoretical foundations of AI research: "AI" or "artificial intelligence"; and "ethic"; and "utilitarian" or "teleological" or "consequentialist"; or "deontic" or "deontological"; or "virtue" or "virtuous." The searches were unconstrained by the date of publication but were confined to those that were peer-reviewed, written in English and where the full-text was available. The study also employed a culturally diverse research team in order to moderate biased interpretation of the subsequent literature.

Repositories such as Scopus, Crossref, Web of Science, Dimensions and Google Scholar, are commonly used in literature searches, each of which presents its own benefits and disadvantages (see e.g., Falagas et al., 2008; Guerrero-Bote et al., 2021; Wilder & Walters, 2021). Some studies have even made direct criticism of these databases, such as Gusenbauer and Haddaway's (2020, p. 181) statement that Google Scholar is "inappropriate as a principal search system," and Franceschini, Masisano and Mastrogiacomo's (2016, p. 174) description of Scopus and Web of Science database errors as "horrors." Therefore, in accord with the approaches used in other systematic reviews in this area (e.g., Marc et al., 2022; White, 2017), the following digital repositories were searched to garner insight from across the fields of business and management, and information technology: Business Source Complete and Emerald for business-related publications, ABI Inform and IEEE Xplore for technology-related publications, and Proquest and Science Direct for both business- and technology-related publications.

The searches returned a total of 380 publications (Table 1). These were filtered to remove non-research articles such as book reviews and indexes, and papers where the terms were used in passing but were not the focus of the study. Following this, duplicates articles were identified through two methods: intra- and inter-repository analyses checked for duplicates within and between the search results for each repository, and intra- and inter-keyword analyses checked for duplicates within and between the search results for each keyword (see Figure 1). Adopting both methods provided a cross-checking methodology that ensured there were no errors or omissions.

The Proquest repository includes ABI Inform results; therefore, there was a high, but not complete, degree of duplication of publications (23 articles). Four articles were common across Proquest, ABI Inform and Business Source Complete, and 1 article was common across Proquest, ABI Inform and Emerald. Keyword analyses identified 7 duplicate articles for "utilitarian," 7 duplicate articles for "deontological," 1 duplicate article for "teleological," 15 duplicate articles for "virtue," and 1 duplicate article for "virtuous." After removal of duplicate publications, the final corpus of literature that was utilized in this study comprised 36 articles. Figure 2 presents the publication date profile of these papers, clearly indicating the considerable rise in interest and the study of AI_E in recent years.

The Emerald and Science Direct repositories were found to generate the most initial "hits," returning 299 publications or 78% of the total (37% and 41% respectively). This, coupled with the absence of duplicate publications across these repositories, may lead future researchers to consider these as the core repositories from which to initiate an efficient literature review in this subject.

3 | FINDINGS

As may be considered apposite in an examination of AI, this study utilizes the nascent Litmaps technology in the examination of the relevant literature. Litmaps is a web-based application that supports the search, organization, and depiction of literature and has found application within libraries (Anna et al., 2023), education (Normann et al., 2023), criminology (Sarkar & Shukla, 2023), and research in general (Rathinasabapathy et al., 2023). While it may be used to conduct initial literature searches, its capability to generate robust scholarly results has not yet been verified, and therefore in this study its use is limited to extension and visualization of the results of the traditional structured literature review and identifying common citations between those results.

Litmaps was populated by adding the publication DOI to a "collection" of articles. Of the 36 publications identified through the structured literature review only one possessed a DOI that was not recognized. A manual search for the DOI as printed on the published paper did not return the correct article and this is therefore omitted from the following analyses. Figure 3 depicts the relationships between the resultant 35 papers that discuss AI_E. Publications are presented in order of oldest to newest along the *x*-axis, and least to most citations along the *y*-axis. Lines between publications indicate a citation. The sizes of the nodes indicate the relative number of

TABLE 1 Summary search results.

	Repositories					
	Business-Literature		Technology-Literature		Business & Technology Literature	
	Business Source Complete	Emerald	ABI Inform	IEEE Xplore	Proquest	Science Direct
"utilitarian"	3	31	8	1	7	32
or "teleological,"	0	9	1	1	1	8
or "consequentialist"	0	3	1	0	0	11
"deontic,"	0	1	0	0	0	2
or "deontological"	3	10	8	0	7	17
"virtue,"	4	70	16	1	15	66
or "virtuous"	0	19	2	1	1	20

Source: Authors' own.

citations. Those with annular rings (e.g., Kim et al., 2021) indicate those nodes that have been repositioned to improve the clarity of the figure.

To the researchers, the most striking feature of the literature map is its fractured composition. There are only three lines of citations: [1] Khargonekar and Sampath (2020)–Mezgár and Váncza (2022), [2] Bryson (2018)–Constantinescu et al. (2021), and [3] Hagendorff (2020)–Ratti and Graves (2021). There appear to be no shared ethic-theoretical foundations between the publications in [1], but in both [2] and [3] the papers adopt a virtue-based ethical stance. It is also notable that both articles in [1] were found within the Science Direct repository, all three articles in [2] were found within ABU Inform, and those in [3] were found within ABI Inform and Proquest: this may indicate a propensity for researchers to focus upon literature within single repositories. The articles in [1] were published in "IFAC Papers Online Conference Papers Archive" and "Annual Reviews in Control." One of the articles in [2] was published in "Philosophy & Technology" and the two others in "Ethics and Information Technology." Both of those in [3] were published in "Philosophy & Technology."

In addressing the first research question, our readings of the core literature indicate the broad spread of publications that draw upon the ethic-theoretical notions of utilitarianism, deontology, and virtue. Several papers draw upon combinations of these ethical theories, such as Stahl et al. (2022) who base their position in Aristotelian virtue ethics to propose the (deontic) terms of reference for an AI regulatory body. Similarly, Bonnemains et al. (2018), Bench-Capon (2020), and Omari and Mohammadian (2016) discuss the appropriateness and consequences of these different ethic-theoretical frameworks upon decision-making in machines.

The greater proportion of literature focuses explicitly upon deontological and virtue ethics. This is perhaps unsurprising since the arguments surrounding the (un)suitability of deontic logic in decision-making machines (part of what is termed "computational ethics") seems to be a perdurable problem (Etienne, 2022; Meyer et al., 1994), and virtue ethics has generally become a "prominent research theme" in business and management (Grant & McGhee, 2022, p. 108; Klimczak et al., 2022; Nguyen & Crossan, 2021; Robinson, 2021).

Within this body of literature several other terms are used for what are ostensibly ethical perspectives that also emanate from "traditional" Western thought. For instance, DeBellis (2018, p. 242) incorporates utilitarianism, Moral Foundations Theory and "the golden rule" to develop a Universal Moral Grammar for the examination of moral situations and the development of "mathematical rigor to the study of human ethics." Mabaso (2021) discusses the use of exemplarism and its uniqueness as a form of virtue ethics. Robbins and Wallace (2007) differentiate between normative (utilitarian/deontic/virtue) and descriptive ethical theories (Theory of Moral Development/Taxonomy of Ethical Ideologies). Sharif and Ghodoosi (2022) discuss normative theories (utilitarian/deontic/value) while adopting contractarianism in their examination of blockchain ethics. Moran-Reyes (2022, p. 2) differentiates between normative ethics (what is a "good" life), applied ethics (what to do in specific situations) and metaethics that is the study of "more theoretical, more abstract terms." Tronto (2020) is a proponent of feminist ethics like Adam (2001, p. 235) who argues that a feminist ethic offers "a more collectivist approach toward computer ethics problems." Constantinescu et al. (2021) focus upon dianoetic that is a subset of virtue ethics which is concerned with the establishment of virtuous action through rational thought rather than intuition.

3.1 | Extended searches

In order to further explore the origins of AI_E, Litmaps "Discover" function was used to identify any further publications that were related to the core articles. Once again, the search was unconstrained by date of publication, but was confined to only those articles that contained the term "artificial intelligence" or "AI," and "ethic." This search returned no further articles and thereby provides some level of confidence in both Litmaps and the structured literature review that was performed.

Extending the search further, Litmaps "Discover" function was used to identify any common articles that were cited by the core 35 publications. The first extended search was unconstrained by date

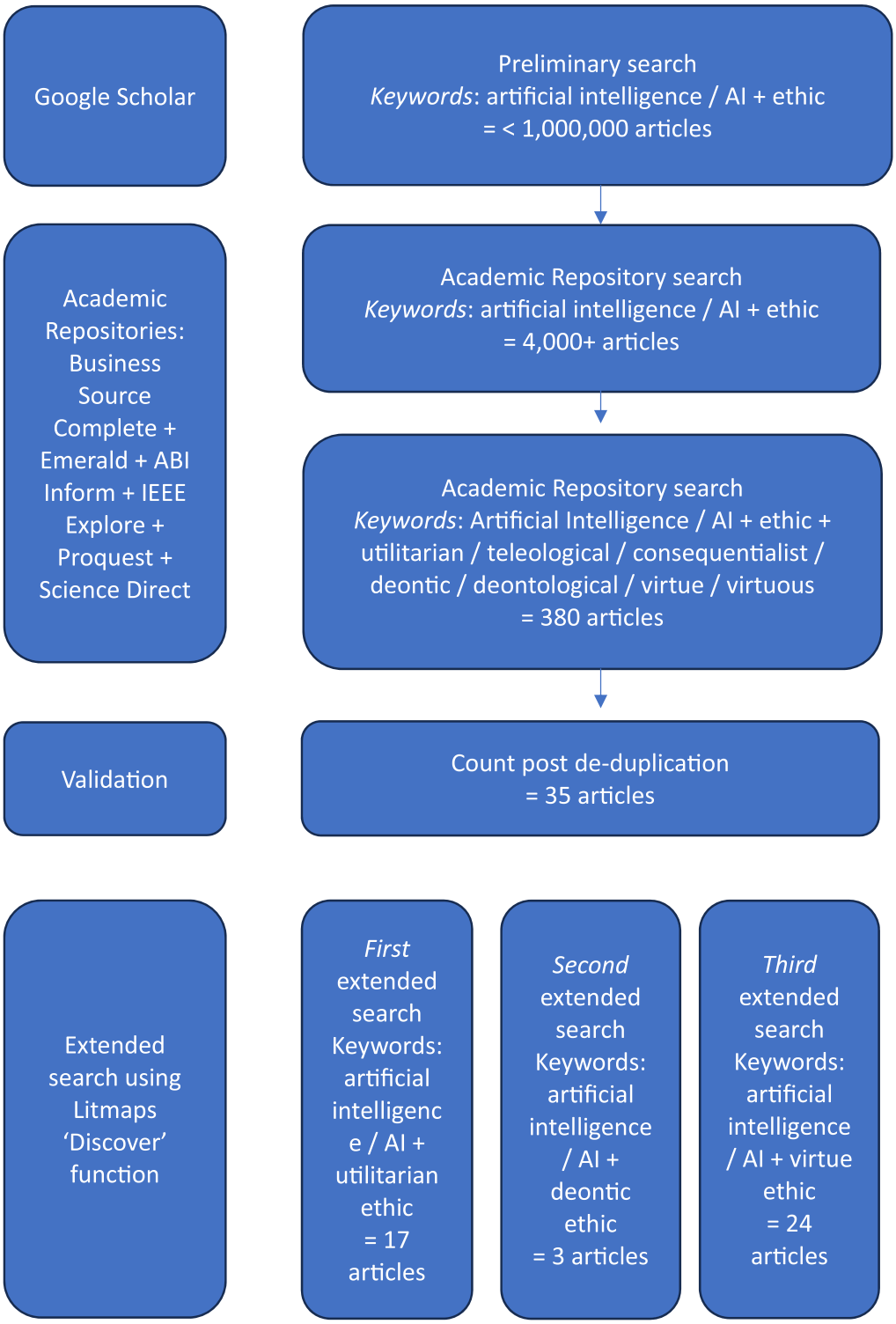

FIGURE 1 Article selection process. *Source*: Authors' own. [Color figure can be viewed at wileyonlinelibrary.com]

but was confined to those articles that utilized the term "utilitarian ethic." The results of this extended search returned a further 17 articles (Figure 4). The second extended search utilized the term "deontic ethic" and returned a further three articles (Figure 5). The third extended search utilized the term "virtue ethic" and returned a further 23 articles (Figure 6).

Overall, we find some "sensitivity" to the Litmaps "Discover" function which future researchers should be mindful of. In particular, over the course of the preparation of this manuscript the results of each search were found to differ: the first extended search for "utilitarian ethic" returned 12 articles which subsequently rose to 17, the extended search for "deontic ethic" returned 1 article which rose to

3, and the extended search for "virtue ethic" returned 20 articles which rose to 23. It is perhaps pertinent that the results only increased over time and involved the addition of older publications, and this may reflect the application's improving algorithmic accuracy in identifying further related articles or its growing dataset. However, it must be noted that this "moving target" causes problems for the practicing researcher when attempting to identify a definitive corpus of literature to review. Furthermore, the DOI link within Litmaps does not always direct the reader to the correct article and this feature needs improvement.

The most striking feature of the addition of the extended search for "utilitarian ethic" publications is the lack of any clear "seminal" materials that have informed the resultant literature. The majority of these additional papers have only been cited by one publication in our core literature. The only publications that have been cited more than once are Tronto's (2020) feminist view of the ethics of care, Callicott's (1980) examination of animal liberation, Harsanyi's (1979) discussion of Bayesian decision theory, Markham's (2006) examination of ethics as a method, Cima et al.'s (2010) study of psychopaths, and Bonnefon et al.'s (2016) exploration of autonomous vehicles. While the extended search for "deontic ethic" publications returned few additional articles, similarly, only one of these was cited more than once in our core literature. The addition of "virtue ethic" publications generated the most hits, yet still the majority of these were only cited once in our core literature. In contrast, a few papers appear to have been particularly influential in the development of virtue-based ethic-theoretical discussions of AI, including Annas' (2011) and Anton's (2017) extended discussions of intelligent virtues, and Hursthouse's (1999) exploration of neo-Aristotelian virtue ethics, both of which were cited several times.

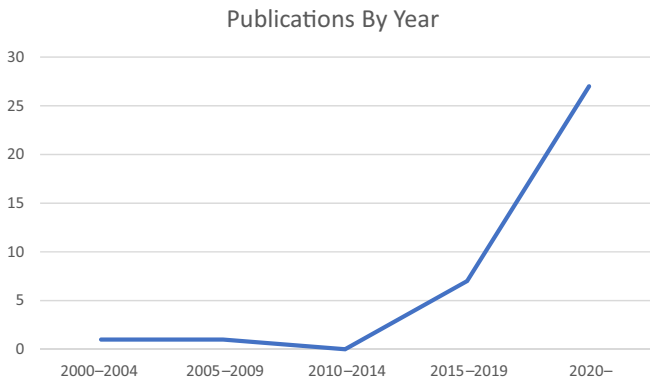

FIGURE 2 Publication profile. *Source*: Authors' own. [Color figure can be viewed at wileyonlinelibrary.com]

Many of these additional utilitarian, deontic, and virtue publications contain interesting and potentially useful discussions of various ethic-theoretical perspectives, but the context of those discussions is rarely concerned with subjects that may be deemed to be directly relevant to the study of AI_E: for instance, Tronto's (2020) work arises in all three extended searches. While this is not a problem per se, it may be regarded as a weakness of the literature in general, when little else draws upon what may be termed "seminal ethical treatises." Having made this general observation, the subject of virtue-based discussions of AI_E appears to possess a somewhat stronger "lineage." Drawing upon the classical works of Hume (1972) and the later contributions of Hursthouse (1999), Annas (2011) and Anton (2017), this literature converges and then develops upon Bryson (2018) and Constantinescu et al. (2021).

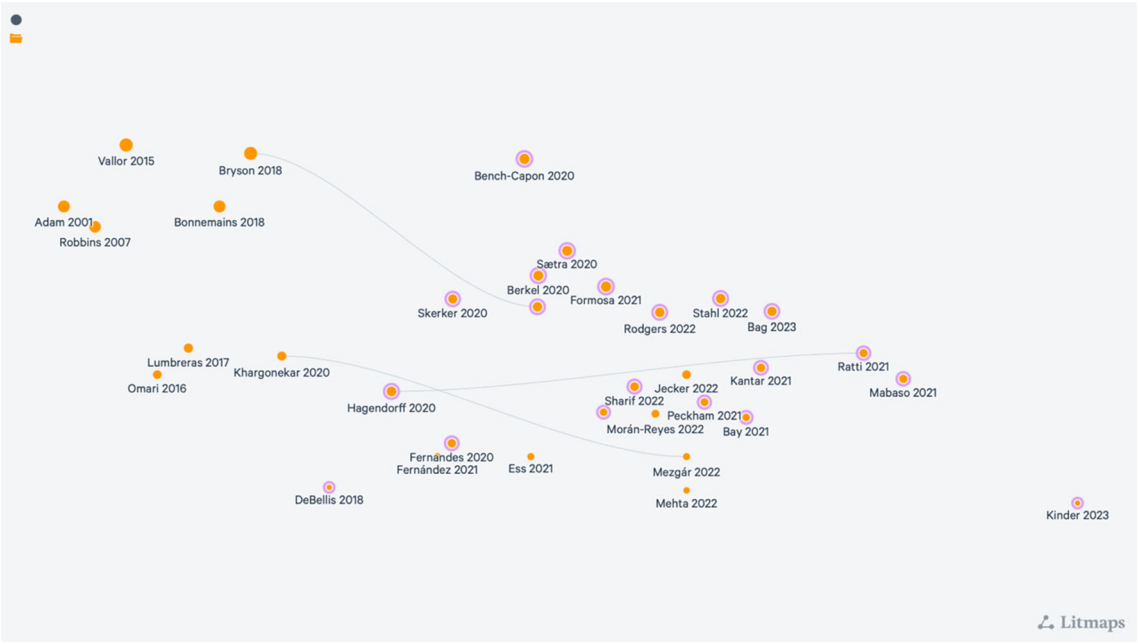

FIGURE 3 Litmaps representation of core literature. *Source*: Authors' own. [Color figure can be viewed at wileyonlinelibrary.com]

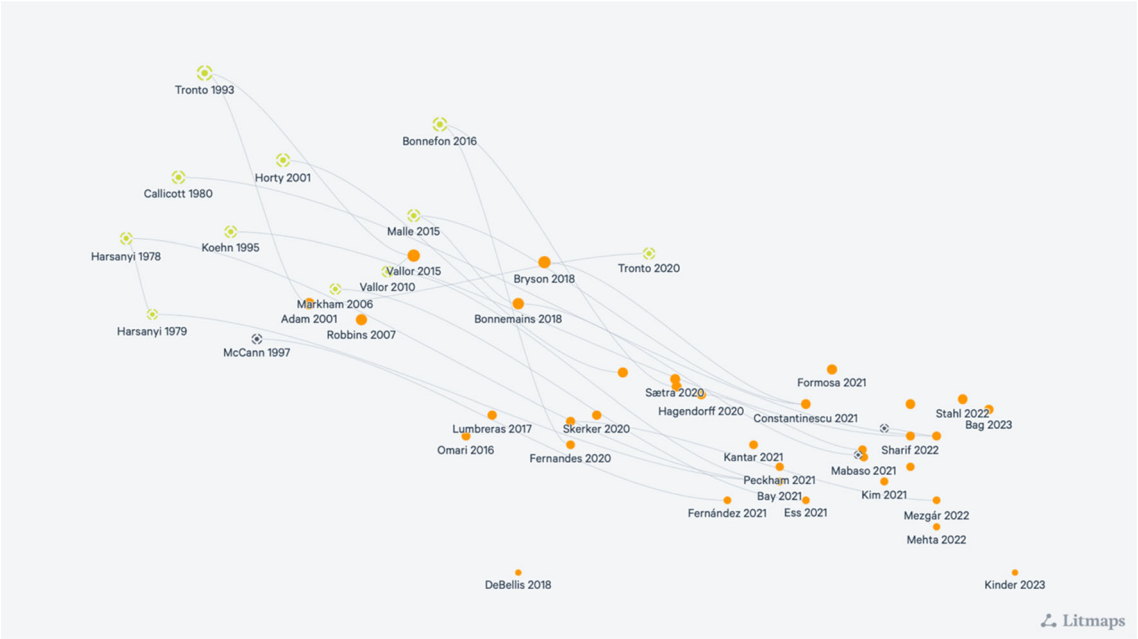

FIGURE 4 Extended search "utilitarian ethic." *Source*: Authors' own. [Color figure can be viewed at wileyonlinelibrary.com]

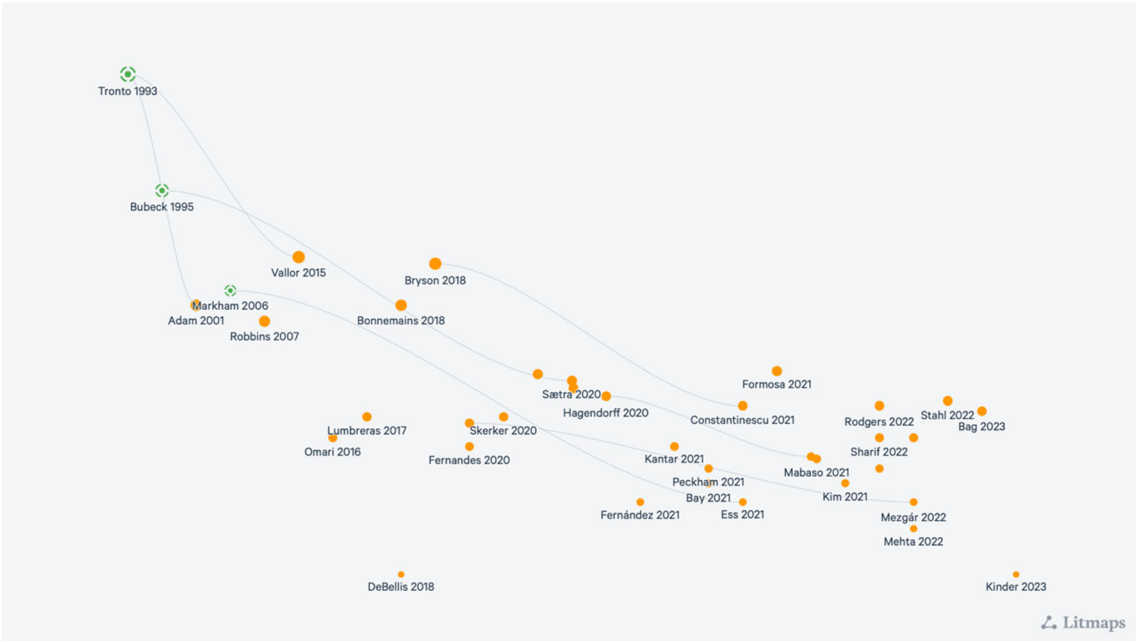

FIGURE 5 Extended search "deontic ethic." *Source*: Authors' own. [Color figure can be viewed at wileyonlinelibrary.com]

4 | NON-WESTERN AI_E

Within the core literature there are several papers that seem to afford approaches to AI_E that are not bound by traditional Western thought, and thereby aid in addressing our second research question. Kantar and Bynum (2021, p. 329) discuss the notion of "flourishing ethics" and argue that it may be regarded as an "umbrella" that incorporates Western viewpoints as well as "additional ethical ideas from cultures of the world (for example, Buddhist, Muslim, Confucianist cultures and others)". Bay's (2021) exploration of Confucian Virtue Ethics in technology warns of its potential limitations but also proffers that future valuable work could be performed through the utilization of other Eastern philosophical positions such as Daoism and Mohism. Jecker, Atiure and Ajei (2022, p. 33) present an account of the reasoning and results of social robots, and argue that one that is governed by ubuntu (humanness) captures "important insights … that many Western accounts miss."

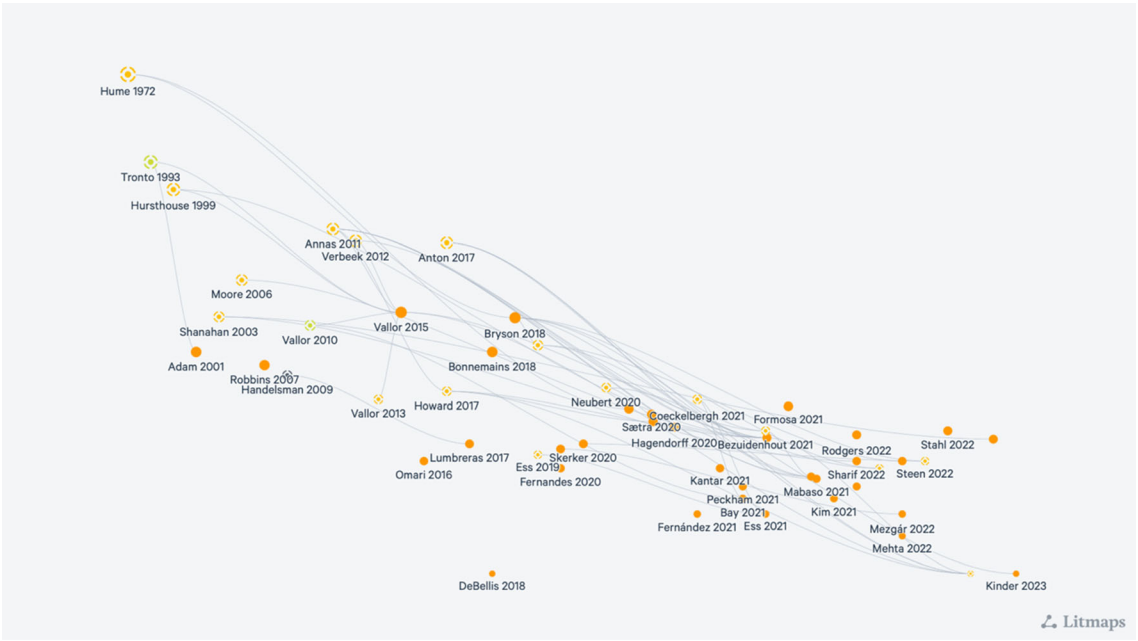

FIGURE 6 Extended search "virtue ethic." *Source*: Authors' own. [Color figure can be viewed at wileyonlinelibrary.com]

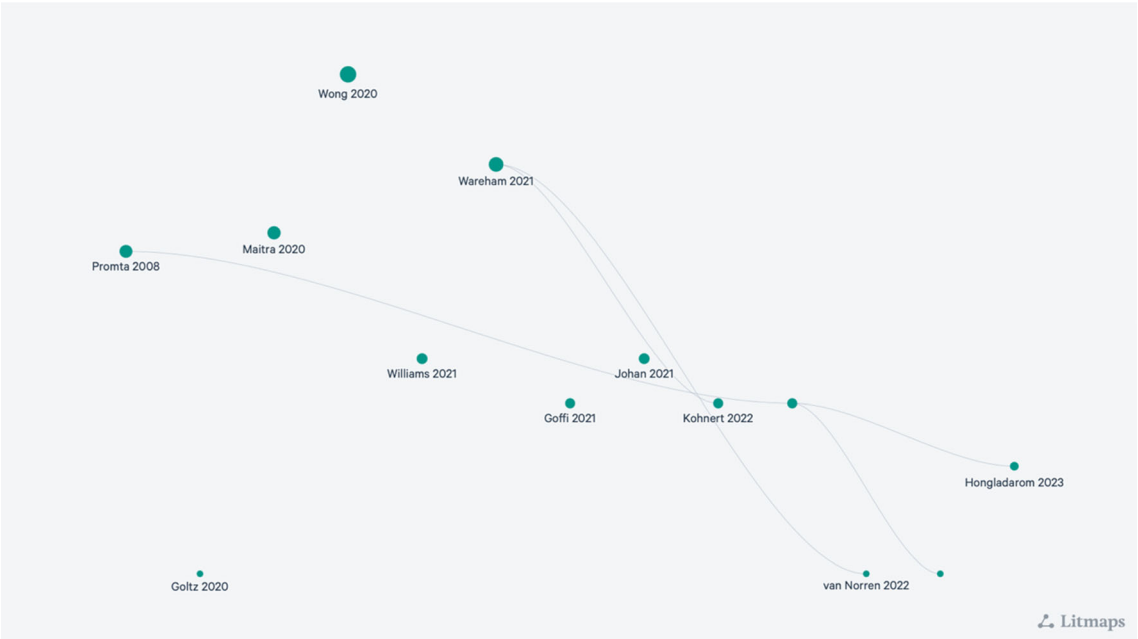

FIGURE 7 Non-Western ethics in AI. *Source*: Authors' own. [Color figure can be viewed at wileyonlinelibrary.com]

In order to explore this area further, extended searches were carried out using Litmaps "Discover" function and the term "non-Western ethic" within the AI literature. This returned a further 13 publications (Figure 7). As in our previous searches, there is little "internal citation" within this relatively small body of literature. The notable exceptions are Promta and Einar Himma's (2008) Buddhist perspective that is followed by Goodman's (2023) similar Buddhist approach, which informs Ziesche's (2023) and Hongladarom and Bandasak's (2023) examinations of multiple non-Western approaches, and Wareham (2023), Kohnert (2022) and van Norren's (2022) adoption of an African perspective in their discussions of AI.

The publications revealed a rich vein of alternative, non-Western approaches to the study of AI_E. Wong (2020) echoes the problems that are encountered by the AI_E literature that tends to adopt a Westernized view, and Maitra (2020) adds to the criticism of the proliferation of Western viewpoints in AI_E advocating for "indigenous perspectives" and the non-anthropocentric insight that they can afford. Furthering this, Williams and Shipley (2021) discuss the Navajo

concept of "hohzo" that promises to free AI_E research from the shackles of its reductionist approach, and Goffi (2021) calls for increased cultural diversity and warns that current discussions of AI_E, at an international level, are predominantly "cosmethics" that comprises forms of wordplay and lack "real long-term philosophical reflections on the risks and benefits of artificial intelligence." Goltz et al. (2020) discuss AI through a Jewish lens, and Eddebo (2021) provides a compendious discussion of Western perspectives of AI as well as Chinese, Japanese, Aboriginal, and African alternatives.

5 | CONCLUSIONS

The subject of AI_E has gained much attention in academic literature yet there remains little clarity around its ethic-theoretical foundations. This study makes an important contribution to the field by mapping the literature that is founded upon utilitarian, deontological, and virtue-based ethical theory. Furthermore, it goes beyond these "traditional" and dominant paradigms to explore the non-Western ethical perspectives that afford new insight into this increasingly important topic.

While there is a vast corpus of literature that discusses AI_E, our structured literature review reflects the view that has been echoed by several researchers that little of this provides an explicit account of the ethic-theoretical stance that it adopts or even could be adopted. Still, when those are refined to only those papers that provide details of specific ethic-theoretical lenses the results remain challenging to interpret as meaningful guidance for the development and adoption of AI systems. These challenges are further magnified by the lack of literature that critiques Western schools of thought and affords alternatives that may be more apposite for international developers and managers.

Even those bodies of AI_E literature that provide explicit acknowledgement of their ethic-theoretical stances are hampered by their lack of recognition of other similar work that exists in the field. Future research needs to undertake more rigorous examination of extant literature, for instance through ensuring that literature searches are undertaken across multiple academic repositories and domains. Useful work could also be performed in AI_E research by returning to the seminal philosophical works that propose and explore ethic-theoretical positions. The study of virtue ethics in AI_E is relatively well developed compared to that of utilitarian or deontic ethics, but all fields would benefit from future research to establish its foundational principles and achieve further cohesion if not convergence.

Both the AI_E literature and research in general have been criticized for being dominated by Western worldviews. There is a small but important corpus of literature that acknowledges this significant problem and proposes alternative ways to conceptualize, develop, and implement AI systems. These are not merely "alternatives" that could be adopted but are argued to offer conceptually radical changes in the way that ethics and AI are conceived and may thereby be invaluable in overcoming the inherently reductionist and insoluble problems that are created through adhering to Western schools of thought. Fruitful future research could be done by exploring these, and other worldviews, to their fullest extent in AI_E research and practice.

Perhaps the fundamental issue for AI_E is that it is tasked with understanding and operationalizing a facet of human nature that defies simple explanation: "what is good?" (Fernández et al., 2021). Each perspective that could be adopted, whether it could be a form of Western normative ethic or a non-Western alternative such as ubuntu, is internally coherent. However, each presents its own limits or problems and seems to be an incomplete solution for the potential ethical dilemmas that could be faced, and which are further complicated by the way that perceptions of morality shift over time (van Berkel et al., 2022). As Bonnemains, Saurel and Tessier (2018, p. 57) stated "the ethical frameworks we have studied do not seem to be relevant in all situations." Bench-Capon (2020, p. 11) proffered more concrete advice when claiming "deontology is suitable only for simple, well-defined systems" and "virtue ethics becomes needed when the problem is too ill-defined to be adequately envisaged by the designer," and van Berkel, Tag, Goncalves and Hosio (2022, p. 514) observed that it is impractical to consider "all potential consequences of all potential actions" that is demanded by utilitarian perspectives.

Despite being faced with this seemingly intractable problem, the literature does afford some means of guidance to practitioners. Rather than wrestling with attempting to develop or adopt "the perfect solution" it is perhaps more important that stakeholders are concerned with understanding and communicating the principles upon which systems are based, since, as Mezgar and Vancza (2022, p. 402) claimed "the real threat of AI is … unexplained decisions." To this end, DeBellis (2018, p. 247) maintain "any ethical system must start with … a statement of what the individual values … because that is the way they desire the world to be." This places the burden of responsibility, at least initially, upon those that are tasked with the construction of any system. As Ratti and Graves (2021, p. 1819) suggest, "data scientists should cultivate ethics as a form of reflection on how technical choices and ethical impacts shape one another." The onus of responsibility also extends to those whom commission or adopt such systems since "it is key for 'those with the power to choose' to remember that their decisions will shape future individual and societal outcomes" (Khargonekar & Sampath, 2020, p. 17013). We posit that valuable empirical research could be undertaken within organizations that are at the vanguard of AI development and implementation. This could explore the real-world ethical frameworks and decisions that are made in the development of AI systems, and how those manifest in the operation of the system. Important work can also be done in exploring how users or organizations that adopt AI, with differing ethical frameworks, which could be determined with the use of tools such as the Ethical Climate Questionnaire (Victor & Cullen, 1987), evaluate the product of those systems.

Finally, the use of Litmaps for some aspects of the literature review reveals some challenges for future researchers. While the software is tremendously valuable in providing a pictorial representation of a body of literature that can be manipulated in real time, the inconsistency of search results and occasional incorrect direction toward source materials is a hindrance to effective research. These problems

will undoubtedly be improved upon and, in reality, are no worse than those that are faced by researchers that are conducting "traditional" literature reviews. Overall, such software should be thought of as useful tools which can be used to augment the process of scholarly discovery.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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