



Technomoral Affordances of Artificial Intelligence in Data-Driven Systems

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In a panel session on "Data, Platforms, and Policies," participants examined the state of artificial intelligence (AI) in the Arab states and discussed the responsible use of AI in data-

driven systems in government, health care, education, and industry.

The idea of utilizing information and communications technologies in applications that result in beneficial outcomes for all stakeholders has gained increasing attention in the form of initiatives, such as "Tech for Good." This is especially true when such applications harness quality data and lead to informed, optimal decisions. The uncertain impact of artificial intelligence (AI), particularly, and its role in driving the Fourth Industrial Revolution is a related concern.¹ While it is widely acknowledged that AI yields many positive affordances, its negative ethical consequences have also been noted. Several international efforts have



resulted in practical recommendations on the subject of ethical AI.² The functional attributes of AI-based systems are such that they mimic human thought and decision making. How does this support technomoral affordances? Is there a real danger that AI will marginalize the less able?

Technology mediates our practices at two levels: micro and macro.³ At the micro level, it is about how we act in a given situation. Technologies are laden with scripts, and we act on the basis of those scripts. Imagine a speed breaker that tells us to slow down when we see it and a coin slot on a supermarket trolley that tells us to return the trolley. Technology, therefore, influences our behavior at a micro level. At the macro level, it is about how we engage with the world around us—not specifically with the technology, but with everything around as well. For instance, if we introduce robots in the classroom to either teach or assist teachers, this will influence the way kids see the role of a teacher and also the way the teacher sees his or her role. The change comes at the level of the values and norms associated with teaching.

Can inanimate objects, such as technology, have morals? To quote Bruno Latour, “We have been able to delegate to nonhumans not only force . . . but also values, duties, and ethics. It is because of this morality that we humans, behave so ethically . . .” or unethically.⁴ In the words of Peter Paul Verbeek, “So if ethics is about how to act and technologies mediate actions, then technologies are ethically charged or they have a form of morality.”⁵ Referring more specifically to AI, it is yet another sociotechnical system that mediates our interactions with the world. In a way, humans and AI are in a cycle of co-constitution. Thinking about social media and recommendation systems, in a micro scenario, it shapes our actions by compelling us to watch a

particular movie, order a pizza for dinner, or read certain posts. At the macro level, it is also shaping our ability to form opinions because it is showing us information based on our prior interests. As a result, it is influencing our thoughts and freedom of expression.

TECHNOMORAL VIRTUES AND AI

Technologies are an essential part of contemporary life, and their effects on society are, to some extent, imperceptible. AI-based emerging technologies have the ability to transform our contemporary way of living. However, while these technologies are about to

practice to learn virtues that can help them defend, understand, and protect their values, freedom, and liberties.⁶ In other words, there are specific technomoral virtues needed to live well with AI-based data-driven decision making. Individuals should be offered opportunities to cultivate their virtues of cheerfulness; prudence; self-discipline; insightfulness; and others, like hopefulness, altruism, commitment, hospitality, humor, tolerance, resourcefulness, and dignity. The study also found that Generations Z and Alpha are more vulnerable to technology abuses than Millennials due to the omnipresence and ubiquity of AI-based

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revolutionize every aspect of our lives, they also pose severe threats to societal values. Most of us want to live with emerging technologies and reap their benefits—but not at the cost of our values, freedom, and liberties. Some scholars have argued that today’s technologies open their own new social and moral possibilities for action.⁶ Indeed, human technological activity has now begun to reshape the very planetary conditions that make life possible. Thus, 21st-century decisions about living well—that is—ethically, are not simply moral choices; they are “technomoral” choices, for they depend on the evolving affordances of the data-driven systems that we rely upon to support and mediate our lives in ways and to degrees never before witnessed.

Research on how we may help design policies that enable people to live well with AI-based emerging technologies shows that individuals’ practical wisdom also requires hands-on

data-driven systems. To help Generations Z and Alpha harness their practical wisdom and technomoral virtues, it is recommended that policy makers develop comprehensive awareness curricula and training simulators after resolving ethical issues in the form of negative affordances.³

When considering technomoral AI, we need to question the morals that we imbibe into our AI technologies. For instance, some Internet browsers have privacy protection as a default versus others. In either case, privacy is a value ascribed to this technology. This brings us to a related question. How do we design technomoral AI in practice? If design artifacts have ethics, then designers need to be ethicists. A software engineer who is designing AI products needs to ensure that the morals imbued into these products do not cause harm.

Isaac Asimov’s three laws of robotics seem to apply here. AI systems

designers may materialize technomorality in three ways⁷:

- › anticipate the kind of mediations their products will involve
- › assess mediations
- › design mediations.

The three mediations, in turn, can be of different types⁵:

- › *coercive*: forcing people to do something unconsciously, such as an automatic revolving door or speed breakers

the rapid onset of the Fourth Industrial Revolution. Based on a comprehensive content analysis of 34 national strategic plans, the report suggested the following⁸:

- › opportunities for AI to modernize the public sector and enhance industry competitiveness
- › the role of the public sector in ensuring that the two most critical elements of AI systems—data and algorithms—are managed responsibly
- › the role of the public sector in the governance of AI systems

though regional, national, and online consultations, such as with the youth group, indigenous communities, and different linguistic groups. This experience suggests that concerns for ethical AI are global, and the need to monitor and govern such data systems is immediate. The experiences of failing to control the excesses of laissez-faire “big tech” have not been lost on regulators from developed and developing economies alike.

PERSPECTIVES ON AI FOR TECHNOMORAL VIRTUES

In a world of continued conflict, the rule of law continues to disintegrate across the globe, perpetuating an unethical and irresponsible political and social order, where a lot of injustices, locally and externally bred, continue to take place. It is, hence, a challenge to promote the modern notion of ethical and responsible AI.¹ Perhaps the most important aspect of this lens on AI can be achieved by promoting the notion of AI for impact. This means addressing the burden of conflict—of our political systems’ negligence of their own people.

The rationale behind this is as follows: if AI cannot promote change, in perception or in action, then its affordances are not sufficiently beneficial. Topics that fall under the realm of AI for good include, but are not limited to, generating fake news data sets and fake news detection around theaters of conflict as well as mining the historical records of newspapers for shifts in political discourse around civil conflicts, including identity politics in liberal democracies and evolving notions of resistance and other ideologies.⁹

All of these scenarios share common features: beginning with no data at all (or very scarce data) and an insufficient number of researchers interested in pursuing such questions. One can extend the definition of ethical and responsible AI to encompass the scenario where people genuinely engage in AI for the betterment of

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- › *persuasive*: encouraging people to participate in an activity, for example, house electricity meters or fuel economy gauges
- › *seductive*: luring people into doing something, such as video games in an attention economy
- › *decisive*: deciding for people, for example, a multiple-story building without elevators.

- › how nations plan to invest in capacity development initiatives to strengthen their AI capabilities.

The findings of this study also showed that AI deployment and capability development for AI have been extensively addressed, though not completely resolved, in most of these countries. However, it is noteworthy that AI governance and technomoral affordances were not analyzed or considered while determining national-level AI needs assessments and capabilities. We conjecture that neither the framework for such an analysis nor a measurement metric exist.

We may question whether these values represent the cultural diversity of the world. In other words, is there a universal set of technomoral virtues for living with AI-based data-driven systems? Probably not. However, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) followed a process where 24 experts from six regions of the world prepared a draft text for ethical AI.² More than 50,000 comments were received

Understanding these design nuances are as important for users as they are for designers themselves.⁷

PROMOTING TECHNOMORAL AI

Efforts at harnessing the positive and technomoral affordances of AI have received global attention.¹ A brief overview of countries’ increasing interest may be examined via the release of national strategic AI plans, massive investment for AI R&D, and the formation of AI-focused governmental agencies.⁸ These strategic plans offer a rich source of evidence to understand national-level strategic actions, both proactive and reactive, in the face of

human begins, tackling data sets and problems that no one is interested in—or, perhaps, has enough courage to investigate—all while aligning with other technical requirements for what makes an AI solution ethical.

Human-centered AI of this sort requires responsible data-centric and model-centric efforts.¹⁰ Responsible efforts in data-centric approaches address the question of how to enrich scarce and poor data sets, accounting for temporal and spatial drifts as well as for shock events. Responsible efforts in model-centric approaches encompass a wide suite of advanced machinery that mitigates the effect of poor or not-so-big data and promotes trust in the resulting AI system. Examples include the following:

- › *few-shot learning*: generalizing better from not-so-big data sets
- › *uncertainty quantification*: revealing a model's shortcomings, machine learning interpretability and explainability, and the modeling of extreme events
- › *probabilistic forecasting*: allowing the end user to hedge against the risk of overestimation or underestimation.

The AI community at large can still take collective action to promote the use of responsible AI. First and foremost, human rights abuses and corruption networks have to be tackled, as one cannot begin to talk about ethical AI in places where basic human rights are not propagated.¹ Global social and political scientists must research ways to help grassroots groups in the region navigate AI solutions under oligarchies and dictatorships.² To help overcome fear of AI, educators must promote teaching risk taking very early on in formal schooling, work to raise the threshold for tolerating mediocrity in AI research, and instill an appreciation of data-informed evidence and when it challenges the status quo.³

AI FOR TRANSFORMATION AND GROWTH: THE CASE OF THE ARAB STATES

In the economies of the Gulf Cooperation Council (GCC), the contribution of AI is projected to take increasing significance in the transformation to postoil economies, both to address skills gaps and to tap state-of-the-art industry practices.¹¹ A study by PricewaterhouseCoopers found that, among the six countries of the GCC, the Kingdom of Saudi Arabia (KSA) is expected to benefit the most from the move toward AI, with an expected contribution of US\$135.2 billion toward its

between AI and security, security does not feature on the AI agenda in the six states of the GCC for reasons we may conclude are a trust issue. Moreover, although AI, machine learning, and blockchain have become three of the most disruptive technologies that may revolutionize the technology industry in the global economy, their take-up in the GCC lags the rest of the world.¹¹

A silver lining is that the GCC states allocate huge financial resources for their health sectors as part of their strategic visions of the transformation to postoil economies. Health diplomacy has become an important part of

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economy. The study also found that the United Arab Emirates (UAE) will benefit from AI-led growth of US\$96 billion, while the remaining four countries are expected to share a total growth of US\$45.9 billion. Various AI initiatives have been undertaken in recent years, especially in the UAE and KSA. Examples from the UAE include establishing the Ministry for AI, launching a national AI strategy, developing an autonomous vehicle transportation strategy, and establishing a specialist research university for AI. Likewise, in Saudi Arabia, the GCC's largest economy, the government has identified AI and data-driven platforms and services as a key enabler of its 2030 vision of transformation.¹¹

However, major inhibiting affordances exist for the smooth deployment of AI in the GCC. These include the sidelining of locally generated knowledge, socioeconomic barriers, and structural rigidities in policies. AI and security are closely linked issues. AI creates new dangers related to privacy, censorship, and surveillance.¹ However, despite the close connection

the global efforts to serve their respective international obligations. This is reflected in the different GCC visions, such as UAE Vision 2021, Qatar Vision 2030, Saudi Arabia Vision 2030, Kuwait Vision 2035, Bahrain Vision 2030, and Oman Vision 2040.¹¹ The idea of technology-led growth in the service sectors of these economies has been accepted as feasible. Another silver lining is the nascent foray of AI into the financial services sector, along with big data innovations. For example, in governance, the Emirate of Dubai has committed to advancing AI-led digital innovation across the UAE, where national strategies and economic policies aim to develop a data-driven learning economy.

The journey to technomoral virtues highlights ongoing concerns across the developed as well as the developing world. Are they on track to catch up with the global push toward AI, or will they be mere users of AI technology? Can they evolve to become effective developers and contributors at the regional and international stages? Are current data infrastructures and


governance ready for such transformation? Is sufficient local talent available and ready? How will countries and organizations exploit technomoral AI to transform themselves and achieve strategic growth?

teleporting. The Internet enables us to work remotely, but it is also changing the norms of work, study, and socializing, allowing us to collaborate across space and time.

How will countries and organizations exploit technomoral AI to transform themselves and achieve strategic growth?

We now return to our original questions. Do AI-based data-driven systems have morals as affordances? How might we build them into the design of such systems? The answer depends on how we view technology. There are three major views of technology:

- In the instrumental view, technology is a neutral means to an end. It is an instrument for humans to use in whichever way they prefer. Drones themselves are neutral; humans decide whether to arm them with weapons or load them with medicines.
- The view of technological determinism interprets technology as a determining force. This means that technology changes us and our norms. We don't steer technology, but, rather, technology steers us. Drones allow weapons to be attached, go to war, and cause suffering. In a way, they determined a course of human action. In both of these views, the reality is an outcome of the supremacy of either a human subject or a technology object.
- In the human and technology view, humans and technology co-create, co-shape, or co-constitute reality. Drones are not simply devices to harm enemies; they also influence how humans think about

In his preface to the 2022 February issue of *Computer*, the editor in chief asked rhetorically, "Is our question of zero-trust AI even worthy of discussion when AI is already ubiquitous and embedded in almost everything we rely on? . . . So, maybe AI is simply a new, hidden, and unavoidable risk to life, devoid of opt-out options."¹² Indeed, this is something to think about. We have, and we conclude that technomoral virtues of AI systems cannot be an afterthought—they must be factored into their design. It's hard but necessary, and it requires community input now.¹³ 

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In December 2020, a 90-min session, convened and moderated by Ravi Sharma, was held under the auspices of the International Telecommunications Union–UNESCO Digital Inclusion Week for the Arab States. The authors of this article were part of a roundtable that examined the state of AI in the Arab states and debated significant issues confronting the responsible use of AI in governance, health care, education, and industry. Norita Ahmad served as the rapporteur. This article is a synthesis of both the discussion and ensuing reflection on what we may understand as the technomoral affordances of data-driven AI.

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