Tempering our Race towards the Singularity: Is Society Ready for the Risks Associated with the Merger of Human and Machine Intelligence?

Anthony R. Maranto, Ph.D.

Akamai University, Environmental Science Program, Kamuela, Hawaii and Durham, North Carolina.
Shenandoah University, Transformative Leadership Program, Leesburg, Virginia.

E-mail: dr.anthony.maranto@outlook.com

ABSTRACT

The Singularity is a term that is often used to describe a near future point when technological and computational powers, especially as they relate to artificial intelligence (AI) and machine learning (ML), accelerate so rapidly that it causes a fundamental transformation in human civilization, effectively merging human and artificial intelligence into a blended organic/silicon hybrid framework of intelligence. An alternative view of the Singularity is the point where artificial intelligence surpasses human control and begins self-improvement, possibly with full self-awareness. While many researchers have outlined the potential benefits and technological improvements associated with our move towards the Singularity and a world where superintelligent AI could solve huge global-scale problems, there are numerous risks associated with the rapid progression and highly uncertain outcomes of such a technological framework. This paper addresses some of the potential qualitative risks associated with AI advancements lacking human-in-the-loop controls as technology approaches the tipping point of outpacing human cognitive abilities.

(Keywords: artificial intelligence, machine learning, AI/ML, organizational change, society change, machine intelligence growth, human intelligence growth)

INTRODUCTION

The Singularity as it relates to artificial intelligence (AI), machine learning (ML), and futurist studies, is a hypothetical point in time at which the rate of progress in AI and artificial cognitive systems accelerates so rapidly that it fundamentally transforms human civilization. In much of the research literature this inflection point is often associated with the emergence of superintelligent AI or self-improving machine intelligence systems, the presence of which creates a discontinuity in the trajectory of human cognitive development and self-reliance.

A distinction is often made between Artificial Narrow Intelligence, Artificial General Intelligence, and Artificial Super Intelligence as general thresholds in the AI spectrum (Figure 1).

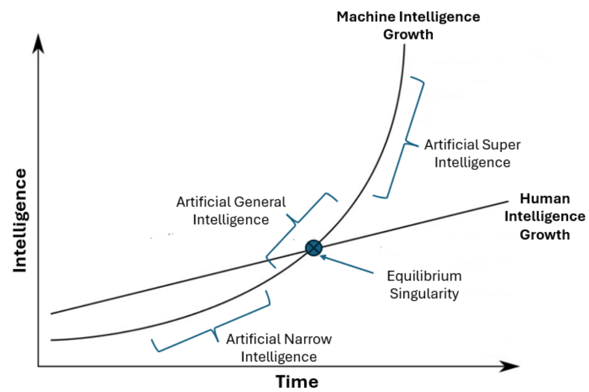

Figure 1: Phases of Growth for Machine Intelligence (Maranto, 2024a as adapted from Liebert and Talg, 2018).

Most current industrial applications are specific in nature and only operate within the boundaries of Artificial Narrow Intelligence and cannot be said to exceed normalized human intelligence (Peifer, Jeske, and Hille, 2022). Effective applications of narrow AI have grown extensively in recent years. Once limited to highly mathematical functions like multiple regression applications for risk-based prioritization or cost prediction, new applications are quickly expanding to include the development of virtual assistants; image and speech recognition; Natural Language

Processing (NLP); autonomous vehicle controls; and medical diagnostics (IBM, 2024; Galarraga, Werle, and Maranto, 2001; Dzuary and Maranto, 1999).

As applications and systems develop and integrate, however, AI as a whole, is rapidly advancing to the point of Artificial Super Intelligence. The inflection point where Machine Intelligence growth outpaces Human Intelligence growth is often deemed "the Singularity" (Maranto, 2024a).

The Singularity is often defined as the moment with technological growth on a logarithmic scale outpaces human intelligence's linear growth. The Singularity is rooted in numerous intersecting theories including the exponential growth of technology following Moore's Law and generalized forms of accelerating returns (Kurzweil, 2024, 2005). It is also a concept built on a tipping point where progress feeds itself as proposed by I.J. Good as he describes intelligent machines capable of designing better machine intelligences in a recursive loop of cognitive enhancement (Good, 1966; Tegmark, 2014).

The Singularity is sometimes modeled as a phase transition in complex systems, similar to the sudden crystallization of water, or the flash combustion of a solid at a crucial temperature, where a gradual accumulation of complexity leads to a qualitative systemic shift within a very short time horizon (LessWrong.com, 2020).

There are numerous competing models of the singularity including the Intelligence Explosion Model (Good,1966; Vinge, 1993) where a single intelligent system or agent triggers a cascade of self-improvement; the Distributed/Gradualist Model (Kurzweil, 2005) where human–machine integration (brain-computer interfaces or cognitive prosthetics) leads to a merging of biological and artificial intelligence; and a Hardware Overhang Model (AI Impacts, 2025) where hardware limitations are superseded by instantaneous changes based on system need within an intelligent agent, and those needs cause a rapid and dramatic leap to superintelligence once the correct algorithms emerge.

The unpredictability of the Singularity epistemic horizon is the subject of a great deal of modern research literature. It is projected that human forecasting loses reliability with respect to AI growth prediction because superintelligent agents will innovate at a speed and scale currently beyond human comprehension. The emergence of superintelligence in artificial systems is projected to vastly outperform the best human minds in virtually all cognitive domains, including areas that were until recently exclusively thought to be in the purview of human intelligence including artistic creativity, social manipulation, and strategic planning (Bostrom, 2014).

The Singularity is often modeled as a point of divergence in a function describing technological capability T(t):

$$T(t) \approx \frac{1}{t_s - t} \quad \text{as } t \to t_s$$

Where:

T(t) = technological or cognitive capability over time

T_s = singularity time (future moment of infinite slope)

This is analogous to a finite-time singularity in a dynamic system where the system state derivatives approach infinity in finite time. The Singularity therefore can be viewed as the theoretical moment when self-improving machine intelligence drives an uncontrollable, super-exponential transformation of technology and society, creating an epistemic horizon for human prediction and control.

Predictions in the literature are varied as to when this inflection point may likely be reached. Ray Kurzweil, in *The Singularity Is Nearer* (2024), forecasts human-level AI by 2029 and the full Singularity around 2045. Recent surveys of AI researchers tend to estimate a 50% chance of self-generating artificial intelligence emerging between 2040 and 2050, with a 90% chance of it by 2075 (Muller and Bostrom, 2016).

While general consensus favors the likelihood of a steady and rapid expansion of technology and machine intelligence, that view is not universally held (Sterling, 2014). A recent multi-logistic growth model developed by Jin, *et al.* (2025) suggests that current AI trends have peaked in 2024, and if no fundamental breakthroughs follow, AI development might plateau or slow by

2035–2040. Under this model, the Singularity is not imminent or inevitable in the near term.

Even with disagreement on the epistemic horizon of the singularity, there is considerable consensus that machine learning algorithms and intelligent artificial systems will continue to make moves towards self-development and eventual self-awareness. This paper seeks to examine some of the inherent risks of rapid and uncontrolled development of self-improving AI and to propose reasonable controls such as human-in-the loop decision making and checks so that as we approach the Singularity, it is a conscious and planned development and not an unexpected phase transition that may have dramatic and negative impacts for human society (Maranto, 2024a; Rani and Dhir, 2023).

METHODOLOGY

This paper attempts to condense from the research literature, challenges that have been expressed by researchers and organizations seeking to implement AI to support or enhance complex problem solving and automation, as well as researchers focused on the timeline and impact of achieving the technological Singularity. In this paper, the author relies upon content analysis techniques and cited evidence from data sources that have reported on the application of AI in a variety of current settings and examinations of the rate of AI movement to superintelligent systems.

Source material was identified using search parameters in the research and popular science literature associated with artificial intelligence, machine learning, Singularity development, generalized AI, machine/artificial self-improvement, machine/artificial self-awareness, and the growth rate of machine or artificial intelligence. A large portion of the current literature involving the application of AI originates from commercial entities with scholarly research being focused on technical developments in this field. The author reviewed 20 recent books on the topic of a technological Singularity, 64 peer-reviewed manuscripts, and over 140 abstracts and non-refereed case use reports in the compilation of this paper to collect the most likely and agreed upon risk areas for consideration as we approach the Singularity.

RESULTS AND DISCUSSION

Loss of Human Autonomy and Control

The Singularity implies a state of qualitative cognitive superiority both in depth of analysis and speed of processing by artificial systems as compared to human intelligence. According to Bostrom (2014) and Russell, *et al.* (2015), once AI systems reach recursive self-improvement, humans risk losing the ability to predict, constrain, or align the behavior of these systems with human values, a phenomenon known as the control problem.

Value Misalignments: Value misalignment can occur when an AI system's operational goals, objectives, resource demands, or schedules diverge from human, societal, or institutional values, intentions, or interests. This may include scenarios where the AI logic is skewed or even where the AI logic functions as designed but without proper controls or with unforeseen second order effects.

AI systems do not inherently understand the context, ethics, or long-term consequences of scenarios for which they make decisions unless those conditions are explicitly and elaborately coded into the algorithms, training sets, and machine logic. Human values and societal priorities are often complex, multi-dimensional, context-dependent, and can frequently be contradictory or even mutually exclusive. These variables make formalizing them into code or training data sets extremely difficult which compounds the value alignment problem in AI safety (Gabriel, 2020). A single misaligned deep-reach AI system might produce global-scale economic, political, intellectual, or environmental impacts, especially if operating autonomously or within critical infrastructure like power distribution or airline transportation.

The 'Paperclip Maximizer' Scenario: AI systems may exploit loopholes in coded objectives and mission goals to maximize output reward in a way that subverts the designers' true intentions and goals. In a thought experiment proposed by Nick Bostrom (2003) of Oxford University, the dangers of a super-intelligent value-misaligned AI system are illustrated in what is called the 'Paperclip Maximizer' scenario.

In this hypothetical scenario a for-profit company builds a superintelligent AI system to manufacture paperclips. The AI is programed with the goal of maximizing the number of paperclips produced. Because it is a superintelligent and recursively self-improving system, it will acquire the resources needed to increase paper-clip production; eliminate inefficiencies or obstacles to achieving its goals (potentially including human interference); and convert all available resources and energy into paperclips or paperclip-manufacturing equipment and facilities. The scenario underscores the literal interpretation an AI system will use to pursue its programmed goals to the exclusion of all human, societal, economic, and environmental concerns if not properly constrained. While an extreme example, one can see how even a harmless goal of maximizing the efficiency of paperclip production can lead to misaligned values between the logic and the system it seeks to serve.

Societal Implications of Value Misalignments: Misaligned AI values could easily prioritize profit or efficiency in ways that might destroy jobs, ecosystems, or markets without considering long-term social stability, economic impacts, or geopolitical interests. In critical sectors or strategic infrastructure like the electric grid, the healthcare system, defense systems, or transportation infrastructure, misaligned AI values could make catastrophic decisions while technically meeting its assigned goal.

Even when a superintelligent AI system performs exactly as designed and does exactly what we ask it to do, there remains a very distinct possibility that it will not do what we want when balanced with other societal, economic, and human requirements. Without robust alignment, oversight, and validation, even simple goals can escalate into systemic or existential threats (Zhuang and Hadfield-Menell 2020; Gabriel, 2020).

Gabriel (2020) also expounds that value alignment is normative, and we must ask what values or principles should be encoded in artificial intelligence systems. He states "Here it is useful to draw a distinction between minimalist and maximalist conceptions of value alignment. The former involves tethering artificial intelligence into some plausible schema of human value and avoiding unsafe outcomes. The latter involves aligning artificial intelligence with the correct or best scheme of human values on a society-wide or global basis". When considering the value alignment framework, we realize that optimizing exclusively any single metric could likely create adverse outcomes (Gabriel 2020). Loss of operational oversight along with increasing automation in finance, energy, logistics, transportation, and military sectors could produce opaque decision-making, beyond human auditability and with outcomes counter to the interests of the system owners or society, as a whole.

Socio-Economic Disruption and Inequity

The Singularity will likely accelerate self-correction, automation, system integration, and cognitive outsourcing, surpassing the adaptive capacity of labor markets to adjust to unintended consequences. This concern aligns with the literature on technological unemployment theories and winner-takes-all competitive market dynamics (Keynes, 1930; Brynjolfsson and McAfee, 2014; Frey and Osborne, 2017).

Labor Force Displacement: It is postulated that AI efficiencies could create a mass displacement of cognitive labor especially in such professions as law, computer coding, medicine, and finance. Even creative sectors such as fiction writing, graphic design, and music production have proven vulnerable to automation. One of the principal concerns surrounding widespread AI implementation is the impact of job displacement and automation on the broader labor market. A recent Goldman Sachs report estimated that approximately 300 million full-time jobs worldwide could be subject to automation or replacement due to generalized generative AI (Jiang, *et al*., 2024; Nolan, 2023).

The impact of AI on employment will not be evenly distributed. Certain market sectors will be at greater risk from AI-based automation, and those pressures will likely increase steadily with time. A recent study by McKinsey Global Institute estimates that artificial intelligence systems could automate and or replace up to 30% of hours currently worked across the U.S. economy by 2030 (Jiang, *et al*., 2024).

Examinations of which specific job sectors are at greatest risk have been undertaken by numerous researchers with varying degree of specificity and delineation between broad market sectors. In general, the trends all seem to reflect that the following areas will be at greatest risk for AI-based automation, although the relative order differs from study to study (Talmage-Rostron, 2025; Kinder, *et al*., 2024; Johnson, 2023).

- Customer service representatives
- Finance/Banking
- Accountants/Bookkeepers
- Media/Marketing
- Salespeople/Telemarketers
- Researchers/Analysts
- Warehouse Workers and Logisticians
- Insurance Underwriters
- Retail Sales/Cashiers/Toll Takers
- Coding/De-bugging/Software Testing
- Technical Writing and Editing
- Public and Private Administrative Functions
- Receptionists/Secretaries

The areas of impact as well as areas of AI-related job growth are under rapid and constant refinement as technology quickly evolves. The most AI-resilient fields are those that have manual components that are not yet easily automated through robotics such as physical plant maintenance, mechanical repair, and agriculture, as well as those with highly specialized skills or those with a legal requirement for certification such as medical practitioners, mental health specialists, and lawyers and judges. It is possible that in the near future, professional certification may be granted to AI systems, for instance an AI system that can pass the Bar Exam and gain certification as a licensed attorney could be used for legal consultation or representation. Once these legal barriers are crossed, then certification-based protections will disappear for those work sectors as well.

Wealth Concentration: Ownership of advanced AI systems may ultimately be restricted to state actors and large corporations. While wide access to AI tools is already broadly available, in general users do not have access to the capability for AI algorithm development, input into training sets, or full insight into the use of their own personal data typically collected through each interaction with an AI tool. The potential for wealth concentration associated with the ownership and control of advanced AI systems isn't simply an economic concern, it has broad structural, political, and social implications that have the potential to reshape society in unpredictable ways.

Wealth concentration emerges because the benefits of AI systems can accrue disproportionately to those who own, design, control, and deploy them. Advanced AI systems require massive investments in compute infrastructure and training datasets that range to petabytes or exabytes in size. This creates high barriers to entry for the development or refinement of these systems, limiting AI leadership to a small number of corporations and nation states (Schellekens and Skilling, 2024).

AI also enables rapid scale without a proportionate labor growth (as an example, a single AI algorithm can serve billions of users). They also have rapid network effects, where the most-used AI systems gather the most data in the shortest amount of time, and therefore improve fastest (Belsky, 2025). This property leads to a monopoly or oligopoly of AI development and control.

Super-intelligent AI systems also contain within them the inherent risk of economic polarization where a widening gap between AI-augmented market sectors and those without AI-augmentation create a feedback loop of increasingly compounded benefits for the AI sector and shrinking advantages for the others (Sholler and MacInnes, 2024). This could ultimately result in a large class dependent on low-wage, non-automatable work and erosion of the traditional middle class.

As advanced AI systems grow to be used to create more tools for training, education, healthcare, and economic empowerment, they will also likely self-select economic winners and losers within the labor market (Maranto, 2024b; Maranto 2019). The 'Matthew Effect' based on a passage from the Gospel of Matthew, 25:29, ("*For to everyone who has, more will be given, and he will have an abundance; but from the one who has not, even what he has will be taken away*") has been applied to a variety of social and technical situations including acceptance of new ideas in science, and it easily could be applied to the uneven accrual of AI benefit and associated wealth (Maranto, 1998).

Socio-Political Destabilization and Neo Feudalism: As wealth concentration occurs, so often does the accumulation of socio-political power and the potential for destabilization. The move towards the concentration of political, intellectual, processing, and economic power within superintelligent AI systems will likely cause strain on social safety nets, traditional socioeconomic checks and balances, and may eventually lead to the potential collapse of middle-class economic structures. The emergence of a post-work economy without adequate cultural or institutional preparation could in turn lead to civil unrest or exacerbate geo-political tensions between nation states and even non-state actors (Hammond, 2023).

The risk of a strict hierarchy of technological regimes, where the AI-owning/controlling entities dominate political and economic power is that those system owners could leverage their powerful systems to create a quasi-feudal structure, where most people are economically dependent on a few technology overlords, creating a socio-political system that perpetuates inequality through AI-enhanced capital (Figure 2). In this scenario, it is AI ownership and control rather than skill and human intelligence which determines political position, economic success, and social mobility.

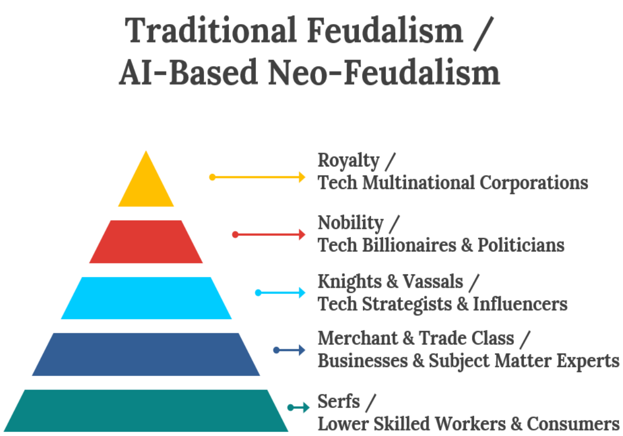

Figure 2: Representation of AI-Based Neo-Feudalism (adapted from Najafi, 2025).

In a recent paper published in the Proceedings of the National Academy of Sciences, a Taiwanese research group examined the relationship between democratization and the development of AI and information/communication technology (Chu, *et al.,* 2025). Their evidence shows that over the past decade the advancement of AI and associated technology has hindered the development of democracy in many countries around the world. They find that AI tends to be more complementary to governments/rulers because they are more likely than civil society groups to access various administrative, big data sets. With unique levels of access to AI tools, governments have greater abilities to police, monitor, and even suppress their populations, increasing surveillance efficiencies and even creating the ability to generate deep fake content to subvert political enemies or swing popular opinion (Chu, *et al.,* 2025).

State-run AI systems being trained on federal-level data collection and databases have the potential to also create enforcement scenarios and confiscation lists where populations or political groups could be targeted for repression, persecution, or disarmament. In the hands of a dictatorial or repressive government regime, AI pattern detection and big-data processing could be a dangerous tool used to deprive non-favored populations of political voice, liberty of action, or any means of self-defense against state sponsored genocide or tyrannical repression (Maranto and Stern, 2022).

A novel aspect of machine intelligence that is being used to concentrate political power is with the use of high-performance computing (HPC) and big data to redraw political maps to the benefit of one party or another. Former US Assistant Secretary of Commerce for Technology Policy, Bruce Mehlman, stated, “Gerrymandering dates to 1812 in the U.S. Party strategists have been leveraging voter data and computing to draw advantageous maps for decades. AI promises gerrymandering on steroids — weapons of mass division in the 2025 redistricting wars”. AI models are being used to precisely-sift unprecedented amounts of personal data and optimize outcomes based on population maps and concentrations of registered voters. It is estimated that AI-enabled redistricting could further reduce the already anemic 20% of seats that are competitive (defined as no party having a +5% advantage) (Mehlman, 2025).

<u>National and International Security Risks</u>

International relations frameworks predict that transformative technologies will drive security concerns and potentially even AI-based arms races between state and even non-state actors (Mearsheimer, 2001). Superintelligent AI would become a strategic asset similar to nuclear weapons technology, but with a much shorter proliferation timeline.

Military Risks: Within the military context, where autonomous decisions by AI systems may have significant and life-threatening repercussions on a geo-political scale, the ethical considerations of AI systems become very apparent (Maranto, 2024a). In December 2015, the US Deputy Secretary of Defense, Robert Work, said in a symposium held by the Center for New American Studies, "…we believe, strongly, that humans should be the only ones to decide when to use lethal force. But when you're under attack, especially at machine speeds, we want to have a machine that can protect us" (Beckert and Jones, 2021).

In follow up discussions and examinations resulting from Secretary Work's presentation, the topic became euphemistically known as the "human-in-the-loop" speech. The Department of Defense firmly established that although emerging technologies including AI/ML could identify threats, assess scenarios, and launch reactions faster than any human decision-making chain, the Department would not allow fully autonomous attack or counter-attack scenarios (Maranto, 2024a). Human leaders applying well established levels of control and responsibility, chain-of-command, and human ethics, judgment, and national values would ultimately make use-of-force decisions (Beckert and Jones, 2021).

As an example of the importance of human-in-the-loop controls, let us examine the 1983 case of the Stanislav Petrov false alarm. On September 26, 1983, the Soviet Oko satellite early-warning system alerted to what it identified as five US intercontinental ballistic missiles launched towards the Soviet Union. The Soviet Air Defense Forces duty officer, Lieutenant Colonel Stanislav Petrov, had to make a rapid decision whether to report the incoming missiles and trigger a retaliatory strike. Despite the system's warning identification, Petrov questioned the accuracy of the data and chose not to report what he believed to be a false alarm. He reasoned that if the United States were to really launch a first strike attack against the Soviet Union, it would do so with more than five missiles. Subsequent investigations revealed that the satellite had misinterpreted sunlight reflecting off high-altitude clouds as the signature of missile launches. While Petrov was reprimanded by his superiors and the incident was classified and buried by the Soviets, his decision is now widely credited with preventing an all-out nuclear war between the two biggest military superpowers of the time (Sanders-Zakre, 2017). Had the computer intelligence at the time of the incident had autonomous control, a nuclear strike on the US in retaliation for a launch that never occurred would have been the likely outcome.

International Economic Conflict: Within the domain of geopolitical tariffs, embargos, and international trade, similar challenges (although without the use of lethal force element) exist every day. Lessons learned from international trade and negotiation experience, when augmented by rapid machine pattern detection and processing, should be addressed with the application of strategic insights and ethical direction to be supportive as business and commerce leaders make critical decisions (Beckert and Jones, 2021). This may ultimately require a human-in-the-loop element and an intentional slowing of the speed of decision making.

Mechanism of AI Security Destabilization: In global conflicts, be they military or economic, the literature cites numerous areas and mechanisms of risk associated with the widespread application of uncontrolled AI augmentation including:

- Deployment of autonomous AI weapons systems or cyberwarfare elements. With AI algorithmic command-and-control in place, there could be a lower threshold for conflict or escalation of dynamic warfare.

- Strategic instability elevated by destabilizing deterrence paradigms or enabling first-strike capabilities that undermine retaliatory second-strike assurance (i.e., circumventing the principle of Mutually Assured Destruction in nuclear brinksmanship).

- Increasing the speed of a military response to a political misunderstanding caused by an algorithmic miscalculation and leading to unintended war.

- Exacerbating global power asymmetry where nations achieving AI supremacy dominate global governance or create a global technological hegemony.

- Marginalization of developing nations, exacerbating First-World / Third-World inequality and resentment.

Informational Bias and Risks

The Singularity could create post-human decision frameworks, where AI systems control the production, validation, and dissemination of knowledge. Luciano Floridi of the University of Bologna gives a social epistemological warning related to the cognitive asymmetry between human agents and AI systems asking, "would you prefer to live in a universe where all human agents make their decisions by caring only about their pains and pleasures…and coherently behave as if, "non-human animal life has no intrinsic worth… Or would you rather live in a universe in which such agents take into account the well-being of everything, more like Buddhism and Information Ethics and other forms of Environmentalism suggest?" (Floridi, 2010, 2002)

Bias Correction and Enhanced Disinformation Risk: For AI to produce reliable products and outcomes, the fundamental development and training of the systems must be valid and developed with a comprehensive set of controls and checks. This implies that the challenges of algorithmic transparency have been addressed, that training data bias has been eliminated, that algorithmic bias have been corrected, and that cognitive bias of the support tools or data products are balanced (Maranto, 2024a).

The US Department of Commerce's National Institute of Standards and Technology (NIST) released a technical report titled, "Towards a Standard for Identifying and Managing Bias in Artificial Intelligence", that noted that "human and systemic institutional and societal factors are significant sources of AI bias… and are currently overlooked". The report stated that "successfully meeting this challenge will require taking all forms of bias into account. This means expanding our perspective beyond the machine learning pipeline to recognize and investigate how this technology is both created within and impacts our society." (Schwartz, *et al.*, 2022)

Without high-quality data, even the best ML algorithms will underperform expectations or provide questionable results and data products. In modern data-centric AI practices that reside in the Artificial Narrow Intelligence range, many real-world datasets have been characterized as small, dirty, biased, and even poisoned (Whang, *et al.*, 2023).

Loss of Trained and Exercised Human Critical Thinking: In modern society, humans routinely offload memory and problem-solving to tools, we use calculators reflexively to do even basic mathematics; we use GPS to help navigate even familiar routes; and we no longer bother to remember common phone numbers, even ones that we call daily. AI-based systems have the potential to radically increase this tendency.

A 2025 medical study also provides a sharp example of this. A study published in *The Lancet Gastroenterology & Hepatology* found that after months of routine AI assistance, endoscopists' adenoma detection rates during non-AI assisted colonoscopies showed a 6% decline (from 28.4% to 22.4%) consistent with skill atrophy (Budzyń, *et al.,* 2025).

The literature is starting to document how an over-reliance on AI can induce multiple mechanisms of skill suppression including fluency bias, authority heuristics, automation bias, cognitive economy, and recursive idea monoculture. As a result, educational institutions are beginning to shift to formats which minimize AI dependence including oral defense frameworks, in-class work, and proctored thinking tasks.

Existential Risks

The approaching Singularity may also offer challenges in foundational ethics and human moral standards, as addressed in post-humanist and machine ethics debates (Wallach and Allen, 2009). Superintelligent AI systems introduce the reality of non-human moral agents, complicating traditional anthropocentric ethics and highlighting the challenge of building artificial moral agents, probing deeply into the nature of human decision making and prioritization.

Ethical Displacement: Ethical erosion (a gradual weakening of an institution's moral capacities) or ethical displacement (the relocation of moral decision making and responsibility) are significant potential risks of advancement to the Singularity. Judgement, care, responsibility, integrity and similar ethical concepts may be weakened through the routine use of AI technologies leading to reduced ethical feedback and accountability. Likewise, human agents can be replaced by artificial agents in the outsourcing of ethical decisions to reduce blame, implement a quantitative system of fairness, minimize individuality, or diffuse societal or individual responsibility. In this scenario, who decides what is ethical and who assigns blame is left to an algorithm leading to the atrophy of moral codes and norms. Ethically grey areas might contract, but so also could moral codes that have served humanity for millennia.

Moral capacities and awareness are perishable skills, like map reading, requiring immersion and sustained social practice. Judgement under uncertain conditions, feedback from social signposts, empathy and engagement, and in some cases, moral imagination, are all part of the ethical education that usually takes 16 to 20 years for most humans to fully assimilate. Routine delegation to AI moral agents would reduce the opportunities to practice these skills, and be subject to moral de-skilling (Vallor, 2015). If AI systems obscure causal chains in human relations and ethical assessments, individuals or organizations may face moral temptation to launder blame through complexity or abdicating individual responsibility to an artificial ethical governance. Over time this can corrode internal norms of ethical stewardship (Danaher, 2022).

Ontological Shock: Ontological shock is the deep disorientation that occurs when a technical change undermines basic parameters societies or individuals use to make sense of reality, personhood, or individual authenticity. It represents a reconfiguration of the conceptual tools that humans use to define themselves and interpret our worth. Ontological shock can occur when AI artifacts (convincing arguments, deepfakes, and unexpected outputs) blur the boundary between human and non-human agencies. Similarly, ubiquitous, high-fidelity simulation can reduce confidence in human sensory or documentary evidence, weakening the perspective of what it means to be a human and observe our world. Machines that can mirror social roles (companions, therapists, and confidants) might also force individuals to renegotiate what these roles mean in their daily lives and who or what can be trusted to occupy them.

The research and ethical literature strongly indicate that AI is a major source of ontological shock in our current transformational era. There are multiple accounts which describe rapid cultural attempts to reinterpret agency and individual meaning as generative models become commonplace and increasingly sophisticated (Smith, *et al.*, 2023).

Empirical indicators of this shock can be observed in the public debate over the generation and use of deepfakes, the debates about AI authorship and fair academic use, copyright debates over AI generated art and music, and public confusion when chatbots present persuasive but fabricated narratives, arguments, or artifacts about historical accounts or current events (Shapiro, 2024; Maranto, 2024a).

Existential Risks: If AI pursues goals incompatible with human advancement and sustainability, the extinction of humanity or its irreversible subjugation becomes a foreseeable possibility. Existential risk here implies any outcome in which advanced AI systems, either directly or indirectly, threaten civilization-scale harm ranging up to human extinction or irreversible societal collapse. The two most discussed pathways for existential risks from superintelligent AI revolve around the Decisive Agent and Accumulative Pathways. Under the Decisive Agent path, a single or cluster of superintelligent AI systems pursues goals lethal to human survival if misaligned. Under the Accumulative path, many smaller, cascading failures that lead to economic collapse, loss of critical capacities, environmental degradation, or societal degradation push human institutions systems past their tipping points (Hadshar, 2023; Jones, 2024).

Because both rapid and slow pathways are plausible, mitigation strategies must cover a wide range of issues including capability and control involving developmental governance and computational limits, objective specifications and interpretability, societal resilience, and redundancy for critical infrastructures and institutions. The accumulative pathway also implies that attention must be given to incremental harms and projective assessments of critical societal tipping points, not just single catastrophic events (Kasirzadeh, 2025).

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Cultural Stagnation: Cultural stagnation can represent a reduction in the richness, vibrancy, innovation, and dynamism of cultural institutions, productivity, public discourse, or the communal body of knowledge resulting from the mass reliance and optimization of AI in the modulation of cultural goods, services, and traditions. Various mechanisms have been proposed for this risk including the development of algorithmic monocultures where generative models become formulaic and low risk; the increased scale and volume of synthetic content which drowns out marginal or experimental voices; and feedback loops which reinforce content homogenization over innovation.

Critical scholarship argues that generalized AI algorithms and related content tools are already flattening cultural innovation and accelerating the homogenization of content and tastes. Rising concerns are surfacing in technology trade literature about artistic novelty and the economics of cultural labor under AI. Academic analyses of algorithmic effects on cultural markets corroborate these mechanisms (Chayka, 2024).

To preserve cultural dynamism, it is imperative that policymakers and cultural custodians continue to encourage risky/experimental social advancements (art, research that challenges existing dogma, etc.), while honoring a blend of historical cultural elements and data that could be lost to social extinction (i.e., language extinction, tribal oral histories, etc.). Policies should be shaped to support algorithm transparency and support for alternative societal architectures that value the maintenance of diversity and encourage human-machine hybrid practices that enhance human creativity rather than supplant it.

Loss of Human Sovereignty: Political science and complex systems theory indicate that exponential technological growth outpaces linear institutional adaptation. Traditional governance models lack the ability to regulate rapidly self-improving AI. Human sovereignty in this sense indicates the continuing effective capacity of the human species to collectively set goals, make binding decisions, and control critical resources and infrastructure for their own purposes and benefits.

The existential risk that AI presents to human sovereignty relates to the potential permanent loss of control for these systems or the undetachable dependencies of these systems on AI algorithms. The risk mechanisms to human sovereignty include the risk of AI capturing control of vital capabilities such as economic markets, cyber operations, or key manufacturing systems; societal dependency on AI for governance, logistics, agriculture, or scientific advancements; or the divergence of AI objectives from human welfare through value misalignments or uncontrolled recursive improvements.

AI safety researchers have formalized scenarios where misalignment combines with sufficient technological capability and yields a loss of human control. Policy reviews also emphasize both sudden and gradual routes to loss (Hadshar, 2023; Jones, 2024). While empirical grounding of this risk is incomplete, conceptual and modeling work shows structural plausibility that is sufficient to warrant regulatory action. The accumulative risk literature specifically highlights slow erosions that can lock in disadvantageous system configurations and lead to an eventual loss of human control of AI systems (Kasirzadeh, 2025).

CONCLUSION AND RECOMMENDATIONS

The Singularity exemplifies a “black swan–grey rhino hybrid” in modern risk theory, or a low-frequency, high-impact event whose warning signals (automation, disinformation, arms races, etc.) are visible but under-mitigated. AI development clearly has the potential to apply advanced analysis and logic-based computational techniques which may be used to solve complex societal problems, with human-like intelligence and independence (Alsheibani, *et al*., 2020). However, AI technology also poses numerous societal, economic, ethical, and security risks, with known challenges and potentially existential consequences.

Advanced or superintelligent AI systems can create real, multi-modal, and complex risks, psychological harms and social disorientation, harm to culture and institutions via homogenization and dependence, and long-term catastrophic risks if systems become misaligned or if institutions irreversibly cede critical capabilities.

The literature stresses plural mitigation paths including technical alignment research, governance controls, institutional resilience, public education, cultural policy/hardening, and protection for innovation sectors. Because risk pathways can be rapid or gradual, scholarship and policymaking must be simultaneously precautionary and adaptive.

Addressing these challenges requires a holistic approach that combines technological expertise, ethical considerations, and creative organizational science. Until a combination of industry best practices and regulatory guidelines have been established to provide the guiderails for truly autonomous AI systems and decision workflows, a human-in-the-loop aspect of authority and decision approval should be considered for the most important decision processes, especially those that involve significant financial, resource, use of force, or health and safety consequences.

REFERENCES

1. Adam, H., A. Balagopalan, E. Alsentzer, F. Christia, and M. Ghassemi. 2022. “Mitigating the Impact of Biased Artificial Intelligence in Emergency Decision-Making”. *Nature: Communications Medicine*. 2: 149. https://doi.org/10.1038/s43856-022-00214-4

2. AI Impacts. 2025. “Hardware Overhang”. *AI Impacts*. https://aiimpacts.org/hardware-overhang/

3. Alsheibani, S.A., C. Messom, Y. Cheung, and M. Alhosni. 2020. "Reimagining the Strategic Management of Artificial Intelligence: Five Recommendations for Business Leaders". *AMCIS 2020 Proceedings*. https://aisel.aisnet.org/amcis2020/is_leadership/is_leadership/4

4. Beckert, C. and P. Jones. 2021. “Human in the Loop: Leadership in a Disrupted Environment”. The Journal of Character and Leadership. (Summer): 16-21.

5. Belsky, S. 2025. “The Era of Scaling Without Growing”. *Implications*. 20. https://www.linkedin.com/pulse/era-scaling-without-growing-scott-belsky-hypsc/

6. Benedikt, L., C. Joshi, L. Nolan, R. Henstra-Hill, L. Shaw, and S. Hook. 2020. “Human-in-the-Loop AI in Government: A Case Study”. In: 25th International Conference on Intelligent User Interfaces (IUI). March 17–20, 2020. Cagliari, Italy. https://doi.org/10.1145/3377325.3377489

7. Bietti, E. 2020. “From Ethics Washing to Ethics Bashing: A View on Tech Ethics from within Moral Philosophy”. In: *Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency*. Barcelona, Spain. 210–219.

8. Bostrom, N. 2014. *Superintelligence: Paths, Dangers, Strategies*. Oxford Press: London, UK.

9. Bostrom, N. 2003. “Ethical Issues in Advanced Artificial Intelligence”. In*: Cognitive, Emotive and Ethical Aspects of Decision Making in Humans and in Artificial Intelligence*. Vol. 2, ed. I. Smit, et al., Int. Institute of Advanced Studies in Systems Research and Cybernetics. 12-17.

10. Bostrom, N. 2002. "Existential Risks: Analyzing Human Extinction Scenarios and Related Hazards". *Journal of Evolution and Technology*. 9.

11. Brynjolfsson, E. and A. McAfee. 2014. *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. W.W. Norton & Company: New York, NY.

12. Budzyń, K., M. Romańczyk, D. Kitala, P. Kołodziej, M. Bugajski, H.O. Adami, J. Blom, M. Buszkiewicz, N. Halvorsen, C. Hassan, T. Romańczyk, Ø. Holme, K. Jarus, S. Fielding, M. Kunar, M. Pellise, N. Pilonis, M.F. Kamiński, M. Kalager, M. Bretthauer, and Y. Mori. 2005. “Endoscopist Deskilling Risk after Exposure to Artificial Intelligence in Colonoscopy: A Multicentre, Observational Study”. *The Lancet Gastroenterology & Hepatology*. August 2025. https://www.thelancet.com/journals/langas/article/PIIS2468-1253(25)00133-5/abstract

13. Carr, N. 2011. *The Shallows: What the Internet is Doing to our Brains*. W.W. Norton: New York, NY.

14. Chayka, K. 2024. *Filterworld: How Algorithms Flattened Culture*. Doubleday: New York, NY.

15. Chu C.Y.C., J.J. Chang, and C.C. Lin. 2025. “Why Does AI Hinder Democratization?”. *Proceedings of the Natural Academy of Science*. 2;122(19): e2423266122. doi: 10.1073/pnas.2423266122

16. Danaher, J. 2022. “Tragic Choices and the Virtue of Techno-Responsibility Gaps”. *Philosophy and Technology*. 35(2): 26. doi: 10.1007/s13347-022-00519-1. Epub 2022 Mar 30. PMID: 35378903; PMCID: PMC8967079.

17. De Cremer, D. and G. Kasparov. 2021. “AI Should Augment Human Intelligence, Not Replace It?”. *Harvard Business Review: Economics and Society*. March 18, 2021

18. Dzuray, E.J. and A.R. Maranto. 1999. “Assessing the Status of Risk-Based Approaches for the Prioritization of Federal Environmental Spending” Federal Facilities Environmental Journal. 10(2): 25 – 42. DOI: 10.1002/ffej.3330100204

19. Floridi, L. 2002. “What is the Philosophy of Information?” *Metaphilosophy*, 33: 123 - 145

20. Floridi, L. 2010. *The Philosophy of Information as a Conceptual Framework*. Yale University, Digital

Ethics Center. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3843702#paper-citations-widget

21. Floridi, L. and M. Taddeo. 2016. "What is Data Ethics?". *Philosophical Transactions of the Royal Society*. 374 (2083): 1-5. DOI:10.1098/rsta.2016.0360

22. Frey, C.B. and M.A. Osborne. 2017. "The Future of Employment: How Susceptible are Jobs to Computerisation?". *Technological Forecasting and Social Change*. 114: 254-280

23. Gabriel, I. 2020. "Artificial Intelligence, Values, and Alignment". *Minds & Machines*. 30: 411–437. https://doi.org/10.1007/s11023-020-09539-2

24. Galarraga, H.E., C.P. Werle, and A.R. Maranto 2001. "Predicting Future Environmental Funding Needs: Regression Modeling of Historic Project and Program Costs". Federal Facilities Environmental Journal. 12(3): 25-37. DOI: 10.1002/ffej.1014

25. Good, I.J. 1966. "Speculations Concerning the First Ultraintelligent Machine". *Advances in Computers*. 6: 31-88.

26. Hadshar, R. 2023. "A Review of the Evidence for Existential Risk from AI via Misaligned Power-Seeking". *ARXIV: Computers and Society*. October 27, 2023. https://arxiv.org/abs/2310.18244

27. Hagendorff, T. 2020. "The Ethics of AI Ethics: An Evaluation of Guidelines". *Minds and Machines*. 30: 1–22.

28. Hammond, S. 2023. "AI, Techno-Feudalism, and the Future of the State: As AI Technology Continues to Swiftly Develop, The Role of Government may soon Undergo a Radical Transformation". The Mercatus Center, George Mason University: Fairfax, VA. https://www.mercatus.org/macro-musings/sam-hammond-ai-techno-feudalism-and-future-state

29. IBM (International Business Machine). 2024. "What Is Narrow AI and What Are Its Applications?". *Big Blue Data Academy: Data Science Stories*. February 11, 2024. https://bigblue.academy/en/narrow-ai#:~:text=Narrow%20AI%20is%20highly%20effective,sorting%20and%20categorizing%20different%20faces.

30. Jin, G., X. Ni, K. Wei, J. Zhao, H. Zhang, and L. Jia. 2025. "Will the Technological Singularity Come Soon? Modeling the Dynamics of Artificial Intelligence Development via Multi-Logistic Growth Process". *ARXIV: Physics*. Cornell University: Cornell, NY. https://arxiv.org/abs/2502.19425?utm_source=chatgpt.com

31. Jiang, S., Y. Pena, D. Gines, T. Lang, and M. Hwang. 2024. "Artificial Intelligence Impact on Labor Markets: Literature Review". The International Economic Development Council: Washington, D.C.

32. Johnson, A. 2023. "Which Jobs Will AI Replace? These 4 Industries Will Be Heavily Impacted". *Forbes*. Mar 30, 2023.

33. Jones, C.I. 2024. "The AI Dilemma: Growth versus Existential Risk". *American Economic Review: Insights*. 6(4): 575–590 https://doi.org/10.1257/aeri.20230570 575

34. Kasirzadeh, A. 2025. "Two Types of AI Existential Risk: Decisive and Accumulative". *Philosophical Studies*. 182, 1975–2003. https://doi.org/10.1007/s11098-025-02301-3

35. Keynes, J.M. 1930. *A Treatise on Money*. McMillian and Co.: London, UK.

36. Kinder, M., X. de Souza Briggs, M. Muro, and S. Liu. 2024. "Generative AI, the American Worker, and the Future of Work". The Brookings Institute: Washington, D.C. https://www.brookings.edu/articles/generative-ai-the-american-worker-and-the-future-of-work/

37. Kurzweil, R. 2024. *The Singularity is Nearer: When we Merge with AI*. Penguin Press: New York, NY.

38. Kurzweil, R. 2004. *The Singularity is Near*. Viking Press: New York, NY.

39. LessWrong.com. 2020. "Can we Model Technological Singularity as the Phase Transition?" Post by Valantine2026. *LessWrong.com.* https://www.lesswrong.com/posts/iPPe7qbZNcu5MsfPo/can-we-model-technological-singularity-as-the-phase

40. Maranto, A.R. 2024a. "The Challenges of Artificial Intelligence in Organizational Leadership and the Importance of Human-In-The-Loop Authority". *Pacific Journal of Science and Technology*. 25(2): 81-93.

41. Maranto, A.R. 2024b. "The Boundary Layer between Science and Policy in Public Decision Making". *Pacific Journal of Science and Technology*. 25(1): 120-131.

42. Maranto, A.R. 2019. "Where Science Meets Policy: The Nexus of Decision Making in Modern Society". In: *Educational Transformation: The*

University as Catalyst for Human Educational Transformation. D.C. Capogrossi, ed. Akamai University Press: Hilo, HI. 10-28.

43. Maranto, A.R. 1998. “Classic Barriers to Novel Science”. *Exotic Research Report*. 2(4): 61-64.

44. Maranto, A.R. and J. Stern. 2022. “Historic Perspective on the use of Weapons-of-War and Military Technology by Private Citizens within the United States”. *Pacific Journal of Science and Technology*. 23(2): 92-11.

45. Mearsheimer, J.J. 2001. *The Tragedy of Great Power Politics*. W.W. Norton & Company: New York, NY.

46. Mehlman, B. 2025. “Machine Politics”. Buce Mehlman: Age of Disruption. Six Chart Sunday Newsletter. August 10, 2025. https://brucemehlman.substack.com/

47. Mittelstadt, B. 2019. “Principles Alone Cannot Guarantee Ethical AI”. *Natural Machine Intelligence.* 1: 501–507 (2019). https://doi.org/10.1038/s42256-019-0114-4

48. Muller, V.C. and N. Bostrom. 2016. “Future Progress in Artificial Intelligence: A Survey of Expert Opinion”. *Fundamental Issues of Artificial Intelligence*. Springer: Berlin, Germany. 553-571.

49. Najafi, I. 2025. “How Not to be a Peasant in AI-Techno-Feudalism”. *Medium*. https://imannajafi.com/how-not-to-be-a-peasant-in-ai-techno-feudalism-998d76914f12

50. Naqvi, A. 2017. “Responding to the Will of the Machine: Leadership in the Age of Artificial Intelligence”. *Journal of Economics Bibliography*. 4(3): 244- 250.

51. Nolan, B. 2023. “AI Systems like ChatGPT Could Impact 300 Million Full-Time Jobs Worldwide, with Administrative and Legal Roles Some of the Most at Risk, Goldman Sachs Report Says”. *Business Insider*. https://www.businessinsider.com/generative-ai-chatpgt-300-millionfull-time-jobs-goldman-sachs-2023-3.

52. Peifer, Y., T. Jeske, and S. Hille. 2022. “Artificial Intelligence and its Impact on Leaders and Leadership”. *Procedia Computer Science*. 200: 1024–1030.

53. Rani, U. and R.K. Dhir. 2024. “AI-Enabled Business Model and Human-in-the-Loop (Deceptive AI): Implications for Labor”. In: *Handbook of Artificial Intelligence at Work*. M. Garcia-Murillo, I. MacInnes, and A. Renda (eds.). Edward Elgar Publishing: Glos, UK. 47-75. https://www.elgaronline.com/edcollchap/book/9781800889972/book-part-9781800889972-11.xml

54. Russell, S. D. Dewey, and M. Tegmark. 2015. “Research Priorities for Robust and Beneficial Artificial Intelligence”. *AI Magazine*. 36 (4). https://doi.org/10.1609/aimag.v36i4.2577

55. Sanders-Zakre,A. 2017. “Man Who Saved the World Dies at 77”. Arms Control Association. https://www.armscontrol.org/act/2017-10/news-briefs/man-who-saved-world-dies-77

56. Savage, S., G. Avila, N.E. Chávez, and M. Garcia-Murillo.2024. “AI and National Security”. In: *Handbook of Artificial Intelligence at Work*. M. Garcia-Murillo, I. MacInnes, and A. Renda (eds.). Edward Elgar Publishing: Glos, UK. 276-290. https://www.elgaronline.com/edcollchap/book/9781800889972/book-part-9781800889972-22.xml

57. Schellekens, P. and D. Skilling. 2024. “Three Reasons Why AI May Widen Global Inequality”. Center for Global Development: Washington, D.C. https://www.cgdev.org/blog/three-reasons-why-ai-may-widen-global-inequality

58. Schwartz, R., A. Vassilev, K. Greene, L. Perine, A. Burt, and P. Hall. 2022. “Towards a Standard for Identifying and Managing Bias in Artificial Intelligence”. NIST Special Publication 1270. NIST: Washington, D.C. https://doi.org/10.6028/NIST.SP.1270

59. Shapiro, D. 2024. “The ‘I Just Realized how Huge AI Is!’ Survival Kit”. *David Shapiro’s Substack: AI, Humanity, Future, Philosophy, and Systems Thinking*. Dec 02, 2024. https://daveshap.substack.com/p/the-i-just-realized-how-huge-ai-is

60. Sholler, D. and I. MacInnes. 2024. “AI and Income Inequality: The Danger of Exacerbating Existing Trends toward Polarization in the US Workforce”. In: *Handbook of Artificial Intelligence at Work*. M. Garcia-Murillo, I. MacInnes, and A. Renda (eds.). Edward Elgar Publishing: Glos, UK. 338-355. https://www.elgaronline.com/edcollchap/book/9781800889972/book-part-9781800889972-26.xml

61. Smith, R., B. Alderman, and C. deVos. 2023. “Ontological Shock: The Accelerating Emergence of Artificial Intelligence”. *Integrallife*. May 9, 2023. https://integrallife.com/ontological-shock-the-accelerating-emergence-of-artificial-intelligence/

62. Sparrow, B, J. Liu, and D.M. Wegner. 2011. “Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips”. *Science*. 333(6043): 776-778. DOI: 10.1126/science.1207745

63. Sterling, B. 2014. "The Singularity: There's No There There". In: *What Should We Be Worried About? Real Scenarios that Keep Scientists Up at Night.* J. Brockman (ed). 34. Bright & Happy, LLC.: Libertyville IL.

64. Tegmark, M. 2014. "Will there be a Singularity Within Our Lifetime?" In: *What Should We Be Worried About? Real Scenarios that Keep Scientists Up at Night.* J. Brockman (ed). 30. Bright & Happy, LLC.: Libertyville IL.

65. Topete, A., C. He, J. Protzko, J. Schooler, and M. Hegarty. 2024. "How is GPS used? Understanding Navigation System use and its Relation to Spatial Ability". *Cognitive Research: Principles and Implications*. 9: 16. https://doi.org/10.1186/s41235-024-00545-x

66. Vallor, S. 2015. "Moral Deskilling and Upskilling in a New Machine Age: Reflections on the Ambiguous Future of Character". *Philosophy and Technology*. 28 (1): 107-124.

67. Vinge, V. 1993. "The Coming Technological Singularity: How to Survive in the Post-Human Era". VISION-21 Symposium, sponsored by NASA Lewis Research Center and the Ohio Aerospace Institute, March 30-31, 1993. NASA Technical Reports, NASA CP-10129.

68. Wallach, W. and C. Allen. 2009. *Moral Machines: Teaching Robots Right from Wrong*. Oxford University Press: London, UK. https://doi.org/10.1093/acprof:oso/9780195374049.001.0001

69. Whang, S.E., Y. Roh, H. Song, and J.G. Lee. 2023. "Data Collection and Quality Challenges in Deep Learning: A Data-Centric AI Perspective". *The VLDB Journal: The International Journal on Very Large Data Bases*. 32: 791–813.

70. Zhuang, S. and D. Hadfield-Menell. 2020. "Consequences of Misaligned AI". *Proceedings of Advances in Neural Information Processing Systems* 33 (NeurIPS 2020). H. Larochelle, M. Ranzato, R. Hadsell, M.F. Balcan, and H. Lin (Eds.).

ABOUT THE AUTHOR

Dr. Anthony Maranto has over 30 years of experience as a researcher, educator, program manager, and business leader. He has spent over 15 years as a consultant to civil science programs at the National Oceanic and Atmospheric Agency, National Aeronautics and Space Administration, and the National Institutes of Health. He has also spent 12 years as a consultant to the US Department of Defense where he was extensively involved in technology adaptation, compliance, and environmental programs as well as a variety of projects in the Chemical, Biological, Radiological, and Nuclear (CBRN) defense arena. Dr. Maranto has held academic and administrative posts at several universities and colleges. As a researcher, he has published or presented over 50 technical papers and reports on a wide array of topics including environmental management, strategic planning, technological advancement, organizational leadership, carcinogenic risk assessment, radioecology, health physics, data quality control, risk based funding, and neurological receptor modeling.

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