Human Dependence on Artificial Intelligence

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May 6, 2025

1 Introduction

Throughout history, humanity's relationship with technology has been a defining force in shaping civilizations. From primitive tools that extended physical reach to complex machines that revolutionized economies, technology has always reflected and molded the values, habits, and self-understanding of the societies that develop and use it. Each technological shift brings with it not only new possibilities but also new dependencies, raising ethical questions about what is gained, what is lost, and what kind of people we become in the process.

The rise of artificial intelligence (AI) marks a profound turn in this historical trajectory. Unlike earlier tools, AI systems increasingly take on tasks once considered the exclusive domain of human beings, such as language, image, and audio processing. As AI becomes more deeply integrated into education, labor, communication, and decision-making, it challenges traditional notions of autonomy, expertise, and moral responsibility.

This paper views the ethical dimensions of human dependence on AI, situating it within a broader historical and philosophical context. We argue that the ethical evaluation of AI reliance cannot be reduced to outcomes or abstract principles alone. Instead, it demands a deeper reflection on the kind of human beings we are becoming through our use of these technologies. Virtue ethics, with its focus on character, habit, and moral development, offers the most holistic and sustainable ethical framework for navigating the age of intelligent machines.

Drawing from historical examples, from antiquity to the industrial age, and analyzing current trends in AI usage through multiple ethical lenses, we aim to understand how technological tools have consistently shaped human culture and understanding of life itself. In doing so, we identify both the risks of moral and intellectual decline as well as the potential for human flourishing, depending on how we choose to relate to AI systems. Our thesis is that only by cultivating virtues such as wisdom, responsibility, and critical discernment can individuals and societies learn to use AI in ways that enrich rather than diminish our humanity.

2 Background

The story of human development includes our relationship with tools and machines. From early agricultural tools that let early civilizations take shape, to pocket-sized computers that carry the world's accumulated knowledge, technological dependence has always been highly correlated with societal evolution. An interesting case is that of Ancient Mediterranean civilizations, which were highly advanced in engineering and infrastructure, yet relied heavily on slave labor. This reliance on human labor limited the necessity of developing labor-saving machines, as the cost of human labor was low and readily available. This paradox illustrates the heavy link between technological development and cultural values.

2.1 Antiquity

When humans first began to settle, the agricultural lifestyle led to the development of tools to aid in farming. The wheel, plow, and loom were all early innovations that allowed for more efficient work. These tools extended human capabilities in farming, transportation, and trade.

The ambitions of some of these cultures led to a regional dominance that would last for centuries. The Romans, for example, built aqueducts and roads that allowed them to expand their empire and maintain control over vast territories.

However, as ancient civilization expanded, so did the reliance on slave labor to perform both skilled and unskilled work. This abundance of cheap, forced labor reduced the incentive to develop new tools and technologies. Scholars such as Mark Elvin call similar phenomena in other cultures *high-level equilibrium traps*, where societies become stagnant due to the over-reliance on human labor (contributors, 2025). Tasks that could have been automated or optimized were instead carried out by enslaved people, making technological advancement not only economically unnecessary, but entirely counterproductive. Innovation in engineering and productivity stagnated, not due to a lack of knowledge or potential, but because of the limits of the current system based on the exploitation of human labor (Cartwright, 2017).

A demonstration of this is the 1st century AD steam-powered device invented by Greek-Egyptian engineer Heron of Alexandria. The aeolipile, as it is known, used steam pressure to create rotational motion. While the power of the steam engine is evident today, the aeolipile was detached from practical application. It was used primarily for religious ceremonies and entertainment, more as a toy than a tool for labor (Nugent, 2020). In the worldview of antiquity, this was the most logical use for such a device. Despite being a marvel of engineering, it was hindered by the cultural context of the time, which did not see the necessity for such a device to replace human labor.

Figure 1: Heron's aeolipile, an early steam engine.

2.2   The Middle Ages

The historical narrative often paints the Middle Ages as a time of stagnation and decline, especially in contrast to the scientific achievements of ancient Rome or the Renaissance. But this view oversimplifies a period that saw significant developments in technology, philosophy, and social organization. Inventions such as the mechanical clock, windmill, and watermill reflected practical innovation driven by necessity (Wikipedia contributors, 2025b). Meanwhile, universities were established, and scholars preserved and expanded upon classical knowledge, making scholasticism the dominant intellectual movement of the time.

During this time, the Church preserved knowledge and promoted moral discourse through monasteries and early universities. While incorporating classical ideas into Christian theology, the Church also challenged the ancient worldview, emphasizing human dignity (Wikipedia contributors, 2025c). This would later bloom into the Renaissance, where technological advancements and humanism flourished

2.3 Renaissance to Enlightenment

The Renaissance was the culmination of centuries of intellectual and cultural development, leading to a massive interest in the arts, sciences, and philosophy. The invention of the printing press during this period had a revolutionary impact, greatly increasing the accessibility of knowledge and contributing to rising literacy rates.

Humanists such as Erasmus and David Hume, though separated by centuries, shared a focus on human reasoning and moral inquiry. Erasmus, a Catholic scholar, called for renewal within the Church through classical education and virtue ethics, while Hume questioned the foundations of knowledge itself through empirical skepticism. These two different approaches would come to define the technological advancements in the centuries to come, as they both shifted the focus from community and tradition to the individual and his own ability to reason (Cartwright, 2020).

This mindset continued into the Enlightenment, where reason and scientific thinking became the primary way of understanding the world and human existence. Out of this period of mass technological innovation, the Industrial Revolution developed, which mechanized production and transformed economies.

2.4 Industrialization

The Industrial Revolution marked a fundamental shift in the relationship between humans and machines. Unlike previous technologies that merely assisted human labor, industrialization introduced large-scale mechanization that restructured economies and reshaped daily life. This shift provoked philosophical reflection on the consequences of replacing human effort with machine power (Wikipedia contributors, 2025a). Thinkers such as John Stuart Mill and Karl Marx offered different critiques of this transformation. Mill acknowledged the benefits of technological progress but warned of its potential to undermine liberty and well-being if not guided by moral responsibility. Marx argued that industrial capitalism alienated workers, turning them into mere appendages of machines and severing their connection from the products of their labor. Later philosophers such as Lewis Mumford extended this critique, distinguishing between democratic technologies that empowered individuals and authoritarian ones that centralized power and control.

Culturally, industrialization shifted people's relationship with time, work, and daily existence. Factories replaced the natural rhythms of farm life with strict schedules governed by clocks. As people moved in to cities seeking factory employment, both family dynamics and community structures underwent change. Tools were no longer extensions of personal craftsmanship but parts of large, impersonal systems of production. Humanity was faced with a paradox: the new era showed remarkable human achievement while simultaneously creating a sense of detachment from traditional ways of working and living. Tension between advancement and alienation would later resurface with computers and eventually AI, as each new technology wave promised efficiency while disrupting long-established human patterns.

2.5 The Era of Artificial Intelligence

Turing's early conjecture that machines might one day *think* (Turing, 1950) and the optimistic *physical symbol system* hypothesis of Newell and Simon (Newell & Simon, 1976) set the stage for viewing AI as capable of performing human-like intellectual tasks. Indeed, pioneers of *classical AI* (symbolic, rule-based programs) argued that a suitably programmed computer could exhibit any pattern of responses achievable by a human mind (Churchland & Churchland, 1990). This optimism implied that AI might eventually augment or even surpass human cognition in certain domains, encouraging reliance on such systems for their superior efficiency or consistency.

At the same time, skeptics have long cautioned against overestimating AI's abilities. Philosophers such as Dreyfus argued that human intelligence is rooted in a contextual understanding and experience that formal algorithms cannot simply replicate (Dreyfus & Dreyfus, 1988). Searle's Chinese Room thought experiment further contended that even an AI that perfectly mimics human responses might lack genuine understanding or consciousness (Searle, 1980). Weizenbaum, an early AI developer-turned-critic, warned that society should establish limits on what tasks are appropriate to delegate to machines (Weizenbaum, 1976). He was disturbed to find users treating his simple psychotherapy chatbot as if it were a real counselor, and he decried as *perverse* the notion that a computer program could serve as an effective

psychotherapist (Weizenbaum, 1976). These divergent viewpoints—ranging from enthusiasm about AI's potential to skepticism about its limitations—inform the ethical analysis of human dependence on AI.

Just as culture and technology have shaped each other throughout history, the rise of AI continues this pattern. While technical progress in AI is heavily funded and actively researched, its broader social impact often receives less attention. Therefore, studying society's growing dependence on AI systems is of interest and necessity.

3   Human Dependence on AI

In what follows, we consider this issue from four major ethical perspectives (*consequentialist, deontological, virtue ethics*, and *care ethics*), alongside real-world examples in domains such as education, creativity, decision-making, and knowledge work. Each perspective highlights different benefits, risks, and moral considerations surrounding our growing reliance on AI.

3.1   Consequences of AI Reliance: Benefits and Risks

A **consequentialist** evaluation of human dependence on AI focuses on outcomes: what harms or benefits result from relying on AI in various roles? On the positive side, AI systems can dramatically improve efficiency, accuracy, and access to services. In knowledge-intensive work, for example, recent studies show that AI assistance can boost human productivity and quality of output. Noy and Zhang found that providing professionals with a generative AI tool (ChatGPT) significantly reduced the time needed to complete writing tasks (by roughly 40%) and improved the quality of their work. In particular, productivity gains were greatest for lower-skilled workers suggesting that AI can help close performance gaps (Noy & Zhang, 2023). Such outcomes support the view that dependence on AI augments human capabilities, potentially increasing overall welfare. In education, AI tutoring systems and search engines give students instant access to information and personalized help, which may enhance learning outcomes in some cases. From a utilitarian perspective, if AI-driven tools help people learn more effectively or make better decisions, then encouraging their use is ethically desirable.

However, a pure focus on positive outcomes must be balanced against the potential negative consequences and externalities of AI reliance. One obvious risk is the loss or atrophy of certain human skills when we outsource tasks to machines. Empirical evidence is accumulating that over-reliance on AI or automation can diminish human expertise in critical areas. For instance, heavy use of GPS navigation is correlated with a decline in users' spatial memory and navigational skills. In one longitudinal study, participants with greater habitual GPS use performed worse on map-based memory tasks and showed a steeper decline in hippocampus-dependent spatial memory over time, compared to those relying on their own navigation abilities (Dahmani & Bohbot, 2020). In a similar vein, researchers have observed a *Google effect* on memory: people are less likely to retain information that they know is easily accessible via an Internet search, indicating that individuals shift to remembering *where* to find answers rather than the answers themselves (Sparrow, Liu, & Wegner, 2011). These findings suggest that while AI systems can efficiently handle certain cognitive tasks, the convenience comes at a cost — users may become less proficient in those tasks, potentially leading to long-term deficits in knowledge or problem-solving ability. For a consequentialist, such trade-offs (immediate gains in efficiency vs. gradual erosion of human skills) must be carefully weighed. The net utility of AI dependence will depend on whether the benefits (e.g. error reduction, cost savings, increased output) outweigh the harms (e.g. skill loss, new systemic vulnerabilities) for individuals and society.

There are also broader societal consequences to consider. Widespread dependence on AI could lead to unemployment or displacement in certain professions, as machines perform tasks formerly done by humans. While increased productivity is a benefit, the distribution of that benefit matters: if it accompany to employers while many workers lose their livelihoods, the overall consequences may be ethically negative unless mitigated by social policies. Additionally, some benefits of AI come with hidden risks. In creative fields, for example, generative AI tools can help users produce novel work more easily, but they might also homogenize creativity in the long run. A recent experiment had writers create stories with and without AI-generated ideas: those with AI assistance wrote stories that were rated more creative and enjoyable (especially among less experienced writers), yet the collective diversity of ideas in the AI-assisted group was lower, as many followed similar AI-suggested themes (Doshi & Hauser, 2024). This illustrates a subtle consequentialist dilemma: what maximizes one individual's success (using AI to

generate high-quality work quickly) could, when adopted by many, reduce the richness of outcomes at the societal level (less diversity and innovation).

In summary, a consequentialist approach highlights that human dependence on AI brings clear practical advantages and significant risks. It calls for empirically examining outcomes of AI use in each context (education, medicine, transportation, etc.) and promoting dependency on AI only as far as it produces a net benefit. This analysis must account not only for immediate effects like efficiency and accuracy, but also for indirect and long-term consequences such as skill degradation, economic disruption, and impacts on collective well-being.

3.2 Deontological perspective on Autonomy, Accountability, and the Duty of Human Oversight

From a **deontological** perspective, the ethics of AI dependence goes on principles such as autonomy, duty, rights, and the moral limits of delegation. Even if AI systems produce good outcomes on average, there may be certain decisions or responsibilities that we have a *moral duty* not to hand over to machines. One central concern is the preservation of human autonomy and agency. Immanuel Kant, for example, emphasized the importance of humans exercising their rational will; blindly outsourcing one's judgment to an algorithm could be seen as a failure to respect one's own rational agency. If individuals become overly dependent on AI recommendations—accepting a system's outputs without critical reflection—they risk becoming, in effect, tools of their tools. Weizenbaum argued that some human functions (especially those involving moral judgment or empathy) should never be delegated to a machine, no matter how capable, because doing so undermines human dignity and responsibility (Weizenbaum, 1976). He drew a sharp line between using computers for mechanical control (e.g. an autopilot keeping an airplane on course) and using them for roles that require human understanding (e.g. interviewing psychiatric patients or providing counsel) (Weizenbaum, 1976). According to this view, there is an ethical duty to maintain *human in the loop* control over certain domains of life, to ensure that moral responsibility and understanding remain distinctly human.

Closely related is the issue of accountability. Deontological ethics is concerned with who has to answer for an action. When humans rely on AI to make decisions—such as an algorithm deciding who is approved for a loan or which medical treatment to administer, there is a risk of creating a responsibility gap. If the AI makes a harmful error, who is to blame: the user, the developer, or the machine itself? Since current AI systems are not moral agents that can bear responsibility, deontologists would argue that it is unethical to abdicate decision-making entirely to them. The EU's AI regulations and many ethical guidelines underscore the principle that humans must retain final accountability for decisions recommended by AI. In practice, this means mechanisms like requiring human review of algorithmic decisions in high-stakes contexts (often termed *meaningful human oversight*). Reliance on AI should not become an excuse to avoid human responsibility. For instance, a doctor who unquestioningly follows an AI's diagnosis without understanding it violates the professional duty of care, even if the AI is highly accurate, because the doctor cannot justify the decision to the patient or take responsibility for it.

Another deontological concern is the potential violation of rights or moral rules by AI systems, especially when humans trust them unconditionally. Consider algorithmic decision systems used in criminal justice (e.g., risk assessment tools for sentencing or parole). Even if such a system improves consistency (a consequentialist benefit), it might infringe on an individual's right to be judged by a human or the right to a fair hearing, if the algorithm's criteria are opaque or biased. There is a principled argument that certain decisions, such as taking someone of liberty, should to be made through human deliberation rather than by a computational formula. Delegating these decisions to AI could be seen as treating persons as mere data points, failing to respect each individual's unique situation and dignity. A deontologist might also invoke Kant's injunction against treating persons as mere means: if an organization uses AI to make choices that affect individuals (hiring, policing, etc.) without regard for their individuality, this could be inherently immoral, regardless of the outcome quality.

Finally, the nature of human-AI interaction raises the issue of **trust**. While trust itself is not exclusively a deontological concept, inappropriate trust in AI systems can lead to de facto loss of autonomy. Empirical studies of human–AI interaction document phenomena like *automation bias*, where users become over-reliant on automated suggestions even when there are warning signs the system may be wrong. In a public administration context, for example, researchers found that decision-makers often showed an *unquestioning trust* in algorithmic recommendations, accepting them without sufficient critical evaluation

([Kupfer et al.](#), [2023](#)). This tendency to place too much trust in AI can result in errors going uncorrected and can undermine the moral duty of due diligence. To counteract this, some have suggested that users must be trained and obligated to critically monitor AI outputs, not just obey them. In deontological terms, users have a responsibility to **treat the AI's advice as informational input**, not as a final command, and to exercise independent judgment.

In summary, a deontological analysis urges caution in ceding control to AI. It emphasizes maintaining human governance over AI decisions to uphold moral agency and accountability, adhering to constraints of duty and rights even when automation might seem more efficient. Humans depending on AI should do so in a way that preserves their role as ultimate decision-makers who can answer for the outcomes.

3.3 Character, Habit, and the Impact on Human Virtues

Virtue ethics shifts the focus from rules or outcomes to the development of moral character and the cultivation of virtues through habitual action. From this perspective, the question becomes: How does relying on AI shape the kind of people we are and the virtues we embody? Human dependence on AI could potentially either support or undermine various virtues. On one hand, using AI wisely might reflect the virtue of prudence (practical wisdom) — for example, a doctor who consults an AI-based diagnostic tool but then thoughtfully verifies and integrates its suggestions with her own expertise could be seen as exercising good judgment. Similarly, willingness to learn and collaborate with AI might be cast as a form of intellectual humility and open-mindedness, recognizing the limits of one's own knowledge and the value of external tools. In some scenarios, AI assistance might free people from cognitive labor, allowing them to engage more deeply in creative or empathetic activities that cultivate human excellence. For instance, an AI system that automates routine bookkeeping could give a professional more time to apply human insight and integrity to complex analytical problems, potentially strengthening virtues like creativity or conscientiousness in their work.

On the other hand, heavy reliance on AI can encourage certain vices or weaken the development of virtues. One prominent worry is the fostering of laziness or cognitive complacency. If students get a habit to rely on AI to solve math problems or write essays, they may fail to develop the attitude that leads to be hardworking, careful, and persistent, or lose the determination in learning. Over time, this could stunt the growth of intellectual virtues such as curiosity, critical thinking, and intellectual courage (the willingness to tackle difficult problems without an immediate shortcut). A virtuous learner, in Aristotelian terms, would practice and internalize skills through effort; outsourcing that effort to an AI might produce a generation of learners who lack the depth that comes from struggling with challenging tasks. Empirical data lend some support to these concerns. For example, when writing with AI autocompletion or editing tools, people may be less inclined to carefully review and improve their own texts, potentially diminishing their writing skill and mindfulness over time. In the experiment by Doshi et al. mentioned earlier, writers with access to AI ideas produced individually better stories, but those stories also became formulaic ([Doshi & Hauser](#), [2024](#)). One could interpret this as a cautionary tale: the crutch of AI-provided ideas may inhibit writers from fully exercising originality and imagination, qualities central to the virtue of creativity.

Additionally, reliance on AI might weaken our sense of moral mindfulness and empathy if we start treating complex human situations as optimization problems to be handed to a machine. For instance, consider a manager who uses an AI tool to rank employees for layoffs solely by algorithmic efficiency metrics. By referring to the tool, the manager might blunt the development of virtues like compassion, fairness, or moral discernment, which would ordinarily be engaged in making such a painful decision. Virtue ethicists would ask whether the habitual use of AI in one's daily practices leads to an erosion of **practical wisdom**, the ability to see what is morally correct in a situation. If AI systems provide quick answers or recommendations, a person might not practice the skill of deliberation as often, possibly impairing their ability to navigate ethical challenges in the future.

At the same time, virtue ethics recognizes that technology itself does not corrupt or promote character in isolation; it depends on how the technology is integrated into life. It is possible to cultivate **virtues of technology use** — traits like perception, moderation, and tech-savviness in choosing when to rely on AI and when not to. For example, an excellent clinician in an age of AI will neither reject decision support out of hand (which might be prideful stubbornness) nor accept it uncritically (which might be careless dependence), but rather engage with it thoughtfully, seeking a harmony between human insight and machine analysis. The goal from a virtue perspective would be to train users of AI to develop

good habits: always double-checking important results, staying curious about how the AI reached its conclusions, and practicing the underlying skills so as not to lose them entirely. In practical terms, this could involve education that emphasizes **AI literacy** as a virtue — understanding the strengths and weaknesses of AI tools is part of being a responsible, virtuous user of them.

In summary, virtue ethics draws attention to the long-term character implications of human-AI relationships. It warns that unreflective dependence on AI can lead to the atrophy of desirable traits like intellectual autonomy, creativity, and empathy. Conversely, conscious and moderated use of AI, guided by virtues like precaution and responsibility, can potentially enrich human activity by offloading tedious work while keeping our most human virtues sharp. The ethical aim should be to foster individuals who use AI in a way that strengthens, rather than weakens, their virtue and wisdom.

3.4   Care, Relationships, and Social Dimensions of AI Dependence

Care ethics offers yet another angle by focusing on relationships, context, and the ethic of care and responsibility toward others. This framework asks how AI dependence affects human relationships, our capacity for empathy, and the well-being of the most vulnerable. One key question is whether delegating caring roles to AI systems undermines the quality of care and the caregiver–receiver relationship. For example, AI-powered companion robots and digital assistants are increasingly proposed for roles such as eldercare, therapy, or education. A care ethicist would note that while these technologies can provide some functional support or simulation of interaction, genuine care is not merely about tasks or information — it involves emotional presence, understanding, and corresponding concern, which AI cannot truly alternate. If children grow up interacting primarily with robot nannies or AI tutors, we might worry that they will be lacking of important emotional scaffolding that comes from human-to-human care, such as the communication of empathy, trust, and shared vulnerability. The dependency on AI in such intimate contexts could lead to a thinning out of human relationships. Sherry Turkle, for instance, has documented cases of children preferring the predictable comfort of a robot toy over peers, which raises concerns that reliance on robotic companions might stunt the development of empathy and social skills in the long run (Turkle 2011). Although an AI might efficiently soothe or distract a child, it does not engage in the mutual growth of a caring relationship.

Weizenbaum's objection to AI therapists can be understood in this light as well. He argued that certain roles, by their very nature, demand human empathy and moral responsibility, and that giving those roles to machines is a fundamental betrayal of the people in need of care (Weizenbaum, 1976). A patient pouring out their emotions to an *AI therapist* might receive canned responses that imitate empathy, but there is no genuine understanding or moral commitment behind the machine's replies. From a care ethics standpoint, this is problematic because it treats the patient as if their need for human connection can be met by a simulation. The patient might even form an emotional attachment to the AI, but this attachment is one-sided and lacks the mutuality that real caring relationships have. This could be seen as a kind of exploitation of the person's need for care. Moreover, if society were to normalize AI caregivers or counselors, it might reduce the perceived obligation to provide human care for those who are vulnerable, effectively outsourcing empathy to machines. Care ethicists would likely find that trend troubling, as it could erode the societal ethic of caring for one another.

On the other hand, care ethics also acknowledges interdependence and the importance of contextual solutions. Some might argue that AI, if used appropriately, could augment care rather than replace it. For example, an AI system could monitor an elderly patient's health signals and alert human nurses to issues, enabling caregivers to provide timely attention. In education, an AI tutor might handle repetitive drills, freeing the human teacher to focus on the emotional and creative mentorship aspects of teaching that an AI cannot provide. In these scenarios, the AI is a tool that supports human care relationships, not a substitute for them. The ethical imperative from a care perspective would be to ensure that AI is integrated in a careful way — one that is attentive to the needs of particular individuals and that strengthens the network of care around them. This might mean designing AI systems to be transparent collaborators that keep human caregivers in the loop, and always keeping a human caregiver responsible for the overall well-being of the person receiving care.

Care ethics also raises concerns about how AI systems are designed and whether they embody values of care or undermine them. Many current AI technologies are developed by large tech companies with profit motives, which may not align with the needs of marginalized or care-dependent groups. If, for instance, an AI caregiving application prioritizes efficiency (number of patients served) over quality of engagement,

it could push human caregivers to adopt a transactional model of care contrary to their professional ethos. Furthermore, biases in AI systems (such as biased language models or facial recognition that works poorly on certain demographics) can lead to unequal care or attention — a violation of the care ethic's emphasis on responding to needs in their particularity. Ensuring that AI tools in caregiving or community settings are inclusive, culturally sensitive, and adjustable to individual contexts is crucial. The process of implementing AI should involve listening to caregivers and care-receivers, treating their input as central (rather than imposing a one-size-fits-all solution).

In essence, care ethics would demand that human dependence on AI be guided by compassion and attentiveness: AI should be used in ways that *enhance the capacity to care* within relationships and communities, and not as a cold replacement for human concern.

4   Discussion

Analyzing human dependence on AI through these varied ethical frameworks reveals a multifaceted picture. **Consequentialism** highlights tangible benefits (increased efficiency, improved outcomes) but also concrete risks (skill erosion, homogenization, misuse consequences) that must be managed for a net positive impact. **Deontological ethics** reminds us of non-negotiable principles: maintaining human agency, upholding duties of oversight, and respecting the moral limits of delegation, even when AI performs well. **Virtue ethics** points to the subtle ways our tools shape our habits and character, urging a balance that preserves human virtues like wisdom, creativity, and empathy in the age of smart machines. **Care ethics** emphasizes the value of human connection and attentiveness, cautioning that no matter how sophisticated AI becomes, human caring relationships are irreplaceable in certain domains of life.

Taken together, these perspectives provide a critical but balanced understanding: human reliance on AI is neither inherently disastrous nor automatically beneficial. It depends crucially on **how** we incorporate AI into our lives, what safeguards and norms we establish, and whether we remain reflective about the kind of society we want to build with these powerful technologies.

4.1   Balancing Augmentation and Atrophy

The empirical evidence presented demonstrates a fundamental tension in human-AI relationships: technologies that augment our capabilities often simultaneously foster dependency. This pattern is not unique to AI but represents an acceleration of dynamics seen throughout technological history. The Romans' reliance on slave labor discouraged mechanical innovation; similarly, our increasing reliance on AI systems risks diminishing our cognitive capabilities through disuse.

4.2   Virtue Ethics as the Most Balanced Perspective

Among these ethical frameworks, we strongly believe that virtue ethics offers the most holistic and sustainable approach. The virtue ethics perspective resonates deeply with human nature itself, recognizing that the tools we regularly use shape our habits and, consequently, our character. Its emphasis on cultivating virtues like wisdom, moderation, and prudence directly addresses the core issue of dependency on AI: the risk of becoming passive users rather than thoughtful and intentional partners.

From a virtue ethics standpoint, the central question becomes how individuals can use AI in ways that support rather than erode their development as autonomous, thoughtful beings. This perspective encourages conscious and reflective interaction with AI, promoting intellectual virtues such as curiosity, critical thinking, and adaptability. By deliberately using AI as an aid—rather than as a crutch—people can enhance their capabilities, maintain cognitive resilience, and avoid intellectual stagnation.

However, virtue ethics is not without its challenges. The primary difficulty lies in its practical implementation. Virtue cultivation requires sustained effort, education, and self-awareness, conditions that are difficult to guarantee universally. It presupposes a certain level of societal commitment to education and moral development that might not always be feasible due to resource constraints, varying educational systems, or differing cultural priorities.

4.3 Education and Policy as the Crucial Factor

Our historical analysis suggests that societal values and economic structures profoundly influence how technologies develop and are integrated. Just as Heron's aeolipile remained a curiosity in a slave-based economy, today's AI developments will be shaped by our collective priorities and institutional frameworks.

Regardless of which ethical perspective one adopts, a recurring theme emerges: the central role of education. Proper education in AI literacy, critical thinking, and ethical reasoning appears essential to managing human dependence on AI effectively. Educational systems must teach not only how to use AI tools but, crucially, how to critically assess their limitations, biases, and impacts on human skills and society.

Implementing this educational shift faces real-world difficulties. Educational institutions must rapidly adapt curricula to incorporate AI literacy, balancing between teaching AI as an empowering tool and preserving students' independent thinking abilities. Yet, institutional immobility, economic constraints, and unequal access to technological resources pose significant barriers. Teachers themselves must be extensively trained and supported, creating additional logistical and financial burdens.

Nevertheless, embracing virtue ethics within education has the distinct advantage of preparing individuals for a lifelong ethical engagement with technology. Rather than solely imparting technical skills, virtue ethics-informed education develops resilient learners capable of critical thought, adaptability, and responsible decision-making.

Additionally, Policy frameworks must likewise balance innovation with safeguards against harmful dependency. This includes considering workforce transitions, promoting research into human-AI collaboration methods that preserve expertise, and potentially regulating AI deployment in domains where human skill preservation is deemed essential for societal resilience.

4.4 Comparing Virtue Ethics with Other Perspectives

Compared to consequentialism, virtue ethics avoids reducing complex human-AI interactions solely to measurable outcomes. Instead, it accounts for subtle but significant effects on human character development, emphasizing long-term growth over short-term gains. Compared to deontology, virtue ethics retains flexibility, advocating for a reflective rather than prescriptive approach, allowing for practical adjustments based on context. Against care ethics, virtue ethics acknowledges the critical importance of emotional intelligence and empathy but extends further, emphasizing broader intellectual virtues and moral character development, thus providing a more comprehensive ethical education for individuals.

4.5 The Reasonable Position of Virtue Ethics

Virtue ethics stands out as the most compelling approach because it gets to the heart of how we actually live with technology; how it shapes our cognition, habits, and ultimately, our identity. Throughout history, from the tool-making of early civilizations to the mechanization of the Industrial Revolution, humans have not only utilized technology but been transformed by it. As demonstrated in the background section, technological tools historically reflect prevailing cultural values and influence societal conceptions of labor, knowledge, and human purpose, making the philosophy of the culture and its tools deeply linked.

Virtue ethics fits this historical pattern by focusing on developing good character through repeated practices rather than simply following rigid rules or calculating outcomes. It grows with us as our relationship with technology evolves. While other perspectives offer valuable arguments (consequentialism's focus on results, deontology's emphasis on rights and duties, and care ethics' attention to relationships), virtue ethics uniquely addresses the person as a whole together with their ongoing development. This makes it especially relevant now, when AI increasingly mediates our choices, abilities, and connections with others.

However, it is important to note that contemporary virtue ethics, especially in secular moral philosophy, differs significantly from its classical roots. Aristotle's original formulation of virtue ethics was deeply embedded in a metaphysical and teleological worldview, where the ultimate good for humans (eudaimonia, as he called it) was closely tied to living in accordance with nature and, implicitly, with the divine order. In this classical view, cultivating virtue meant fulfilling one's divine purpose as a rational being within a cosmos that had moral structure and hierarchy, created an maintained by God. This, in a classical sense, would be explained as spiritual fulfillment. Modern secular adaptations of virtue ethics, by contrast, tend to frame virtue in terms of psychological flourishing, moral development, and practical

wisdom, without appealing to a transcendent or theological foundation. While the emphasis on habit and character remains central, the goal of virtuous living is generally seen in terms of human well-being rather than spiritual alignment. This plays into the mindset of the modern world, where the focus is on individual autonomy and self-actualization rather than a collective moral order, further defining the relationship between humans and AI.

5 Conclusion

The evolution of artificial intelligence has been marked by both optimism and skepticism. Although the tool is new, similar debates have occurred throughout every period in history. Just as the tools of past eras shaped not only how people worked but also how they thought, learned, and lived together, AI now reshapes the limits of human agency and cognition.

Historically, societies have mirrored their values through the technologies they embraced or neglected. From the stagnation caused by reliance on slave labor in antiquity to the alienation of industrial workers under mechanization, technological development has always been deeply dependent on cultural context. The same is true for AI: whether it serves as an empowering cognitive partner or a source of moral and intellectual atrophy will depend on how we choose to engage with it.

Ethical frameworks have been applied to analyze AI dependence, showing risen concerns for the erosion of human skills, the loss of moral agency, and the potential for exploitation. Among these frameworks, virtue ethics stands out for its focus on consistent character development and the cultivation of good habits. This approach is interested in not only what we can do with AI but also who we become through our interactions with it. It emphasizes the importance of education and policy in shaping our relationship with AI, advocating for a balanced approach that preserves human virtues while embracing technological advancements.

Education emerges as the linchpin for navigating this new reality. Beyond teaching technical skills, it must foster virtues like curiosity, judgment, and ethical reflection—traits that help individuals use AI wisely rather than passively. Likewise, thoughtful policy and institutional design are needed to ensure that AI deployment aligns with human dignity and societal resilience, for engineering ought not to be a mere technical endeavor but a moral one as well.

Ultimately, our goal should not be to resist technological change, but to shape it in accordance with human values. AI has the potential to enrich our lives, amplify our abilities, and expand our understanding; but that is only if we approach it with the virtue, care, and responsibility that such a powerful tool demands.

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