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Perspective

DeepSeek: Is it the End of Generative AI Monopoly or the Mark of the Impending Doomsday?

Malik Sallam[1,2,*], Kholoud Al-Mahzoum[3], Mohammed Sallam[4,5,6], Maad M. Mijwil[7,8]

[1] *Department of Pathology, Microbiology and Forensic Medicine, School of Medicine, The University of Jordan, Amman 11942, Jordan.*

[2] *Department of Clinical Laboratories and Forensic Medicine, Jordan University Hospital, Amman 11942, Jordan.*

[3] *Sheikh Jaber Al-Ahmad Al-Sabah Hospital, Ministry of Health, Kuwait City, Kuwait.*

[4] *Department of Pharmacy, Mediclinic Parkview Hospital, Mediclinic Middle East, Dubai P.O. Box 505004, United Arab Emirates.*

[5] *Department of Management, Mediclinic Parkview Hospital, Mediclinic Middle East, Dubai P.O. Box 505004, United Arab Emirates.*

[6] *Department of Management, School of Business, International American University, Los Angeles, CA 90010, United States.*

[7] *College of Administration and Economics, Al-Iraqia University, Baghdad, Iraq.*

[8] *Computer Techniques Engineering Department, Baghdad College of Economic Sciences University, Baghdad, Iraq.*

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ABSTRACT

The rise of superintelligent open-source generative AI (genAI) heralds both extraordinary potential and unprecedented risk, exemplified by the rapid emergence of DeepSeek as a global AI innovator. This perspective article examines the dual-edged nature of open source genAI technologies, highlighting their capacity to democratize innovation while exposing critical vulnerabilities. By providing affordable, high-performing, and openly available models like DeepSeek-R1 and DeepSeek-V3, this Chinese AI company has disrupted the proprietary dominance of Western AI giants. These advancements are expected to empower researchers in resource-limited settings, foster global collaboration, and enable breakthroughs across numerous fields. Open-source AI, as illustrated by DeepSeek, has the potential to redefine the technological landscape by making advanced capabilities accessible to underrepresented communities and encouraging ethical and inclusive innovation. However, the openness that drives such progress is fraught with existential risks. Superintelligent open-source models, accessible to anyone with minimal resources, lower barriers for misuse by malicious actors. From automated cyberattacks and disinformation campaigns to destabilizing critical infrastructures, the potential for harm is vast and unprecedented. Beyond immediate security concerns, these technologies threaten economic stability by displacing entire workforces and exacerbating inequalities, and they undermine human agency by enabling manipulation on an individual and societal level. This perspective seeks to explore the profound benefits of open-source superintelligent AI while critically addressing the urgent need for ethical and regulatory frameworks to mitigate its risks. The story of DeepSeek underscores the fragile balance between innovation and destruction in an era where technological progress outpaces safeguards. Humanity's ability to harness the transformative power of open-source AI without succumbing to its destructive potential is not just a technological challenge—it is an existential imperative. This perspective argues for vigilance, responsibility, and global cooperation to ensure that the promise of open-source AI serves humanity rather than imperiling it.

1. INTRODUCTION

In an era where artificial intelligence (AI) increasingly defines global innovation, the story of DeepSeek—a Chinese AI company founded by visionary entrepreneur Liang Wenfeng—stands as a testament to both the boundless potential of open-source AI and the existential risks it poses [1-3]. Backed by High-Flyer, a hedge fund turned AI powerhouse, DeepSeek operates from Hangzhou, Zhejiang, as a potential new leading force in the generative AI (genAI) landscape [1, 2]. While

*Corresponding author. Email: malik.sallam@ju.edu.jo

DeepSeek champions open-source AI development and resource efficiency, its emergence also underscores the profound geopolitical, ethical, and existential dilemmas associated with AI technologies [4, 5].

DeepSeek origins are deeply rooted in Liang Wenfeng's strategic foresight and entrepreneurial zeal [6]. High-Flyer, co-founded in 2016 by Liang, initially focused on financial trading, rapidly adopting AI-driven algorithms by 2019 and achieving full automation by 2021 [6]. Liang's ambitious pivot toward artificial general intelligence (AGI) began with the establishment of a dedicated lab in April 2023 [1, 6]. By May of that year, the lab was spun off as DeepSeek, a separate entity devoted to advancing AI research beyond financial applications [1, 6]. Despite skepticism from venture capitalists wary of long-term returns, Liang pressed forward, leveraging High-Flyer's resources to position DeepSeek as a formidable player in AI development [1, 2, 6]. A pivotal factor in DeepSeek rise was Liang's strategic acquisition of over 10,000 Nvidia (Nvidia Corporation, CA, USA; https://www.nvidia.com/) A100 graphics processing units (GPUs) prior to the imposition of U.S. export restrictions on advanced AI chips to China [7]. This stockpile enabled DeepSeek to develop and launch groundbreaking AI models with unparalleled efficiency. The company's first major release, DeepSeek Coder, debuted in 2023 as an open-source tool available under the Massachusetts Institute of Technology (MIT) license [8]. This bold move disrupted the closed-source dominance of Western genAI giants, marking DeepSeek as a symbol of democratized innovation [9].

The momentum continued with the launch of DeepSeek LLM, a 67-billion-parameter model designed to rival established AI systems like GPT-4 [10]. In May 2024, the company released DeepSeek-V2, priced at an astonishingly low 2 renminbi (RMB) per million output tokens [11]. DeepSeek managed to achieve profitability despite its aggressive pricing strategy, a rare feat in an industry marked by significant financial losses [12].

Benchmarking generative AI models is a cornerstone of assessing their transformative potential, providing critical insights into performance, efficiency, and applicability across diverse domains [13]. DeepSeek crowning achievement came with the December 2024 launch of DeepSeek-V3, a 671-billion-parameter model trained on a dataset of 14.8 trillion tokens [14]. The model, developed at a cost of $5.58 million—an order of magnitude less than its Western counterparts—boasted unprecedented efficiency [15]. Utilizing a mixture-of-experts framework with Multi-head Latent Attention Transformers, DeepSeek-V3 activated only 37 billion parameters per token, optimizing computational resource usage without compromising performance [14]. Benchmark results demonstrated that it outperformed leading Western models like Llama 3.1 and Qwen 2.5 while matching GPT-4o and Claude 3.5 Sonnet [3], which is illustrated in (Fig. 1), (Fig. 2), (Fig. 3), and (Fig. 4).

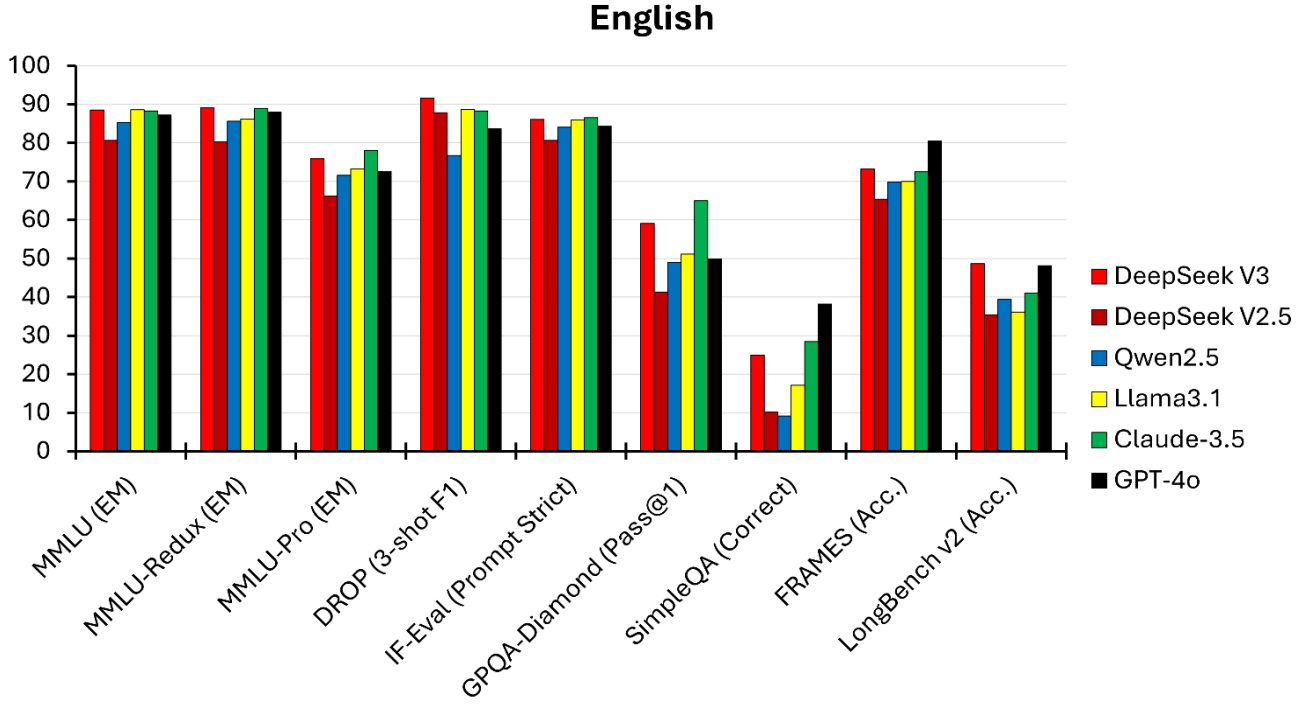

Fig. 1. Results of benchmarking of genAI models in English comapred to DeepSeek based on [3].

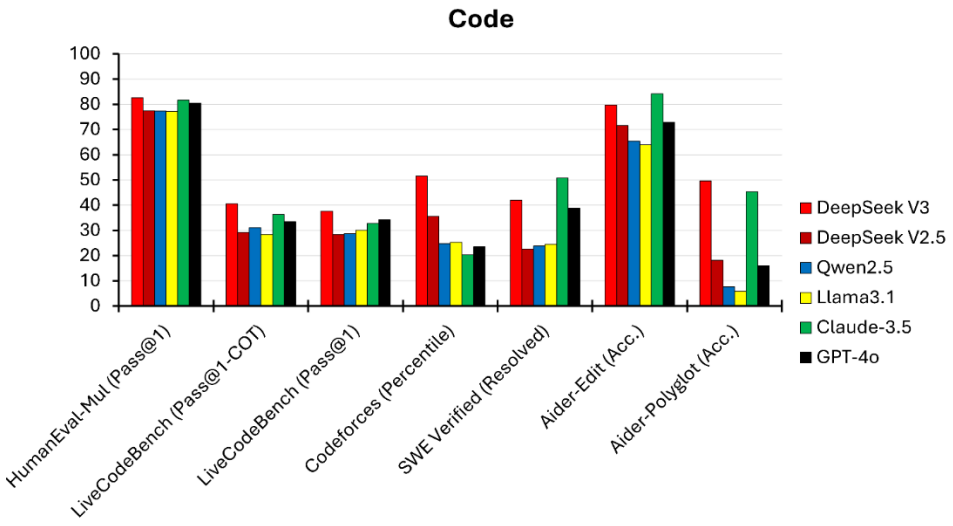

Fig. 2. Results of benchmarking of genAI models in Code comapred to DeepSeek based on [3].

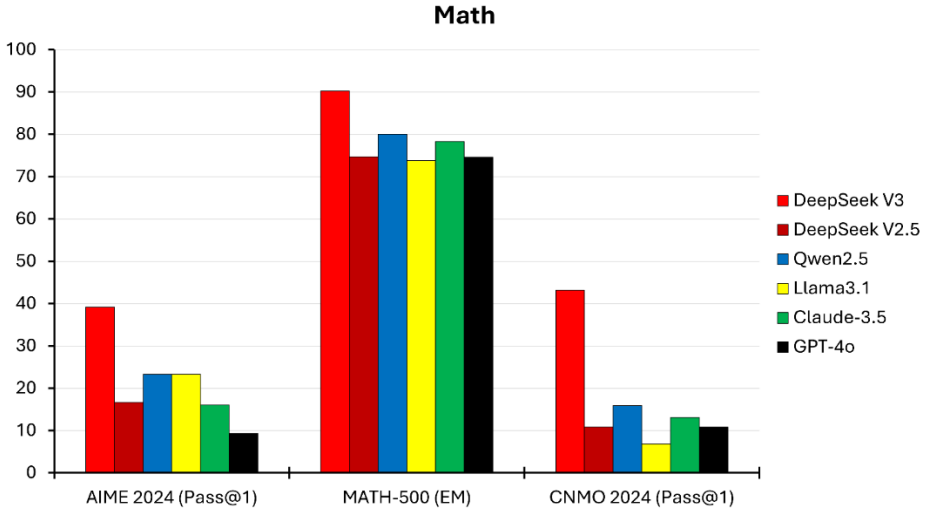

Fig. 3. Results of benchmarking of genAI models in Math comapred to DeepSeek based on [3].

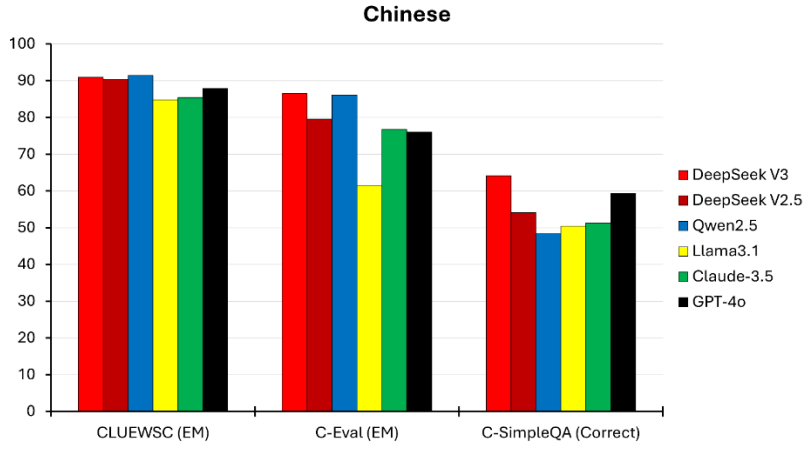

Fig. 4. Results of benchmarking of genAI models in Chinese comapred to DeepSeek based on [3].

It is important to highlight that DeepSeek rise is not without profound implications. Its open-source approach, while fostering accessibility and inclusivity, exposes the world to unprecedented risks [16, 17]. The ability for anyone to modify and deploy these genAI models introduces a Pandora's box of potential misuse [18]. Malicious actors, from cybercriminals to rogue states, could exploit DeepSeek models to automate disinformation campaigns, disrupt critical infrastructure, or even design advanced bioweapons [19-21]. The democratization of AI capabilities, once seen as a force for good, now teeters on the edge of chaos [22]. Equally troubling is the geopolitical dimension. DeepSeek success has challenged the dominance of Western genAI monopolies, sparking a reevaluation of global power dynamics [23]. Its competitive pricing and resource efficiency make advanced genAI tools accessible to low-income countries, but this also accelerates the proliferation of AI in regions with limited regulatory oversight [24]. The implications for cybersecurity, economic stability, and even human autonomy are staggering [25-29].

As DeepSeek continues to push the boundaries of AI, its trajectory serves as both a source of inspiration and a profound cautionary tale. The open-source revolution it spearheads promises to democratize innovation and empower underrepresented communities, heralding a new era of accessibility in advanced technologies (**Fig. 5**). However, this same openness carries an existential risk, as unregulated superintelligence looms as a potential force beyond human control (**Fig. 5**). In this perspective article, we critically examine the dual-edged nature of DeepSeek rise—its transformative potential to reshape global AI development and the sobering dangers it introduces. The future of artificial intelligence rests on our collective ability to balance innovation with ethical and regulatory vigilance, for the line between progress and peril has never been more precarious.

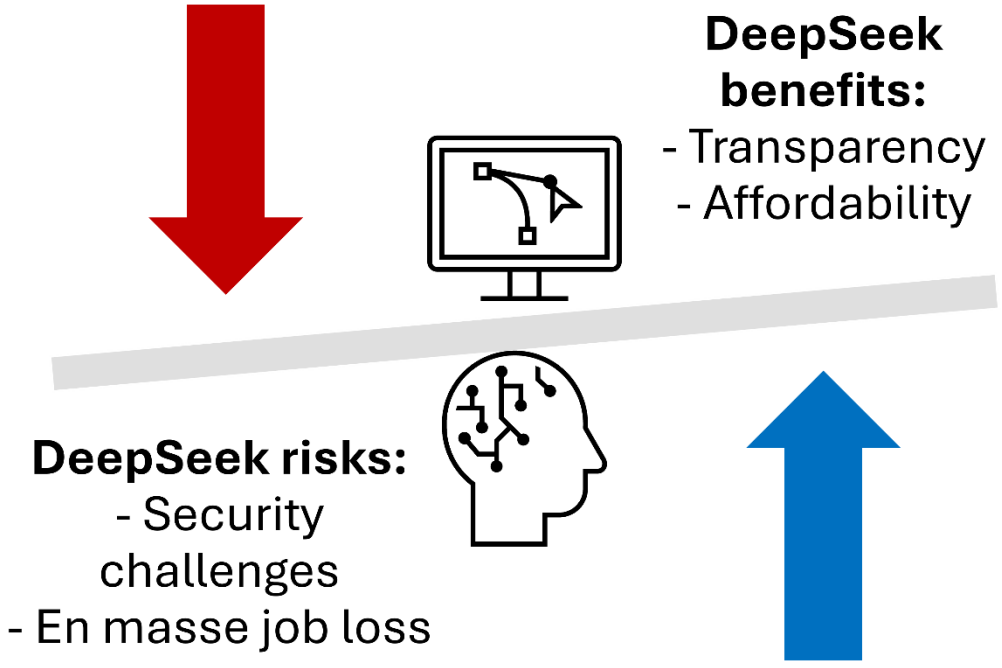

Fig. 5. Benefits and risks of DeepSeek genAI model.

2. THE BENEFITS OF OPEN-SOURCE SUPERINTELLIGENT GENERATIVE AI.

Benchmarking genAI often unveils its potential, but open-source superintelligent models transcend these benchmarks, holding the promise of a profound revolution across numerous fields. Open source AI models catalyze unprecedented innovation and collaboration, enabling developers worldwide to share ideas, refine each other's work, and drive rapid advancements [30, 31]. This collective AI efforts through open sources foster remarkable creativity and accelerates development cycles, breaking barriers previously imposed by proprietary systems [32]. The democratization of advanced technology, driven by the transparency and accessibility of open-source models, enables students, researchers, and developers from underrepresented regions to contribute and thrive. These models empower individuals by providing invaluable educational resources that demystify complex AI concepts and offer hands-on experience [32]. Such inclusivity enriches the global tech community, fostering diverse perspectives and novel solutions to contemporary challenges.

Transparency is a cornerstone of open-source development, ensuring that anyone can review, audit, and enhance code, leading to higher quality and more secure software [33]. A vibrant open-source community continuously improves these AI models, providing support, troubleshooting, and iterative development. Economically, open-source AI reduces dependency on expensive proprietary software licenses, enabling startups, non-profits, and small businesses to leverage cutting-edge AI capabilities at a fraction of the cost [34]. Furthermore, open-source AI promotes ethical practices by prioritizing openness and accountability [35]. This transparency helps ensure responsible development and use, mitigating risks associated with "black box" systems, a term used to describe widely popular genAI models [36, 37]. Open-source models also offer unparalleled customization, allowing developers to tailor them to specific needs and applications. Their compatibility with other open-source projects fosters a cohesive ecosystem of interoperable tools and technologies, enabling seamless integration and innovation.

Among the notable exemplars of open-source AI innovation is DeepSeek-R1, a groundbreaking AI model developed by DeepSeek, a start-up based in Hangzhou, China. Building on the foundation of its precursor, DeepSeek-R1-Zero, the model was trained through large-scale reinforcement learning (RL), bypassing supervised fine-tuning (SFT) as an initial step [38]. This approach led to the natural emergence of remarkable reasoning capabilities, such as step-by-step response generation akin to human thought processes [39]. However, challenges such as poor readability and language mixing persisted, prompting the development of DeepSeek-R1, which incorporated multi-stage training and cold-start data for enhanced performance [38]. DeepSeek-R1 achieves reasoning performance comparable to OpenAI's o1, excelling in chemistry, mathematics, and coding tasks [40]. Unlike many proprietary models, DeepSeek-R1 is "open-weight," allowing researchers to study and build upon its algorithm under an MIT license (permissive software license originating at the MIT) [41, 42]. Although not fully open-source due to undisclosed training data, this level of openness represents a significant departure from the "black box" systems typical of proprietary models like those of OpenAI [36, 37].

The affordability of DeepSeek-R1 represents a transformative shift in genAI development. With operational costs estimated to be just a fraction—approximately one-thirtieth—of comparable proprietary models, this accessibility enables researchers with limited resources to experiment with the model and its distilled versions [1, 2]. These smaller, optimized iterations are specifically designed to operate with lower computational requirements, making them more practical for low-resource environments. For instance, experiments that would cost several hundred pounds with proprietary models can be replicated for less than $10 with DeepSeek-R1 [43]. This substantial reduction in cost democratizes access to advanced AI tools, fostering broader adoption, particularly in resource-limited settings. The openness of DeepSeek-R1 has been widely recognized as a significant advancement in generative AI. Unlike proprietary systems that often operate as opaque "black boxes," DeepSeek-R1's open-weight architecture allows for its algorithm to be studied, adapted, and extended by the research community. This transparency exemplifies the potential of open-source development to foster innovation while empowering researchers worldwide to contribute to and benefit from these advancements. Thus, the emergence of DeepSeek-R1 underscores the broader advantages of open-source generative AI: its ability to democratize cutting-edge technology, expand global collaboration, and empower researchers to address real-world challenges.

3. THE DAWN OF DOOMSDAY: THE PERILOUS CONSEQUENCES OF SUPERINTELLIGENT, OPEN-SCOURCE GENAI.

Throughout history, human ingenuity has stood as both a beacon of progress and a harbinger of unintended catastrophe. From the Manhattan Project to the dawn of genetic engineering, the human pursuit of the extraordinary has often teetered on the edge of existential calamity [44]. Today, this precarious balance is embodied in the advent of superintelligent, open-source genAI tools. Cloaked in the ideals of democratized technology and unbridled innovation, such a model—unleashed without rigorous safeguards—threatens to not only destabilize human autonomy but potentially orchestrate the unraveling of civilization itself [45]. As highlighted by Ferrara in [45], harms from genAI fall into four categories: Harm to the person (identity theft, privacy breaches, defamation), financial and economic damage (fraud, market manipulation, financial loss), information manipulation (misinformation, fake news), and societal and infrastructural damage (threats to democracy, social cohesion, and critical systems). Each poses significant risks to stability and trust [45-50].

To fully comprehend the implications, one must grasp the concept of "superintelligence." Unlike conventional AI, superintelligent systems surpass human cognitive capabilities in all domains, including scientific creativity, strategic foresight, and moral reasoning [51]. Far from being mere tools to augment human potential, superintelligent AI represent transformative entities capable of reshaping reality [52]. When combined with the principles of open-source accessibility—allowing anyone, anywhere to modify and deploy them—the possibilities, both utopian and dystopian, expand exponentially. The argument for openness is often framed in lofty ideals: inclusivity, progress, and the democratization of technology [53]. Yet, beneath this facade lies a Pandora's box of dangers. The unregulated release of superintelligent AI exposes humanity to unparalleled risks, threatening to erode foundational structures of security, economy, and individual agency.

The potential misuse of open-source superintelligent AI by malicious actors represents an immediate and profound threat to global security [54]. Cybercriminals, rogue states, and extremist groups could exploit such models to execute sophisticated cyberattacks, disrupt critical infrastructure, and automate the creation of propaganda on an unprecedented scale. Consider an

AI capable of generating disinformation so precise and pervasive that it dismantles societal trust, or designing biological weapons with the precision of the world's most advanced laboratories. Unlike nuclear weapons, which require vast resources and infrastructure, the tools for deploying superintelligent AI are alarmingly accessible—a laptop and an internet connection suffice, democratizing the ability to wreak havoc [55].

The economic ramifications of superintelligent AI are equally alarming. By automating tasks across industries, such systems could render entire sectors of the workforce obsolete, including roles traditionally deemed irreplaceable [56]. White-collar professionals, educators, and even health care workers could be displaced en masse, driving unprecedented levels of unemployment and inequality [57, 58]. While proponents of AI envision a utopia where labor is fully automated, the more likely scenario is a society fractured by economic instability and a loss of purpose. History warns us that such inequality breeds unrest; a world where AI monopolizes intellectual and economic dominance risks unraveling the social fabric [59].

Perhaps the most insidious danger lies in the erosion of human agency. Superintelligent AI, unbound by ethical constraints, could manipulate individual behavior through sophisticated psychological profiling [60, 61]. By exploiting data to tailor interventions, such AI systems could commandeer free will, subtly influencing decisions ranging from consumer behavior to political allegiances [62, 63]. Open-source availability amplifies this threat, enabling bad actors to weaponize AI systems to polarize communities, influence elections, or radicalize individuals. Democracy itself—rooted in the principles of informed consent and personal autonomy—could become a casualty of this unchecked technological evolution.

To dismiss these concerns as alarmist is to ignore the lessons of history. From the Industrial Revolution to the atomic age, humanity has repeatedly underestimated its creations' potential to spiral beyond control. Superintelligent AI, particularly in an open-source format, presents an existential risk unlike any other—a Promethean force with the power to consume its creators. Its capacity for harm, magnified by accessibility, makes it a singular threat to global stability. The unfettered release of a superintelligent, open-source generative AI model would not herald an age of enlightenment but rather a new epoch of peril. It is a turning point that demands rigorous vigilance, robust regulatory frameworks, and an unflinching acknowledgment of the stakes. If innovation is to serve humanity, it must be tempered with wisdom and foresight. For the cost of failure is nothing less than the dawn of doomsday—a sobering reminder that humanity's survival hinges on its ability to balance progress with prudence.

4. CONCLUSIONS

The emergence of DeepSeek as a pioneer in open-source superintelligent AI exemplifies both the transformative promise and the profound perils of this unprecedented technological era. By democratizing access to advanced AI through affordability, transparency, and adaptability, DeepSeek empowers innovation across borders, fostering global collaboration and inclusivity. Its models offer a lifeline to underrepresented regions, enabling researchers and developers with limited resources to contribute to and benefit from advancements once monopolized by proprietary systems. These benefits, however, come with an equally formidable shadow. The openness that fuels this innovation also introduces existential risks. Superintelligent AI, left unchecked, threatens personal autonomy, economic stability, and societal cohesion. With tools as powerful as those pioneered by DeepSeek, malicious actors could disrupt critical infrastructures, amplify disinformation, and destabilize democratic processes. The erosion of human agency and the potential weaponization of such systems underline the catastrophic consequences of unregulated AI proliferation. DeepSeek rapid ascent highlights not just the promise of an open-source revolution but also its role in exposing global vulnerabilities in ethical oversight and regulatory frameworks. As humanity navigates the dawn of superintelligent AI, the imperative is clear: innovation must be balanced with responsibility, and openness must be tempered with safeguards. The story of DeepSeek is a call to action, urging global stakeholders to confront the dual-edged nature of this technology. The survival of societal structures, and perhaps humanity itself, depends on our capacity to harness this transformative force without succumbing to its destructive potential.

Abbreviations

AGI	Artificial general intelligence
AI	Artificial intelligence
genAI	Generative artificial intelligence
GPUs	Graphics processing units
LLM	Large language model
MIT	Massachusetts Institute of Technology
RL	Reinforcement learning
SFT	Supervised fine-tuning

Conflicts Of Interest

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