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DeepSeek: The Sputnik Moment of the AI Era?

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Abstract

The emergence of the generative AI developed by Chinese startup DeepSeek has shocked the world, with some likening it to a "Sputnik moment" for AI. The DeepSeek-R1 model, which achieves high efficiency despite relatively modest computing resources, is expected to have a significant impact on the global AI market. As China marks the 10th anniversary of its "Made in China 2025" initiative, it actively promotes DeepSeek's achievements to expand the international reach of Chinese-style AI models. However, concerns have been raised about potential risks, including indiscriminate data collection, possible misuse by the Chinese government, and politically biased responses. The U.S. Stargate Project and China's DeepSeek AI model highlight the different strategies of the two rivals to gain an edge in the AI race. South Korea must prepare for deeper U.S.-China decoupling in strategically important sectors such as AI and semiconductors while focusing on accumulating key technologies and securing top-tier talent.

Keywords

DeepSeek, AI, High-efficiency AI model, U.S.-China AI competition

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On January 20, coinciding with the inauguration of the second Trump administration, Chinese AI startup DeepSeek announced DeepSeek-R1, a large language model (LLM) with performance comparable to that of existing AI models developed by major tech companies. Notably, the DeepSeek-R1 inference model shocked the market by outperforming OpenAI's o1 model, released in September 2024, in certain performance tests. This breakthrough was achieved despite the U.S. government's stringent semiconductor export controls, demonstrating the potential of efficient AI models that do not rely on high-end computing structures.

The success of DeepSeek-R1 has heightened U.S. concerns, reinforcing regulations around emerging technologies. Some venture capitalists in Silicon Valley have described DeepSeek-R1 as "the emergence of AI's Sputnik" and warned that U.S. AI hegemony could be at risk. Assessments pointing to potential disruptions in the existing AI order, which is currently centered on high-specification semiconductors and large-scale computing resources, have great implications for the future of AI.

DeepSeek Cracks the 'High-Cost Formula' for AI Success

DeepSeek claims to have developed DeepSeek-R1 at just $5.6 million—only 5.6% of OpenAI's investment—while achieving high scores across various benchmarks and demonstrating stable performance. What stands out is the hardware aspect. Due to U.S.

export controls restricting access to NVIDIA's high-end GPUs (H100), DeepSeek used lower-spec GPUs (H800) instead. By optimizing model architecture to overcome memory bandwidth and processing power limitations, DeepSeek reduced dependency on expensive computing resources.

Regarding software optimization, DeepSeek enhanced efficiency in the reinforcement learning phase, employing a "Mixture of Experts" approach that selectively activates only necessary model components. This significantly reduced energy consumption and lowered training and inference costs compared to traditional AI models.

DeepSeek has released DeepSeek-R1 as open-source software, allowing developers to use and refine the model free of charge. This approach contrasts with OpenAI's closed-source policy and Google and Meta's practice of releasing scaled-down versions of their models. DeepSeek's strategy challenges the status quo, namely, the high-cost, closed AI development model, pressuring global AI firms to reconsider their investment approaches in light of potential cost savings. This shift is expected to spark a broader debate about what constitutes a successful formula in the AI industry.

Moreover, China may use this opportunity to promote a low-cost, high-efficiency AI standard symbolized by DeepSeek to Global South countries seeking to develop their AI capabilities.

DeepSeek's Rise on the 10th Anniversary of "Made in China 2025"

Deepseek's emergence coincides with the conclusion of the first phase (2015–2025) of Beijing's "Made in China 2025" initiative, a national strategy aimed at the qualitative transformation and advancement of the Chinese industry. Amid U.S. technology

sanctions and supply chain restrictions, there was increased skepticism regarding China's ability to meet its targets. However, DeepSeek's breakthrough has sent shockwaves across the field and may signal a renewed and assertive push toward China's ambitions for technological supremacy under the "Made in China 2025" framework.

In particular, China continues to fuel its innovation drive with a key resource: a vast domestic talent pool. According to the South China Morning Post (SCMP), China has seen a surge in homecoming talent, with the percentage of Chinese scientists returning from the U.S. rising from 48% in 2018 to 75% last year. The influx of highly skilled researchers has improved not only the research capabilities of Chinese universities and institutions but also the overall educational environment, laying fertile ground for nurturing top-tier talent. Paradoxically, the U.S.-China rivalry has accelerated China's ability to develop a self-sustaining talent ecosystem.

Meanwhile, the West has cast doubts over China's tactics in circumventing the stringent export controls on advanced semiconductor technologies. Some reports suggest China has used "gray trade networks" to acquire high-end semiconductors through third-party countries such as Singapore or operated servers under rebranded foreign entities. However, it is difficult to deny that China has been localizing semiconductor production, gradually moving from low-end chips to mid-level nodes. The Chinese government continues to support this trend with massive investment funds targeted at equipment, precision chip design, and manufacturing. Although Chinese-made semiconductors still lag in technological sophistication, it is important to note that such semiconductors are undergoing continuous tests and improvements within China's vast domestic market.

DeepSeek is headquartered in Hangzhou, Zhejiang Province, which has become a hub for China's AI innovation. The city hosts China's most promising AI tech firms, collectively referred to as the "Six Little Dragons," including DeepSeek (AI models), Unitree (robotics solutions), BrainCo (neuroscience), DeepRobotics (humanoids), Anycubic (3D printing), and Game Science (blockbuster games). Backed by a rich supply of IT talent, these firms are building a Chinese counterpart to Silicon Valley to produce more "DeepSeek" moments.

Risks of Using DeepSeek and Expanding Restrictions

As the U.S. media highlighted DeepSeek's R1 model, President Trump commented that "the release of DeepSeek should be a wake-up call" for the American tech industry and that the U.S. needs to be "laser-focused on competing to win." However, the first move by the U.S. was to block DeepSeek from military and government public networks over data security concerns. Key risks regarding the DeepSeek AI model include indiscriminate collection of sensitive data, potential leakage and exploitation by the Chinese government, and political bias and censorship.

First, DeepSeek's data collection policy includes not only personal information provided by users during registration, but also users' input patterns, chat history, device model, operating system, and IP address. Services such as ChatGPT (OpenAI), Gemini (Google), and Clova-X (Naver) also collect text inputs, uploaded files, and device identifiers. However, data is processed utilizing tokenization —partially encoding information to prevent the identification of specific users—making it relatively safer. In addition, data retention is limited to 30 days and users can opt-out to prevent their input data from being used to train the AI model. In contrast, DeepSeek reportedly lacks any tokenization process, opt-out option, or a clear data retention policy, allowing the

company to collect and retain user information for an unspecified period.

Second, under its National Security Law and Data Security Law, all companies in China are required to provide customer information to authorities upon request. This means that any personal data stored on DeepSeek's servers in China could potentially be accessed by the government. Furthermore, DeepSeek coding can transfer users' data to servers operated by China Mobile, a state-owned telecommunications company, making it highly likely that sensitive data could be exposed to China's surveillance system. South Korea's Personal Information Protection Commission (PIPC) confirmed on February 17 that DeepSeek had been transferring user data to ByteDance, the parent company of the Chinese social media app TikTok, and recommended suspending new downloads of the app.

Third, regarding political bias, all generative AI models in China are compelled to "uphold core socialist values" and are prohibited from producing content that undermines the authority of the state, the ruling party, or national security interests. As a result, both algorithm design and training data selection are subject to government censorship. As a result, DeepSeek either refuses to answer questions related to the Chinese Communist Party, President Xi Jinping, territorial disputes involving China, and pro-democracy movements or provides heavily censored responses, undermining the credibility of its outputs. Due to these concerns, the U.S., Australia, Taiwan, Japan, and Italy have banned DeepSeek in public institutions. South Korea has also blocked access to DeepSeek in government and financial sectors.

Outlook and Implications

The U.S. Stargate Project under Trump 2.0 and China's DeepSeek incident highlight the different strategies of the two rivals to gain an edge in the AI competition. The U.S. relies on capital-intensive investments to develop cutting-edge AI models, building an AI ecosystem led by Big Tech. In contrast, due to trade restrictions, China has learned to develop cost-effective, high-performance AI models, and seeks to export its models to the Global South. Furthermore, the third phase of China's "Big Fund" investment initiative for AI and semiconductors signals continued efforts toward technological self-reliance. Under such a trend, the U.S. and China will likely dominate most of the AI industry, while other countries struggle to keep up. This could result in the formation of a dual system of technological standards, divided between the two powers.

For South Korea, the growing U.S.-China decoupling in AI and semiconductors presents both challenges and opportunities. Korean companies, with large-scale production capabilities in memory and general-purpose foundry services, may face increasing supply requests due to China's growing demand for low-spec semiconductors not yet subject to export restrictions. This puts Korean firms in a delicate position between U.S. policies and Chinese market opportunities. Given the rapid expansion of U.S. export controls, Seoul needs to employ a cautious approach to avoid triggering conflict with Washington.

Some argue that the Trump administration's tougher export restrictions against China offer South Korea a strategic opportunity in key industries. Yet the DeepSeek incident underscores that trade barriers are not a fundamental solution to global technological competition. Ultimately, accumulating technological capabilities and securing AI talent will be critical. Faced with

numerous warning signs in strategic industries such as semiconductors and batteries, this has become an increasingly urgent issue for South Korea.

At the same time, small and medium-sized enterprises (SMEs) in Korea, long overshadowed by a handful of large semiconductor and platform companies, are now receiving renewed attention. During his recent visit to Korea, OpenAI CEO Sam Altman expressed interest in a partnership and potential acquisition of a domestic fabless startup specializing in AI semiconductors for data center servers. As U.S. Big Tech seeks greater efficiency in response to the DeepSeek shock, Korean AI startups are gaining recognition, and national efforts to support these emerging players could provide Korea with strategic leverage in the AI landscape.