NITI AAYOG DISCUSSION PAPER

THE STATE OF AI – UNDERSTANDING THE RECENT AI SHIFTS AND IMPLICATIONS

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Introduction

In the final days of his administration, President Biden issued two pivotal directives aimed at bolstering the United States' leadership in artificial intelligence (AI). On January 13, 2025, his administration introduced an Interim Final Rule to regulate the export of GPUs, a critical component for AI development. This rule sought to limit the transfer of advanced AI-enabling technologies to adversaries while streamlining exports to allies. The following day, Biden signed an executive order emphasizing clean energy development for AI data centers, directing federal agencies to lease land for infrastructure projects powered by low- or zero-carbon energy sources.

However, on January 20, 2025, President Trump revoked Biden's Executive Order 14110 as one of his first actions in office. Days later, on January 23, Trump issued his own executive order titled "Removing Barriers to American Leadership in Artificial Intelligence." This order aims to sustain U.S. AI dominance by promoting free-market innovation and reducing regulatory constraints perceived as barriers to growth. While Trump has yet to take decisive action on Biden's GPU export controls and green energy initiatives, early indications suggest that the broader strategy of securing U.S. dominance in AI through supply chain control will remain largely intact.

This has been likened to a modern Manhattan Project, with AI positioned as the cornerstone of future global power dynamics. However, just as the U.S. once faced a "Sputnik Moment" during the Cold War, a similar challenge has emerged in the form of DeepSeek—a rising AI powerhouse from China.

DeepSeek: A Disruptive Force in AI

DeepSeek has rapidly gained attention as a formidable competitor in the global AI race. Its architectural innovations and cost-effective approaches have sent shockwaves through the industry, much like Sputnik did in 1957. While U.S. Big Tech has traditionally relied on deep financial resources to maintain its edge, DeepSeek has shattered this paradigm by achieving comparable results with focus on increasing model efficiency.

In December 2024, DeepSeek unveiled its V3 model, boasting 671 billion parameters. The company claims to have trained this behemoth for a mere $5.6 million, utilizing approximately 2,000 NVIDIA H800 GPUs over two months. If these claims hold true, DeepSeek has achieved comparable or superior results to industry leaders like GPT-4 and Claude 3.5 Sonnet at a fraction of the typical cost and resource investment.

On January 20, 2025, coinciding with President Donald Trump's inauguration, DeepSeek unveiled its R1 model series[1]. This reasoning-focused model achieved impressive results on mathematical and logical tasks, propelling the DeepSeek app to become the most-downloaded free application on Apple's App Store in the United States. DeepSeek-R1 outperformed competitors in several key areas, including mathematics and coding, as demonstrated by its superior performance on benchmarks like MATH-500 and LiveCodeBench.

As per its technical paper, DeepSeek's success can be attributed to several key innovations:

1. **Pure Reinforcement Learning**: Unlike traditional supervised fine-tuning methods, DeepSeek employs reinforcement learning, allowing models to learn through trial and error and self-improve via algorithmic rewards. This approach has been particularly effective in developing DeepSeek-R1's advanced reasoning capabilities.

2. **Mixture-of-Experts (MoE) Architecture**: DeepSeek's models utilize an MoE architecture, activating only a small fraction of their parameters for any given task. This selective activation significantly reduces computational costs and enhances efficiency.

3. **Multi-Head Latent Attention**: DeepSeek-V3 incorporates multi-head latent attention, improving the model's ability to process data by identifying nuanced relationships and handling multiple input aspects simultaneously.

4. **Distillation Techniques**: DeepSeek employs distillation to transfer knowledge and capabilities from larger models to smaller, more efficient ones. This approach makes powerful AI accessible to a wider range of users and devices.

The impact of DeepSeek's breakthroughs has reverberated through financial markets. On January 27, 2025, tech stocks experienced a significant sell-off, with Nvidia alone seeing a nearly $600 billion drop in market value. This market reaction underscores the disruptive potential of DeepSeek's innovations and the uncertainty it has introduced into the AI industry's future.

Democratizing AI and Challenging the Status Quo

DeepSeek's achievements demonstrate that high-performing AI models can be built with significantly fewer resources than previously thought necessary. This revelation challenges the fundamental advantage that Big Tech companies have long relied upon –

their vast financial resources and deep pockets. By making its models open-source and accessible, DeepSeek has democratized access to cutting-edge AI technology, potentially opening the field to a wider range of players and spurring innovation. As more high-quality language models become freely available, market forces are expected to drive down prices across the industry.

Geopolitical Implications

The emergence of a Chinese AI company releasing such a capable open-source model has been highlighted by President Trump as a wake-up call for America. This breakthrough underscores how research and development (R&D) and talent can overcome even the most entrenched barriers, including capital.

Ironically, while U.S. GPU export controls were aimed at curbing China's access to advanced AI hardware and slowing down its overall AI momentum, they might have played a role in accelerating China's push toward self-reliance in the AI supply chain—a move that could reshape global supply chains over time.

Meanwhile, other nations are responding with their own strategies. The European Union is advancing ethical AI frameworks and research funding, while Japan and South Korea are ramping up domestic semiconductor production capabilities to reduce reliance on U.S. exports. These developments reflect a broader recalibration of AI strategies worldwide.

Looking Ahead

As the AI landscape continues to evolve, DeepSeek's success serves as both a wake-up call for established players and a source of inspiration for newcomers. It highlights the importance of efficiency, innovation, and open collaboration in driving progress in artificial intelligence.

The coming months and years will likely see increased competition and rapid advancements as the industry adapts to this new paradigm of AI development. The validation of DeepSeek's claims could mark a turning point in the AI race, **where ingenuity and efficient resource utilization trump sheer financial might.**

This shift in the AI landscape promises to bring about transformative changes in various sectors, from healthcare and education to finance and manufacturing. As the technology becomes more accessible and affordable, we can expect to see a surge in AI-driven innovations across industries, potentially leading to significant improvements in productivity, decision-making, and problem-solving capabilities worldwide.

The Path Ahead for India: Self-Reliance and the Need to Lead Disruption

India is at a pivotal moment in the AI landscape, facing both significant challenges and unprecedented opportunities. The rise of disruptive innovation has demonstrated that technology can redefine traditional limitations, while global trends emphasize the increasing importance of self-reliance in critical industries. To establish itself as a leader,

India must prioritize fostering cutting-edge research to unlock model efficiencies and build disruptive applications. We have to focus our engineering prowess to focus on identifying new ways to build more effective models and leverage our traditional vertical expertise in tech services to lead the era of vertical solutions and agents. We need worldclass talent to position India as a disruptor vs follower. Given that a significant percentage of the global AI talent is of Indian origin, this is the perfect time to build a Talent Repatriation Program to incentivise the best talent to build for India, as we nurture homegrown talent. Last but not the least, we need to create an environment conducive to scalable innovation, and the urgency for scale and impact.

Collaboration among policymakers, industry leaders, and researchers will be essential in shaping an AI framework that reflects India's diverse culture and values while ensuring ethical and sustainable growth. By strengthening its AI capabilities and forging strategic global partnerships, India can enhance its technological sovereignty and play a defining role in shaping the future of AI for the developing world.

Conclusion

The time for incremental progress is over. The next decade will define global AI leadership, and India has a once-in-a-generation opportunity to emerge as both an innovator and a leader in equitable AI development. DeepSeek's rise proves that disruption is no longer reserved for the richest players—it belongs to those who innovate faster, smarter, and with greater impact. By acting decisively, we can position ourselves as an advocate for sovereign and ethical AI, driving advancements that benefit both its economy and society. The urgency to act has never been greater. The goal is not just to build AI but to **own the disruption.** By fostering a world-class AI ecosystem, driving vertical AI applications, and leading ethical and responsible AI at scale, India can not only secure its technological future but also shape AI for the benefit of the world.

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