

A Comparative Study of DeepSeek and Other Ai Tools

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Abstract: Artificial intelligence (AI) has rapidly evolved, with various companies developing large language models (LLMs) and AI-driven tools. DeepSeek, a Chinese AI company, is one of the most recent entrants in this field, and it has been praised for its open-source approach and cost-efficient model training. In terms of AI tools such as OpenAI's GPT-4, Google's Gemini, or Meta's Llama, how does DeepSeek stand out? For quite some time, we have been tinkering with AI tools, and we have been updating this list with countless hours of research. While all these apps are getting better every day, they're far from perfect: be sure to always check AI's work with your human brain. With that being said, please keep all hands and legs inside the vehicle—it's time to explore.

Keywords: Artificial Intelligence, Machine Learning, DeepSeek, AI Tools

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I. INTRODUCTION

Artificial intelligence (AI) has rapidly evolved, with various companies developing large language models (LLMs) and AI-driven tools. DeepSeek, a Chinese AI company, is one of the most recent entrants in this field, and it has been praised for its open-source approach and cost-efficient model training.

In terms of AI tools such as OpenAI's GPT-4, Google's Gemini, or Meta's Llama, how does DeepSeek stand out? For quite some time, we have been tinkering with AI tools, and we have been updating this list with countless hours of research. While all these apps are getting better every day, they're far from perfect: be sure to always check AI's work with your human brain. With that being said, please keep all hands and legs inside the vehicle—it's time to explore.

DeepSeek's approach to training its reasoning model, R1, is particularly innovative. Instead of relying on human-labeled data, they assembled a dataset of problems with verifiable outputs, especially in math and coding. They then designed a training pipeline that encouraged the model to think through these problems and arrive at correct answers. This process did not involve external examples; instead, the model learned through reinforcement learning (RL), receiving feedback based on the accuracy and formatting of its outputs. DeepSeek introduced a novel technique called Group Relative Policy Optimization (GRPO) to update the

model effectively. Over thousands of reinforcement learning (RL) steps, the model developed advanced reasoning skills, including extended chain-of-thought processes, reflection, and self-correction. Notably, the model experienced “aha moments,” where it recognized its own mistakes and backtracked to correct them, demonstrating emergent problem-solving abilities.

However, this purely RL-driven approach led to outputs that often suffered from poor readability, including issues like language mixing within responses. To address these challenges, DeepSeek introduced a “cold start” phase, fine-tuning the model on a small dataset of high-quality, human-readable examples before applying RL. This strategy improved the coherence and user-friendliness of the model's outputs.

➤ Why Is Everyone Talking About DeepSeek?

In late January 2025, DeepSeek introduced its latest reasoning model, R1, an open-source artificial intelligence that purportedly matches the performance of OpenAI's o1 while being developed at a significantly lower cost. This announcement created considerable waves in the technology sector, resulting in notable market responses. For example, Nvidia saw a marked decline in its market capitalization, underscoring the disruptive potential of DeepSeek's innovations.

In contrast to many Western AI laboratories that maintain proprietary model weights, DeepSeek has been actively publishing its research and releasing model weights for several months. This open-weight strategy stands in stark contrast to the closed-weight models employed by companies such as OpenAI, Google, and Anthropic, making DeepSeek’s progress particularly remarkable.

➤ *What Makes DeepSeek’s AI Different?*

DeepSeek’s artificial intelligence framework consists of two main models: DeepSeek v3 and DeepSeek R1. Launched in December 2024, DeepSeek v3 serves as a versatile base model, delivering performance that rivals other top models, including OpenAI’s GPT-4o and Anthropic’s Claude 3.5 Sonnet.

Following this, DeepSeek unveiled R1 at the close of January 2025. R1 is a reasoning-focused model that has been specifically fine-tuned for intricate problem-solving tasks, achieving results comparable to OpenAI’s o1 and Google’s Flash 2.0 on various benchmarks.

II. COMPARATIVE STUDY

➤ *Open-Source vs. Proprietary Models*

DeepSeek sets itself apart by embracing an open-source model, allowing developers and researcher’s unrestricted access to its AI models and training techniques. In contrast, platforms such as OpenAI’s GPT-4 and Google’s Gemini operate under a closed-source framework, restricting access to their foundational algorithms and training datasets.

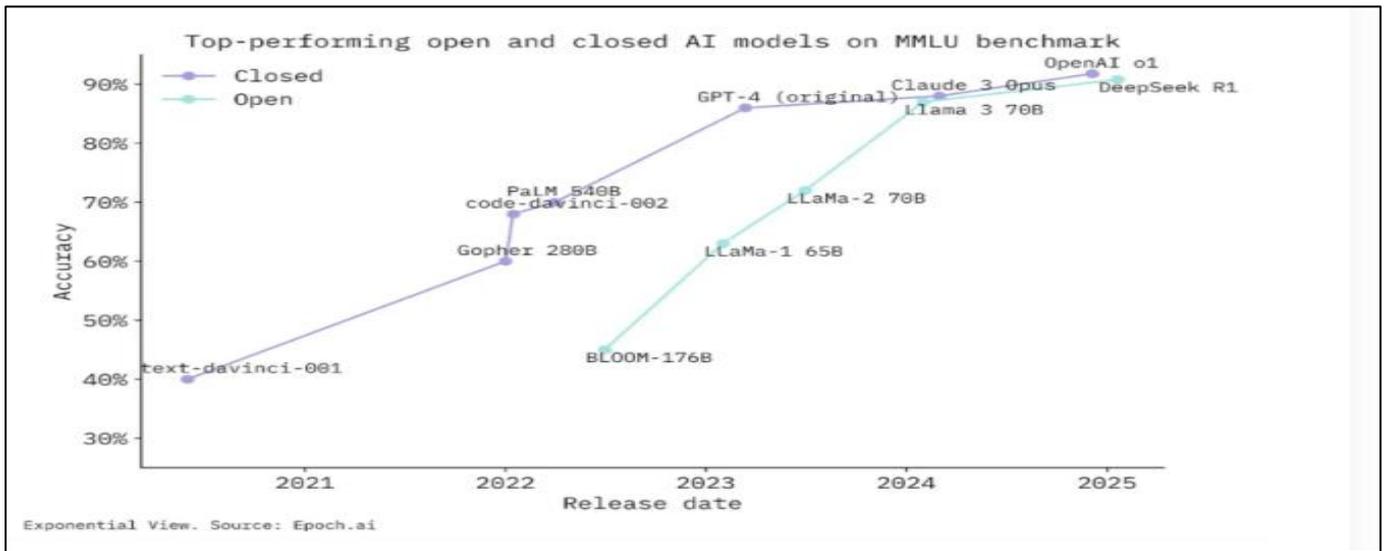


Fig 1 Open-Source Vs. Proprietary Models

➤ *Cost of Training*

DeepSeek has successfully created advanced models at a significantly lower cost than its competitors. For example, the training of DeepSeek-R1 amounted to only \$6 million, whereas OpenAI is said to have invested more than \$100 million in the development of GPT-4. This cost-effectiveness

positions DeepSeek as a compelling choice for companies aiming to utilize AI while minimizing expenses.

DeepSeek R1 is not just 25x cheaper than GPT o1 It is better than the unreleased OpenAI o3 at the same cost at coding on Codeforces and ARC-AGI!

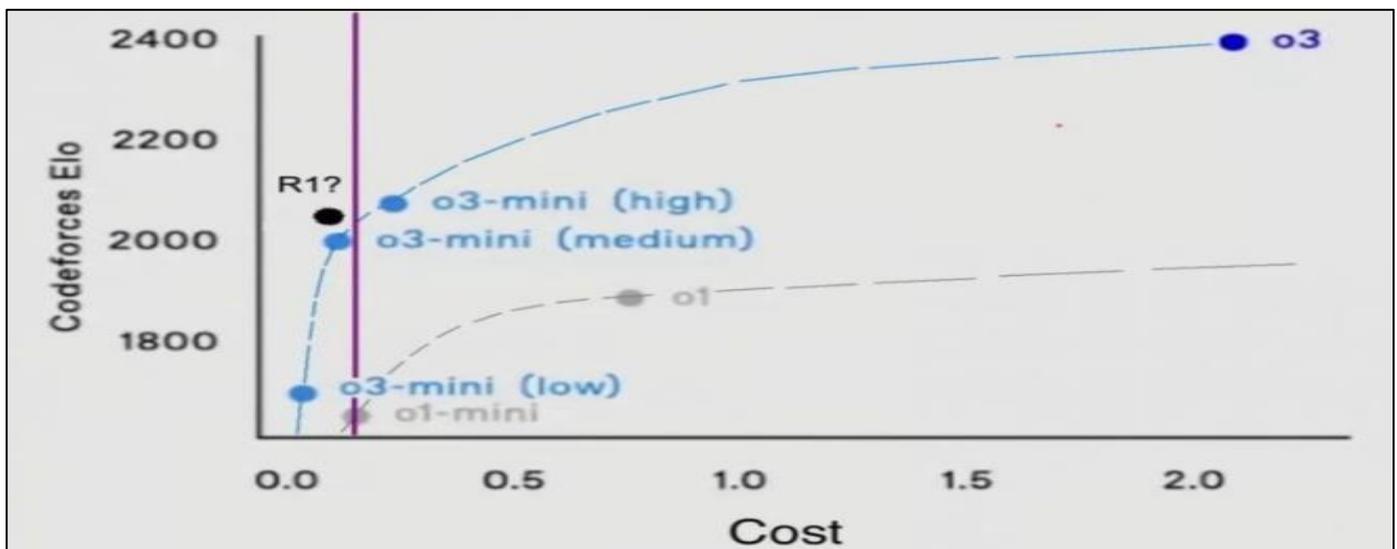


Fig 2 Cost of Training

➤ *Computational Efficiency*

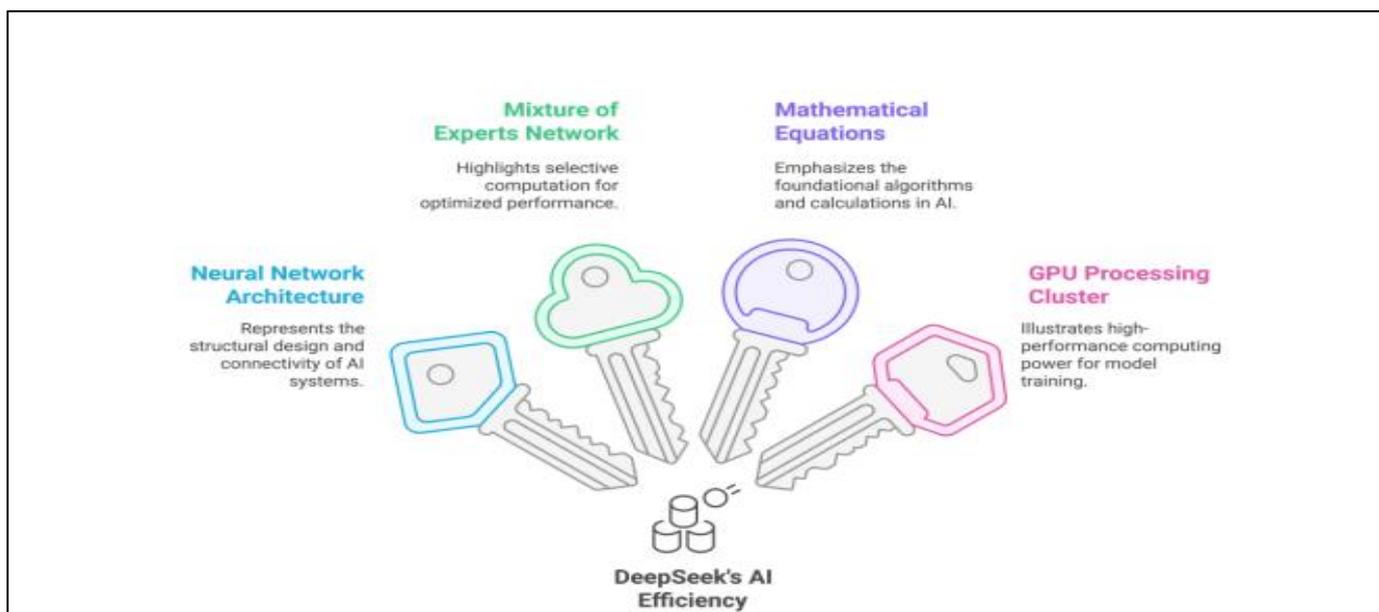


Fig 3 Computational Efficiency

In contrast to other large language models that necessitate extensive computing resources, DeepSeek utilizes a "mixture of experts" (MoE) approach, activating only a portion of the model for each query. This method greatly diminishes the demand for computational power, rendering DeepSeek more energy-efficient than models such as GPT-4 and Gemini, which depend on fully activated transformer architectures.

➤ *Performance vs. Scale*

DeepSeek is engineered to achieve an effective balance between performance and scalability. In contrast to GPT-4 and Gemini, which emphasize model size with multi-trillion parameters, DeepSeek aims to provide similar outcomes while utilizing fewer resources, thereby enhancing its accessibility for broader application.

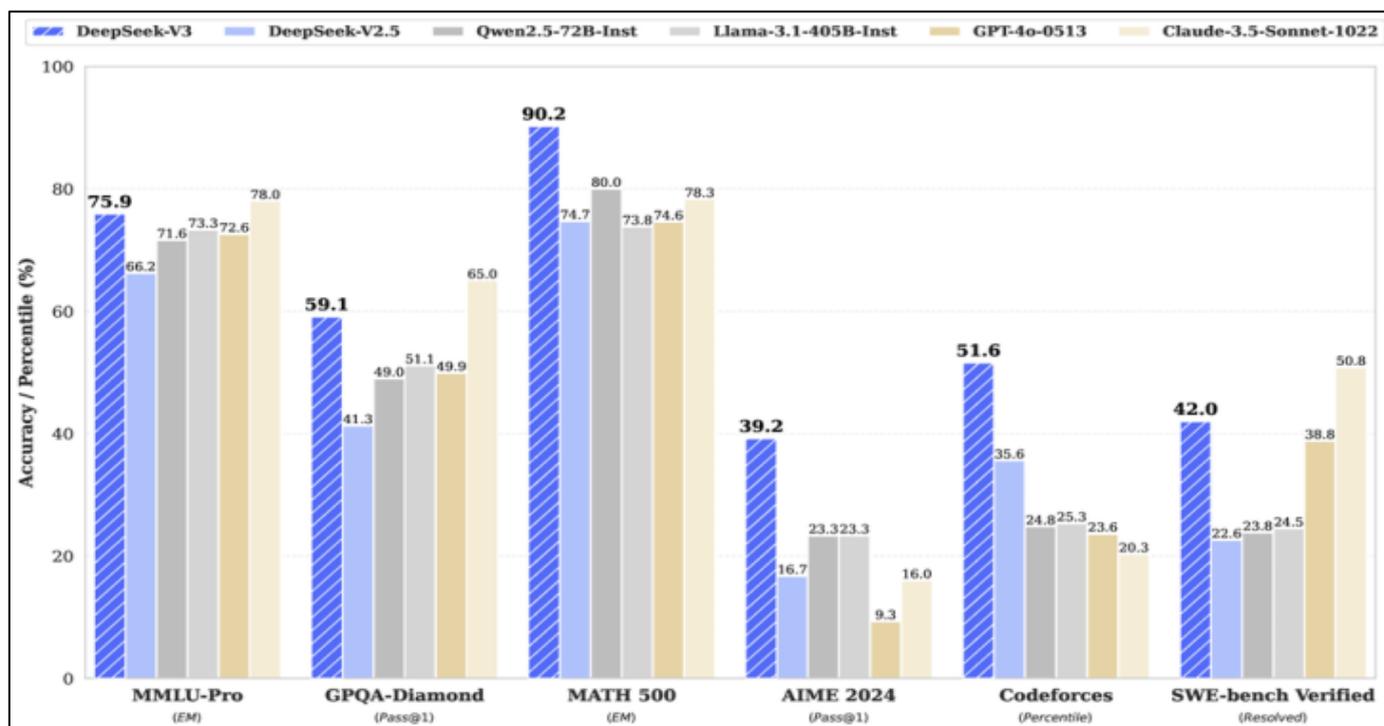


Fig 4 Performance Vs. Scale

➤ *Language and Regional Focus*

DeepSeek is uniquely tailored for processing the Chinese language, delivering enhanced capabilities in understanding

and generating Chinese text when compared to numerous Western AI tools.



Fig 5 Language and Regional Focus

In contrast to models developed by OpenAI and Google, which cater to a global audience, DeepSeek is specifically refined to align with the linguistic and cultural nuances of China.

➤ *Business Model*

DeepSeek advocates for a development model that is driven by community involvement, enabling both enterprises and developers to leverage its open-source framework. In contrast, OpenAI and Google follow a subscription-based

business model that restricts access to their APIs, necessitating payment from companies for the use of their models.

➤ *Hardware Dependency*

DeepSeek's low-compute architecture enhances its efficiency on standard GPUs, in contrast to GPT-4 and Gemini, which depend on advanced NVIDIA GPUs, resulting in elevated infrastructure expenses. This distinction allows a greater number of businesses to explore DeepSeek models without the burden of significant investments in AI hardware.

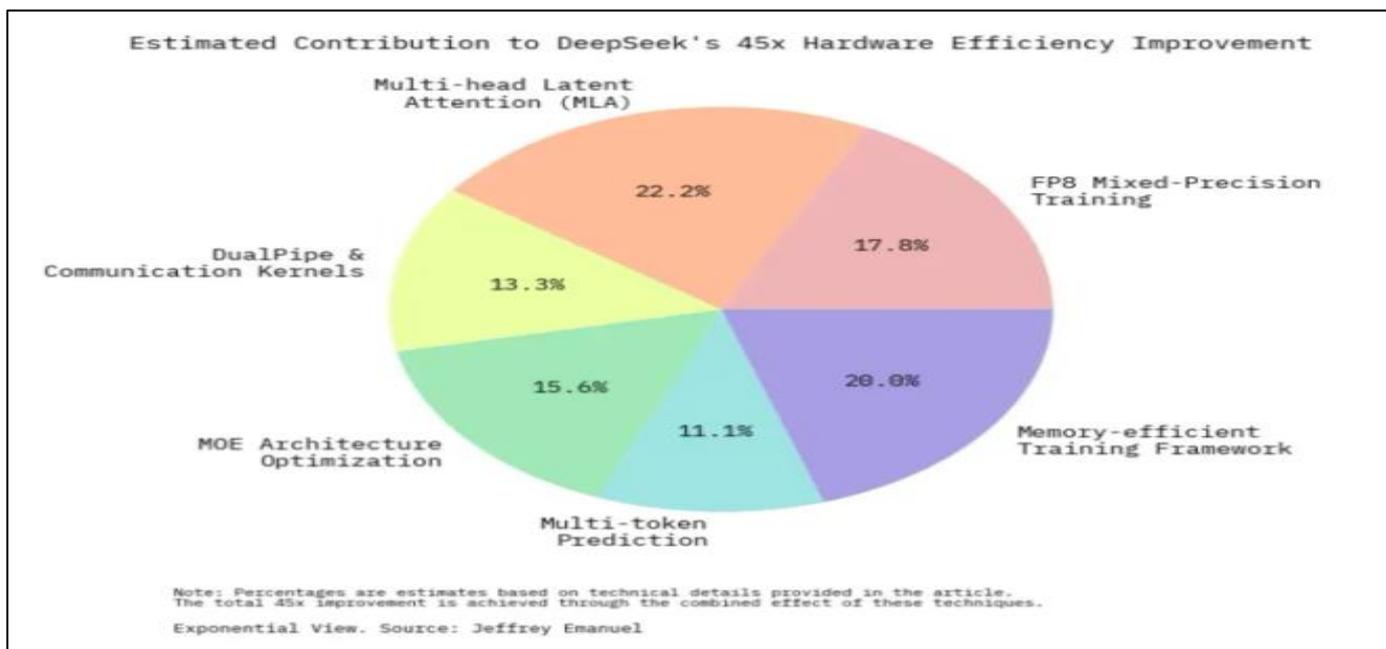


Fig 6 Hardware Dependency

➤ *AI Model Transparency*

DeepSeek offers enhanced transparency regarding its model architecture, training procedures, and the datasets utilized. In contrast, proprietary models developed by OpenAI and Google frequently face criticism for their opacity concerning data sources and training methods.

➤ *Adaptability and Customization*

As DeepSeek is an open-source model, organizations have the flexibility to customize and adapt it for particular uses, including sectors like healthcare, finance, or customer service. In comparison, altering GPT-4 or Gemini necessitates API-based fine-tuning, which entails extra expenses and constraints.

➤ *Market Impact and Disruption*

The introduction of DeepSeek has already shaken the AI market, leading to notable fluctuations in the stock prices of firms such as NVIDIA, which had previously thrived during the AI surge. This indicates that cost-effective AI models like DeepSeek may pose a challenge to established competitors by rendering advanced AI technologies more accessible.

➤ *Government and Regulatory Environment*

As an AI developed in China, DeepSeek adheres to the country's AI regulations, in contrast to Western models such as GPT-4 and Gemini, which must comply with stringent requirements set by the U.S. and EU. This distinction impacts the deployment, accessibility, and censorship of these models across various markets.

DeepSeek is emerging as a formidable alternative to leading AI models, providing cost-effectiveness, transparency through open-source principles, and optimization for applications in the Chinese language.

Although it may not yet match OpenAI's GPT-4 or Google's Gemini in every regard, its potential to disrupt the market is significant. As the field of AI continues to advance, DeepSeek's commitment to open-source development and efficiency may play a crucial role in shaping the future of AI tools on a global scale.

➤ *Free & Accessible AI Chatbot*

In contrast to certain AI services that necessitate paid subscriptions, DeepSeek is available at no cost. This aspect has facilitated its swift uptake, positioning it as a formidable contender in the AI chatbot market. Furthermore, its accessibility across various platforms guarantees that users around the globe can take advantage of its features.

III. POTENTIAL USE CASES OF DEEPSEEK

Artificial intelligence has evolved beyond being merely a tool for chatbots or text generation. With the emergence of reasoning-based AI, models such as DeepSeek have the potential to revolutionize various industries.

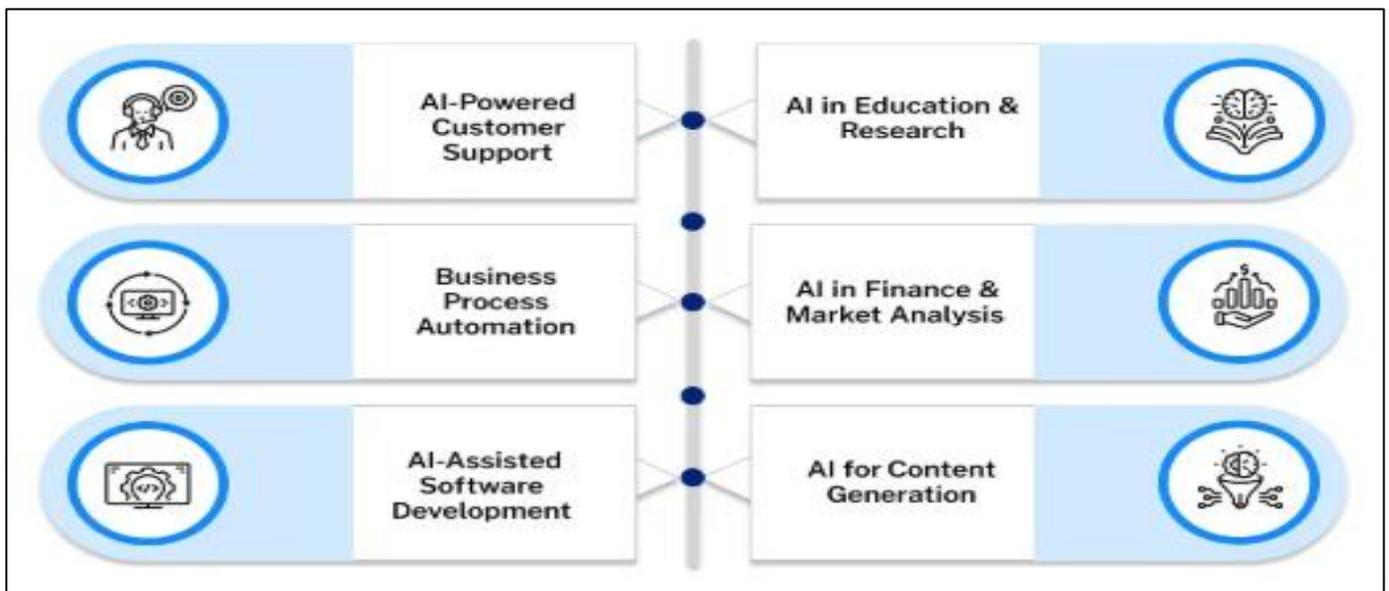


Fig 7 Potential Use Cases of DeepSeek

- AI-Powered Customer Support
- Business Process Automation
- AI-Assisted Software Development
- AI in Education & Research
- AI in Finance & Market Analysis
- AI for Content Generation

following are some sectors where DeepSeek AI could significantly impact.

IV. COMPARISON OF MODELS: INTELLIGENCE, PERFORMANCE PRICE ANALYSIS

Comparison and analysis of AI models across key performance metrics including quality, price, output speed, latency, context window & others. Click on any model to see detailed metrics.

➤ *Model Comparison Summary:*

- *Intelligence:*
o3-mini (high) logo o3-mini (high) and o3-mini logo o3-mini are the highest quality models, followed by o1 logo o1 & DeepSeek R1 logo DeepSeek R1.

• **Output Speed (tokens/s):**

DeepSeek R1 Distill Qwen 1.5B logo DeepSeek R1 Distill Qwen 1.5B (386 t/s) and Nova Micro logo Nova Micro (323 t/s) are the fastest models, followed by Gemini 1.5 Flash (May) & Nova Lite logo Nova Lite.

• **Latency (seconds):**

Aya Expanse 32B logo Aya Expanse 32B (0.15s) and Aya Expanse 8B logo Aya Expanse 8B (0.15s) are the lowest latency models, followed by Command-R (Mar '24) logo Command-R (Mar '24) & Command-R logo Command-R.

• **Price (\$ Per M tokens):**

Qwen2.5 Coder 7B logo Qwen2.5 Coder 7B (\$0.03) and Llama 3.2 1B logo Llama 3.2 1B (\$0.04) are the cheapest models, followed by Ministral 3B logo Ministral 3B & DeepSeek R1 Distill Llama 8B logo DeepSeek R1 Distill Llama 8B.

• **Context Window:**

MiniMax-Text-01 (4m) and Gemini 2.0 Pro Experimental (2m) are the largest context window models, followed by Gemini 1.5 Pro (Sep) & Gemini 1.5 Pro (May).

• **Intelligence:**

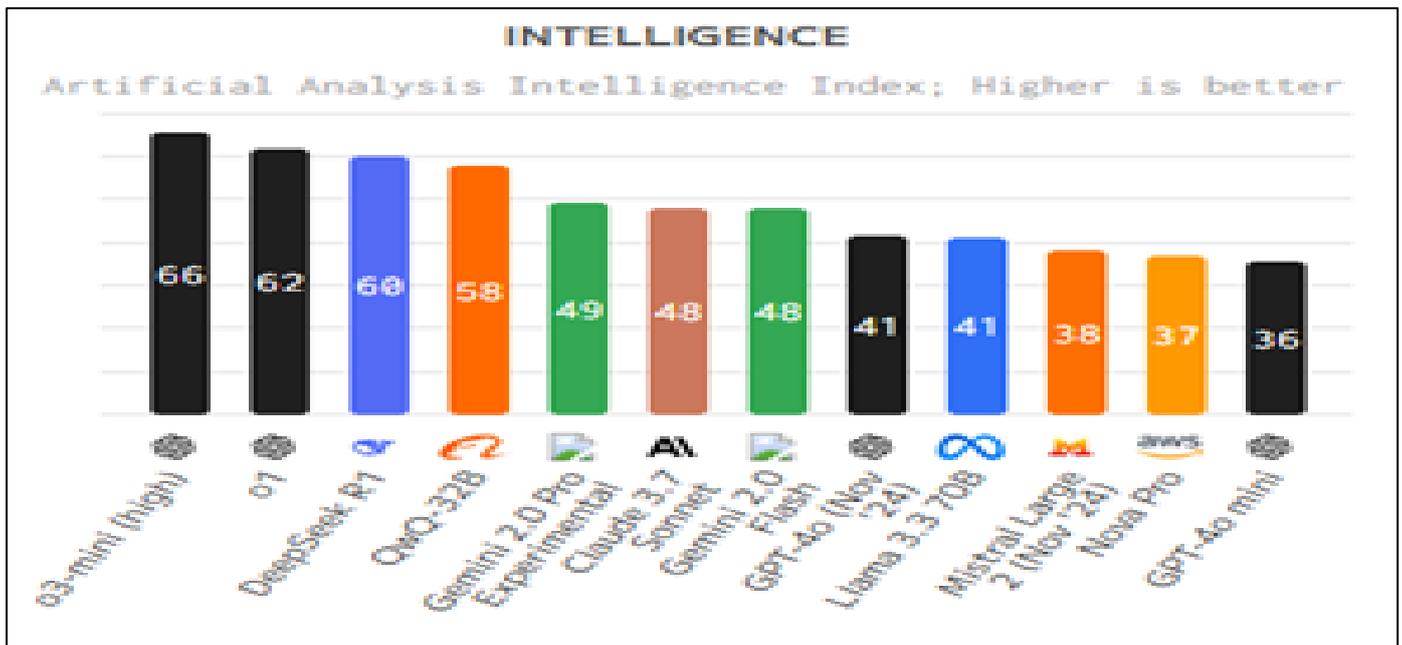


Fig 8 Intelligence of DeepSeek

• **SPEED:**

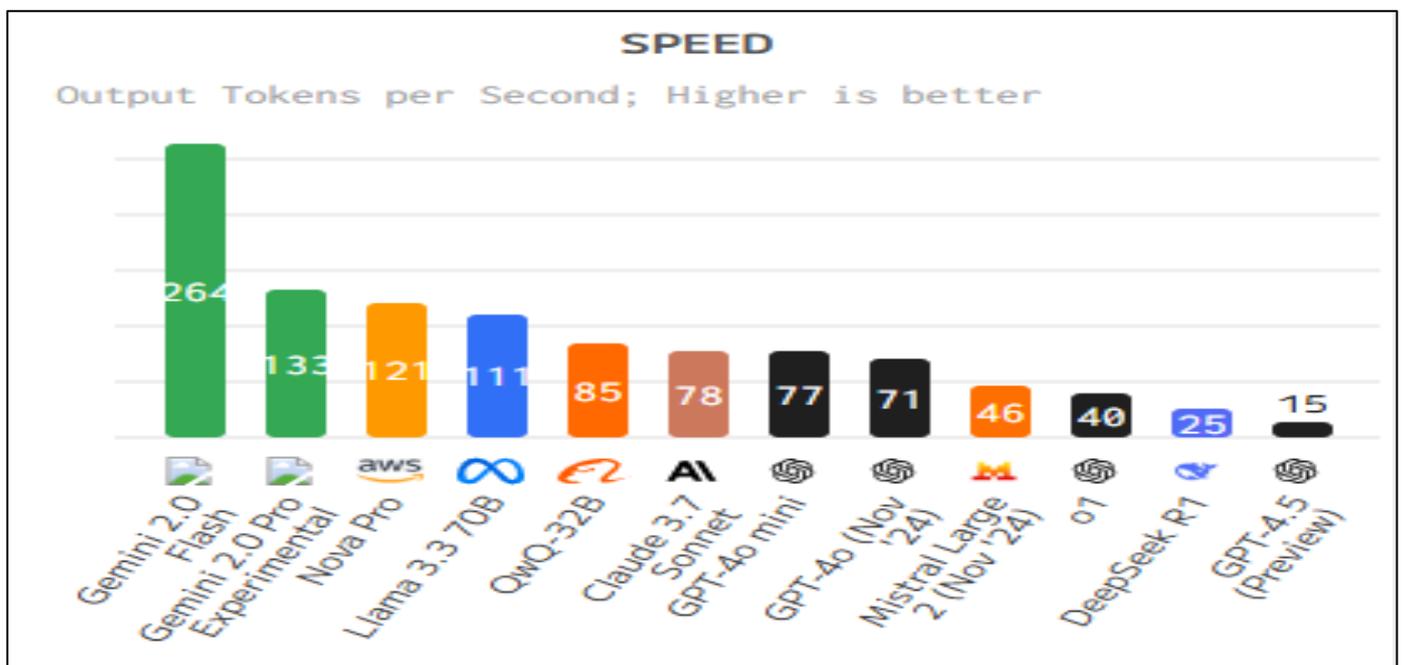


Fig 9 Speed of DeepSeek



FIG 10 Price of Deep Seek

- *MMLU-Pro (Reasoning & Knowledge)*

Intelligence evaluations measured independently by Artificial Analysis; higher is better.

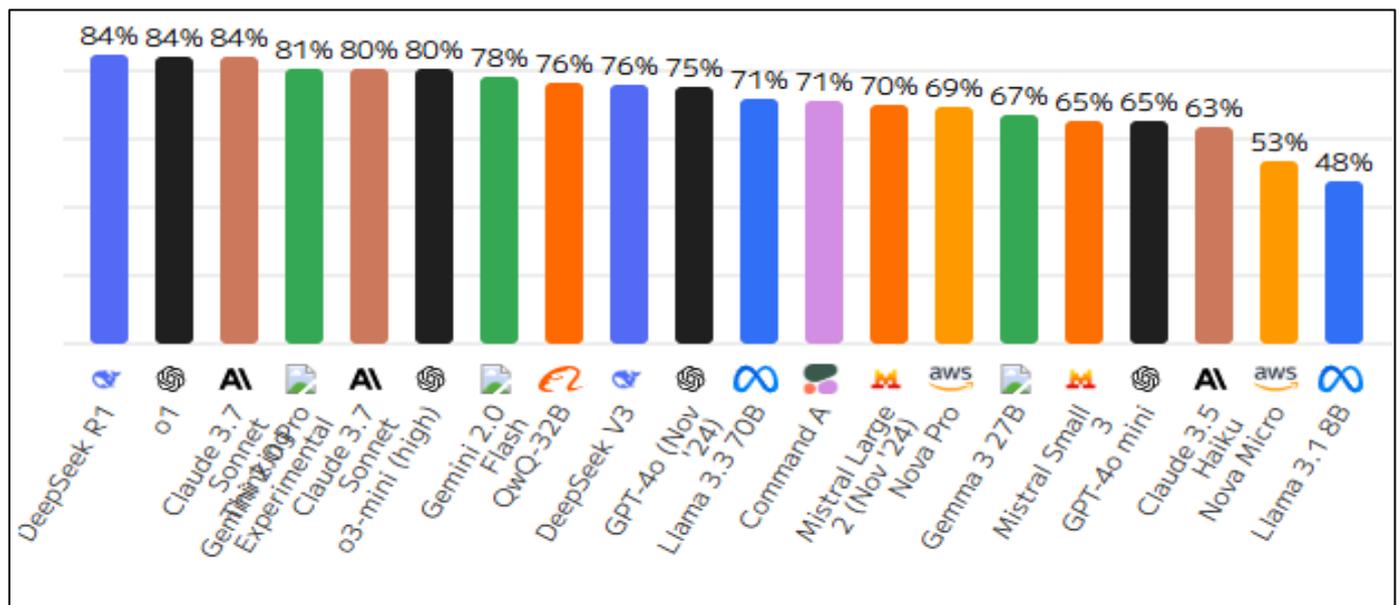


Fig 11 MMLU-Pro (Reasoning & Knowledge)

V. DEEPSEEK’S FUTURE IN THE GLOBAL AI MARKET

One of the biggest challenges for DeepSeek AI is expanding beyond China. While its technology is strong, built-in censorship may limit its adoption in Western markets.

If DeepSeek-AI can address these concerns while maintaining its efficiency and cost advantage, it could become a global AI leader. The shift toward cost-effective AI solutions is inevitable, and DeepSeek is well-positioned to capitalize on this trend.

As businesses look for smarter, cheaper AI solutions, DeepSeek could become a major force in the AI industry.

The coming years will determine whether it remains a regional success or reshapes the global AI landscape.

VI. CONCLUSION

DeepSeek’s innovations underscore the potential for new players to make significant contributions to AI development through technical ingenuity rather than sheer financial power. The company’s work highlights the importance of optimizing GPU workloads, improving software at the inference layer, and developing AI-generated kernels. These areas present opportunities for further advancements in AI efficiency and performance.

As the AI landscape continues to evolve, DeepSeek’s approach serves as a reminder that there is ample room for

innovation in optimizing both hardware and software aspects of AI systems. This is encouraging news for AI applications across various industries, as it suggests that the cost of deploying intelligent systems will continue to decrease, making advanced AI more accessible than ever before.

In conclusion, DeepSeek's journey illustrates that with strategic engineering optimizations and a commitment to open research, it's possible to develop high-performing AI models efficiently. This not only challenges existing paradigms in AI development but also paves the way for more inclusive and cost-effective advancements in the field.

The realm of AI innovation has historically been led by organizations with extensive resources and advanced hardware capabilities.

However, DeepSeek is demonstrating that true intelligence is not solely reliant on power; rather, it hinges on efficiency. The company has disrupted the AI sector by achieving high performance while minimizing computing expenses. With an expanding range of products, DeepSeek AI is well-positioned to cater to multiple sectors, including business automation, education, and finance. Its reasoning-driven methodology presents a compelling alternative to conventional AI frameworks. Should businesses focus on adopting cost-effective AI solutions without compromising on efficiency, DeepSeek AI may emerge as a significant player in the global AI landscape. Its journey is only beginning.

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