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Deep Seek vs. ChatGPT: A Deep Dive into AI Language Mastery

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Abstract

The rapid growth in artificial intelligence (AI) has immensely changed natural language processing (NLP), with two prevalent large language models (LLMs) in the form of DeepSeek and ChatGPT. DeepSeek's Mixture-of-Experts (MoE) model enables efficient scaling, cost-effectiveness, and problem-solving and is, therefore, best for use in STEM, coding, and processing structured information. In contrast, ChatGPT's dense transformer model is best for fluency, conversation, general NLP, customer service, content creation, and interactive use cases. However, DeepSeek's cloud-dependent model raises security concerns and must be locally run via LM Studio or Ollama for added security and information protection. This article compares architectures, training processes, performance tests, and real-life use cases of both LLMs, offering a complete analysis of both the strengths and weaknesses of both models. In the future, AI development must strive for a model with both MoE efficiency and transformer-based fluency, allowing for scalability, accuracy, and cost-effective AI use in industries..

Keywords: DeepSeek, ChatGPT, Artificial Intelligence, LLMs, Security

1. Introduction

Large language models (LLMs) have changed NLP with its capability to enable complex comprehension and creation of text. OpenAI's ChatGPT, for instance, has become ubiquitous in numerous sectors, including chatbots and automated content creation. However, DeepSeek, a model attained by the Chinese AI group DeepSeek, enters with a strong competitor, claiming to offer increased efficiency through its Mixture-of-Experts (MoE) model.

This paper compares DeepSeek and ChatGPT in a systematic way on architectural design, training approaches, security vulnerabilities, benchmarking performance, and usability in real life. The comparison seeks to form the primary differentiators between DeepSeek's MoE-based efficiency and ChatGPT's dense transformer performance, especially in enterprise use cases, cost control, and security issues.

2. Architectural Differences

DeepSeek: Mixture-of-Experts Approach

DeepSeek leverages a Mixture-of-Experts (MoE) model, selectively exciting a subset of its 671 billion parameters for specific input data. This maximizes computational efficiency, using only a subset of its 671 billion parameters (with 37 billion active per token) at any time. Inference cost is kept low with high performance in a specific domain, such as math and coding, through its design. One of the most important advantages of DeepSeek is its long context length, with a 128,000-token capability, many

times larger than ChatGPT's default 8,000-token value (Heinrichs, 2025). It is best utilized in long-range dependency scenarios, such as generating code and document summarization.

ChatGPT: Dense Transformer-Based Model

ChatGPT, particularly its GPT-4o model, employs a dense transformer model with all model parameters utilized during inference. Consequently, language accuracy is assured, but computational costs increase. OpenAI's ChatGPT is tuned for general-purpose use, and thus, it is immensely flexible in chatbots, generating creative output and general NLP and common-sense reasoning operations (Belcic & Stryker, 2024). Since it is a dense model, ChatGPT has high latency and computational demand over DeepSeek but generally outpaces NLP operations and chatbot AI use cases.

3. Training Methodologies

DeepSeek's Training Pipeline

DeepSeek's training pipeline is built upon 14.8 trillion tokens, heavily biased towards English, Chinese, math, and computer programs for logical thinking enhancement. Supervised Fine-Tuning (SFT) reinforces performance in specific task areas, and Reinforcement Learning (RL) enhances its ability to address complex problem-solving (Lambert, 2024). Meanwhile, Multi-head Latent Attention (MLA) optimizes parameter selection with fewer computational overheads and greater efficiency (Richter, 2025). The Mixture-of-Experts (MoE) model enables selective parameter activation, and thus, DeepSeek is remarkably proficient in areas like mathematics, debugging, and problem-solving in a structured format. Due to such structured training, DeepSeek is better at math thinking, debugging, and problem-solving in a structured format. However, its specialization in logical-task performance makes it less versatile in conversational AI and natural language inference, where, by contrast, it needs to have high fluency and general contextual awareness.

ChatGPT's Training and RLHF

ChatGPT follows a two-step training schedule, with generalizability through pretraining over various web sources and supervision-fine-tuning for factuality and coherence. Reinforcement Learning from Human Feedback (RLHF) aids in the supervision-fine-tuning of response prioritization and, thus, in high interactivity and contextual awareness in ChatGPT (IBM, 2023). Unlike DeepSeek, with its technical expertise, ChatGPT is trained for general-purpose use and is effective in chatbots, customer service, and content creation. Its dense transformer model can generate output similar to humans with added fluency and inventiveness and performs better in language inference, narrative, and emotion analysis. Nevertheless, its configuration comes at a computational and latency price, and in less-resourced environments, it will not be as efficient as DeepSeek.

4. Performance Benchmarks

DeepSeek and ChatGPT are benchmarked with datasets, including SuperGLUE, MMLU, and BIG-bench, with each showcasing its respective strengths. DeepSeek is particularly strong in math problem-solving, with an 88.5 in MMLU over 87.2 for ChatGPT, benefiting from its efficiency with Mixture-of-Experts (MoE) (Doshi, 2025). It performs even better in coding, with 97% accuracy in debugging and logical puzzles (Benjamin, 2025). However, in general language comprehension, ChatGPT takes over, with a high rank in SuperGLUE through its high level of fluency and common-sensical thinking. Where DeepSeek is geared towards specific use in STEM-related areas, ChatGPT offers a balanced NLP experience in various areas.

5. Real-World Applications

Customer Support

According to Roumeliotis and Tselikas (2023), ChatGPT is best for customer service, offering contextual feedback and fluent output that maximizes user engagement. With its training via RLHF, it can dynamically answer questions posed by a user. For that reason, it is ideal for general customer queries, debugging, and chatbots with an interactive function. For technical support, specifically mathematics and computer programs, when accuracy and problem-solving matter in an organized manner, use DeepSeek. With its upgraded thinking, it is even safer to use with sophisticated queries about computer programs, engineering, and financial modeling. For general customer service, utilize ChatGPT, but for focused technical service in STEM, utilize DeepSeek.

6. Content Creation

According to Haleem et al. (2024), ChatGPT is particularly utilized for generating content and performs admirably in blog posts, fiction, marketing, and scriptwriting. The combination of contextual competence and text generation abilities with tone accuracy capability positions this tool as an essential asset in digital media adv, retirement, and journalism. DeepSeek delivers superior results in structured content, including computer program reports, technical documentation, and scientific articles. Factuality remains its strength, which allows DeepSeek to succeed best in detailed environments. The feature of creativity and fascination in ChatGPT's output contrasts with DeepSeek's preference for brief factual results and accuracy in content delivery, specifically for academic research and engineering work.

7. Education

According to by Jiang et al. (2024), ChatGPT is most frequently used in academic settings, in humanities, language, and general academic support. It can serve as a useful tool for explanations, summaries, and discussion, and thus, it can become a useful tool for both students and teachers. On the contrary, DeepSeek is best in the case of STEM, and it works best in mathematics, computer programming, and logical thinking (GeeksforGeeks, 2025). With its trained background in organized information, it can best work for engineering, finance, and physics-related queries. ChatGPT can work in general subjects, but for high-precision, technical subjects, DeepSeek is best. Thus, it can become a must-use tool for students and professionals in STEM who require correct, organized information.

8. Security and Privacy Concerns

Security and information privacy are most apparent when comparing DeepSeek and ChatGPT, particularly in processing and infrastructure methodologies. DeepSeek employs cloud servers in China, and its use is a cause for privacy concern, with experiences being processed remotely with no guarantee of confidentiality. There is a high degree of potential risk in terms of tracking, unapproved access, and transparency in information management. Organizations working with sensitive information must exercise caution, with cloud use in DeepSeek having a chance of opening confidential information to outsiders' observation.

In contrast, ChatGPT operates under OpenAI's structured security policies, with stricter data security protocols in use. One must, however, exercise care when dealing with OpenAI's information collection, in that sessions can be stored for training and tracking. For additional security, one can run DeepSeek locally via LM Studio or Ollama and use Docker isolation to circumvent tracking and maintain

anonymity in data. Next-generation AI development must involve hybrid architectures with both efficiency and robust security controls.

9. Cost and Efficiency Considerations

Computational Costs

The Mixture-of-Experts (MoE) model from DeepSeek performs its computations quickly through its capability to activate minimal parameter subsets for token processing during dataset operations. All parameters in the dense transformer model of ChatGPT require excessive processing that exceeds the requirements of Mixture-of-Experts architecture. DeepSeek achieves cost-efficient processing, whereas ChatGPT processing becomes expensive as the system requires extensive operations resources as Field (2025) states.

10. Latency and Response Time

DeepSeek achieves high inference speed through selective activation of parameters, taking less processing time and being ideal for real-time scenarios. In contrast, even with high accuracy, ChatGPT's rich model of transformers creates high latency through full-parameter activation during inference time (Arasa, 2025). Hence, DeepSeek is most suitable for real-time operations, but for ChatGPT, slow response times can arise.

11. Conclusion

DeepSeek achieves faster inference due to its ability to choose processing parameters from active sets, thus operating well for real-time scenarios. The ChatGPT system becomes slower during DeepSeek, and ChatGPT has disparate AI use cases. DeepSeek's use of a Mixture-of-Experts model for efficient scaling and expert problem-solving, and its suitability for use in STEM, coding, and budget-conscious use cases, stands in contrast to ChatGPT's use of a dense transformer model for increased fluency and conversationality, and its suitability for use in customer service and creative writing. However, DeepSeek's security vulnerabilities require caution, and one is encouraged to run it locally or in Docker for increased privacy. AI future development must develop hybrid models, fusing Mixture-of-Experts efficiency with dense transformer accuracy, for best performance in a variety of NLP tasks because it processes all its parameters simultaneously.

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