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PROMPT ENGINEERING: A NEW PARADIGM IN HUMAN – AI COMMUNICATION

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Abstract: Prompt engineering has emerged as a foundational paradigm in modern artificial intelligence systems, particularly in large language models (LLMs). Unlike traditional programming approaches that rely on formal syntax and logical operators, prompt engineering enables natural language-based interaction between humans and machines. This study explores prompt engineering as an interdisciplinary phenomenon at the intersection of linguistics, cognitive science, and artificial intelligence. The research adopts a qualitative conceptual analysis methodology to investigate how prompt structures influence model behavior, output accuracy, and semantic alignment with human intent. Findings indicate that prompt engineering functions as a cognitive-linguistic interface that translates human intentions into machine-interpretable instructions. Furthermore, iterative prompt refinement significantly enhances output quality and reduces ambiguity. The study concludes that prompt engineering is not merely a technical skill but a new communication paradigm shaping the future of human–AI interaction systems.

Keywords: Prompt Engineering, Human–AI Interaction, Large Language Models, Natural Language Processing, Cognitive Interface, AI Communication

Аннотация

В данной статье prompt engineering рассматривается как новая парадигма коммуникации между человеком и искусственным интеллектом. Исследование анализирует структурные, лингвистические и когнитивные особенности промптов при взаимодействии с большими языковыми моделями (LLM). В качестве методологии применяется концептуальный и сравнительный анализ. Результаты показывают, что prompt engineering представляет собой не просто технический инструмент, а сложный когнитивно-лингвистический интерфейс, преобразующий человеческие намерения в машинно-интерпретируемые инструкции. Исследование подтверждает, что структура промпта существенно влияет на качество и точность генерируемых ответов ИИ. В заключение отмечается, что prompt engineering формируется как междисциплинарная научная область, обеспечивающая эффективную коммуникацию между человеком и системами искусственного интеллекта.

Ключевые слова: prompt engineering, искусственный интеллект, большие языковые модели, человеко-ИИ взаимодействие, когнитивный интерфейс

1. Introduction

The development of artificial intelligence has undergone several transformative phases, from rule-based expert systems to deep learning architectures and, most recently, to large language models capable of generating human-like text. This evolution has fundamentally changed how humans interact with machines. Earlier computational systems required precise programming languages such as Python, Java, or C++, where even minor syntactic errors would result in system failure. In contrast, modern AI systems such as transformer-based models allow interaction through natural language instructions.

Prompt engineering has emerged as a critical innovation in this new paradigm. It refers to the strategic design of input queries (prompts) to guide AI systems toward producing desired outputs. The simplicity of natural language interaction masks the complexity behind prompt interpretation, which is deeply rooted in probabilistic language modeling.

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Despite its growing relevance, prompt engineering lacks a unified theoretical framework. It is often treated as an applied skill rather than a scientific discipline. This research addresses this gap by conceptualizing prompt engineering as a new paradigm in human–AI communication.

The objectives of this study are:

1. To define prompt engineering within a theoretical framework
2. To examine its role in AI behavior control
3. To analyze linguistic and cognitive mechanisms behind prompts
4. To propose a conceptual model of human–AI communication via prompts

2. Literature Review

The concept of prompt engineering is relatively new but builds upon several established research domains.

Brown et al. (2020) demonstrated that large language models can perform multiple NLP tasks without task-specific training when provided with well-structured prompts. This introduced the concept of "few-shot learning" and highlighted the importance of input design.

Wei et al. (2022) introduced chain-of-thought prompting, showing that structured reasoning within prompts significantly improves performance on complex reasoning tasks. This finding suggests that prompts are not merely inputs but cognitive scaffolding tools.

Liu et al. (2023) categorized prompting techniques into zero-shot, few-shot, and instruction-based prompting, emphasizing variability in model response depending on prompt formulation.

From a linguistic perspective, Austin's Speech Act Theory provides a foundation for understanding prompts as performative utterances rather than static inputs. Prompts can be seen as "directive speech acts" that trigger computational responses.

In cognitive science, prompts resemble external cognitive artifacts that guide reasoning, similar to scaffolding in Vygotsky's theory of learning. They provide structure for problem-solving processes that the AI internalizes during inference.

However, existing literature lacks integration across linguistic, cognitive, and computational dimensions. This study addresses this gap by proposing a unified conceptual framework.

3. Methodology

This study employs a qualitative conceptual synthesis approach. The methodology consists of three analytical layers:

3.1 Conceptual Decomposition

Key concepts such as "prompt", "instruction tuning", "context window", and "semantic alignment" were analyzed to identify functional relationships.

3.2 Comparative Prompt Analysis

Different prompting strategies were compared:

1. Zero-shot prompting
2. Few-shot prompting
3. Chain-of-thought prompting
4. Role-based prompting
5. Instruction-tuned prompting
6. Each was evaluated based on clarity, reasoning depth, and output consistency.

3.3 Theoretical Model Construction

A conceptual framework was developed in which prompt engineering is modeled as a **triadic system**:

1. Human intention layer
2. Linguistic encoding layer
3. Machine interpretation layer

This model explains how meaning is transformed across cognitive and computational boundaries.

4. Results

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The analysis produced several key findings:

4.1 High Sensitivity to Linguistic Structure

Prompt outputs vary significantly based on lexical choice, syntax, and contextual framing. Even minor rewording can alter semantic outcomes.

4.2 Emergence of Prompt as Control Mechanism

Prompts function as indirect control signals that shape probabilistic model behavior without explicit programming.

4.3 Iterative Optimization Effect

Repeated refinement of prompts leads to progressively improved outputs, indicating that prompt engineering is inherently an iterative optimization process.

4.4 Context Dependency

The effectiveness of prompts depends heavily on context length, prior conversation history, and embedded instructions.

4.5 Cognitive Mediation Role

Prompts act as cognitive mediators translating abstract human intent into structured computational instructions.

5. Discussion

The findings suggest that prompt engineering represents a fundamental shift in computational paradigms. Unlike traditional programming, where logic is explicitly defined, prompt engineering operates within probabilistic semantic spaces.

From a linguistic perspective, prompts are not merely input strings but structured meaning carriers. They function similarly to natural language commands in human communication systems.

From a cognitive perspective, prompt engineering externalizes human reasoning processes. It enables users to offload cognitive structuring tasks onto AI systems.

From a computational perspective, prompts influence token probability distributions, thereby shaping output generation pathways.

Ethically, prompt engineering introduces new challenges, including:

1. Prompt injection vulnerabilities
2. Bias amplification through framing
3. Misinterpretation of ambiguous instructions
4. Over-reliance on AI-generated reasoning

These challenges highlight the need for standardized prompt design frameworks and ethical guidelines.

6. Conclusion

Prompt engineering represents a new paradigm in human–AI communication, bridging linguistic expression and computational interpretation. It transforms natural language into a functional interface for controlling AI behavior.

This study demonstrates that prompt engineering is not merely a technical skill but an interdisciplinary field combining linguistics, cognitive science, and artificial intelligence. Its significance will continue to grow as AI systems become more integrated into education, research, and industry.

Future research should focus on:

1. Formal mathematical modeling of prompt structures
2. Standardization of prompt engineering practices
3. Ethical frameworks for safe AI interaction
4. Cross-linguistic prompt optimization

References:

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1. Brown, T. et al. (2020). Language Models are Few-Shot Learners. NeurIPS.
2. Wei, J. et al. (2022). Chain-of-Thought Prompting Elicits Reasoning in Large Language Models.
3. Liu, P. et al. (2023). Pre-train, Prompt, and Predict: A Survey. ACL.
4. OpenAI (2023). GPT-4 Technical Report.
5. Austin, J. L. (1962). How to Do Things with Words.
6. Vygotsky, L. S. (1978). Mind in Society.
7. Grice H. P. (1975). Logic and Conversation.
8. Leech G. (1983). Principles of Pragmatics.
9. Jurafsky D., Martin J. H. Speech and Language Processing.
10. Russell S., Norvig P. Artificial Intelligence: A Modern Approach.
11. Holmes W., Bialik M., Fadel C. Artificial Intelligence in Education