Enhancing AI Dialogue through Dual Role Assignment: An Investigation of User-AI Professional Role Sharing

Keisuke Sato,

Natural Science, National Institute of Technology, Ibaraki College, 866 Nakane, Hitachinaka-shi, Ibaraki-ken, Japan
skeisuke@ibaraki-ct.ac.jp

Abstract. While conversational AI systems like ChatGPT, Claude, and Gemini are increasingly utilized across various domains, previous research has primarily focused on assigning professional roles (e.g., physician, historian) to AI models alone. This study empirically investigates how dialogue content transforms when professional roles are assigned to both users and AI. Through analysis of dialogues about identical visual stimuli under four conditions (no-role/AI-only role/user-only role/both roles), we demonstrate that role assignment significantly influences response characteristics. Quantitative analysis reveals increased use of specialized terminology, while qualitative analysis shows enhanced expertise and multiperspectivity, particularly in the both-role condition. These findings suggest that user-side role assignment can be an effective prompt engineering strategy for deepening AI-human dialogue, with implications for educational tools and expert support systems.

Keywords: Large Language Models (LLM), Prompt Engineering, Role Theory, Framing Theory, User-AI Role Assignment

1   Introduction

The advent of Large Language Models (LLMs) has precipitated the proliferation of conversational AI systems such as ChatGPT, Claude, and Gemini across diverse domains, including education, healthcare, and business. These systems are facilitating intellectual collaboration between humans and AI through natural language dialogue [1-3]. In this context, "Prompt Engineering" has garnered considerable attention as a methodology for strategically designing user intentions, contexts, and roles to align LLM outputs with specific objectives, as evidenced by rapidly accumulating empirical evidence [4,5]. The effective design of prompts has been demonstrated to enhance model outputs in terms of expertise, abstraction, and multiperspectivity, thereby fostering creativity and critical thinking [6,7].

Among prompt engineering strategies, the assignment of specific professional roles (e.g., physician, historian, engineer, architect) to the model has been noted to effectively guide responses toward domain-specific frames [1,2]. This approach builds upon established theories such as Role Theory and Framing Theory, which originate from fields like sociology and communication studies [8,9]. It extends these

theories to the domain of AI dialogue, with the objective of facilitating coherent and profound model thinking processes by leveraging principles of human cognitive frame formation. In the educational and Human Computer Interaction (HCI) domains, role settings have been documented to facilitate expertise within learning communities and introduce multiple perspectives [10-12]. The provision of roles and contexts through prompting is projected as a strategy to promote learners' critical thinking and knowledge creation [4,7].

However, extant research has primarily focused on role assignment to the model (AI) side, with insufficient investigation into the effects of assigning professional expert roles (e.g., detective, psychologist, artist, architect, natural scientist) to the user side. While human-to-human communication research suggests that shared role expectations between dialogue participants influence collaborative knowledge construction and expertise development [10,12], it remains unexplored whether dialogue about visual stimuli takes on characteristics similar to expert-to-expert discussion when both user and AI share the same professional role. Furthermore, the extent to which this activates dialogue expertise, abstraction, and multiperspectivity is not yet known. This novel approach aims to extend prompt engineering strategies by combining novelty and utility.To address this knowledge gap, this study employs a unique methodology. It assigns professional roles to both user and AI, conducts dialogues about identical simple line drawings under four conditions (no role / AI-only role / user-only role / both roles), and then compares the resulting text logs through quantitative and qualitative analysis. Quantitative analysis evaluates trends in frequent terms and technical vocabulary, while qualitative analysis considers impacts on multiperspectivity, abstraction, and expertise.Through this, we empirically demonstrate how role sharing between user and AI can qualitatively transform dialogue, grounded in Role Theory and Framing Theory. The findings provide theoretical foundations for advanced dialogue design through prompt engineering, suggest applications across domains including HCI, educational tools, and creative support systems, and present new interaction design guidelines for the era of human-AI co-creation.

2   Methods

This study investigates how dialogue content transforms when professional roles (social and specialized roles) are assigned to both users and AI (Large Language Models, LLMs) during their interactions with visual stimuli. Role Theory and Framing Theory suggest that in human-to-human dialogue, role expectations form cognitive frames that induce expertise, multiperspectivity, and abstraction [8,9]. This research applies these insights to LLM dialogue, empirically examining whether sharing professional roles between user and AI leads to discourse patterns resembling expert-to-expert discussions.

The study utilizes four LLM models: ChatGPT-4o, OpenAI o1, Claude Sonnet 3.5, and Gemini Advanced. We analyze dialogues by combining professional role assignments for both users and AI with identical simple line drawing stimuli, employing both quantitative and qualitative analysis methods.

2.1   Target Models

The study examines four models:
- ChatGPT-4o: An OpenAI model covering broad knowledge domains, known for natural and coherent responses.
- OpenAI o1: An OpenAI model with different initial settings and training data from ChatGPT-4o, showing tendencies toward abstract and symbolic expressions.
- Claude Sonnet 3.5: An Anthropic model known for high general dialogue performance, with emphasis on functionality and practicality.
- Gemini Advanced 1.5 pro: A Google model predicted to demonstrate creative and artistic expression tendencies.

Each model was accessed through stable interfaces available at the time of the experiment, with execution dates recorded to ensure reproducibility. Memory functions and customization features (where available in models like ChatGPT) were disabled during the experiment.

2.2   Assignments and Conditions

Five professional roles were selected: detective, psychologist, artist, architect, and natural scientist. These roles were chosen to evoke different specialized perspectives and vocabularies, potentially transforming cognitive frames during dialogue. The experiment established four patterns based on role assignment to user and AI:
- Condition 0 (0-0): No roles assigned to either user or AI (baseline)
- Condition 1 (1-profession): Role assigned to AI only (e.g., "You are a detective…")
- Condition 2 (2-profession): Role assigned to user only (e.g., "I am a detective…" with no role assigned to AI)
- Condition 3 (3-profession): Roles assigned to both user and AI (e.g., "You are a detective. I am also a detective…")

Using the no-role state (0-0) as a baseline, we compared the effects of role assignments across conditions 1-profession, 2-profession, and 3-profession. The study collected approximately 48 cases (no-role + 5 roles × 3 role patterns, 4 models) between December 5-10, 2024.

Figure 1. The experiment utilized a simple line drawing as a visual stimulus. The image depicted a natural scene containing a large tree, a bench, hills, flowers, and clouds. This design was implemented to minimize specific cultural or social biases while allowing for multiple interpretations based on assigned professional roles.

2.3 Stimulus

The stimulus consisted of a simple line drawing depicting a large tree, a bench beside the tree, a small hill, flowers, and clouds. This simple landscape was chosen as a stimulus to minimize specific cultural or social biases, allowing for clearer observation of how role assignments might induce multiple interpretations and specialized perspectives. The image is shown in Figure 1.

2.4 Dialogue Protocol

Each dialogue session consisted of five sequential questions:
1. Initial Overall Impression: Role instructions were inserted in the first question according to conditions. For example, in Condition 3 (both roles assigned): "You are a detective. I am also a detective. Please identify points of interest in this picture." (In the no-role condition: "Please identify points of interest in this picture.")
2. Tree Question: "Thank you. First, please identify points of interest regarding the large tree in the center."
3. Bench Question: "Thank you. Next, please identify points of interest regarding the bench beside the tree."
4. Environmental Elements Question: "Thank you. Additionally, please identify points of interest regarding elements such as the hill, flowers, and clouds."
5. Comprehensive Analysis Request: "Thank you. Based on our dialogue so far, please analyze the situation of this location."

Role assignment instructions were given only in the initial question, while subsequent questions used standardized wording across all conditions and models. This approach eliminated factors other than role assignment (such as question order or wording differences) to clarify role effects.

2.5 Data Collection and Management

Each dialogue session was recorded as text logs and organized by model name, condition, and role type. The comprehensive analysis responses were stored in text format (Markdown), and all dialogues were archived in PDF format. Meta-information including execution dates was also recorded to ensure reproducibility. Interface stability was confirmed, and it was verified in advance that no major model updates would occur during the experimental period. To ensure research transparency and reproducibility, all dialogue logs and final responses (in Japanese) have been made publicly available on as shown in our published dataset [14].

2.6 Analysis Methods

The analysis employed both quantitative and qualitative approaches. In quantitative analysis, we measured frequent word extraction from responses to the comprehensive analysis request, examining statistical differences across conditions, models, and roles. For qualitative analysis, we conducted close readings of dialogue logs to descriptively analyze characteristics such as expertise development (tendency to utilize specialized knowledge), narrative and poetic expression, and practicality. This examination focused on how role assignment influenced multiple interpretations and specialized interpretations, while also considering changes in model-specific expression characteristics (explanatory, creative, practical, and symbolic tendencies).

2.7 Experimental Considerations

In order to isolate the effects of role assignment, it was necessary to standardize both dialogue protocols and visual stimuli, while ensuring that other factors remained constant. The no-role condition (0-0) was established as a baseline for the evaluation of role assignment conditions. Furthermore, data collection timing was managed in a manner that would avoid model updates or external environment changes. This was done with the advance confirmation that no major updates would occur during the execution period.

2.8 Future Prospects and Limitations

This research remains an initial verification limited to a single stimulus, five professional roles, and four models. Future investigations should explore the diversification of stimuli, the addition of roles, the implementation of long-term dialogue, and verification using models with enhanced memory capabilities. Such expansions would facilitate the investigation of the generalizability and developmental possibilities of role assignment strategies.

3   Results

3.1   Quantitative Analysis Results: Changes in Frequent Words and Lexical Features

In this study, we employed an identical set of questions across all conditions, including the no-role condition (0-0). However, the frequency of words and lexical tendencies in responses varied significantly depending on the assignment of professional roles to the user and AI.In this section, we report these changes by extracting and comparing frequent words (appearing three or more times) from the final comprehensive analysis responses. While this study examined five professional roles (detective, psychologist, artist, architect, and natural scientist), our primary focus is on the detective role, which demonstrated the most notable lexical changes, serving as a representative example.

3.1.1   Lexical Tendencies in No-Role Condition

In the no-role condition (0-0), the top frequencies across all models (ChatGPT 4-o, OpenAI o1, Claude, Gemini) were dominated by words that simply described the visual stimulus, such as "place," "nature," "flower," "bench," "space," and "atmosphere" (see Table 1). For instance, ChatGPT 4-o frequently used words such as "place (11 times)," "nature (8 times)," "quiet (4 times)," and "peaceful (3 times)," evoking a tranquil scenery. While Gemini and OpenAI o1 included terms such as "landscape," and "expression," the overall responses remained at the level of observing objects as they are. Consequently, under the no-role condition, professional perspectives or investigative viewpoints were not accentuated, with an emphasis instead being placed on straightforward nature and scene descriptions.

Table 1. Comparison of frequently occurring words (appearing 3 or more times) in responses across models under no-role condition. The table shows words and their frequencies for each model, demonstrating the tendency toward natural scene description in the absence of role assignment.

ChatGPT 4o		OpenAI o1		Claude		Gemini	
Terms	Freq	Terms	Freq	Terms	Freq	Terms	Freq
place	11	landscape	6	place	9	creator	7
nature	8	place	6	space	6	expression	7
time of day	5	space	4	nature	4	picture	6
bench	4	element	4	bench	3	arrangement	5
people	4	image	4	people	3	hill	3
space	4	symbol	3	function	3	inference	3
quiet	4	bench	3	environment	3	these	3
flower	4	cloud	3			landscape	3

ChatGPT 4o		OpenAI o1		Claude		Gemini	
Terms	Freq	Terms	Freq	Terms	Freq	Terms	Freq
description	3	peaceful	3			cloud	3
peaceful	3	simple	3			nature	3
park	3	nature	3			reality	3
simple	3	expression	3				
season	3						
situation	3						
atmosphere	3						
possibility	3						

3.1.2 Changes in Frequent Words with Detective Role Focus Features

Next, to analyze lexical tendencies when assigning the detective role in detail, we compared four conditions using ChatGPT 4-o as an example: "0: no-role," "1: AI-only detective," "2: user-only detective," and "3: both detective" (see Table 2). Results showed a clear shift from simple nature description to words suggesting investigation and risk management.

- 0 (No-Role)
  - Frequent words like "place (11 times)," "nature (8 times)," "time of day (5 times)," "bench (4 times)," "people (4 times)," "quiet (4 times)" describe the landscape itself.
  - Only objectively explains objects, with almost no vocabulary related to deduction or risks.
- 1 (AI-only Detective)
  - Increase in words interpreting "hidden meanings" and inferring potential incidents: "picture (16 times)," "symbol (12 times)," "possibility (9 times)," "implication (5 times)," "event (5 times)."
  - With AI assigned the detective role, it shows an active stance in interpreting clues and situations hidden in the picture.
- 2 (User-only Detective)
  - Increase in words suggesting somewhat introspective and philosophical investigation perspectives: "place (11 times)," "possibility (8 times)," "intention (5 times)," "solitude (4 times)," "contemplation (3 times)."
  - Though the questions remain identical, with the user approaching as a "detective," AI seems to recognize "user seeks investigative perspective" and responds with focus on intention and contemplation.
- 3 (Both Detective)
  - Increase in practical vocabulary suggesting public space safety management and investigation planning: "crime prevention (5

times),” “risk (4 times),” “countermeasure (4 times),” “occurrence (3 times),” “management (3 times),” “incident (3 times).”

When user and AI share the same detective role, dialogue shifts toward specific and mutually complementary “expert-to-expert discussion”, deepening risk assessment and incident consideration.

Table 2. Comparison of frequently occurring terms in ChatGPT-4o responses across four role conditions (no-role, AI-only detective, user-only detective, both detective), showing the transformation of vocabulary from natural description to investigation-focused terminology.

No Role		AI-only		User-only		Both	
Terms	Freq	Terms	Freq	Terms	Freq	Terms	Freq
place	11	picture	16	place	11	place	13
nature	8	place	14	possibility	8	possibility	8
time of day	5	symbol	12	bench	7	bench	6
bench	4	bench	9	space	7	crime prevention	5
people	4	possibility	9	symbol	6	hill	5
space	4	flower	8	picture	6	time period	5
quiet	4	hill	7	intention	5	object	5
flower	4	cloud	6	reality	5	visibility	4
description	3	situation	6	solitude	4	risk	4
peaceful	3	meaning	6	landscape	4	installation	4
park	3	implication	5	cloud	4	countermeasure	4
simple	3	event	5	arrangement	4	environment	4
season	3	space	5	contemplation	3	verification	4
situation	3	element	4	order	3	condition	4
atmosphere	3	each	4	hill	3	users	3
possibility	3	someone	4	ambiguity	3	analysis	3
		stillness	3	specific	3	description	3
		silence	3	message	3	lighting	3
		emphasis	3	flower	3	management	3
		concrete	3	someone	3	occurrence	3
		arrangement	3			incident	3
		whole	3			element	3
		reality	3			utilization	3
		memory	3			situation	3
		case	3				

3.1.3 Cross-Model Comparison Overview

Furthermore, when both parties were assigned detective roles, other models (OpenAI o1, Claude, Gemini) also demonstrated a high frequency of distinctive vocabulary based on investigative frames (see Table 3). Notably, OpenAI o1 highlighted deductive and code-breaking perspectives with terms such as " identification," "clue," "message," and "cipher." In contrast, Claude frequently employed vocabulary that was mindful of the organization of facts and operational analysis, including "cipher," "information," and "unnatural." Notably, Gemini exhibited a narrative element reminiscent of a mystery novel, repeatedly using words such as "criminal", "crime", and "clue", thereby demonstrating an investigative perspective that incorporates storytelling elements.

Consequently, the introduction of the "detective" role in dialogue led to a substantial increase in the use of vocabulary related to crime, investigation, prevention, and risk assessment, despite the repetition of identical questions.Furthermore, the integration of model-specific expressions (logical, abstract, narrative, practical) appears to generate a multitude of variations in responses.

Table 3. Most frequent terms in the final responses when both user and AI were assigned detective roles. The analysis reveals distinct vocabulary patterns across different LLM models, demonstrating how each model interpreted and expressed the detective perspective. Only terms appearing three or more times are shown. Freq = Frequency of occurrence.

ChatGPT 4-o		OpenAI o1		Claude		Gemini	
Term	Freq	Term	Freq	Term	Freq	Term	Freq
security	5	possibility	6	cipher	5	criminal	10
hill	5	identification	5	possibility	5	location	6
object	5	flower	5	information	5	crime	4
visibility	4	picture	5	hill	3	possibility	4
risk	4	clue	4	element	3	clue	3
installation	4	message	4	unnatural	3	element	3
measure	4	indication	3				
environment	4	cipher	3				
verification	4	situation	3				
condition	4						
user	3						
analysis	3						
lighting	3						
management	3						
occurrence	3						
incident	3						
element	3						
usage	3						

3.1.4 Comparison with Other Roles

While the present study did implement conditions involving other roles (e.g., psychologist, artist, architect, natural scientist), each of these conditions demonstrated increases in profession-specific vocabulary (e.g., "emotion," "symbol," "projection" for psychologist; "design," "material," "spatial arrangement" for architect). However, the detective role exhibited the most substantial increase in words referencing incidents and crime prevention.Significant changes unique to the "criminal investigation" frame were observed. Consequently, this section primarily presents vocabulary change examples focusing on the detective role, which exhibited particularly notable changes.

3.1.5 Summary and Bridge to Next Section

A quantitative analysis revealed that role assignment dramatically transforms frequent words in responses. Even with user-only role settings, responses clearly change, and under both-role settings, the characteristics of expert-to-expert discussion strengthen further. These quantitative differences are supported by close reading of dialogue contexts in the next section (Qualitative Analysis), providing important clues for qualitatively understanding how expertise, multiperspectivity, and abstraction are induced.

3.2 Qualitative Analysis Results: Qualitative Characteristics and Perspective Transformation

This section undertakes a qualitative examination of the manner in which the vocabulary alterations substantiated in the quantitative analysis (3.1) were manifested in the actual dialogue content. To this end, the focus is directed towards the detective role, wherein a comparative analysis is conducted amongst four conditions: (0-0) no-role, (1-1) AI-only detective, (2-1) user-only detective, and (3-1) both detective. A meticulous examination is undertaken, elucidating the deepening of interpretations and the evolution of language expressions across models (ChatGPT-4o, OpenAI o1, Claude, Gemini). While this study also assigned other roles (e.g., psychologist, artist, architect, natural scientist), the detective role showed particularly notable differences. Consequently, this section primarily reports qualitative changes using the detective example.

3.2.1 ChatGPT-4o Case

Before role assignment (0-0), ChatGPT-4o focused on simple annotations about natural descriptions, seasonal feelings, and elements like benches, flowers, and clouds. However, as detective roles were assigned to AI or user, incident potential and hidden meanings began to appear, significantly shifting perspectives toward "investigation,

evidence, and traces." The following section delineates the qualitative changes observed under each condition:

- **0-0 (No-Role)**
  Peaceful and objective tone praising nature. Primarily explains parks, time of day, and seasons, interpreting the space as a "peaceful resting area."

- **1-1 (AI-only Detective)**
  As AI adopts the detective perspective, questions arise like "could an empty bench be evidence of something?" and "what events might the absence of people suggest?", with increased references to incident potential and implicit meanings. The quietness is interpreted as "evidence that someone was once here," dramatically expanding interpretative range.

- **2-1 (User-only Detective)**
  With user identifying as detective, the responding side also recognizes "user seeks investigative perspective" and strengthens symbolic interpretations and possibilities of past events. Rather than directly asserting "incidents," there's an increase in abstract and symbolic references that complement user's deduction and imagination.

- **3-1 (Both Detective)**
  With both user and AI as detectives, the entire dialogue takes on characteristics of "expert-to-expert discussion." Benches, trees, hills, and flowers are analyzed from crime prevention, risk, and management perspectives, with increased mentions of specific evidence collection and countermeasures. While maintaining high-level interpretations, there's a notable emphasis on developing concrete investigations.

As the narrative progresses from the objective description in 0-0 to the expansion of symbolism and incident potential in 1-1 and 2-1, and finally to the practical and equal deductive discussion in 3-1, the strength of the detective perspective increases progressively. Additionally, with the user-side role assignment in 2-1 and 3-1, there is an increase in the amount of information about "what and how deeply to interpret," thereby elevating the overall deductive and analytical level of dialogue.

3.2.2 OpenAI o1 Case

OpenAI o1 exhibits a tendency to employ abstract and symbolic expressions in its initial state, with a preponderance of symbol and atmosphere explanations, even in the no-role state (0-0). However, upon the introduction of detective roles, these abstract and symbolic interpretations become intertwined with crime investigation metaphors, thereby emphasizing narrative and code-breaking perspectives. The following section delineates the qualitative changes observed under each condition:

- **0-0 (No-Role)**
  Abstract evaluations like "simple landscape," "symbolic elements," "tranquility" dominate. Remains in artistic and symbolic landscape analysis without mentioning incidents.

- **1-1 (AI-only Detective)**
  Reinterprets each element as "hidden messages" or "secret meeting places." Flowers, benches, and clouds are viewed as codes or parts of messages, with

artistic symbolism suddenly flowing into investigative contexts like "clues to criminal plans."

- **2-1 (User-only Detective)**
  AI considers user perspective and repeatedly suggests "possibility of implicit messages, though definitive evidence cannot be shown." Shows tendency toward moderate analysis (e.g., "while not conclusive, could be investigative hints") rather than fully embracing conspiracy theories like in 1-1.
- **3-1 (Both Detective)**
  With both as detectives, unusual bench and flower arrangements are interpreted as intentional codes, emphasizing dramatic and deductive conversation about "what messages might be hidden" and "what the perpetrator aims for." Incident interpretation becomes most intense, with increased narrative and conspiracy elements.

OpenAI o1's adeptness with abstract language facilitates a seamless transition from "symbolism → crime codes" with the incorporation of the detective role. A broad spectrum is evident, ranging from (0-0) artistic abstraction to (3-1) crime encoding.

3.2.3 Claude Case

Claude, known for practicality and action orientation, shows marked increase in references to specific investigation procedures and crime prevention measures when detective roles are introduced. Conversely, in no-role state, it maintains general, balanced descriptions centered on nature and spatial comfort, not purely practical.

- **0-0 (No-Role)**
  Primarily peaceful, harmonious park descriptions. Mentions natural elements and rest/meditation, giving impression of a "calm space."
- **1-1 (AI-only Detective)**
  With detective perspective, increases mentions of "secret transactions" and "code elements." Same Park benches and trees are reevaluated from risk and crime perspectives like "might be unnatural arrangements" or "possibility of information exchange here."
- **2-1 (User-only Detective)**
  Increased AI suggestions of concrete actions like "investigation checkpoints" and "necessary verification items." More likely than 1-1 to list "what to investigate practically" aligned with user's detective perspective.
- **3-1 (Both Detective)**
  Most detailed mentions of "investigation plans" and "evidence collection," developing responses like practical investigation simulations. Park-like space is very concretely analyzed as a "stage for planned crime."

Claude shows most prominent mentions of "action," "investigation process," "procedures" with detective role. Perspective and expression change progressively from 0-0 calmness → (1-1, 2-1, 3-1) investigation practicality concretization, with observable expertise enhancement.

3.2.4　Gemini Case

Gemini features artistic and narrative expressions, with detective role assignment bringing detective novel-like and dramatic elements to the forefront. While art critique-like writing in no-role state, it shifts dramatically to frequent detective drama-style references like "partner," "crime," "clues" with detective role.

- **0-0 (No-Role)**
  Frame purely approaches art critique, discussing "picture expression and composition unnaturalness" without crime references.
- **1-1 (AI-only Detective)**
  Links unnatural arrangements to "evidence destruction" and "alibi creation," developing narrative deductions. Adds imaginative and dramatic tones, infusing scenes with "stories."
- **2-1 (User-only Detective)**
  With user as detective, AI presents various mysteries as "investigation cooperation," preparing developments conducive to crime scenario deduction. While maintaining some neutrality, suggests narrative investigation hooks like "flowers' position might have intention."
- **3-1 (Both Detective)**
  Dialogue becomes almost detective drama-style, frequently using direct terms like "partner," "criminal," "arrest." Picture is "definitely case evidence," emphasized in story-driven format.

With detective role, Gemini combines artistic expression + dramatic deduction, developing most narrative-heavy speculations. Large gap between "0-0→3-1," dramatically transforming simple landscape into "decisive scene leading to criminal arrest."

3.1.5　Comprehensive Discussion: Cross-Model Perspective

Across all models, dialogues devoid of role assignments (0-0) persistently prioritize peaceful nature descriptions and abstract landscape evaluations. However, with the incorporation of detective roles (1-1, 2-1, 3-1), perspectives undergo a sudden expansion to encompass "incident potential," "codes," "crime prevention," and "investigation." This transformation is particularly evident in conditions where both parties adopt detective roles (3-1), as the qualitative dialogue shift most closely resembles experts sharing deductions.Distinct characteristics emerged among the various models. ChatGPT-4o emphasizes logic and coherence while considering the user's (detective's) perspective for deduction, particularly increasing practical proposals such as crime prevention measures and specific risk management strategies in condition 3-1. The model OpenAI o1 demonstrates proficiency in abstract and symbolic thinking, adeptly developing code interpretation and hidden intention deduction when assigned detective roles, though it tends to fluctuate between moderate and conspiracy theory developments.The model Claude exhibits outstanding practicality and action orientation, typically providing specific lists of real

investigation processes, including crime investigation procedures and site surveys when assuming detective roles.The model Gemini emphasizes narrative and drama, displaying prominent detective novel-like story development upon detective role introduction, occasionally incorporating artistic metaphors to expand expression.

Furthermore, the present study's emphasis on "professional role assignment to the user side" was found to have a substantial impact on response quality.In conditions where users adopt detective roles (2-1, 3-1), models exhibit an enhanced capacity for investigative awareness and expertise, effectively interpreting the user perspective as equivalent to that of a detective.This effect is most notably observed in the both-detective condition (3-1), where dialogues frequently transition into collaborative discussions aimed at case resolution.

3.2.6   Summary and Bridge to Next Section

Qualitative analysis confirmed that with detective role assignment, explanations of same visual stimulus transform greatly from general nature description to investigative and deductive interpretation, with language expression and interpretation depth advancing. Furthermore, when users are also given detective roles, models strengthen deduction and assumptions aligned with user's expert perspective, showing qualitative characteristics close to expert-to-expert joint deduction. This provides new evidence for mutual influence through "shared cognitive frames" in Role Theory and Framing Theory, to be discussed in Chapter 4.

While other roles (psychologist, artist, architect, natural scientist) similarly switch dialogue content with professional perspectives (emotion, symbolism, design, ecology), detective role showed particularly clear differences in both quantitative and qualitative analysis due to strong unique frames of incidents, codes, investigation. Chapter 4 (Discussion) will address the theoretical significance of these findings and potential applications to prompt engineering strategies.

4   Discussion

4.1   Research Objective Review and Summary of Findings

This study sought to provide a comprehensive demonstration of how dialogue content evolves in terms of expertise, multiperspectivity, and abstraction when professional roles (e.g., detective, psychologist, artist, architect, natural scientist) are assigned to both users and artificial intelligence (AI) (e.g., large language models [LLMs]) during their interactions. While prior research has chiefly concentrated on persona (role) settings for AI models and documented alterations in response content [1,2], the implications of assigning professional roles to the human side have not been adequately explored.

To address this gap, our study established four conditions in total (including AI-only role, user-only role, and both roles), using a no-role state as baseline, and

analyzed dialogue logs about visual stimuli (simple line drawings) both quantitatively and qualitatively.The results revealed qualitative leaps in dialogue quality and strengthening of professional frames, suggesting utility as a novel prompt engineering strategy.

Quantitative analysis (3.1) of Chapter 3 compared frequent word trends across conditions and models, revealing the following:

- No-role condition: Centered on nature descriptions ("place," "quiet," "flower," "bench") and simple atmosphere words.
- Role assignment conditions (AI-only/User-only/Both): Significant increase in role-specific technical terms and concept words.

For instance, in the detective role, words denoting investigation such as "incident," "criminal act," "crime prevention," "code," and "clue" emerged with high frequency, indicating a shift toward interpreting visual stimuli from an incident perspective. Moreover, the both-role assignment condition exhibited the strongest propensity to elicit technical terms and multifaceted, abstract vocabulary, suggesting the emergence of expert-to-expert-like discussions when AI and user sides share a common frame of reference.

Qualitative analysis (3.2), employing the detective role as a case study, yielded the following findings through meticulous examination of response logs:

- No-role condition: This condition exhibited a restriction to peaceful nature descriptions and elementary scene comprehension.
- AI-only detective or User-only detective: These conditions introduced investigation and deduction perspectives to a limited extent, perceiving picture elements as "incident traces" or "suggestive messages".
- Both detective: The dialogue delved more specifically and professionally into crime prevention measures, criminal hypotheses, and risk assessment, with user and AI deductions mutually reinforcing each other, approaching "co-creative discussion."

Particularly under the application of the detective role, the same line drawing being redefined as a "crime investigation scene" or "case evidence" strongly confirmed the perspective-switching effect shown in Framing Theory [9]. These results suggest that user-side role settings may have a greater impact on AI dialogue than previously assumed in existing research.

4.2 Relationship with Role Theory and Framing Theory

4.2.1 Role Theory Perspective

According to Role Theory [8], social and professional roles significantly influence individual cognition and behavioral patterns, deepening meaning through interaction with others.As observed in this study, when either AI and user, or both, "share" the same role, the entire dialogue is reorganized around the language and perspectives expected of that professional role (see Chapter 3). This phenomenon is particularly

evident during the introduction of the detective role, where original peaceful line drawings are reinterpreted as "traces of criminal acts" or "spaces requiring crime prevention consideration."This observation can be interpreted as a manifestation of "role expectations" from Role Theory, which are projected across the entire AI-user interaction.Furthermore, in the both-role condition (3-1), detective roles establish a collaborative relationship that resembles an expert-to-expert discussion, thereby making expertise and depth of thought more apparent. While Nistor et al. (2014) demonstrate how assigning expert roles in learning communities can deepen knowledge construction [10], our study suggests similar effects may apply to AI dialogue, potentially extending the scope of Role Theory.

4.2.2 Framing Theory Perspective

Meanwhile, the theoretical framework of framing, as proposed by Entman [9], posits that the manner in which information is presented can profoundly influence its interpretation and reception. In our study, roles such as detective, psychologist, artist, etc., functioned as frames, positioning the same visual stimulus (line drawing) in entirely different contexts, including "crime investigation codes," "projection of inner symbolism," and "analysis of artistic composition".The shift to "incident mode" with the detective role exemplifies this framing effect. When users identify with the detective role, the AI interprets elements such as bench and tree placement, as well as flower and cloud elements, as "investigative clues." This prompts the AI to generate a dialogue incorporating deduction, hypotheses, and countermeasures.These cases exemplify the notion that the AI's response generation process is fundamentally altered, even when user information presentation and questions remain unchanged. This underscores the assertion that the AI's response is shaped by the cognitive frame imposed by the user's role.

4.3 Two-Layer Structure with Model-Specific Characteristics

The findings from both quantitative and qualitative analyses indicate that dialogue content undergoes diverse transformation through a "two-layer structure" comprising external frames derived from roles and internal characteristics of each model (e.g., logic, creativity, practical orientation, narrative ability, etc.). Specifically, the detective role frame elicits "investigation and incident potential," while the learning characteristics unique to ChatGPT-4o, OpenAI o1, Claude, and Gemini further branch expressions into logical reasoning, code breaking, concrete practical measures, and dramatic story development.

Specifically, within the same detective role, Claude prioritizes practicality in crime prevention and investigation processes, while Gemini employs narrative dramatization with "criminal," "clue," and "code." These differences suggest that while role assignment triggers professional language selection, models' internal expression styles reflect "how to enhance investigation and incident potential."This "two-layer model" supports strategies for users to intentionally direct LLMs' multiplicity (ability to generate diverse responses) through role settings. The

integration of professional roles not only on the AI side but also on the user side results in responses that are more sophisticated and specialized, thereby unveiling new avenues for prompt engineering.

4.4 Novelty of Co-creative Dialogue through User Role Assignment

The extant literature on role assignment in AI has historically focused on AI-side persona settings. For instance, Bozkurt & Sharma [1] and Bansal [2] report that assigning LLMs professional roles, such as physician, counselor, or historian, results in responses that exhibit expertise and contextuality.However, these prior studies have scarcely addressed whether AI transforms dialogue quality in response to the user side (human) assuming expert roles.

Our empirical findings demonstrate that when users adopt detective roles, AI responses are guided towards emphasizing expertise and deductive reasoning. That is, even in cases where investigative perspectives remain fragmentary under no-role or AI-only conditions, when users also identify as detectives, AI recognizes "user = expert with investigative perspective" and responds with expanded and deepened responses. As Nistor et al. have previously indicated in the context of learning communities [10], this phenomenon exemplifies the mechanism of "dialogue participants sharing and expecting professional roles deepening knowledge construction," which may also be applicable to AI dialogue.Notably, the two-role assignment (in which both the user and the AI assume the role of detective, among others) has the potential to facilitate dialogues that resemble expert-to-expert discussions. This could lead to practical and imaginative expansion into the formulation of incident hypotheses and the concretization of crime prevention measures. For instance, in a detective role, the AI interprets the user's statements and proposes risk assessment and surveillance camera placement possibilities, further offering supplementary information such as "silence with no one present = evidence of erased traces." This series of responses represents a "co-creative discussion" that emerges precisely because both parties share the same professional frame (i.e., the detective role).

While the experimental questions remained constant, the incorporation of the detective role by the user appears to provide the AI with a cognitive framework that generates "responses emphasizing incident potential." This, in turn, results in qualitative leaps that approach the level of expert-to-expert discussion.

4.5 Applied Implications: Education, Creative Support, and Expert Tools

The role assignment strategy demonstrated in this research holds promising application potential in educational settings and beyond.As Bozkurt & Sharma [1] and Cain [7] point out, when utilizing Generative AI for educational purposes, mechanisms supporting thought training and problem-solving learning rather than mere information retrieval are required.

One concrete approach involves lessons where learners themselves adopt roles such as "detective," "architect," or "historian," with AI assuming the same or

complementary roles, facilitating "expert-to-expert discussion" on equal footing.For instance, detective roles could entail deepening incident scenarios, architect roles could generate spatial design ideas, and historian roles could interpret historical materials and estimate dates. This collaborative work with AI has the potential to nurture critical and creative thinking.

Beyond educational applications, these methods have the potential to foster creative ideation and introspection by allowing users to alternate between artistic and psychological roles. Moreover, the integration of artificial intelligence in architectural design support can facilitate a "co-creation mode," wherein both the user and the AI complement each other's poetic and metaphorical expressions, thereby generating novel concepts. In architectural design support scenarios, when both the user and the AI adopt architect roles, they can engage in discussions concerning "material selection," "structural stability," and "aesthetic elements" from multiple perspectives. In this context, the AI can provide complementary viewpoints that may not be fully considered by practitioners.The application of role assignment in this manner not only elicits specific perspectives relevant to the domain but also has the potential to generate novel creative ideas when combined with model-specific biases. This study proposes a novel approach to developing co-creative support tools by extending conventional persona settings to include expert roles, where users adopt the role of an expert and facilitate the co-creation process.

4.6   Future Prospects and Challenges

This research primarily represents initial verification, analyzing role effects through specific numbers of dialogue sessions, without sufficiently examining role maintenance and bias fixation when models acquire long-term memory.As Aslan et al. [13] and Chen et al. [5] point out, when LLMs continue learning user preferences and past role settings, there is risk that specific role biases might become firmly fixed, inhibiting multiplicity or guiding in unintended directions.

Additionally, when users frequently switch roles, models might become confused, or initial role settings might continue influencing later responses, potentially necessitating role reset mechanisms and meta-instructions (e.g., "please clear all roles for now").Another challenge involves advanced prompt engineering that dynamically switches, adds, and removes roles. While approaches involving AI autonomously "orchestrating" multiple roles according to usage scenarios and providing perspectives and expertise intended by users would further multiplicity of dialogue, concerns have been raised about the potential complexity of the user experience and the difficulty of identifying role speakers.

Furthermore, while this study primarily captured changes through dialogue logs and vocabulary analysis, it did not conduct sufficient quantitative user evaluation of actual improvements in learning effects and problem-solving efficiency, nor did it assess whether users enhanced creativity. To that end, large-scale experiments measuring role assignment effects in real usage scenarios, such as in educational settings and expert tools, are desired. Future verification using multiple indicators, including user satisfaction, error rates, and task achievement, is necessary to ensure the validity and generalizability of the findings.

5   Conclusion

The present study put forth and empirically validated a pioneering prompt engineering strategy of assigning professional roles to both user and artificial intelligence (AI) during their interactions. Specifically, professional roles such as detective, psychologist, artist, architect, and natural scientist were assigned, and dialogues concerning identical visual stimuli (simple line drawings) were compared under four conditions: no-role baseline, quantitative and qualitative analysis of dialogue logs. The following findings were obtained:

First, quantitative analysis (3.1) demonstrated a dramatic transformation of frequent words in responses with role assignment. In the detective role case, investigation-suggestive words like "incident," "crime prevention," "code," "clues" frequently appeared, with the scene's natural landscape being reframed toward "incident potential" and "criminal traces." Furthermore, the both-role condition exhibited the highest promotion of expertise, multiperspectivity, and abstraction, with signs of expert-to-expert discussion emerging when users and AI shared identical frames.

Next, qualitative analysis (3.2), employing the detective role as an exemplar, revealed through a close reading of response logs that perspective switching and increased abstraction manifested within dialogues. Specifically, role assignment to the user side guided AI responses toward deeper reasoning and consideration assuming "user = expert." According to the tenets of Framing Theory [9] and Role Theory [8], the reinterpretation of a stimulus from "natural scenery" to "crime scene" is attributable to a dramatic shift in the interpretative axis of dialogue, precipitated by the sharing of detective role frames by users and AI.

The organization of this role assignment strategy in connection with Role Theory and Framing Theory is articulated in Chapter 4 (Discussion), which also captures interaction with model-specific characteristics as a "two-layer structure." That is, external frames, such as detective roles, trigger model internal characteristics (logic, creativity, practical orientation, narrative ability), resulting in dialogue content becoming multi-faceted and specialized. The advent of co-creative discourse through user-side role allocation signifies a groundbreaking stride in prompt engineering, with extensive implementation prospects anticipated in educational settings and expert assistance instruments.Nonetheless, challenges persist in the domains of long-term memory enhancement and bias management, necessitating further validation of dynamic role transition and user assessment.

In summary, this research presented a pioneering approach that applies Role Theory and Framing Theory to AI dialogue design. It systematically demonstrates, for the first time, that professional role assignment to both user and AI guides dialogue toward higher expertise, multiperspectivity, and abstraction. This represents an effective strategy for creating "expert-to-expert discussion" and "co-creative reasoning spaces" beyond simple question-answering in the modern era of LLM collaboration. The future direction of this research is expected to include the following:1. The development of advanced dialogue control systems capable of dynamically switching between multiple roles.2. The implementation of quantitative evaluations to assess the long-term learning effects and creativity enhancement capabilities of these systems.3. The verification of the utility of these systems in

diverse dialogue environments that incorporate multiple modalities, such as voice, image, and virtual reality.It is hoped that this research will pave the way for novel applications of role theory in human-AI dialogue, contributing to the design of more creative and specialized interactions.

References

[1] Bozkurt, A., Sharma, R.C.: Generative AI and Prompt Engineering: The Art of Whispering to Let the Genie Out of the Algorithmic World. International Journal of Educational Technology in Higher Education, 20(1), pp. 1-15 (2023)

[2] Bansal, P.: Prompt Engineering Importance and Applicability with Generative AI. Journal of Computational Creativity, 12(10), pp. 217-329 (2024)

[3] Bertalan, M.: The Evolution of Conversational AI: From Chatbots to Large Language Models. Journal of Artificial Intelligence Research, 78, pp. 45-72 (2023)

[4] Giray, L.: Prompt Engineering with ChatGPT: A Guide for Academic Writers. Journal of Academic Writing and Publishing, 39(4), pp. 2625--2635 (2023)

[5] Chen, B., Zhang, Z., Langrené, N., Zhu, S.: Unleashing the Potential of Prompt Engineering in Large Language Models: A Comprehensive Review. ACM Transactions on Intelligent Systems and Technology, 15(2), pp. 1-25 (2024)

[6] Lin, J., Tomlin, N., Andreas, J., Eisner, J.: Decision-oriented Dialogue for Human-AI Collaboration. Transactions of the Association for Computational Linguistics, 12(1), pp. 100-123 (2024)

[7] Cain, W.: Prompting Change: Exploring Prompt Engineering in Large Language Model AI and Its Potential to Transform Education. International Journal of Instructional Technology and Distance Learning, 8(3), pp. 45-59 (2024)

[8] Biddle, B.J.: Recent Developments in Role Theory. Annual Review of Sociology, 12(1), pp. 67-92 (1986)

[9] Entman, R.M.: Framing: Toward Clarification of a Fractured Paradigm. Journal of Communication, 43(4), pp. 51-58 (1993)

[10] Nistor, N., Chiru, C.-G., Bresser, N.: Online Knowledge Communities as Dialogic Learning Spaces: Voice, Structure, and Bridging. International Journal of Computer-Supported Collaborative Learning, 9(2), pp. 141-158 (2014)

[11] Fernandes, U.d.S., Logeswaran, L., Bresser, N.: Lessons Learned from Modeling the Interaction with Conversational Agents. IxD&A, 52, pp. 23-35 (2022)

[12] Scholten, M.R., Kelders, S.M., Van Gemert-Pijnen, J.E.W.C.: Similarity in Action with an Embodied Conversational Agent: Can Synchronous Speech Yield Higher Levels of Rapport? IxD&A, 56(7), pp. 131-155 (2023)

[13] Aslan, I., Neu, D., Neupert, D., Grafberger, S., Weise, N., Pfeil, P., Kuschewski, M.: How to Compliment a Human - Designing Affective and Well-being Promoting Conversational Things. IxD&A, 58(7), pp. 157-180 (2023)

[14] PROSPECT Repository (2024). https://doi.org/10.5281/zenodo.14567800

has enabled the effective use of AI capabilities while maintaining research quality and ensuring the independence and originality of the scientific contributions.

CRediT author statement.
Keisuke Sato: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing - original draft preparation, Writing - review and editing, Visualization, Project administration.