

## 1 Research interests

In our research, we aim to achieve SDS capable of generating responses considering user preferences. While users have individual topic preferences, existing SDSs do not adequately consider such information. With the development of LLMs, SDSs are expected to be implemented in various tasks, including coexisting with humans in robotic applications. To become better partners with humans, systems are anticipated to memorize user preferences and utilize them in their response generation. Our future research aim to realize SDSs that can remember and complement user information through dialogue, enabling personalized interactions.

### 1.1 Personalized Dialogue System

Persona dialogue is a dialogue task where systems generate responses by referring profile information called personas, aiming to induce certain social behaviors in LLMs. A persona refers to information such as desired personality traits and background that systems should exhibit, enabling SDSs to provide more natural and human-like conversations. The primary goal of persona dialogue is to enhance the naturalness, consistency of system personality, and character, thereby increasing user engagement. For instance, setting information like "Name: Alice, Age: 25, Occupation: Virtual Assistant, Hobbies: Reading, Traveling, Music" allows interactions with users based on this setup. When a user asks, "Hello, Alice. How's the weather today?" Alice might respond, "Hello! It's sunny today, and the temperature is warm. Perfect weather for a walk. Have you read any new books recently?" This setup enables SDSs to deliver human-like dialogues tailored to specific backgrounds.

An important aspect of this task is that it's impractical to pre-define all system profile information, leading to hallucinations where new profile information emerges in responses as dialogue turns increase. Failing to consider such hallucinated personas may result in inconsistencies in system character and lack of response coherence in subsequent dialogues.

Our past research [Yoshida et al. (2024b)] addressed this challenge by extracting and storing persona information from generated texts for retrieval-based response generation. However, effective methods have yet to be proposed due to challenges in experimental setups for

long-term dialogues and factors like language model generation accuracy.

In future work, based on the knowledge gained so far, we aim to design long-term dialogue experiments and response generation systems to address the issue of persona hallucination in long-term dialogues.

### 1.2 Topic Transition on Dialogue

The research interests in Section 1 can be further divided into subsections, as found appropriate by the author. For SDSs and dialogue robots to establish rapport with users, it is anticipated that system-level personalization of users is necessary. Hence, our research focuses on topic transitions in dialogues. While users have preferences for specific topics, existing LLMs do not explicitly utilize these preferences for response generation. For instance, offering discussions on baseball to users who prefer it can enhance dialogue engagement. The goal is for systems to provide personalized dialogues based on such user preferences, fostering rapport between humans and systems.

As a preliminary step towards this goal, we have previously explored methods to naturally transition topics from current to desired topics by inducing word associations in LLMs [Yoshida et al. (2024a)]. This approach has suggested that it enables more natural and diverse transitions compared to transition methods using knowledge graphs.

However, we have not yet addressed the realization of personalized topic transitions using user information. Therefore, future efforts will focus on initiatives like biasing transition content based on user information.

### 1.3 Automatic Evaluation of Dialogue Topic Transition

While the dialogue performance of LLMs is advancing daily, current LLMs adopt passive dialogue strategies and lack the ability to lead conversations. Therefore, our research focuses on topic transitions in dialogues to enable SDSs to acquire the ability to lead conversations. Specifically, we are working on achieving personalized topic transitions for each user, which is crucial for LLMs to take the lead in dialogues.

One major challenge in this endeavor is the lack of automated evaluation metrics for assessing the naturalness of topic transitions. Existing studies often use

benchmarks that measure the accuracy of topic transitions against correct labels in datasets, but reference-free evaluation metrics for topic transitions are still insufficient. In topic transitions, due to the characteristic that the next topic candidate is not uniquely determined, reference-free evaluation metrics are suitable for reference-based ones. Moreover, automated evaluation metrics for topic transitions are important for inferring natural transition targets.

Therefore, our future research will focus on developing reference-free automated evaluation metrics for topic transitions.

## 2 Spoken dialogue system (SDS) research

In the coming years, SDS research is expected to split into two major directions: practical applications and the study of dialogue mechanisms. Moreover, these areas are not independent of each other but are expected to mutually influence one another.

### 2.1 Interaction of dialogues

To generalize SDSs more broadly, it is necessary to make them more appealing to users. To achieve this, it is important to study the interactions between SDSs and users.

Before the advent of ChatGPT, dialogue research primarily focused on generating natural sentences or producing sentences according to specifications. However, with the advancement of LLMs, it has become possible to generate reasonably natural responses to given contexts. Consequently, the groundwork is being laid for examining human interaction when using LLMs as agents.

Given these developments, it is anticipated that future research will focus heavily on how generated sentences affect users and what dialogue strategies should be employed to influence users.

Therefore, advancing this research will likely require approaches that include fields such as psychology and linguistics. Hence, future researchers in the SDS field will need interdisciplinary knowledge that extends beyond engineering alone.

### 2.2 Social Adaptation

To further generalize and popularize SDS, it is essential to address problems set in real-world environments. For example, long-term dialogues spanning multiple sessions and turn-taking in multi-party conversations are expected to become important. Investigating the gap between SDS applications and experimental environments and establishing these as defined tasks is necessary. Additionally, collaboration with companies developing these services is crucial.

## 3 Suggested topics for discussion

The author would like to propose the following topics for discussion.

- What is the necessity of SDSs aimed specifically at dialogue rather than being just user interfaces? What do general users need from SDSs through conversation?
- The relationship between SDSs and users: Should SDSs act just as agents, or should they aim to become like friends or family?
- Privacy in conversational content. Nowadays, many SDS applications operate online via APIs, but is this preferable from a privacy perspective? If it is not preferable, how can this issue be resolved?

## 4 Acknowledgments

### References

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### Biographical sketch



Kai Yoshida is a PhD student at NAIST in Japan. His research interests lie in personalized dialogues, open-domain dialogues, and in their interaction. As part of his master's thesis, he worked on persona dialogue system on long-term conversation settings.

He enjoys eating ramen, reading comic book and discovering new ramen.