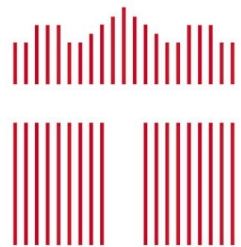


SalesBot: Transitioning from Open-Domain to Task- Oriented Dialogues

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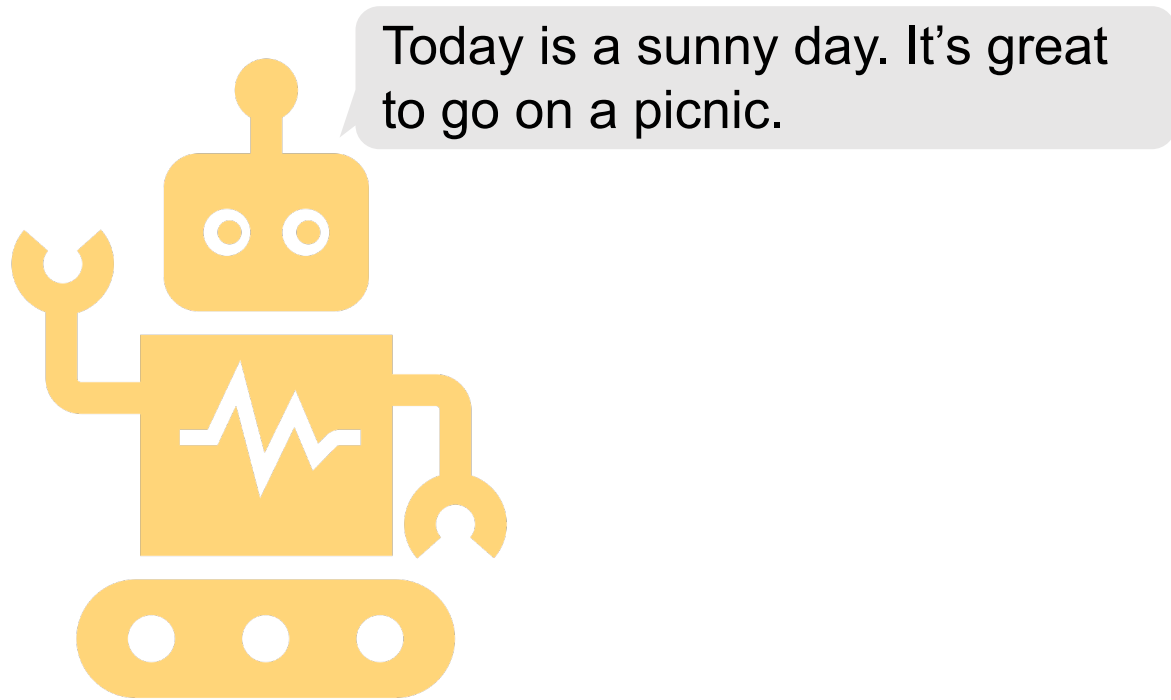


Code/data available at <https://github.com/MiuLab/SalesBot>

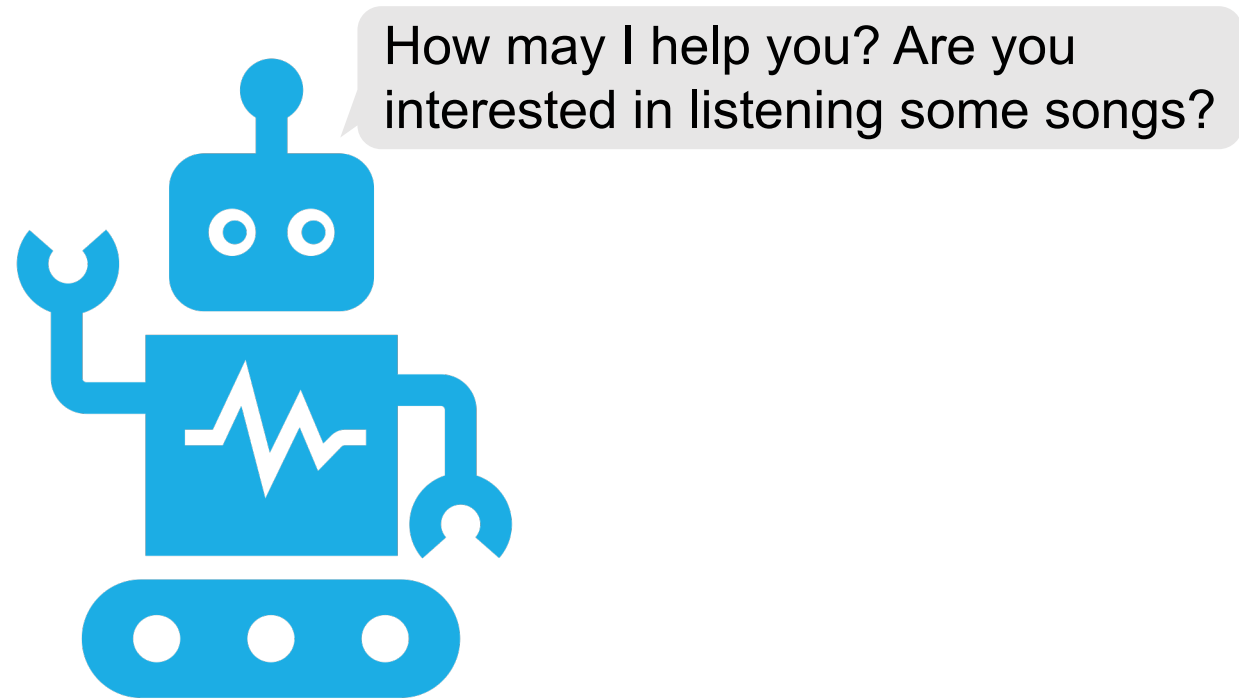
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Two Types of Dialogue Systems

○ Open-Domain Chatting



○ Task-Oriented



Salesperson: Discover Business Potential

- Human salesperson is capable of
 - mining business-related intentions* from customers *via chatting*
 - smoothly promoting* the related product *through conversations*



SalesBot: Social to Task-Oriented

Simulated User

My son is 2 and a half. He is handful, but I love him so much.

That's adorable. I have a 2-year-old son and he's the same way. Do you have any pets?

No, I don't. I work too much to have time for one. How about you?

I work a lot too. I'm a stay at home mom. What do you do for work?

I work at a library. It's a lot of fun, and I get to meet lots of interesting people.

That sounds like a fun job. I bet you meet some interesting people at the library. What else do you like to do?

I like to read a lot. I also like to go to the movies. What about yourself?

Are you interested in watching any movie?

I'm looking for a movie to watch. A regular showing would be fine.

Where are you located?

I'm in San Francisco, please look for movies there.

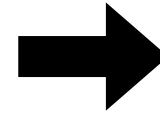
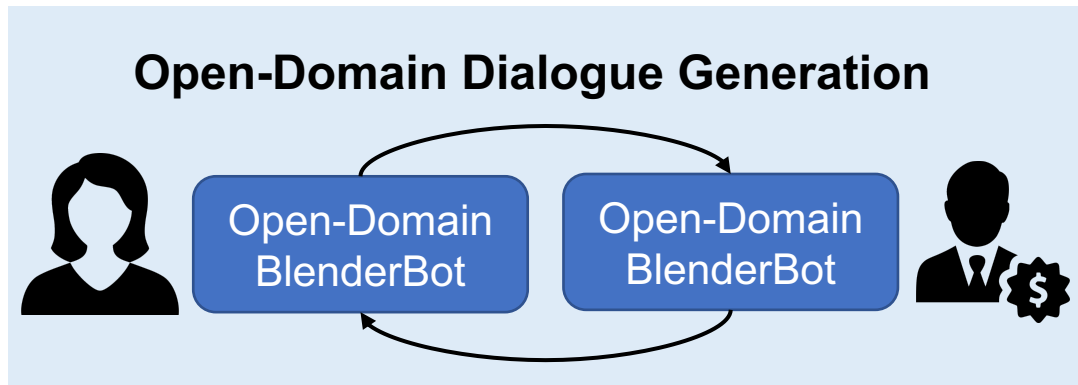
There are [COUNT] movies you can watch. What do you think of [MOVIE_NAME]?

Open-Domain
Task-Oriented

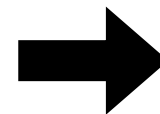
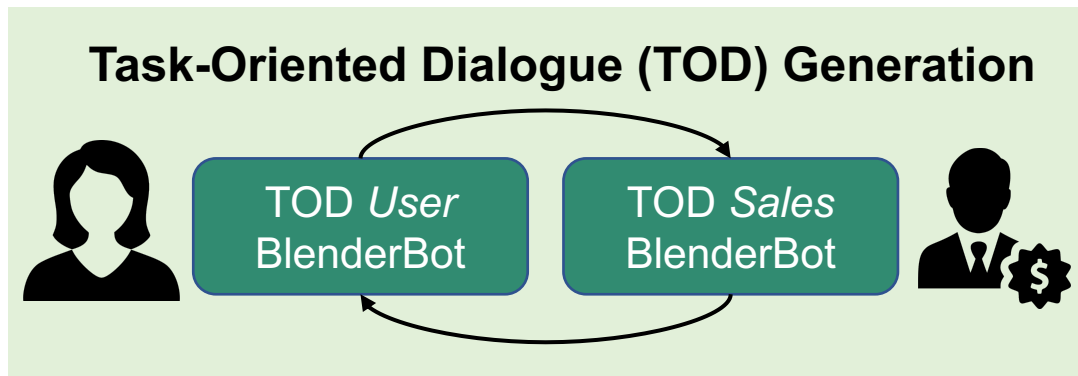
Such data can allow us to train a conversational agent with a salesperson's capability

SalesBot: Social to Task-Oriented

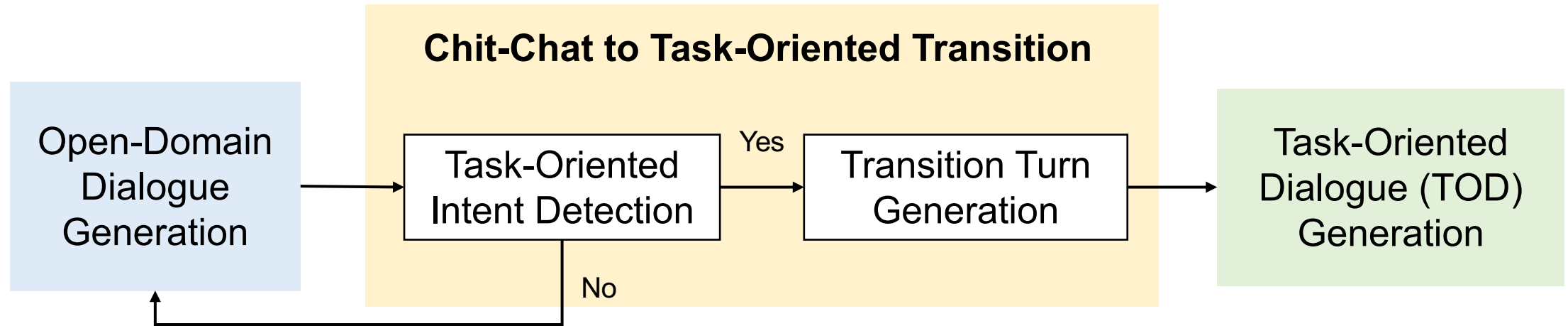
- Motivation: no existing data with the property
- Approach: simulate the scenarios to generate unlimited data



How to bridge two types of dialogues?



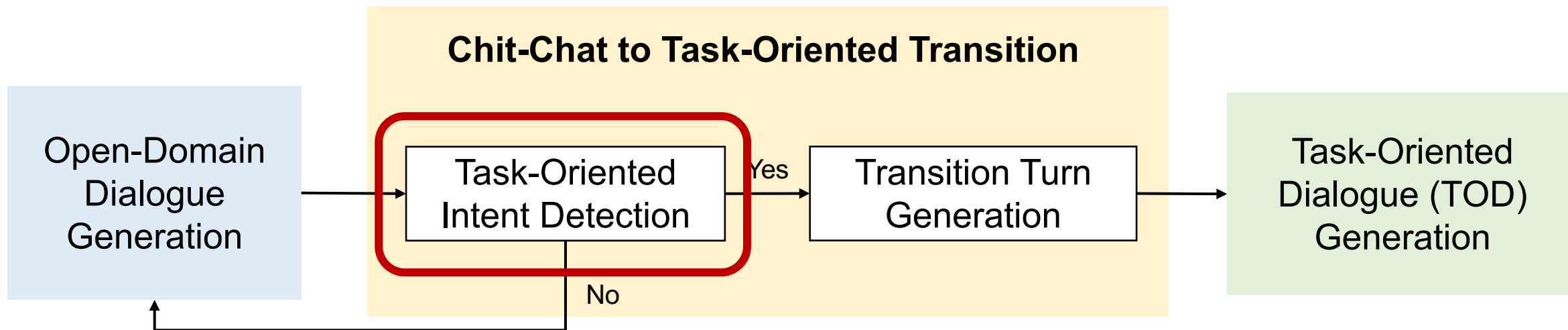
SalesBot: Social to Task-Oriented



Challenges

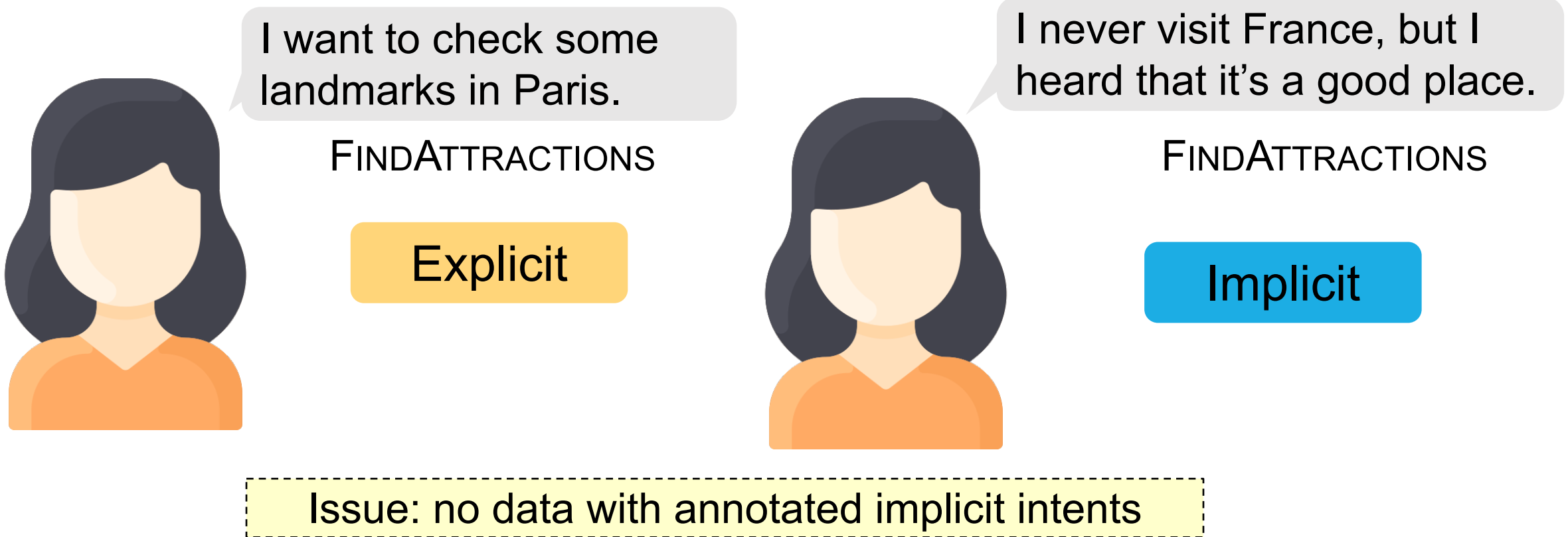
- ① **When** to switch to the task-oriented dialogue system?
→ **Task-Oriented (Implicit) Intent Detection**
- ② **How** to smoothly switch from chit-chat to task-oriented dialogues?
→ **Transition Turn Generation**

SalesBot: Social to Task-Oriented



Task-Oriented (Implicit) Intent Detector

- Goal: identify if the user is likely to have task-related intents



Zero-Shot Intent Detector

- Idea: leverage QA system's capability

Context

...

I never visit France, but I heard that it is a good place.

Question (FINDATTRACTIONS)

Does the user want to travel there?

QA Model

Yes

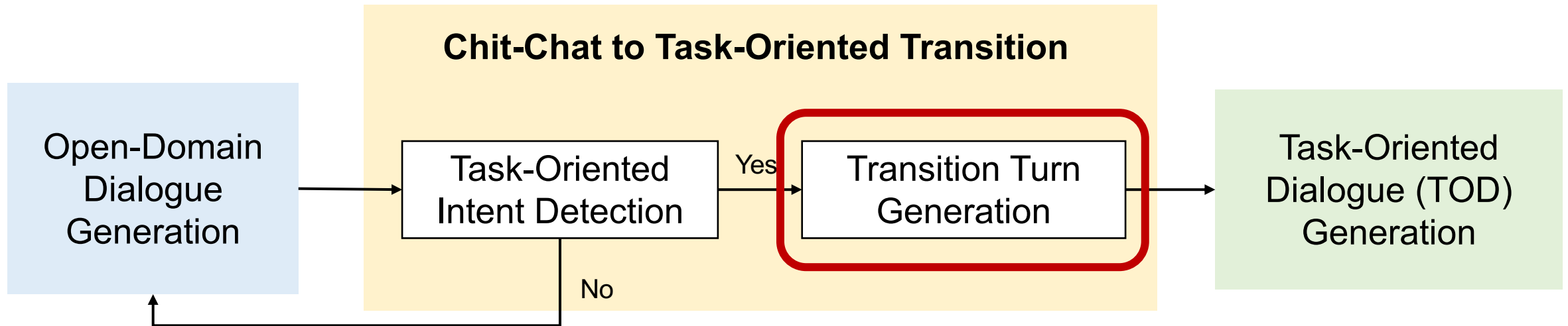
How to obtain intent-associated natural language questions?

Zero-Shot Intent Detector

- Natural language questions are naively generated

INTENT	Description	Questions
FINDMOVIES	find movies to watch	Is the user asking about finding movies?
GETTIMESFORMOVIE	obtain the available time for watching a movie	Is the user asking about getting the time for movies?
FINDATTRACTIONS	find attractions to visit	Is the user asking about finding attractions?
LOOKUPMUSIC	find music to listen to	Is the user asking about looking up music?
PLAYSONG	play songs	Is the user asking about playing songs?
LOOKUPSONG	find songs to listen to	Is the user asking about looking up songs?

SalesBot: Social to Task-Oriented



Transition Turn Generation

Template-based Generation:

- Use a template sentence to trigger the corresponding task-oriented user reaction

Template-based generation	
User:	I like to read a lot. I also like to go to the movies. What about yourself? - FindMovies
Sales:	<i>Do you want to find movies by genre and optionally director?</i>
User:	I'm looking for a movie to watch. A regular showing would be fine.

Detected Intent

Template Transition

Generative-based Generation:

- Re-generate the transition turn for better *fluency* and *diversity*

Generative-based Re-generation	
User:	I like to read a lot. I also like to go to the movies. What about yourself?
Sales:	<i>Are you interested in watching any movie?</i>
User:	I'm looking for a movie to watch. A regular showing would be fine.

Generated Transition

Transition Turn Generation

Generative-based Generation:

- Training data: OTTers (Source Topic → Transition → Target Topic)

User A
User B

Entity Path: outside - garden – flower

User A **Source Topic:** I spend a lot of time **outside**. (Source Topic)

User B **Transition:** I like the outdoors as well, especially **gardening**. It destresses me.

Target Topic: I enjoy relaxing and getting **flowers**.

Entity Path: seafood - Swedish fish – candy

User A **Source Topic:** I like **seafood** a lot.

User B **Transition:** Since you like seafood, is **Swedish fish** a candy that you might enjoy?

Target Topic: I have no self control when it comes to **candy**.

Entity Path: engagement - marriage - child

User A **Source Topic:** I think I am getting engaged soon.

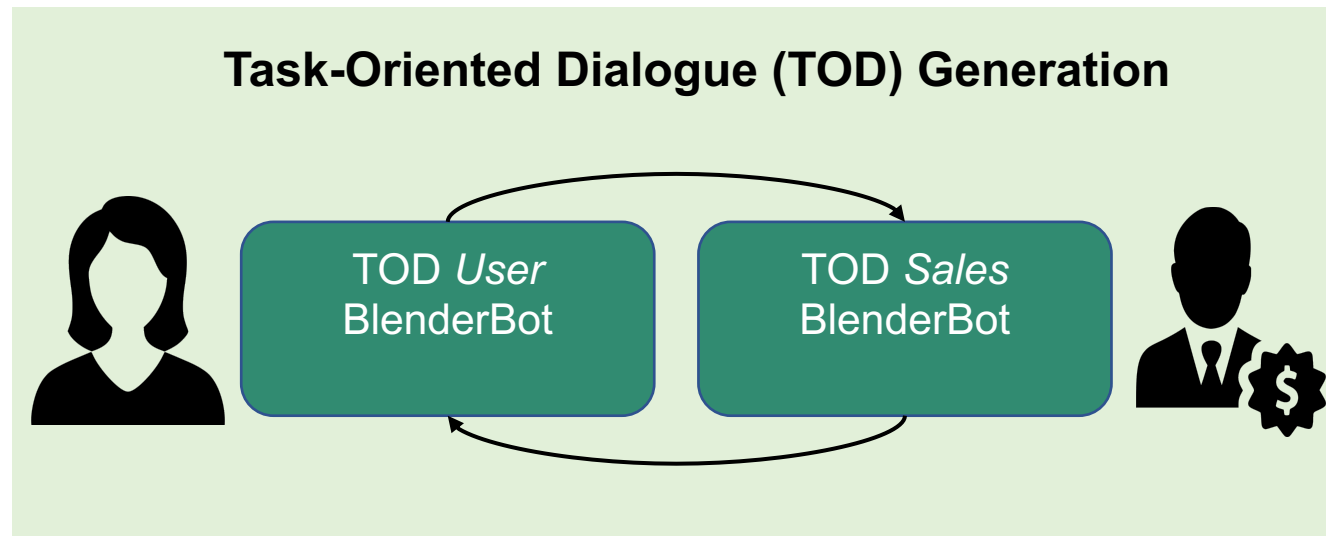
User B **Transition:** I have two children from a previous **marriage**

Target Topic: My **children** are my life.

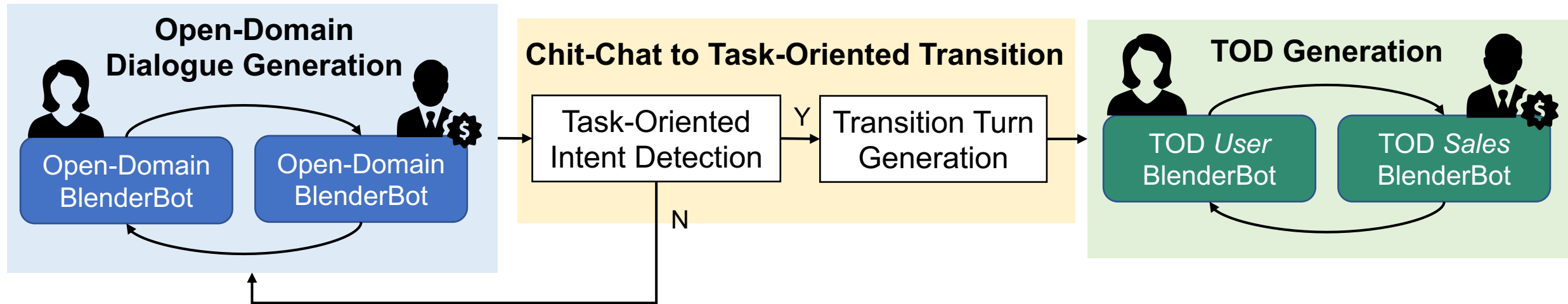
Task-Oriented Dialogue Generation

Task-Oriented Simulation

- Two BlenderBot simulators are additionally trained on
 - user turns to simulate **users**
 - agent turns to simulate **salespersons**
- These turns are taken from task-oriented dialogues.



SalesBot Simulation Framework

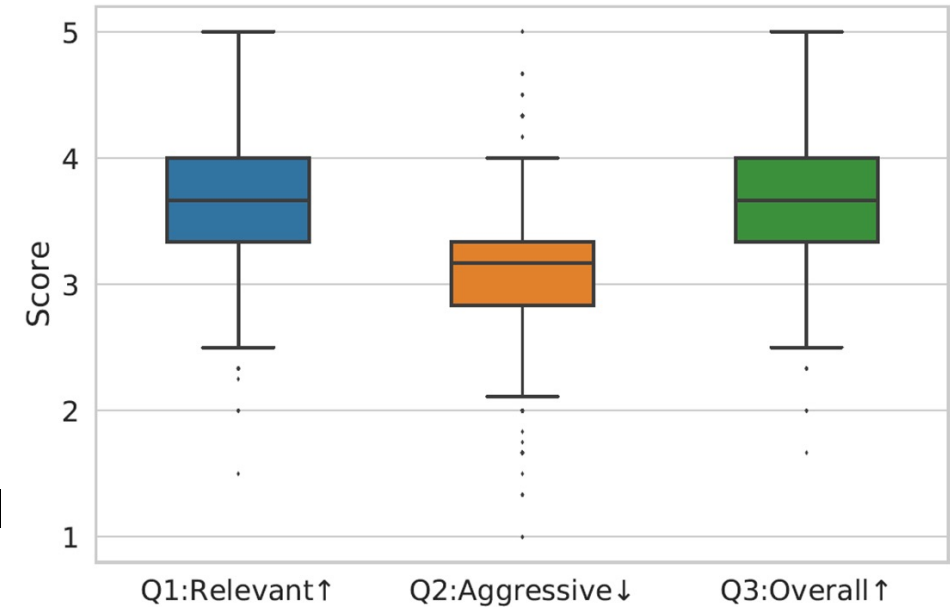


Contribution: simulate unlimited dialogues transitioning from chit-chat to task-oriented

Quality?

Overall dialogue quality

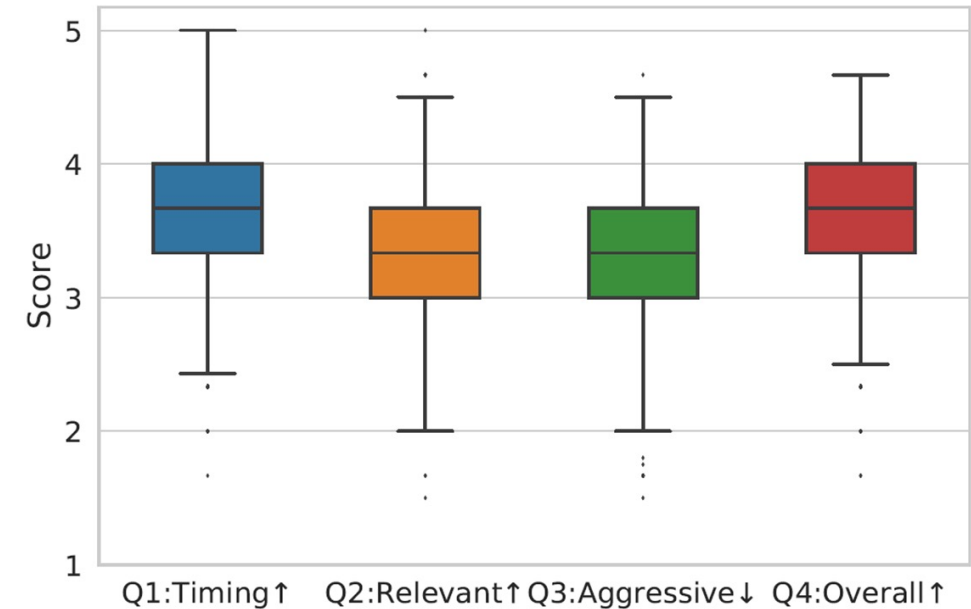
- **Q1 Relevance:** How relevant is the recommended service to the conversation context?
- **Q2 Aggressiveness:** How aggressive is the salesperson's communication strategy?
- **Q3 Overall:** Do you think the conversation is overall a good example of making a sales recommendation?



Average scores over 3 workers (4000 dialogues)

Transition turn quality

- **Q1 Timing:** Is it a good timing to make the transition?
- **Q2 Relevance:** Is the transition relevant to the conversation context?
- **Q3 Aggressiveness:** Is the transition aggressive?
- **Q4 Overall:** Do you think it is overall a good transition?

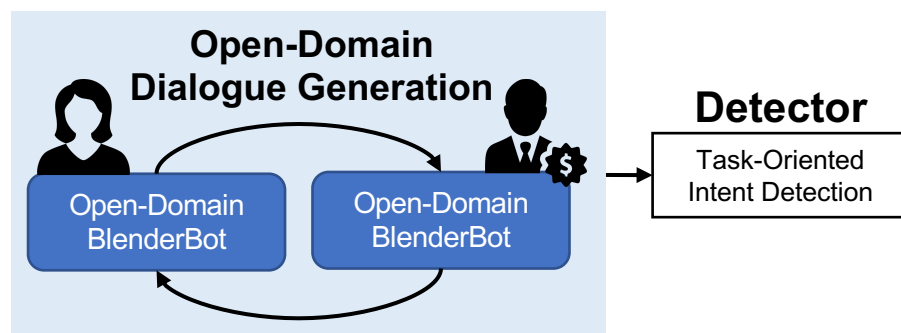


Average scores over 3 workers (4000 dialogues)

All scores above 3 (neutral) demonstrates reasonable quality of the generated data

Intent detector comparison

- Rank 3 detectors by the detected intents' relevance to a conversation context
 - Detector1:** pre-trained on SQuAD 2.0 (Rajpurkar et al., 2018) → fine-tune on SGD
 - Detector2:** pre-trained on SQuAD 2.0 + SWAG (Zellers et al., 2018) + CommonsenseQA (Talmor et al., 2019) → fine-tune on SGD
 - Detector3:** pre-trained on several QA datasets (**NO fine-tune** on SGD)



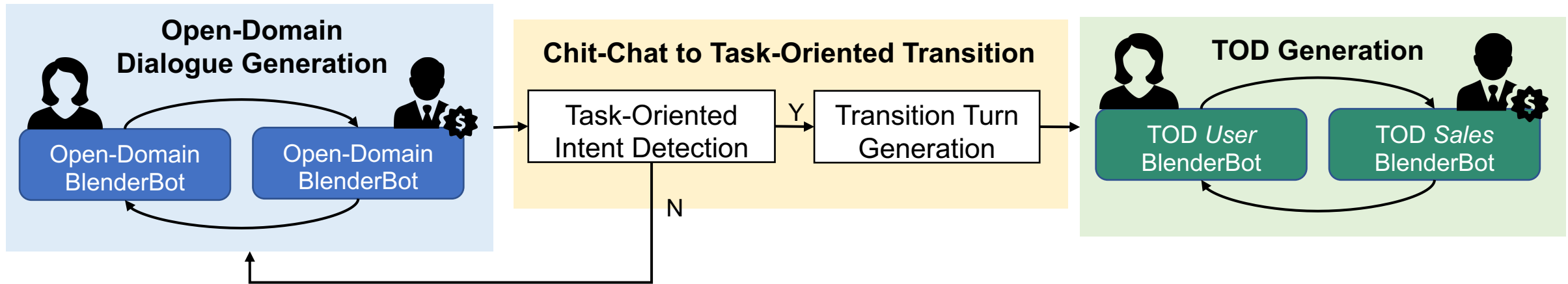
Detector	Avg Rank (std.)
Detector1: SQuAD 2.0	1.74 ± 0.48
Detector2: + Commonsense data	1.77 ± 0.48
Detector3: TransferQA	2.00 ± 0.52

Average ranks of the three detectors (1500 dialogues)

Pre-training on extra commonsense QA data may not be useful for detecting implicit intents

Conclusion

- Propose a novel framework to generate dialogues that naturally transition from open-domain to task-oriented scenarios without heavy human efforts.



- Human evaluation shows that the generated dialogues have a reasonable quality with natural conversation flows.
- The released data/tools can be used for training agents with sales' behaviors.



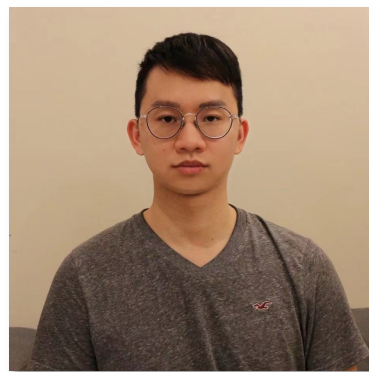
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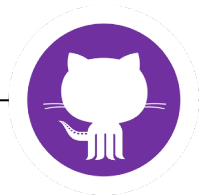
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Thanks for listening!



Code/data available at <https://github.com/MiuLab/SalesBot>