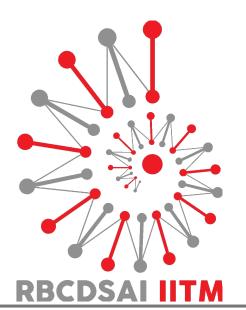


Towards Exploiting Background Knowledge for Building Conversation Systems

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Introduction

- Problem: Existing dialogue datasets fail to incorporate background knowledge while conversing which has led to treating the problem as yet another seq2seq paradigm.
- Proposed Direction: We create a new dataset containing movie chats wherein each response is explicitly generated by copying and/or modifying sentences from unstructured background knowledge such as plots, comments and reviews about the movie.
- ▶ Motivation: This approach mimics the human way of conversation which relies on knowledge acquired through reading background articles/resources.
- ▶ Baselines: We evaluate the dataset using (i) pure generation based model, (ii)copy-and-generate model and (iii)span-prediction model

Example: Conversation on Spider-Man

Plot: ... Peter's science class takes a field trip to a genetics laboratory at Columbia University. The lab works on spiders and has even managed to create new species of spiders through genetic manipulation. While Peter is taking photographs of Mary Jane for the school newspaper, one of these new spiders lands on his hand and bites him ...

Review: I thoroughly enjoyed "Spider-Man" which I saw in a screening. I thought the movie very engrossing. Director Sam Raimi kept the action quotient high, but also emphasized the human element of the story. The casting was perfect. Tobey Maguire was very believable as the gawky teenager in the early part of the film and then, after his run-in with the radioactive

Speaker 1(N): Which is your favourite character in this? Speaker 2(C): My favorite character was played by Tobey Maguire.

Speaker 1(N): I thought he did an excellent job as Peter Parker, I didn't see what it was that turned him into Spider-Man though. Speaker 2(P): Well this happens while Peter is taking photographs of Mary Jane for the school newspaper, one of these new spiders lands on his hand and bites him.

Speaker 1 (N): I see. I was very excited to see this film and it did not disappoint!

Speaker 2(R): I agree, I thoroughly enjoyed "Spider-Man"

Speaker 1(N): I loved that they stayed pretty true to the comic.

Speaker 2(C): Yeah, it was a really great comic book adaptation

Speaker 1(N): The movie is a great life lesson on balancing power.

Speaker 2(F): That is my most favorite line in the movie, 'With great power comes great responsibility.'

Comments: Crazy attention to detail. My favorite character was played by Tobey Maguire. I can't get over the "I'm gonna kill you dead" line. No spoilers, but it does start to take itself more seriously towards the finale. It was too heavily reliant on constant light-hearted humor. However the constant joking around kinda was low. A really great comic book adaptation.

	Collection	\$403,706,375
	Taglines	With great power comes
		great responsibility
		Get Ready For Ultimate Spin!
	Awards	Golden Trailer Awards 2002
	Similar Movies	Spider-Man 2
		Iron Man

DataStats

9071 dialogues

91K utterances 921 movies 9278 resources 15.29 Avg words/turn

153.07 Avg words/chat

Data Collection Method



Step 1. Curate a list of popular movies

- 921 movies across 34 genres
- Collected using IMDb popular 250 list, top rated in every genre list, top 10 popular movies in the past five years and other lists



Step 2. Collect background knowledge

- Fetch top 2 popular Reviews per movie from IMDb
- Collect Plot and Fact Table data using Wikipedia pages and Infoboxes
- Use Reddit to collect Comments which are rich in informal interaction



Step 3. Crowdsource

- Collect opening statements for chats with a fixed starting template
- Collect complete chats by showing the user four background resources
- The Turker must produce coherent chats where alternate responses are copied from these resources while performing a role-play of both the speakers



Step 4. Manually Verify

- Check if the workers copied the spans and marked the respective documents
- Check if the chats were coherent and on topic

Is this a natural way of conversation?

Intelligible Coherent Grammar Two-person-chat On Topic 4.47 4.33 4.41 4.47 4.57

Table: Human evaluation on randomly chosen 500 collected chats (Scale 1-5)

Baseline Results and Analysis

Model	Method	F1	BLEU	Rouge-1	Rouge-2	Rouge-L
HRED[1]	-	-	5.23	24.55	7.61	18.87
GTTP[2]	oracle	-	13.92	30.32	17.78	25.67
GTTP [2]	mixed-long	-	7.51	23.20	9.91	17.35
BiDAF[3]	oracle	39.69	28.85	39.68	33.72	35.91
BiDAF[3]	mixed-short	45.73	32.95	45.69	40.18	43.46

Table: Performance of the proposed models on our dataset. (Single Reference)

Model	Method	F1	BLEU	Rouge-1	Rouge-2	Rouge-L
HRED[1]	-	-	5.38	25.38	8.35	19.67
GTTP[2]	oracle	-	16.46	31.6	21.21	27.83
GTTP [2]	mixed-long	-	8.73	21.55	10.42	18.12
BiDAF[3]	oracle	47.18	34.98	46.49	40.58	42.64
BiDAF[3]	mixed-short	51.35	39.39	50.73	45.01	46.95

Table: Performance of the proposed models on our dataset. (Multi Reference)

- Natural language generation capabilities of current generation based models are far from being acceptable.
- Span prediction models can exploit background knowledge much better than generation models.
- State-of-the-art span prediction models are complex and expensive which makes it infeasible for long resources.

Conclusion and Future Work

- ▶ Introduced a **new dataset** for building dialog systems that explicitly uses **background knowledge** associated with current context.
- ▶ Develop **hybrid** methods based on span prediction and generation.
- ▶ Build less complex models which can handle longer resources.

References

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