

Comparison	Informativeness				Appropriateness			
SEQ2SEQ vs MTASK	0.501	$\pm 0.016$	0.499	$\pm 0.015$	<b>0.530</b>	$\pm 0.017$	0.470	$\pm 0.017$
SEQ2SEQ vs MTASK-F	0.478	$\pm 0.015$	<b>0.522</b>	$\pm 0.015$	<b>0.537</b>	$\pm 0.016$	0.463	$\pm 0.017$
SEQ2SEQ vs MTASK-RF	0.492	$\pm 0.013$	0.508	$\pm 0.013$	0.502	$\pm 0.015$	0.498	$\pm 0.014$
SEQ2SEQ vs MTASK-R (*)	0.479	$\pm 0.017$	<b>0.521</b>	$\pm 0.013$	0.495	$\pm 0.015$	0.505	$\pm 0.015$

Table 3: Mean differences in judgments in human evaluation, together with 95% confidence intervals. Differences sum to 1.0. Boldface items are significantly better ( $p < 0.05$ ) than their comparator. (\*): Main system, pre-selected on the basis of BLEU.

1	A: I would give ALMOST anything for some [ <i>Mexican restaurant</i> ] right now. B: Me too. Creamy jalapeno sauce is really good.
2	A: Visiting the celebs at Los Angeles International Airport (LAX) - [...] w/ 70 others B: Nice airport terminal. Have a safe flight.
3	A: Obsessed with [ <i>jewelry company</i> ] :-* B: oh my gosh obsessed with their bracelets and the meaning behind them !
4	A: Live right now on [ <i>FM radio</i> ] Tune in!!!! B: Listen to Lisa Paige
5	A: Is that [...] in your photos? It's on my list of places to visit in NYC. B: Don't forget to check out the 5th floor, while you are here, it's a great view.
6	A: Are you [ <i>coworking community</i> ] today or tomorrow? B: I think so. Try the cookies and coffee.
7	A: Cant wait for my [ <i>pizzeria</i> ] tonight B: Order bacon n pepperoni thin crust pizza.
8	A: So [...] is down to one copy of Pound Foolish. I'm curious to see if they are re-ordering it. B: Check out the video feed on 6 and take a picture of the Simpsons on the 3rd floor.
9	A: I wish [...] would introduce another vegetarian option besides the shroomburger. It's delicious but kind of ridiculous. B: This is the best j.crew in the world. Try the lemonade!
10	A: Just had an awesome dinner at [ <i>restaurant</i> ] Great recommendation [ <i>person</i> ] B: One of my favorite places I've ever been to in NYC. The food is great and the service is lackluster.

Figure 6: Responses produced by our neural response generation system MTASK-RF. Entities marked [...] are anonymized.

tem in terms of appropriateness, while significantly improving informativeness (Table 3).

## Conclusions

We have presented a novel knowledge-grounded conversation engine that could serve as the core component of a multi-turn recommendation or conversational QA system. The model is a large-scale, scalable, fully data-driven neural conversation model that effectively exploits external knowledge, and does so without explicit slot filling. It generalizes the SEQ2SEQ approach to neural conversation models by naturally combining conversational and non-conversational data through multi-task learning. Our simple entity matching approach to grounding external information based on conversation context makes for a model that is informative, versatile and applicable in open-domain systems.

## Acknowledgements

We thank Xuetao Yin and Leon Xu for helping us obtain Foursquare data, and Kevin Knight, Chris Quirk, Nebojsa

Jojic, Lucy Vanderwende, Vighnesh Shiv, Yi Luan, John Wieting, Alan Ritter, Donald Brinkman, and Puneet Agrawal.

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