Controllable and Natural Response Generation for Virtual Assistants

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Motivation

- Virtual Assistants have become good enough at responding to queries to have achieved fairly mainstream use (Alexa, Siri, Google Assistant, etc.)
- Despite this, none of these assistants could pose convincingly as a human
- Responses, while accurate, cannot be considered natural
Related Work on Controllable Text Generation

Plug and Play Language Models (Dathathri et al, 2020)

- Text generation with GPT-2
- Control topic and sentiment
- Challenge: there is a trade-off between controlling attributes and grammaticality
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What Makes a Good Conversation (See et al, 2019)
- Conditional training and weighted decoding
- Control repetition, specificity, response relatedness, and question asking

They are NOT conditioned on semantics.
Related Work on Virtual Assistant Response Generation

Many papers have come out in the past few weeks!

- Few-Shot Natural Language Generation by Rewriting Templates (Kale et al, 2020)
- Few-shot Natural Language Generation for Task-Oriented Dialog (Peng et al, 2020)

They all use MultiWOZ, SGD-NLG or other large annotated datasets.

No Controllability
What We Want to Do

What do we mean by naturalness?

- What Makes a Good Conversation? Balance
- Correct grammar, clean sounding speech, tonality, variance in speech
- More natural verb patterns

Controllability

- “Paraphrasing” with control on sentiment

At the end of the day, naturalness, sentiment, etc. are what humans believe they are. So we will do human evaluation.
Synthetic Almond - High Level Overview
hello! what are the food places
hello! what are the food places
hello! what are the food places
hello ! what are the food places
User Utterance

hello! what are the food places

Agent Utterance

i have found several restaurants matching your request. what cuisine do you want?
hello ! what are the food places

I have found several restaurants matching your request. What cuisine do you want?
I'm seeing many restaurants. What type of food would you like to eat today?
Main Goal

AGENT

Agent Utterance

I'm seeing many restaurants. What type of food would you like to eat today?

Naturalized Agent Utterance

I'm seeing some great restaurants! Can I ask which type of food you are looking for?

Naturalized Agent Utterance With Sentiment
Main Approach: Building on GPT-2

i see <name_1> and <name_2>. both are restaurant in the east part of town. <s>
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Main Approach: Building on GPT-2

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Agent Utterance (A)

Naturalized Agent Utterance (With Sentiment)
Proposed Demo

Interactive agent that we can talk to

Gio (User)
I want an Italian restaurant nearby.

Gio (User)
No, give me something more luxurious.

I see Terún. It is a moderate Italian restaurant in the area. Would you like me to book the restaurant for you?

I found this restaurant:
name=Vina Enoteca,
cuisine=Italian,
price=expensive,
location=Palo Alto

Gio didn’t like my first suggestion. I need to reflect this in my sentiment

This is the second time, I should be concise
Proposed Demo

Interactive agent that we can talk to

Must:

- Responses are natural
- User can select sentiments by checking a box
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## Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Finish</th>
<th>Start</th>
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<tbody>
<tr>
<td>5/5-5/11</td>
<td>Further research into related work</td>
<td>Baselines: current model &amp; feasibility check for PPLM</td>
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<tr>
<td></td>
<td></td>
<td>Connecting current model to PPLM</td>
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<tr>
<td>5/12-5/18</td>
<td>Baselines: current model &amp; PPLM</td>
<td>Initial round of human evaluation for naturalness of baseline</td>
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<td>Continue working on model for natural output</td>
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<tr>
<td>5/19-5/25</td>
<td>Mini-evaluation of naturalized output</td>
<td>Sentiment control</td>
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<td>- Reconsider which controllable aspects make output more engaging and “human” in our opinions</td>
<td>- Use plug and play model as reference</td>
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<td>- Classifier for automatic metric</td>
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<tr>
<td>5/26-6/1</td>
<td>Sentiment control</td>
<td>If time permits, open scope from pos/neg sentiment to more generalized emotion</td>
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<td>- May need to revisit previous steps if necessary</td>
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<tr>
<td>6/2-6/8</td>
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<td>Final Evaluation</td>
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