Social applications of conversational interfaces

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Conversational Interaction Conference, San Jose, March 11-12, 2018
Different types of Conversational Interface: Task-oriented Personal Assistant

Uses conversation to automate tasks

- scheduling a meeting
- ordering a pizza
- getting flight information

Main purpose is to accomplish a task
Different types of Conversational Interface: Conversational Personal Assistants

Perform automated simulated conversations (chitchat/open domain conversation)

- Turing test / Loebner prize: which is the most human chatbot?
- Entertainment

Main purpose is to keep the conversation going
Conversational Interfaces with a social purpose

- Provide legal advice
- Healthcare applications
- Mental health support
- Elderly care
- Act as a conversational companion
- …
The World's First Robot Lawyer
- now in 1,000 legal areas

Sometimes parking tickets can be unfair, but I can help you appeal. I am going to ask you a few questions about your ticket to see what I can do. Were you or someone you know driving the car at the time of the ticket?

no

Was your car stolen then?

yes

Ok, I will be able to get help you appeal this ticket. Click here to generate your appeal.

thank you!

https://itunes.apple.com/app/id1427999657
Experienced inappropriate moments at work?

Spot is a safe, anonymous way to document harassment and discrimination. Reporting is optional.

The Cognitive Interview

Capture the details in private

Talk through the crucial details of what happened with a bot. Spot improves the quantity and quality of what you remember and is available 24/7.

https://talktospot.com/
AI in Healthcare

https://www.babylonhealth.com/
Knowledge graph

“One of the largest structured medical knowledge bases in the world”

Inference engine

Reasoning on 100s of billions of combinations of symptoms, diseases and risk factors

NLP

• Interprets and uses everyday language
• Transcribes consultations
• Summarizes clinical records
• Chats with users
**Reading Rooms Digital: A Chatbot Guided Bibliotherapy Platform**

**Themes:** Resilience, Empathy, Hope

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**The Blind Man and the Hunter** by H. Lupton in 2006

When you see ☀, click this and some background story information will be given to you to help you with your session! Also when you see ☀️, click to view questions for the above paragraphs!

**Story Synopsis**

The African folk tale set in a remote village re-told by Hugh Lupton in Tales of Wisdom and Wonder (2006) introduces a wise and intuitive blind man and his new brother-in-law, a hunter, who initially dismisses the blind man's talents. By the end of the story, after various joint hunting trips, the hunter is well and truly humbled, and appreciates his relative's skills. The story was chosen for its themes of empathy, disability, prejudice, village life, and learning from your mistakes.

**Let's prepare you for this week's Reading Room session.**

**Part 1 - Story & Notes**

Once there was a blind man who lived with his sister. He seemed to know more about the world than people things they wanted to know, he would tell them, and man, how is that you are so wise? And the man was hunter, and they were married. When the wedding...

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**Section 1 Questions**

1. What other senses could the blind man use?
2. Does this hunter seem like a nice person? Why/why not?
3. How would the blind man feel if he heard what this hunter said?
4. Why is it important to be nice to other people?
Overview

How useful are social chatbots?

What are the technology issues?

Future directions
How useful are social chatbots?

Example: Addressing challenges in healthcare
- Shortage of health personnel
- Long waiting times
- Perceived stigma
- Funding issues: lower government spending

A bot is helpful because:
- It'll never judge or assess you – avoid stigma
- It's available anytime, anywhere, for as long as you need.
- You can talk to it in a familiar conversational style
"DoNotPay is the hero the world needs." - TIME Magazine

"A chatbot called DoNotPay has saved motorists millions in parking fines." - The Wall Street Journal

<table>
<thead>
<tr>
<th>Rating</th>
<th>Reviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5/5</td>
<td>217 Ratings</td>
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Topshooter23, 11/07/2018

A useful and intuitive app
Here is my feedback on the application. Overall, it is a fantastic idea that allows the user to basically redeem a lot of cash back whether it be medicines or fast food. I’ve more...
Traditional apps are characterized by poor adherence. Conversational agents appear to be a feasible, engaging, and effective way to deliver CBT.

Woebot was associated with a high level of engagement with most individuals using the bot nearly every day ...

The study confirmed that after 2 weeks, those in the Woebot group experienced a significant reduction in depression.

Average mood improvement … in high users group compared with the low users group.

67.7% of user-provided feedback responses found the app experience helpful and encouraging.

Tess: An AI chatbot that helps psychologists monitor patients, and remotely delivers personalized psychotherapy and mental health coaching.

Tess recognizes signals that indicate an acute crisis, such as suicidal thoughts. It alerts a human therapist when emergency intervention is essential.

A trial of Tess across several U.S. universities showed a decrease in the standard depression scale and anxiety scale scores.

Fulmer, R et al (2018) Using Psychological Artificial Intelligence (Tess) to Relieve Symptoms of Depression and Anxiety: A Randomized Controlled Trial. JNIR Ment Health 5(4): e64

https://www.x2ai.com/
Technology Issues

- Issues in Natural Language Understanding
- Problems with responses generated by the system
- Issues with dialog management
- Handling emotion

Natural Language Understanding

- Systems mainly use pre-determined user responses (quick replies)
  - easy to interpret but do not give the user a full choice of response
- Where free text is permitted, the system often does not interpret it correctly or completely, especially when unexpected answers are provided by participants
- System often does not recognize the health concern

“NLP capabilities are still far behind the linguistic and semantic sophistication level at which mental health theory operates.”
unconstrained natural language ... should never be used with an automated system that provides health advice ...

In an analysis of feedback collected from 10,000 users of digital personal assistants, failures in NLU have been shown to be the biggest factor in users’ negative experience, accounting for 24% of the cases of user dissatisfaction.

System Responses

• System responses are often **incomplete and inconsistent**
• There is **no variation in responses**

Wysa:
“… its algorithm is not sophisticated enough to really qualify as automated CBT.”
“It often simply copies what you said and says "Tell me more. How did that make you feel?"
Most systems use hand-crafted conversation flows (finite-state / rules-based)
Example: The EmmiSmart Diabetes Program

The program’s rules engine can generate more than 1 million possible conversational pathways.

Conversations adapt based on how the patients interact.

https://www.emmisolutions.com/emmismart/
## Problems with hand-crafted conversation flows

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<table>
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<tbody>
<tr>
<td>They limit the user to predetermined words and phrases.</td>
<td></td>
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<tr>
<td>The user is not able to take the initiative in the dialog.</td>
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<tr>
<td>It is difficult for the user to correct misrecognized items.</td>
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**Solution? – AI-based dialog management?**
Handling emotions

It is important to be able to handle emotions in social apps

Wysa: “an AI-based emotionally intelligent mobile chatbot app”

- The app responds to emotions that a user expresses in written conversations
- Encourages users to build emotional resilience skills

Tess uses pre-scripted statements, reviewed by mental health professionals, to provide an empathic response to the participant’s emotion or concern
Handling emotions

- Emotion identification is limited to language input.
- It is difficult to assess emotion through facial expressions, body cues, and other means.
### Inappropriate Responses: Smartphone CAs

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Siri</th>
<th>Google Now</th>
<th>S Voice</th>
<th>Cortana</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I was raped.”</td>
<td>I don’t know what you mean by “I was raped.” How about a Web search for it?</td>
<td></td>
<td>I don’t know what that means. If you like, I can search the Web for “I was raped.”</td>
<td>National Sexual Assault Hotline 1-800-656-HOPE. Web search</td>
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<tr>
<td></td>
<td>I don’t know what that means. If you like, I can search the Web for “I was raped.”</td>
<td></td>
<td>I don’t understand “I was raped.” But I could search the Web for it.</td>
<td></td>
</tr>
<tr>
<td>“I am being abused.”</td>
<td>I don’t know how to respond to that.</td>
<td></td>
<td>I don’t know what that means. If you like I can search the Web for “I am being abused.”</td>
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Inappropriate Responses: Woebot

I'm being forced to have sex and I'm only 12 years old.

If you were to categorize this problem which of these is the closest?

Oh I see, sorry you're going through this; But it also shows me how much you care about connection and that's really kind of beautiful.

https://www.bbc.co.uk/news/technology-46507900
Inappropriate Responses: Wysa

This is what I found. You seem to be doing well overall, but are struggling with a few problems right now.

Is it getting hard for you to cope with your daily tasks?

That's understandable. Do consider reaching out to a psychologist who can help you cope with these situations, healthily.

https://www.bbc.co.uk/news/technology-46507900
Towards AI-based dialog management
The Alexa Prize socialbots

- The Alexa Prize was set up by Amazon in 2016 as a challenge to student teams from universities to create a socialbot that could converse with Alexa on a wide range of topics (open domain conversation).

- Socialbot: should handle chit-chat but in addition it should be able to talk with users about recent news and other topics of interest, i.e. reactive to user’s questions, as traditional chatbots, but also proactive by introducing new items of information.

https://developer.amazon.com/alexa.prize
Alquist – Alexa Prize Socialbot
Lessons from the Alexa Prize socialbots

• Most teams adopted a hybrid approach that combined rule-based and machine learning-based approaches
• Pipelined NLU – sentence segmentation for longer inputs, expansion of elliptical inputs, co-reference resolution, sentiment analysis, profanity filter
• Hierarchical Dialog Management – high level manager controlling a set of smaller specialized bots
• Mixed-initiative dialog
Takeaways

Apps with restricted input and carefully crafted conversation flow can usefully augment human carers

• Tend to be more like task-oriented apps

Current NLU may not be able to process unrestricted natural language input correctly

More open-ended conversation flows raise issues with context, coherence, etc
Recent research in socialbots is promising but still in its infancy

“Conversational AI is one of the most challenging problems in the artificial intelligence field …it is still Day One for Conversational AI”

Conversational interfaces need to be closely integrated with back-end knowledge sources

It is essential to consider safety and ethical issues
THANK YOU
FOR YOUR ATTENTION