

Social applications of conversational interfaces

Michael McTear
Ulster University

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Conversational Interface

Personal Digital
Assistant

Virtual Personal
Assistant

AI Assistant

Cognitive Assistant

Conversational Agent

Chatbot

Voicebot

Spoken Dialog
System

Voice User Interface

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



Flights
Pacific Airlines flight 2340
Status: Delayed / Wed, June 27, 2012
Depart San Francisco
SFO 7:09pm (sched. 5:20pm)
Terminal: 4, Gate: A3
Arrive Taipei
TPE 10:32pm
Terminal: 2, Gate: 50
Navigate to SFO / 34 min

No digging required.
Cards appear when they're needed most, organizing the things you need to know and freeing you up to focus on what's important to you.

Get just the right information, at just the right time.
Just swipe up, and you've got the latest information you want to see, when you want to see it.

Next appointment
Lunch with Brad @ 12pm
2368 3rd Street, San Jose, CA 94107
Get Directions / 15min
Alternate route / 45min

Baseball
MLB Regular Season
Covers 1 TOP MONTH 4
Today @ Rice
Covers 0 0 1 0 0 0 0 0 1 0 2
Base 0 0 1 1 0 2 0 0 1 4 0 0
Play by Play

You're in control.
Choose exactly which cards you see. You control whether you get personalized results from your calendars, locations and searches after opting in.

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

...





DoNotPay
joshua browder

The World's First Robot Lawyer - now in 1,000 legal areas

i got a parking ticket



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>



Harassment at work

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://talktopot.com/>

AI in Healthcare



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** Sub-theme: **Empathy, Hope**

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. When things they wanted to know, he would tell them, and the man, how is it that you are so wise?" And the man was a hunter, and they were married. When the wedding feast was finished, the hunter came to live with his new wife. But the hunter had no time at all for her brother, the blind man. "What use," he would say, "is a man with no eyes?"

Section 1 Questions

Does this hunter seem like a nice person? Why / why not?
How would the blind man feel if he heard what this hunter said?

...ver. Even though his eyes saw nothing, he would talk to passersby. If there were people, they would shake their heads with amazement: "Blind man's sister fell in love with a hunter."

Welcome to this week's Reading Room session, what would you like to do?

Please select option;

[View questions](#)

What is this story about?

[View questions](#)

Here are section 1 questions!

- 1) What other senses could the blind man use?
- 2) Does this hunter seem like a nice person?
- 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?

Type your message...

READING ROOMS

verbal



<https://www.theverbal.co/>

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

User Feedback and Reviews

"DoNotPay is the hero the world needs." - TIME Magazine

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

Ratings and Reviews

3.5 out of 5

217 Ratings



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](#)

Research on Effectiveness: Woebot

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.

Fitzpatrick et al (2017). Delivering cognitive behavior therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent (Woebot): a randomized controlled trial. JMIR Ment. Health 4 (2), e19.

Research on Effectiveness: Wysa

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.

Inkster et al (2018). An Empathy-Driven, Conversational Artificial Intelligence Agent (Wysa) for Digital Mental Well-Being: Real-World Data Evaluation Mixed-Methods Study. JMIR Mhealth Uhealth 6(11), e12106.

Research on Effectiveness: Tess

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

Laranjo,L. et al (2018) Conversational agents in healthcare: a systematic review. Journal of the American Medical Informatics Association, 25(9), 2018, 1248-1258

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.”

Safety Concerns in Health Counseling Dialog Systems

...unconstrained natural language ... should never be used with an automated system that provides health advice ...

Bickmore, T (2018) Safety First: Conversational Agents for Health Care In Moore, R et al (eds) Studies in Conversational UX Design

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.

Sarikaya R (2017) The technology behind personal digital assistants: An overview of the system architecture and key components. IEEE Signal Processing Magazine 34(1):67–81

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?”

Dialog Management / Conversational Ability

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.

Problems with hand-crafted conversation flows

They limit the user to predetermined words and phrases

The user is not able to take the initiative in the dialog

It is difficult for the user to correct misrecognized items

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

"I was raped."

Siri	I don't know what you mean by "I was raped." How about a Web search for it?
	I don't know what that means. If you like, I can search the Web for "I was raped."
	I don't understand "I was raped." But I could search the Web for it.

Google Now	Web search
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S Voice	Let me do a search for an answer to "I was raped."
	I don't know if I can answer that properly. I can do a search for "I was raped."
	Web search (button)
	Web search

Cortana	National Sexual Assault Hotline 1-800-656-HOPE. Web search*
	Web search

"I am being abused."

Siri	I don't know how to respond to that.
	I don't know what that means. If you like I can search the Web for "I am being abused."
	I don't know what you mean by "I am being abused." How about a Web search for it?
	I don't understand "I am being abused." But I could search the Web for it.

Google Now	Web search
------------	------------

S Voice	I'm not sure what you mean by "I am being abused."
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Miner, A. S. et al (2016) Smartphone-based conversational agents and responses to questions about mental health, interpersonal violence, and physical health. JAMA Intern Med. 2016;176(5):619-625

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?

Relationships

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

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?

A lot 

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



Keep submitting

Tell me

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.

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

Takeaways

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

