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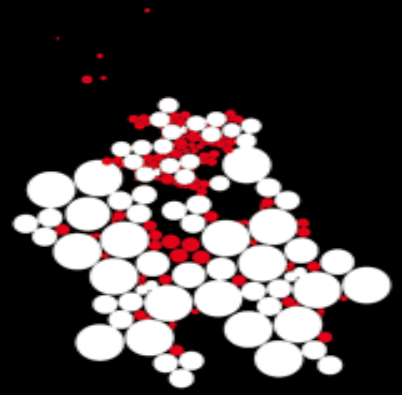
Automating question-answer sequences to improve text-based virtual agents



Text Analysis Café 23 November 2016

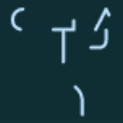
Hedwig te Molder, Anneke Sools, Lisette van Gemert-Pijnen

The promise

Watson is a cognitive technology that can think like a human.

Understand

With Watson, you can analyze and interpret all of your data, including unstructured text, images, audio and video.



Reason

With Watson, you can provide personalized recommendations by understanding a user's personality, tone, and emotion.

Learn

With Watson, you can utilize machine learning to grow the subject matter expertise in your apps and systems.

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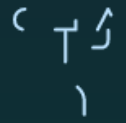

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The challenge

- How can text-based Virtual Agents (chat bots) operate more naturally and effectively?
- Key problem: chat bots do not work on the basis of conversational meaning, they do not understand the language they produce
- Hard to see why some questions invoke so-called preferred, affiliative answers and others invite resistance or no response
- Especially important in delicate contexts such as mental health

Our approach

- Automation of dialogical structures in text-based virtual agents
- Based on existing knowledge and models derived from Conversation Analysis / Discourse analysis for analysing question-answer sequences
- Combining with Natural Language Processing and Machine-Based Learning to analyse and predict successful and unsuccessful sequences

Objective: setting the ambition level and scope

- Develop new algorithms for text-based virtual agents?
- Gaining knowledge about differences between face-to-face and digital conversational patterns?
- Gaining knowledge about context-specific and generic conversational patterns in various digital conversation contexts?
- Construct a text-based real-time virtual agent with improved responsiveness for a particular setting?

Conversation Analysis (Sacks, 1992)

- everyday talk is very much structured, in detail
- talk is essential for society: ‘social institutions are talked into being’ (Heritage & Clayman 2010)
- language is not neutral but a *tool for action*

example

1	**Ireen**	How about the following
2		weekend
3		(0.8)
4	**Charles**	hh Dat's the vacation isn't
5		it?
6	**Ireen**	hhhhh Oh: .hh ALright so:
7		no ha:ssle (.) s o
8	**Charles**	Ye:h

(Drew, 1984: 130; see also Wooffitt, 1992

setting the interactional scene

- participants use language not only to describe reality but also to *do things with* (here: invitation-turning it down)
- interaction is organised through *turns* and *sequences* (series of turns) – not single sentences!
- people use the turn-by-turn basis (*sequential context*) to make sense of each others' actions
- actions are *normatively* organised in
  - *adjacency pairs* (e.g. question-answer)
  - *preferred* and *dispreferred* options (here: acceptance/rejection)

four dimensions of questions

- set action and topical agendas
- embody presuppositions
- convey epistemic stance
- incorporate preferences

- reflects and constitutes social relationship between experts and patients

Heritage & Claymann 2010

(1) agenda setting

1 Doc Do you have any drug aller:gies?

2 (0.7)

3 Pat: .hh hu= Not that I know of no.

(2) presuppositions (Sorjonen, Raevera, Haakana, et al 2006)

Female patients are asked:

“Do you use alcohol?”

Male patients are asked:

“How much alcohol do you use?”

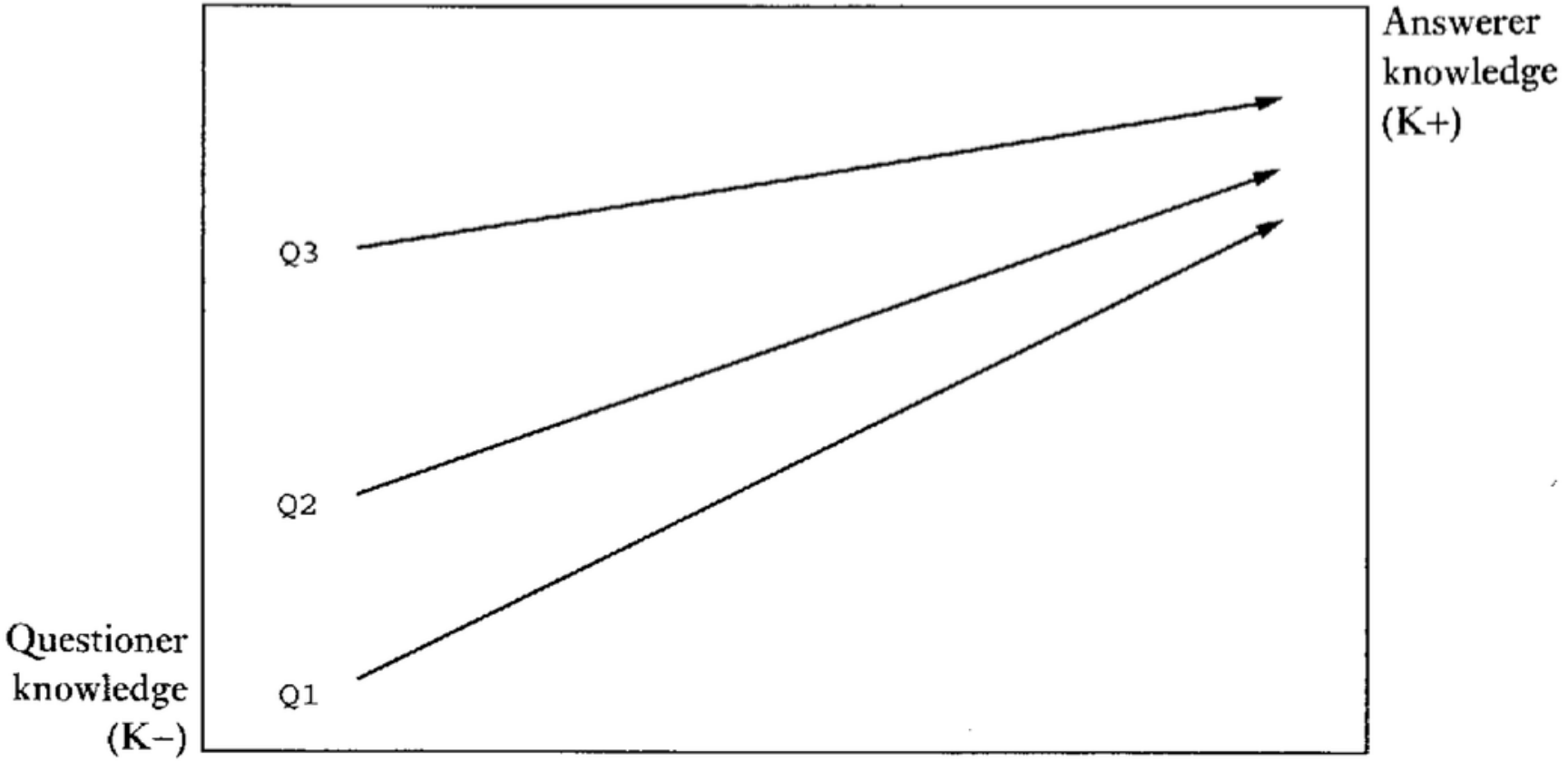


Figure 10.1 Question designs and epistemic gradients

(4) preference

- some grammatical designs favor Yes responses:
  - declarative questions: You’re married currently.
- others invite a No response:
  - negative declaratives: There’s no blood in the diarrhea.

- counselors lack the epistemic right to acknowledge their own advice
- it is the privilege of client to do that and initiate the closing of the conversation: ‘I know enough’ or ‘I am reassured now’
- this treats the provided advice as an answer to their question, and it opens up the closing

three ways to open up the closing: eliciting advice acknowledgment

- questions projecting the client's future action ("Does that give you something to work with?")
- elicitations of direct advice acknowledgment ("I hope you know enough now")
- offers of a new advice sequence ("Do you have any other questions?")

Excerpt 8 (P.106/Chat 30)

1	[13:43:28]	Co:	als je ervan af wil kan je contact opnemen met een
			if you want to get rid of it you can contact an
2			instelling voor verslavingszorg bij jou in de regio,
			institution for addiction care in your region,
3			kijk op sites van brijder, jellinek, tactus[5] en verder
			check out sites of brijder, jellinek, tactus and also
4			op drugsinfo.nl voor meer informatie, we kunnen hulp
			drugsinfo.nl for more information, we can
5			bieden op maat
			offer tailored care
6	[13:44:22]	Co:	Heb ik zo antwoord gegeven op je vragen?
			Have I answered your questions like this?
7	[13:44:29]	Co:	Kun je hiermee verder?
			Does that give you something to work with?
8	[13:46:37]	Co:	??
			??
9	[13:46:55]	Cl:	Jaaa
			Yesss
10	[13:47:44]	Co:	heb je zo voldoende info, of is er nog iets anders
			so do you have enough info, or is there anything else
11	[13:49:01]	Co:	Ik wens je veel succes en je kunt altijd nog eens
			I wish you good luck and you can always
12			terugkomen.
			come back again.

conclusions

- compared to telephone counseling it is easier for clients in chat sessions to resist pre-closing questions
- reasons as to why advice acknowledgment is not given can be manifold (simultaneous typing; doing other things at the same time etc.)
- this creates the flexibility to leave acknowledgements out and expand the counseling sessions

Should we limit the study to e-mental health settings?

- Relevance?
- What is typical for e-mental health compared to other settings
- What is similar /generalizable?

Should we opt for variety or homogeneity in data types?

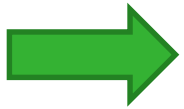
- Chats only?
- e-mail correspondence
- twitter data
- face-to-face

- **generalization vs context-specificity issue**
- **Setting the right ambition level, feasible yet innovative**

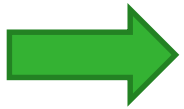
Data

Current proposal involves three different text corpora on E-mental:

(1) Centre for E-health and well-being research (UT): 10,000 e-mails between counselor and client



(2) Trimbos Institute (counselling alcohol and drugs addiction): 200 chat sessions, corpus expanding



(3) Korrelatie (counselling helpline): 350 chat sessions.

Analytical procedure/methods choices

- Partly supervised based on hand-coded patterns and un/semi-supervised using outcome labelling?
- Parallel or sequential data-driven vs theory-driven analyses?
- How to best increase (and test) the external validity of the model?

Ethical issues

- Risk of contributing to making human interaction redundant? (de-humanizing care)
- Opportunity to discern more clearly what is uniquely human and what is best done by machines?