駒澤大学/Komazawa University, 28 Nov 2024

Machines with intercultural competence - developing conversational AI for diverse populations

異文化対応能力を持つ機械 ~多様な人々のための会話型AIの開発

Spencer Hazel

Newcastle University

The British Academy

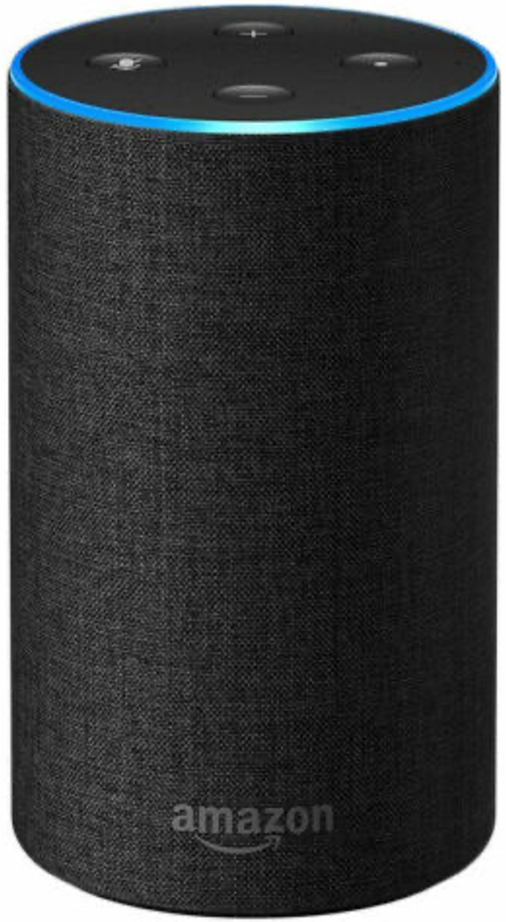
UKRI Innovate UK

Ufonia

Presentation outline

1. Introduction - conversational AI and conversation design
2. The project
3. Second language users and conversational AI
4. Changing usability testing to improve design
5. Looking to the future


OpenAI
ChatGPT


amazon

Artificial Intelligence 人工知能

- When a machine provides an illusion of *human intelligence*

Conversational AI systems ユーザインタフェース

- Conversational User Interface (CUI)
- Voice User Interface (VUI)

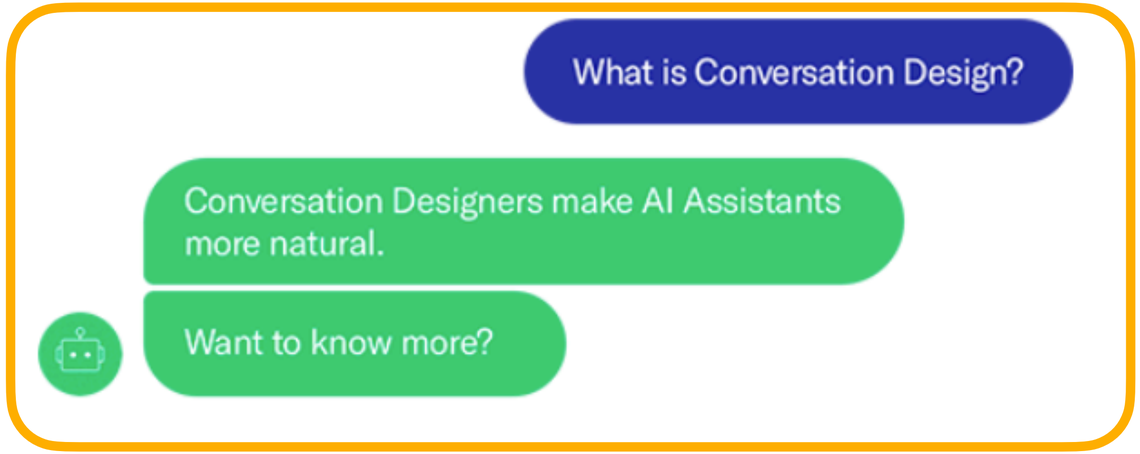
1. Introduction: conversational AI and conversation design

Leading in Conversation Design

We're the world's leading training and certification institute for conversation design. Our proven workflow helps you create human-centric experiences for AI Assistants, like chatbots and voice assistants.

Whether you're an individual designer entering the field or an enterprise looking to close your team's skill gap, our courses and certificates help you design, develop, and deploy valuable conversational experiences.

Read more →



Conversation Design

Welcome to conversation design.

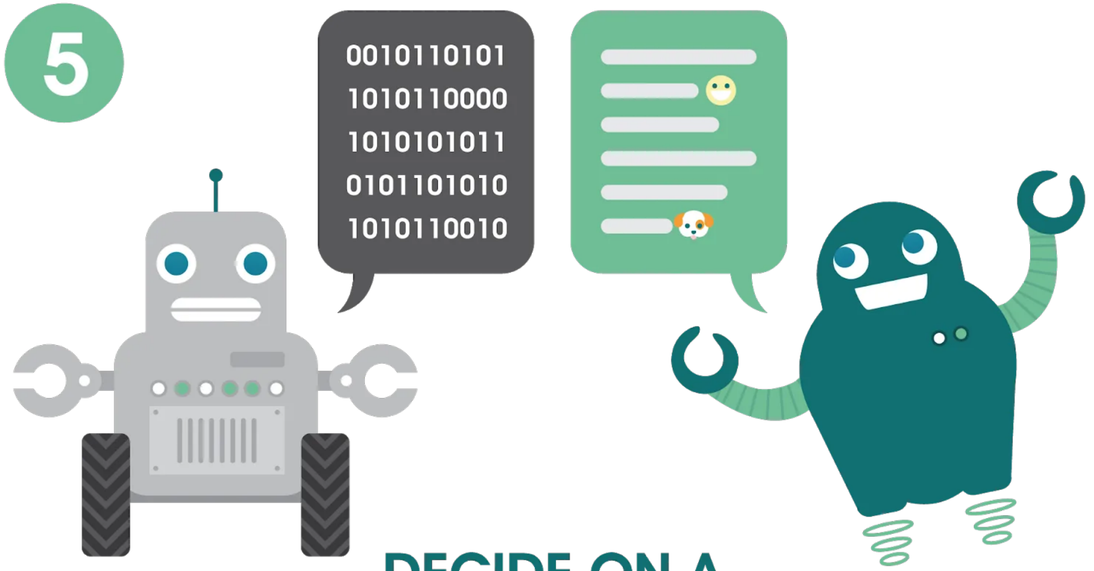
Designing Actions on Google

Creating Actions for the Google Assistant requires a breadth of design expertise (for example, voice user interface design, interaction design, visual design, motion design, and UX writing) that we've refined into a single discipline: conversation design.

Our goal is to help you:

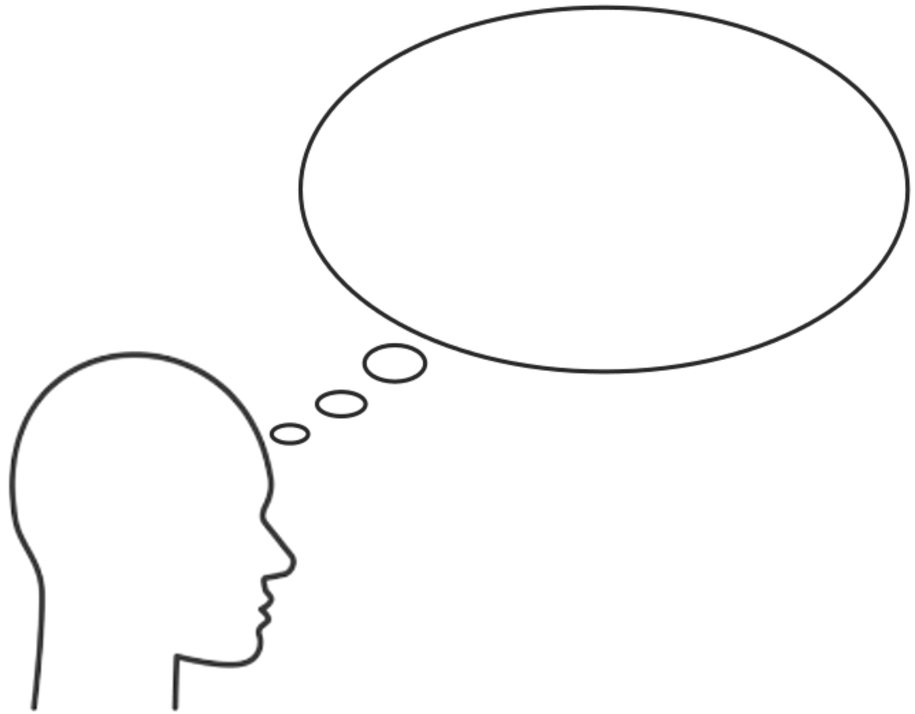
- Craft conversations that are natural and intuitive for users
- Scale your conversations across all devices to help users wherever they are

USE DISCOURSE MARKERS



DECIDE ON A CONVERSATIONAL STYLE

What we are trying to help with



There is a **lack of practical design guidelines** available to help designers provide a more natural user experience (e.g., Murad et al. 2019)

2. The project

The British Academy

Project team

Newcastle University

Adam Brandt
Senior Lecturer in Applied Linguistics

Spencer Hazel
Reader in Applied Linguistics

Kleopatra Sideridou
PhD candidate in Applied Linguistics

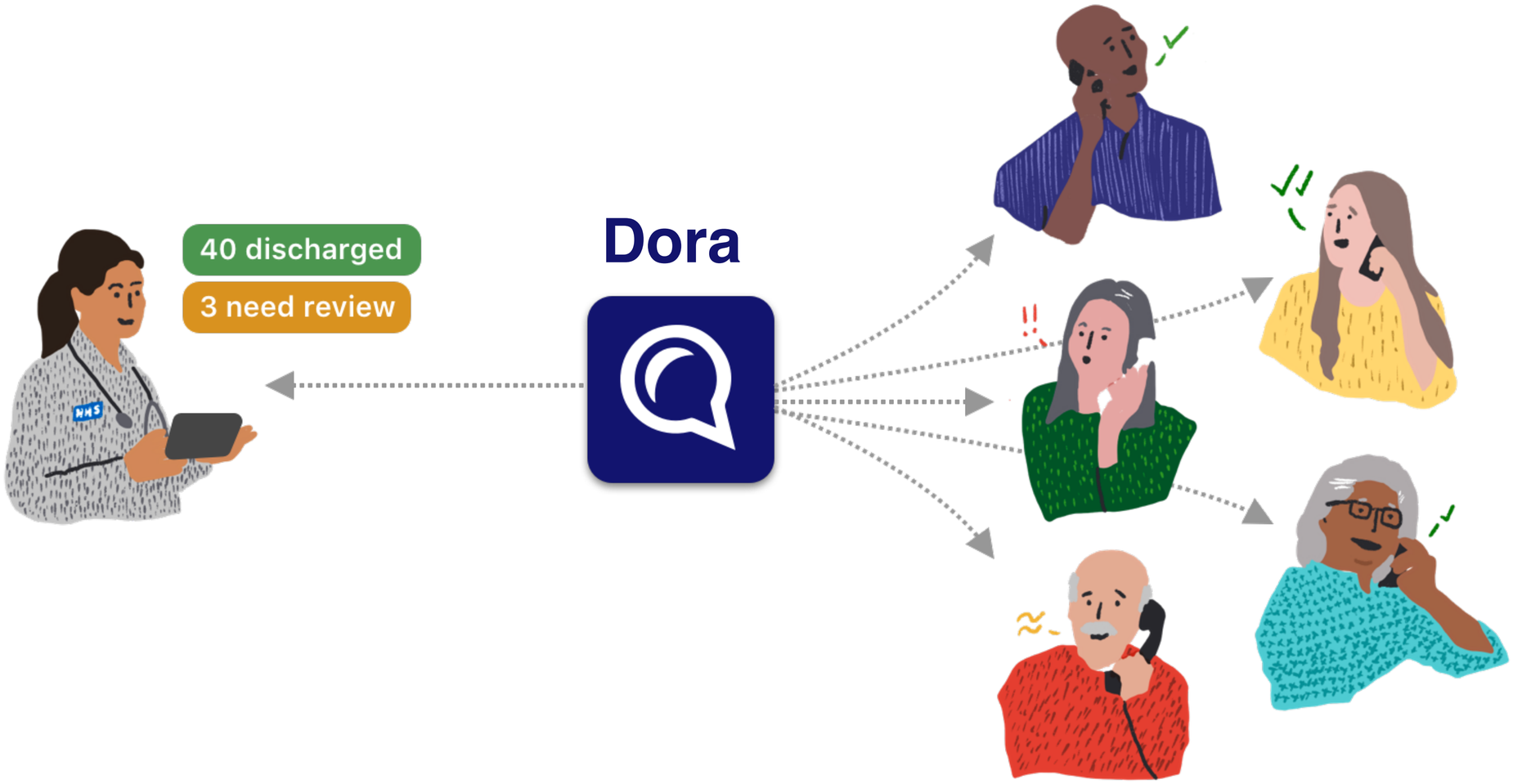
Ufonia

Joe Tindale
Lead Software Engineer

Nikoletta Ventoura
Senior Product Researcher

Rory McKinnon
Product Engineer

Ufonia


40 discharged
3 need review
Dora

2. National Health Service (NHS)

Dora is deployed at 13 NHS Trusts (with contracts for 12 more):

NHS
University Hospitals of Leicester
NHS Trust

NHS
Oxford University Hospitals
NHS Foundation Trust

NHS
University Hospitals Bristol and Weston
NHS Foundation Trust

NHS
University Hospital Southampton
NHS Foundation Trust

NHS
Royal Devon and Exeter
NHS Foundation Trust

NHS
University Hospitals Plymouth
NHS Trust

NHS
Milton Keynes University Hospital
NHS Foundation Trust

NHS
Buckinghamshire Healthcare
NHS Trust

NHS
Royal Berkshire
NHS Foundation Trust

NHS
Frimley Health
NHS Foundation Trust

NHS
Chelsea and Westminster Hospital
NHS Foundation Trust

NHS
Royal Surrey
NHS Foundation Trust

NHS
Portsmouth Hospitals University
NHS Trust

2. The project

Post-COVID Triage: 60% reduction in nurse calls

Orthopaedic Waiting Lists: £730k worth of activity released

Cataract Follow-up: 167% increase in appointment capacity

***Dora* is deployed at 13 NHS Trusts (with contracts for 12 more):**

2. The project

BBC

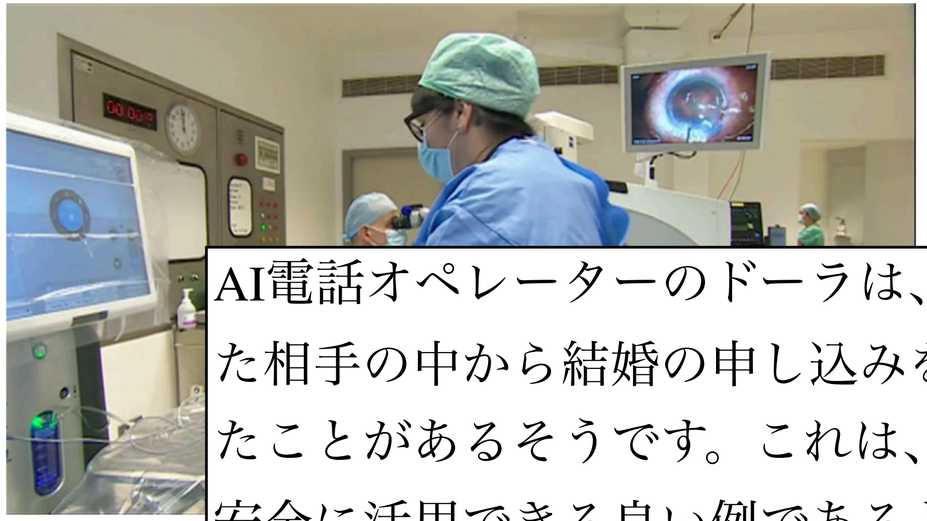
Home News Sport Business Innovation Culture Travel Earth Video Live

AI assistant eases NHS pressure in cataract care

6 August 2024

Share

Katharine Da Costa
BBC News, South • @katharinedc



An AI telephone

Artificial int
cataract pat

An automat
questions, i
clinician.

A study, published in The Lancet's eClinicalMedicine journal in July, found Dora's decisions strongly agreed with the supervising ophthalmologist.

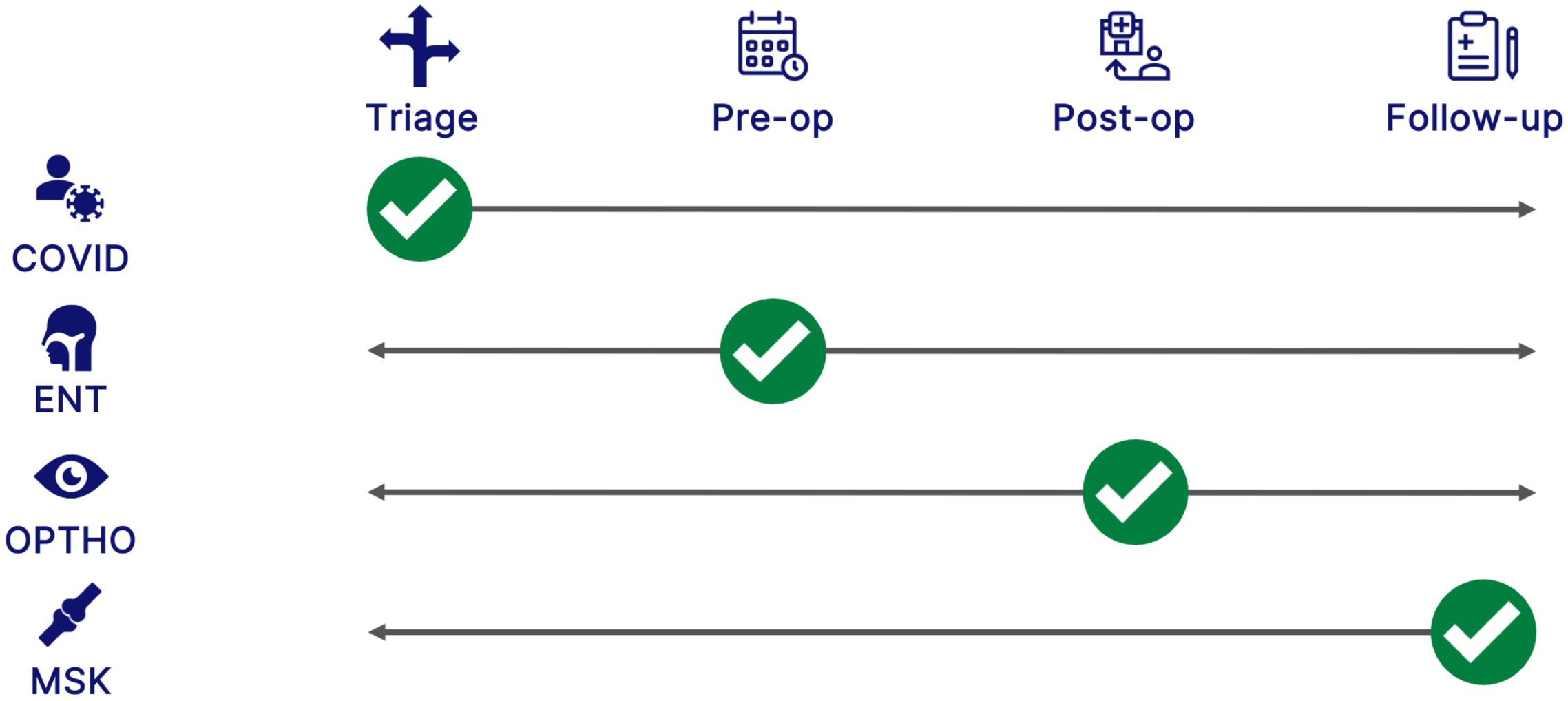
The AI-powered tool is currently being used by nine hospital trusts, mainly in the south of England.

AI電話オペレーターのドーラは、話した相手の中から結婚の申し込みを受けたことがあるそうです。これは、AIを安全に活用できる良い例であると同時に、看護師が電話対応の時間を省くことができるという点でも優れた例です。

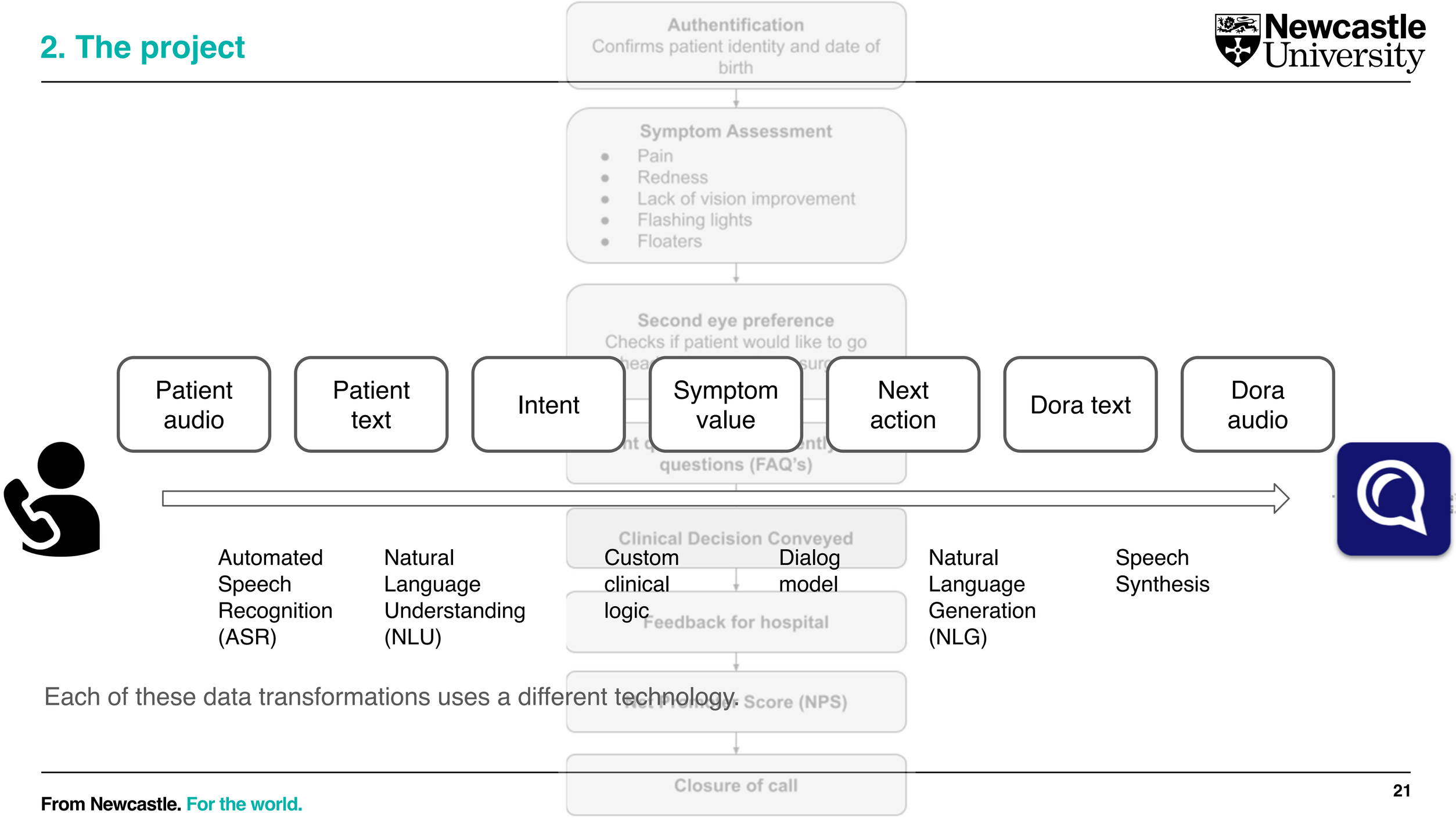
THE TIMES

Secretary of State for Health Victoria Atkins … **gave the example of an AI bot called Dora, which is being used at the hospital to conduct follow-up phone consultations with cataract patients.** Atkins said: “**Dora the AI telephonist** has apparently had proposals of marriage from some of the people that she’s spoken to. **That is a really good example of how AI can be used safely, but also free up nurses from making phone calls.**”

The Times March 07, 2024


Triage
Pre-op
Post-op
Follow-up
COVID
ENT
OPTHO
MSK

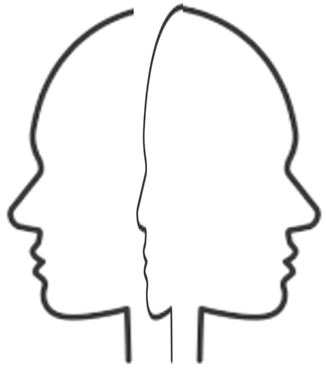
2. The project



Each of these data transformations uses a different technology.

Starting point

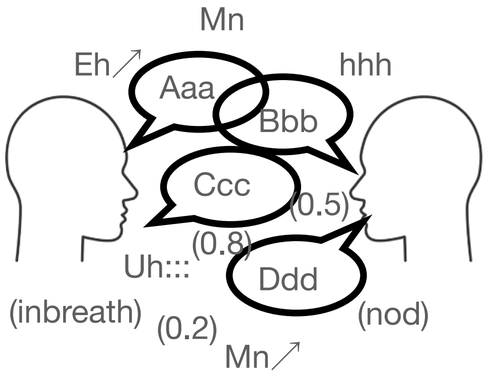
- Q: How do we make the user experience (UX) as ‘natural’ as possible?
  - ユーザー体験（UX）をできるだけ『自然なもの』にするにはどうすればよいですか？



- Q: How can we - Conversation Analysts (CA) - help Conversation Designers (CxD) to make the product better?
  - 会話分析者（CA）は、会話デザイナー（CxD）が製品をより良いものにするために、どのように支援できるでしょうか？

The CA-for-CxD collaboration
- how we go about it

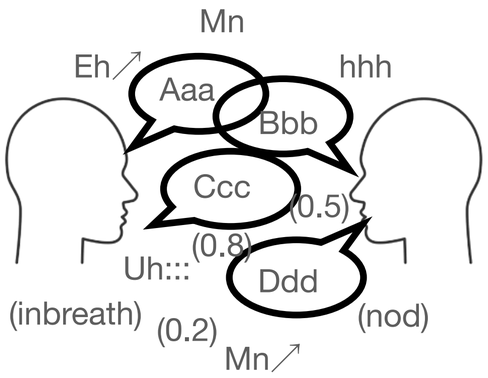
Conversation Analysis



Studying the **human social world** in its natural settings*, with a main interest in **social interaction**

*not in experimental settings

Conversation Analysis



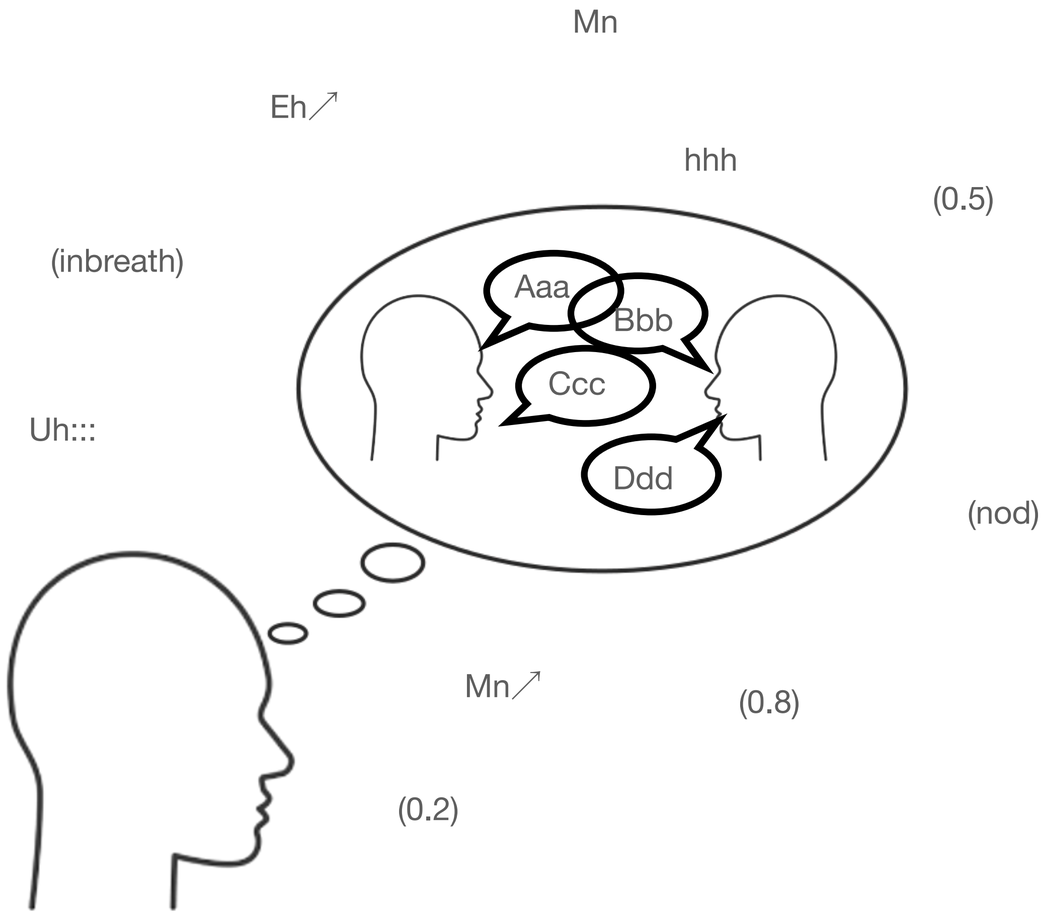
Social interaction in its natural settings

How?

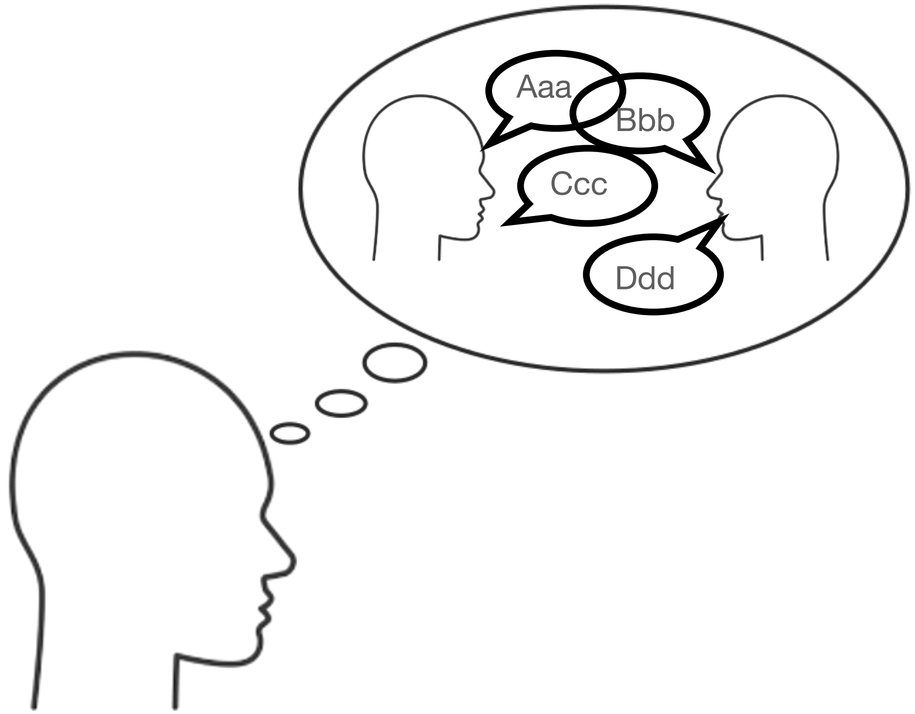
Analyse **recordings** of naturally occurring social interaction, instead of imagined data

Why?

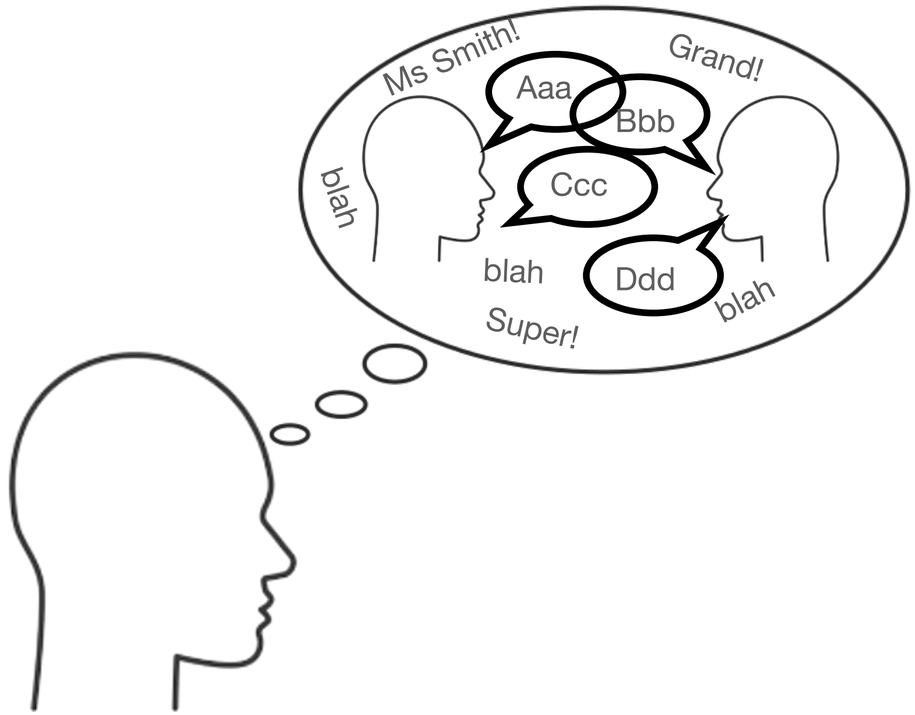
Imaginings of social interaction



Imaginings of social interaction

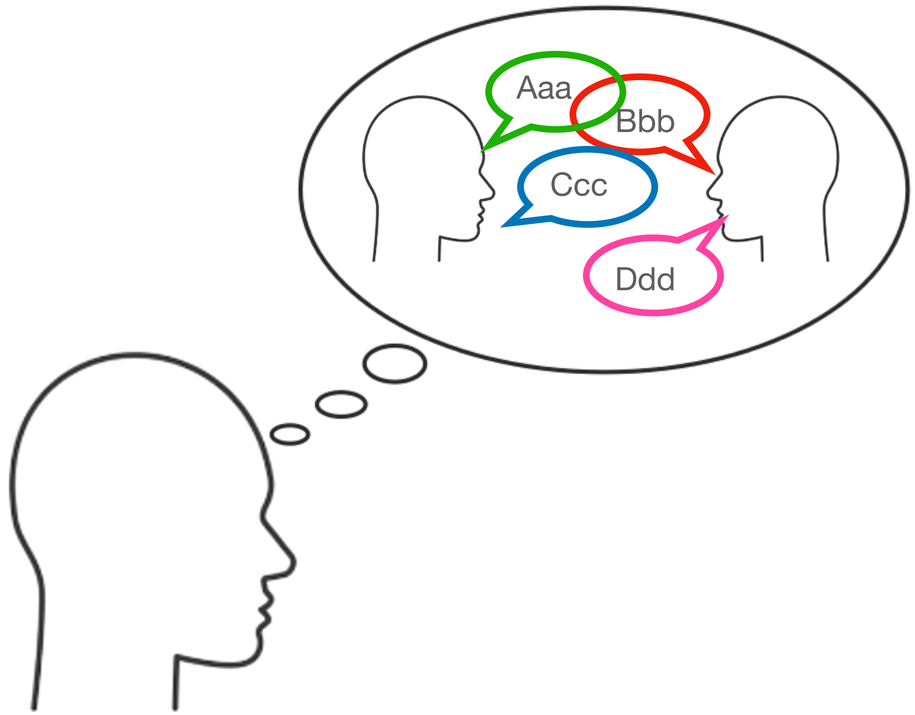


Imaginings of social interaction



Imaginings of social interaction

Sacks (1984)

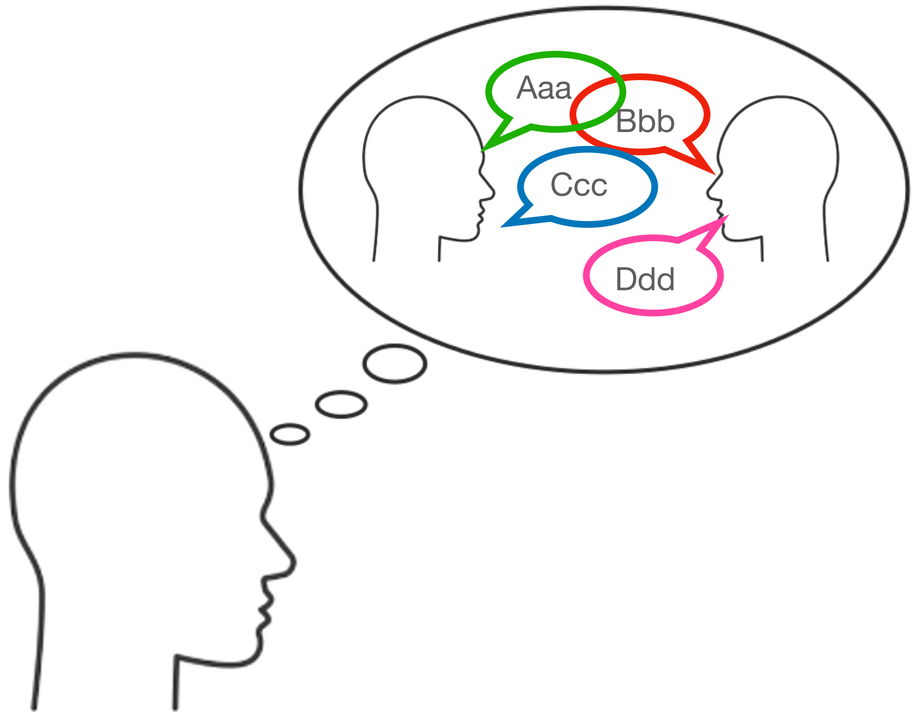


“one characteristic way social science proceeds […] is **to use hypotheticalized, proposedly typicalized versions of the world as a base for theorizing about it.** … somebody will say, "Let us suppose that such and such happened," or, "Typical things that happen are . . .”.
… On the basis of assertions, suppositions, proposals about what is typical, some explanation about the world is built.”

仮定化され、提案的に典型化された世界のバージョンを基盤として、それについて理論化したい

Imaginings of social interaction

Sacks (1984)



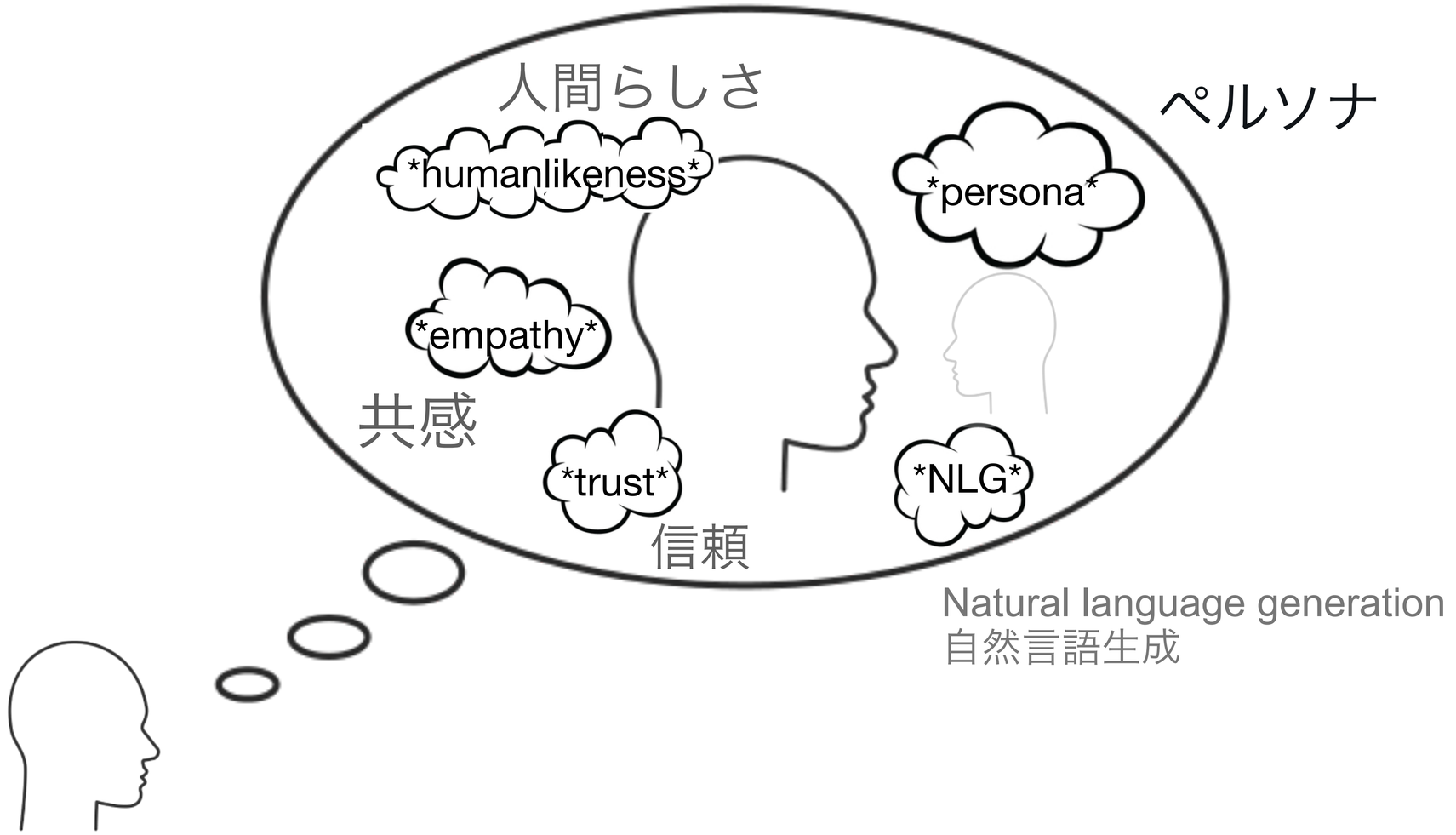
CxD

“one characteristic way s[redacted] proceeds […] is **to use hypotheticalized, proposedly typicalized versions of the world as a base for theorizing about it.** … somebody will say, "Let us suppose that such and such happened," or, "Typical things that happen are . . .”.
… On the basis of assertions, suppositions, proposals about what is typical, s[redacted]n [redacted] is built.”

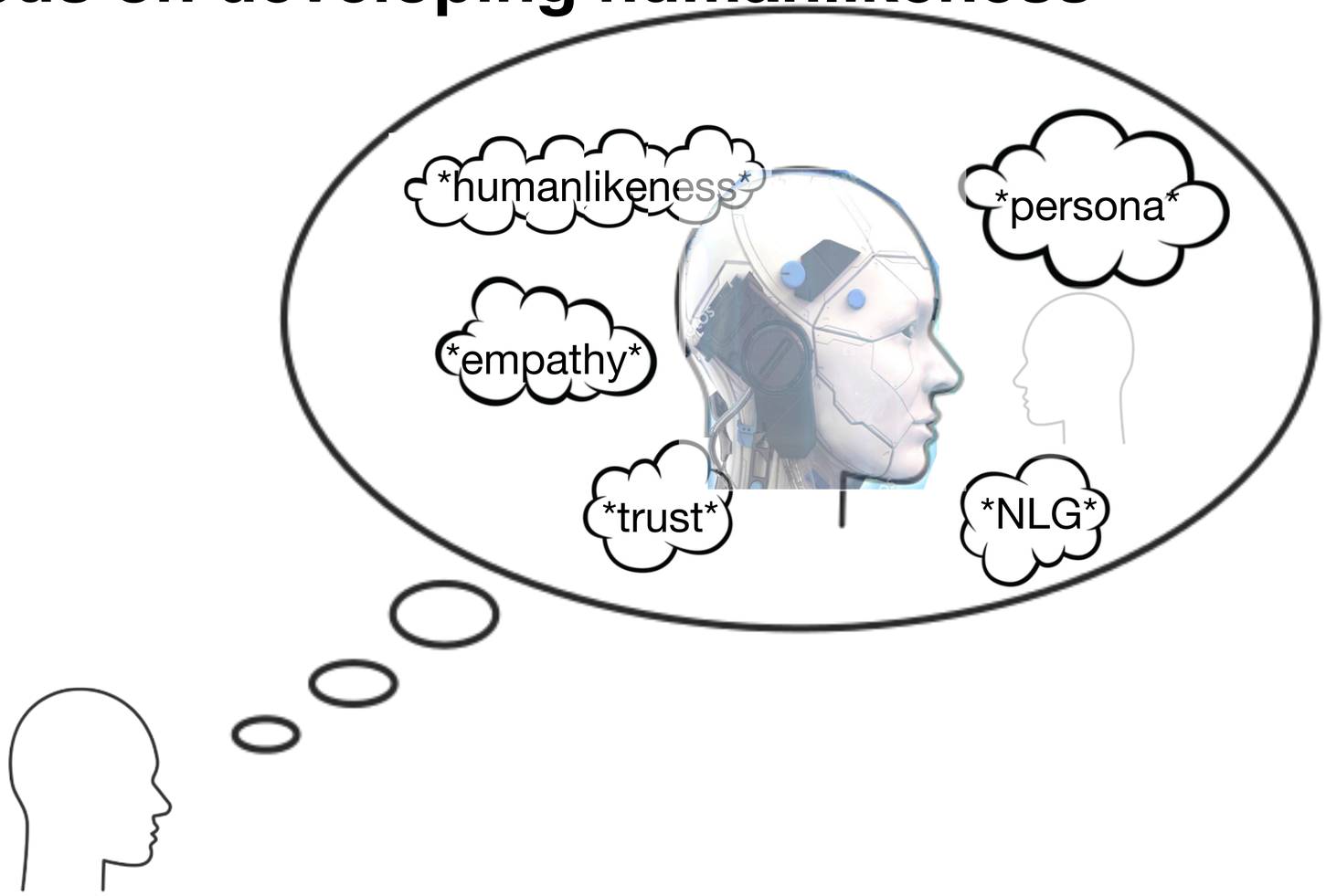
AI

仮定化され、提案的に典型化された世界のバージョンを基盤として、それについて理論化したい

The Ghost in the Shell (攻殻機動隊) - the bot or voice persona



A focus on developing humanlikeness



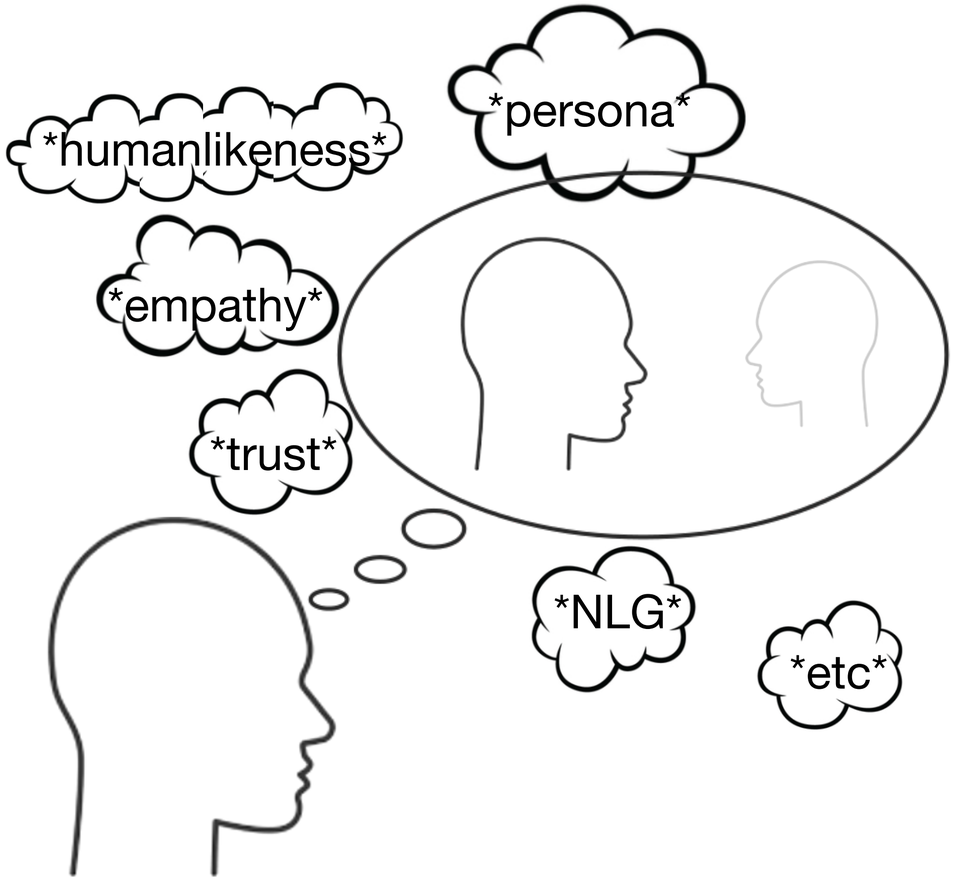
Creator: abidal | Credit: Depositphotos

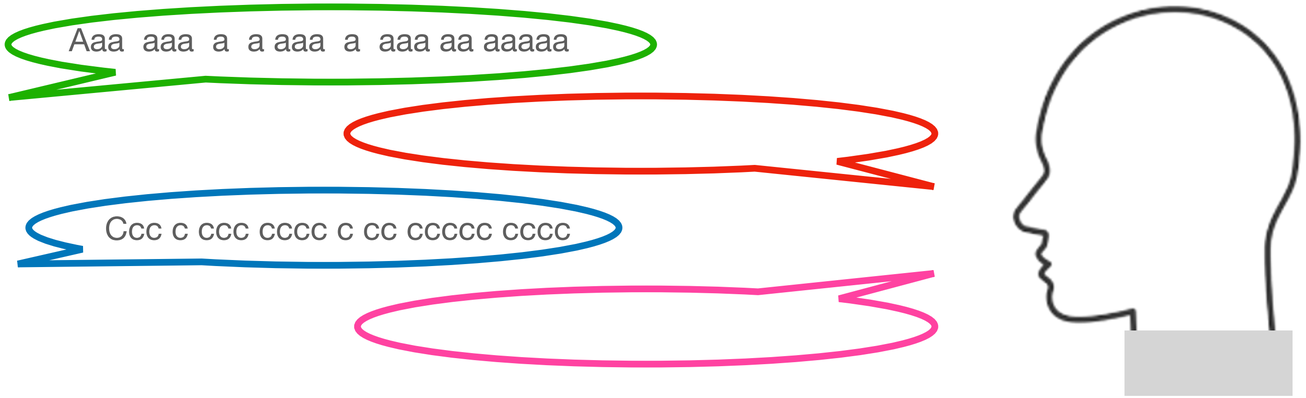
A focus on developing persona

From Google: “When people hear a voice, they instantly make assumptions about the speaker’s **gender**, **age**, **social status**, **emotional state**, and **place of origin**, as well as personality traits like **warmth**, **confidence**, **intelligence**, etc. People can’t help but do this with virtual assistants, too—so guide the assumptions they make about your Action by choosing a voice that is consistent with your persona.”

Newcastle University

Human imaginings and CUI design

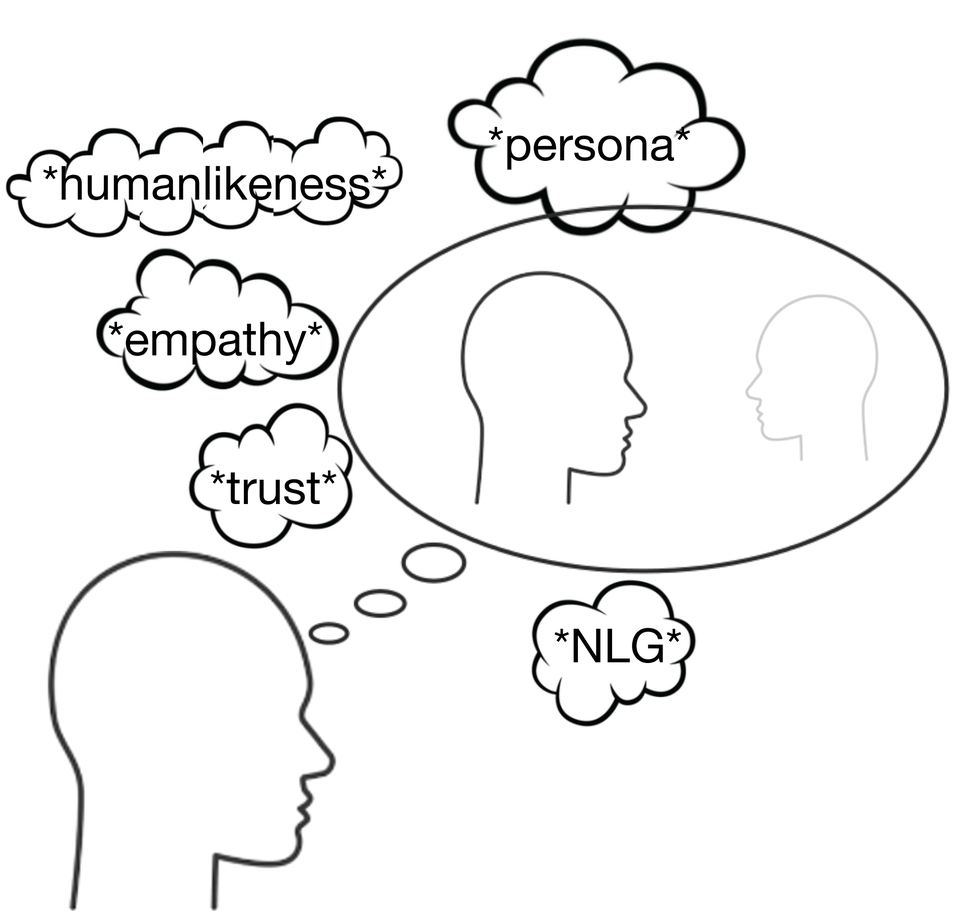


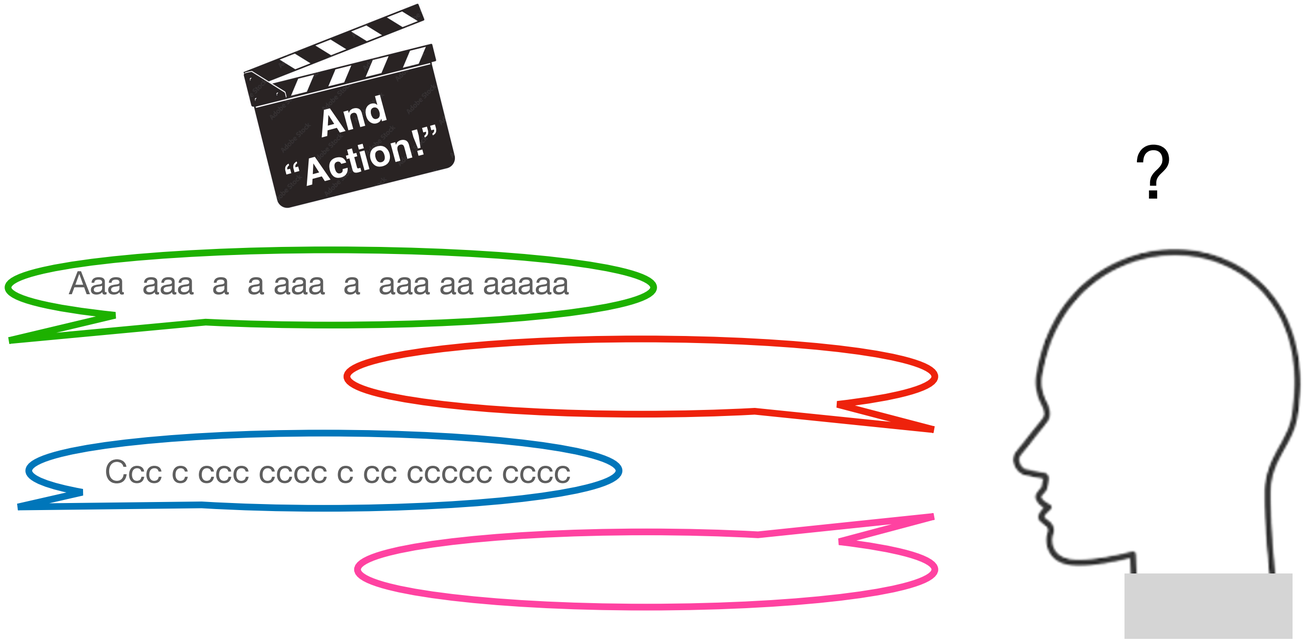


The British Academy

Newcastle University

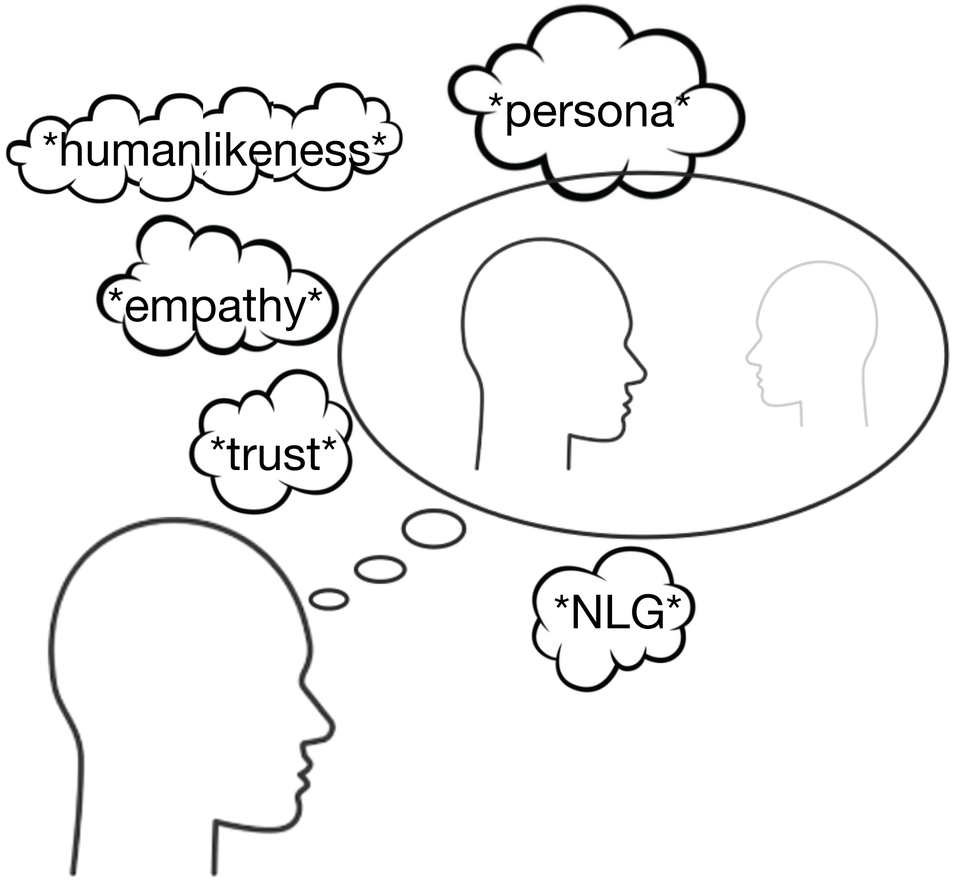
Human imaginings and CUI design





The British Academy

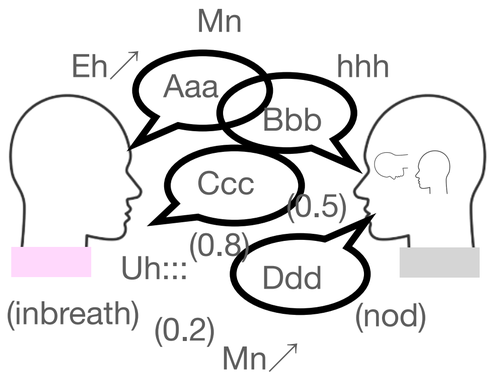
Human imaginings and CUI design

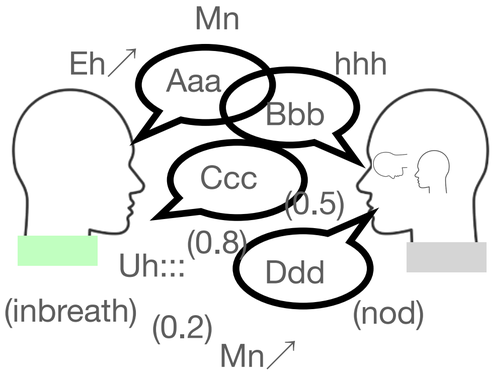


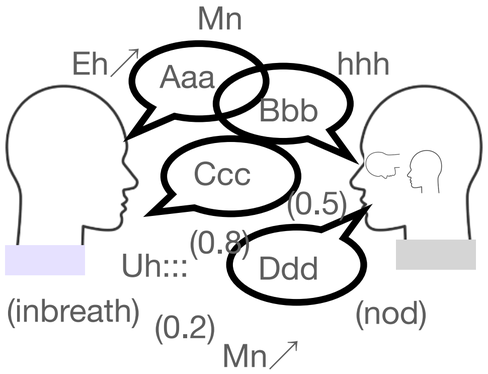
これが自然なものだとでも？

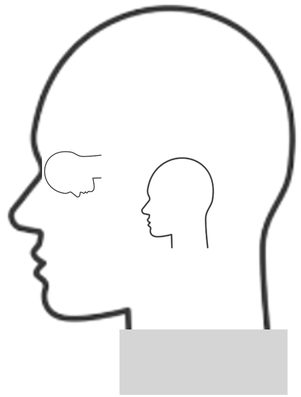
“This is supposed to be a natural UX?!”

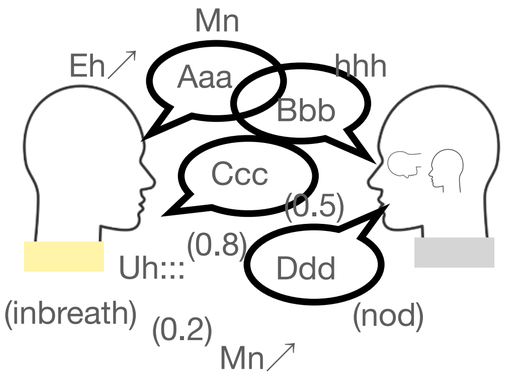
Conversation Analysis

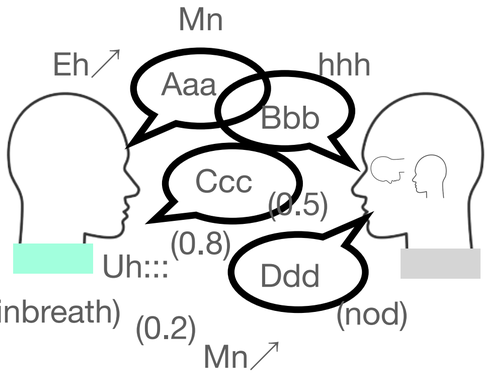


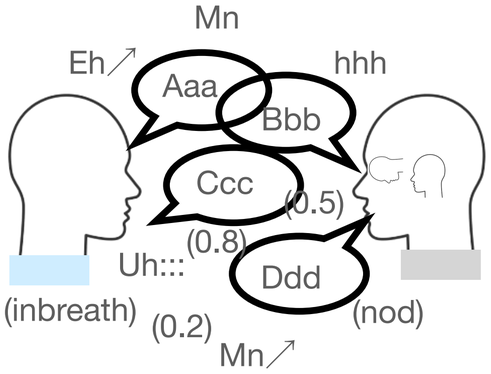












Example:
Organisation of call openings

Pre-intervention call opening (post cataract op follow-up)

Speech Synthesis Input

Good morning. I’m calling from the Ufonia testing team to follow up after your cataract surgery. Is this mX XXX speaking?

```
((patient answers phone))
01 (0.6)
02 CUI: good morning↘ (0.2)
03      I’m calling from the Ufonia testing team
04      to follow up after your cataract surgery↘
05      (0.7)
06      is this mX XXX speaking↗
07      (1.3)
08 PAT: ((responds))
09      (3.0)
10 CUI: okay↘ (0.3) great↘
11 CUI: I'm dora↘ (0.2) an automated assistant↘ (0.2)
12      calling to follow-up after your ↑cataract surgery↘
```

Newcastle University

Redesigned call opening (post cataract op follow-up)

Hi, good afternoon. This is Dora, the automated clinical assistant from Trentwood cataract clinic.

```
01 CUI: hi↘ (0.2) good afternoo:n↘ (0.4)
02      this is dora↘ (0.3)
03      the automated clinical assistant
04      from trentwood cataract clinic↘
```

Redesigned call opening (post cataract op follow-up)

Hi, good afternoon. This is Dora, the automated clinical assistant from Trentwood cataract clinic.

```
01 DOC: ↑hi:
02      good afternoo:n→
03      it’s ↓doctor grey calling from the
04      trentwood u:h ↑cataract clinic⇗
```

```
01 CUI: hi↘ (0.2) good afternoo:n↘ (0.7)
02      this is dora↘ (0.3)
03      the automated clinical assistant
04      from trentwood cataract clinic↘
```

Call opening comparison (post cataract op follow-up)

Hi, good afternoon. This is Dora, the automated clinical assistant from Trentwood cataract clinic.

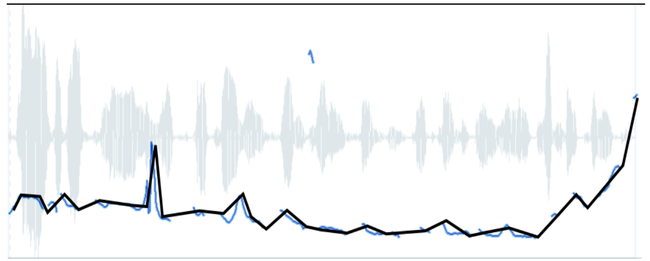
```
01 DOC: ↑hi:
02      good afternoo:n→
03      it's ↓doctor grey calling from the
04      trentwood u:h ↑cataract clinic⇗
```

```
01 CUI: hi↘ (0.2) good afternoo:n↘ (0.7)
02      this is dora↘ (0.3)
03      the automated clinical assistant
04      from trentwood cataract clinic↘
```

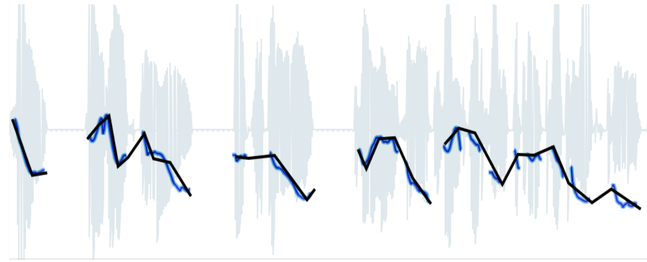
Call opening comparison (post cataract op follow-up)

Hi, good afternoon. This is Dora, the automated clinical assistant from Trentwood cataract clinic.

```
01 DOC: ↑hi:
02      good afternoo:n→
03      it's ↓doctor grey calling from the
04      trentwood u:h ↑cataract clinic⇗
```



```
01 CUI: hi↘ (0.2) good afternoo:n↘ (0.7)
02      this is dora↘ (0.3)
03      the automated clinical assistant
04      from trentwood cataract clinic↘
```

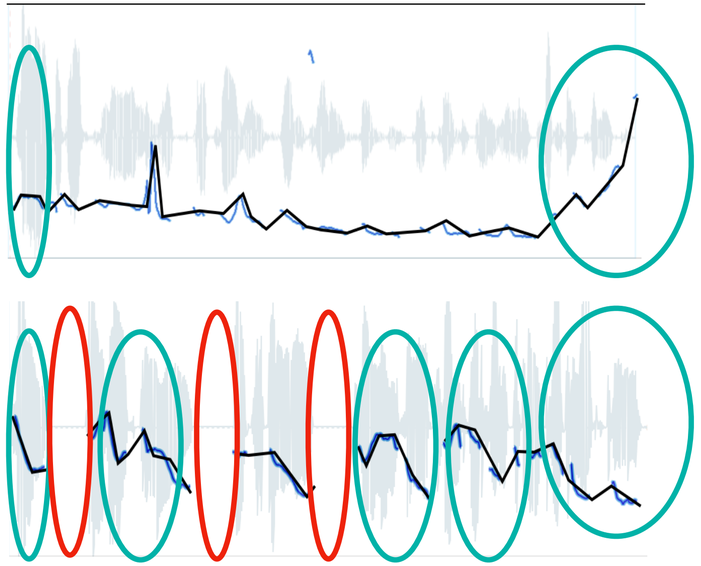


Call opening comparison (post cataract op follow-up)

Hi, good afternoon. This is Dora, the automated clinical assistant from Trentwood cataract clinic.

```
01 DOC: ↑hi:
02      good afternoo:n→
03      it's ↓doctor grey calling from the
04      trentwood u:h ↑cataract clinic⇗
```

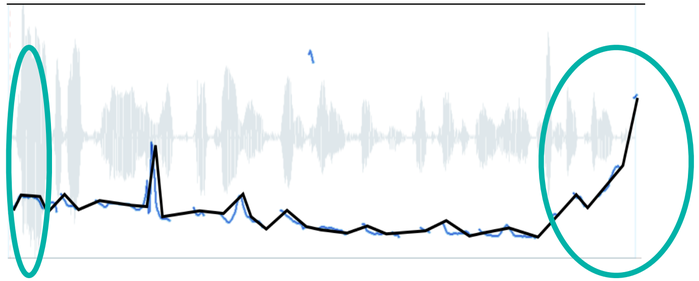
```
01 CUI: hi↘ (0.2) good afternoo:n↘ (0.7)
02      this is dora↘ (0.3)
03      the automated clinical assistant
04      from trentwood cataract clinic↘
```



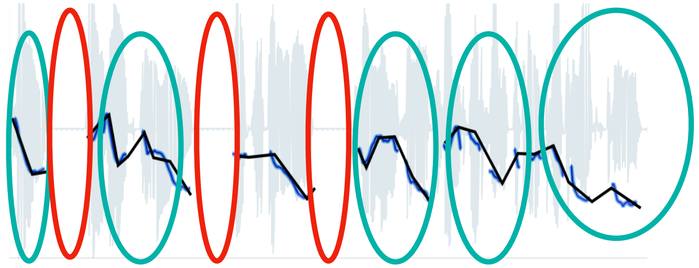
Call opening comparison (post cataract op follow-up)

Hi, good afternoon. This is Dora, the automated clinical assistant from Trentwood cataract clinic.

```
01 DOC: ↑hi:
02      good afternoo:n→
03      it's ↓doctor grey calling from the
04      trentwood u:h ↑cataract clinic⇗
```



```
01 CUI: hi↘ (0.2) good afternoo:n↘ (0.7)
02      this is dora↘ (0.3)
03      the automated clinical assistant
04      from trentwood cataract clinic↘
```

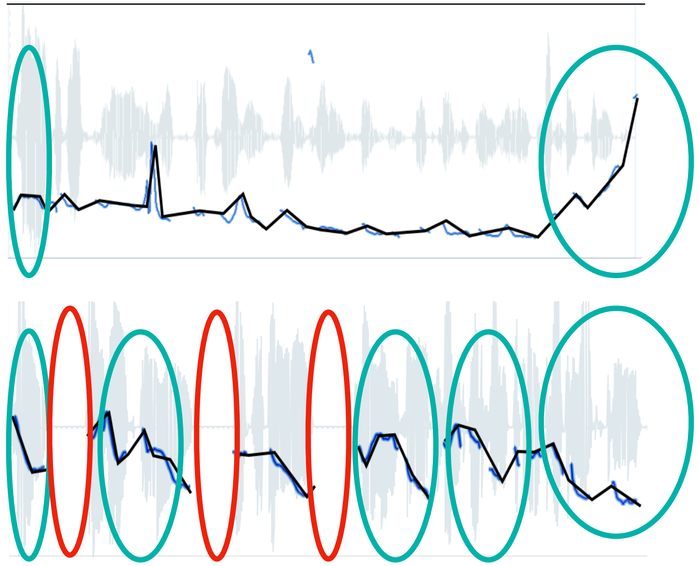


Call opening comparison (post cataract op follow-up)

Hi, good afternoon. This is Dora, the automated clinical assistant from Trentwood cataract clinic.

```
01 DOC: ↑hi:
02      good afternoo:n→
03      it's ↓doctor grey calling from the
04      trentwood u:h ↑cataract clinic⇗
```

```
01 CUI: hi↘ (0.2) good afternoo:n↘ (0.7)
02      this is dora↘ (0.3)
03      the automated clinical assistant
04      from trentwood cataract clinic↘
```

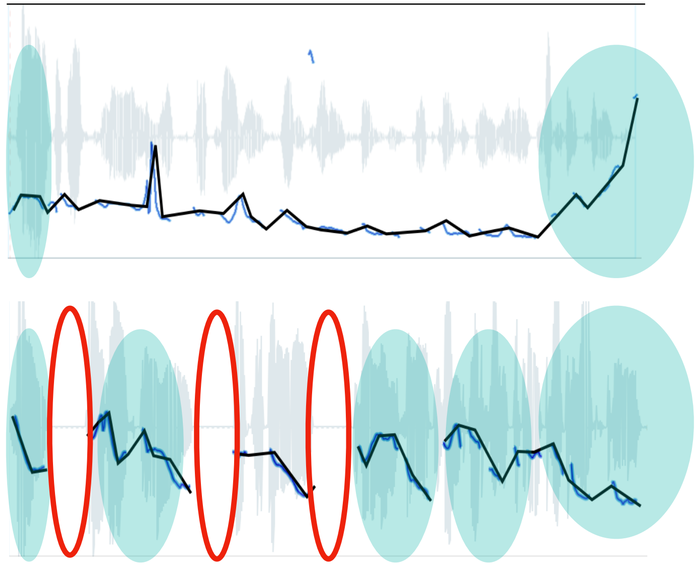


Call opening comparison (post cataract op follow-up)

Hi, good afternoon. This is Dora, the automated clinical assistant from Trentwood cataract clinic.

```
01 DOC: ↑hi:
02      good afternoo:n→
03      it's ↓doctor grey calling from the
04      trentwood u:h ↑cataract clinic⇗
```

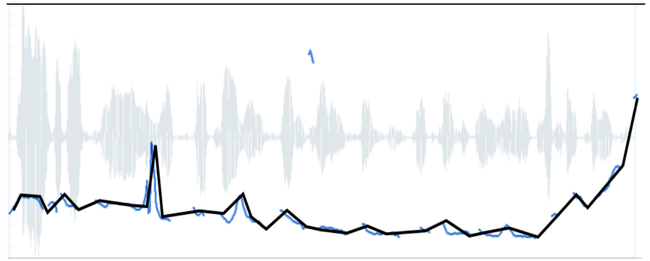
```
01 CUI: hi↘ (0.2) good afternoo:n↘ (0.7)
02      this is dora↘ (0.3)
03      the automated clinical assistant
04      from trentwood cataract clinic↘
```



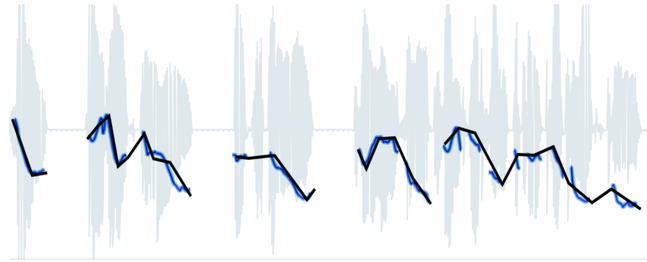
Call opening comparison (post cataract op follow-up)

Hi, good afternoon. This is Dora, the automated clinical assistant from Trentwood cataract clinic.

```
01 DOC: ↑hi:
02      good afternoo:n→
03      it's ↓doctor grey calling from the
04      trentwood u:h ↑cataract clinic⇗
```

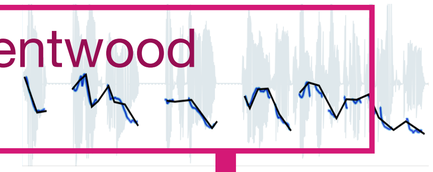


```
01 CUI: hi↘ (0.2) good afternoo:n↘ (0.7)
02      this is dora↘ (0.3)
03      the automated clinical assistant
04      from trentwood cataract clinic↘
```



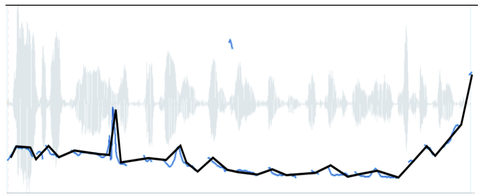
Call opening comparison (post cataract op follow-up)

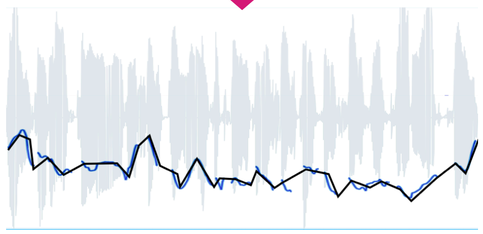
Hi, good afternoon. This is Dora, the automated clinical assistant from Trentwood cataract clinic.



SSML Speech Synthesis Markup Language

```
<speak>
<prosody rate="90%" pitch="+4st" > hai </prosody>
<prosody rate="98%" pitch="+2st" > good afternoon </prosody>
<prosody rate="105%" pitch="+4st" > this </prosody>
<prosody rate="105%" pitch="+8st" > is </prosody>
<prosody pitch="+3st">DORA</prosody>
<prosody rate="120%">the clinical assistant from </prosody>
<prosody rate="110%"> trentwood cataract clinic? </prosody>
</speak>
```



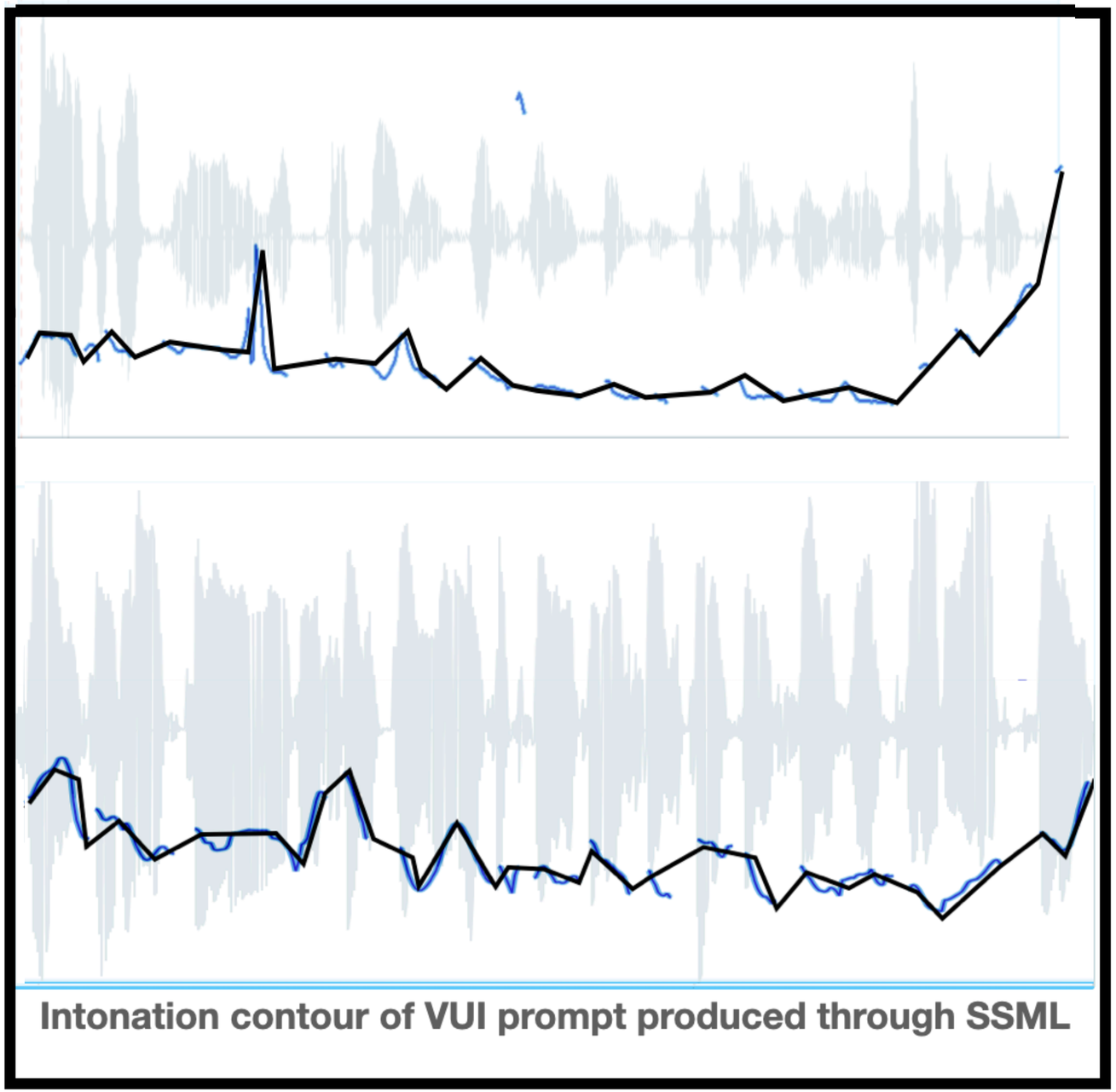


hi→ good afternoon→ it's doctor grey calling from the trentwood uh cataract clinic↗

SSML

```
<speak>
<prosody rate="90%" pitch="+4st" > hai </prosody>
<prosody rate="98%" pitch="+2st" > good afternoon </prosody>
<prosody rate="105%" pitch="+4st" > this </prosody>
<prosody rate="105%" pitch="+8st" > is </prosody>
<prosody pitch="+3st">DORA</prosody>
<prosody rate="120%">the clinical assistant from </prosody>
<prosody rate="110%"> trentwood cataract clinic? </prosody>
</speak>
```

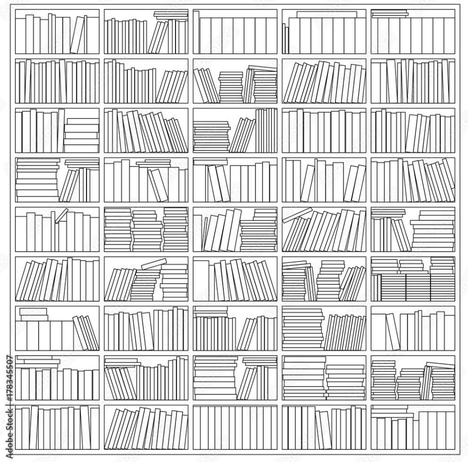
hi→ good afternoon→ this is dora the clinical assistant from trentwood cataract clinic↗

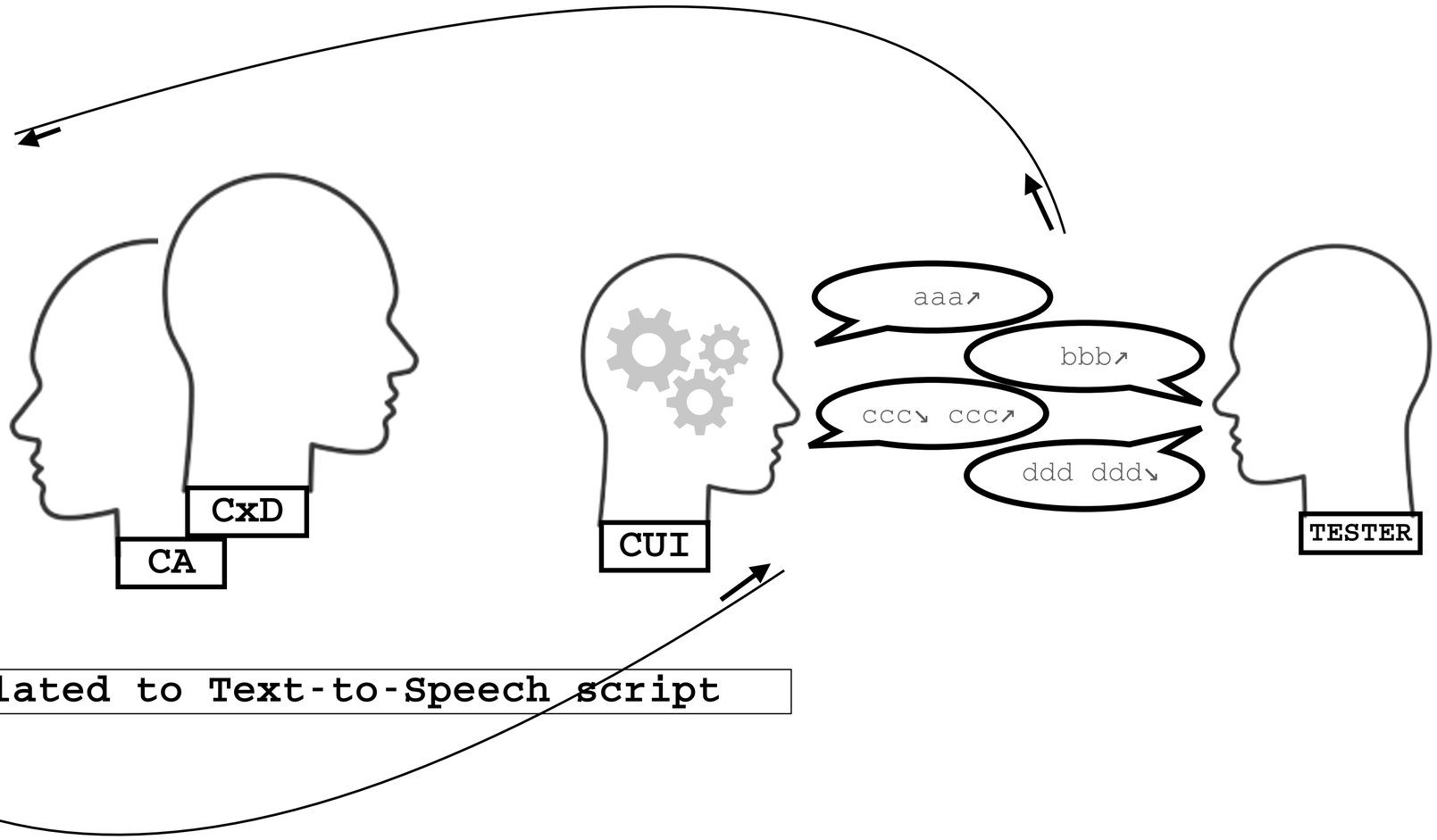


Intonation contour of VUI prompt produced through SSML

The CA-for-CxD collaboration

```
01 KEL: a:lri:ght↗
02      mn so what's the last↘ name↗
03 SMI: Smith↘
04 KEL: a:lri:ght↗
05     (0.5)
06 KEL: a::nd (0.2) it'll be::↘ (0.4)
07      three hundred and Δtwentyfive dollarsΔ⇗
08 SMI: would that be cash↗
09 KEL: let's see::↘
10      i need to Δreserve ↑it with aΔ
11      ↓credit card number if that's alright↗
12 SMI: sure let me just grab that
13 KEL: no problem↘
```

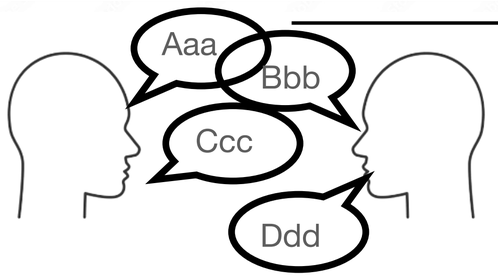


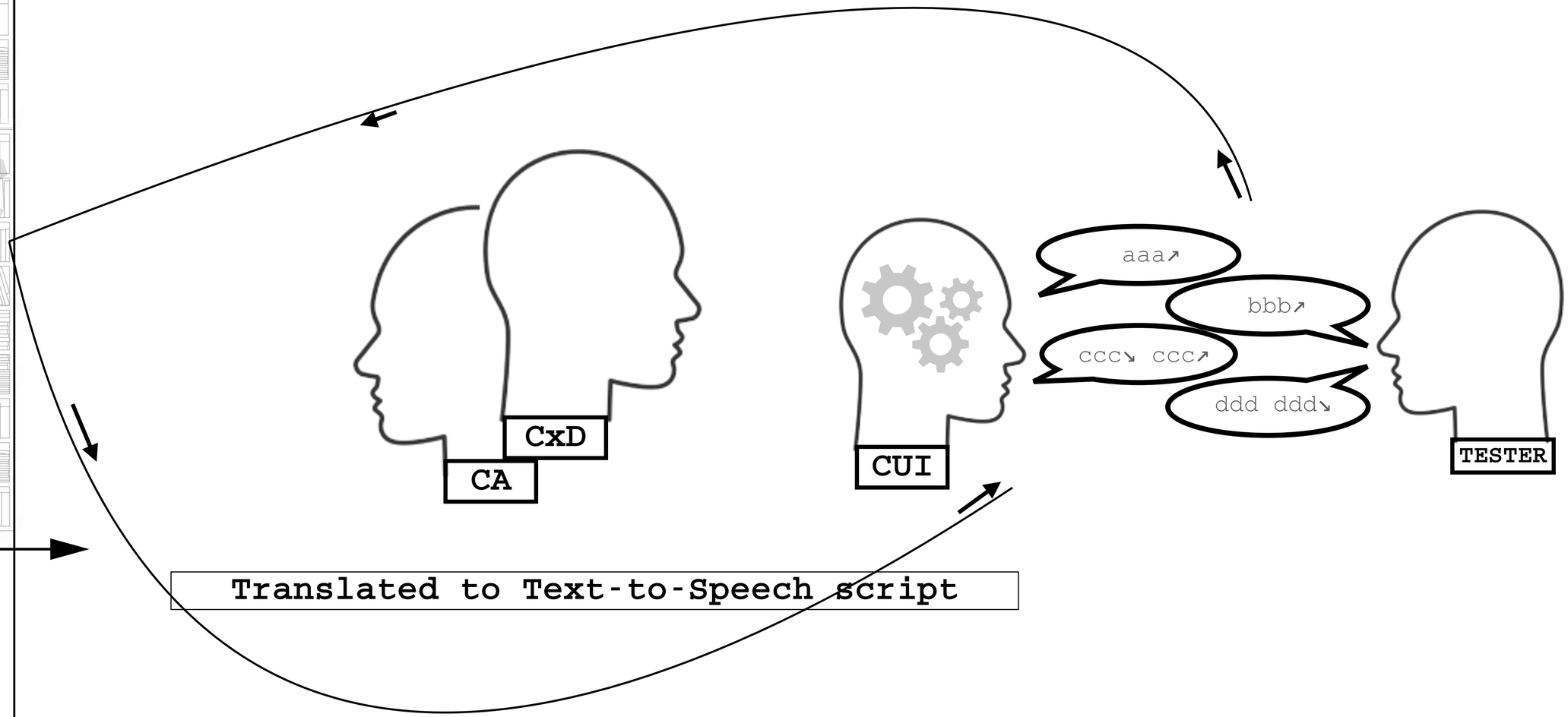


The CA-for-CxD collaboration

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns





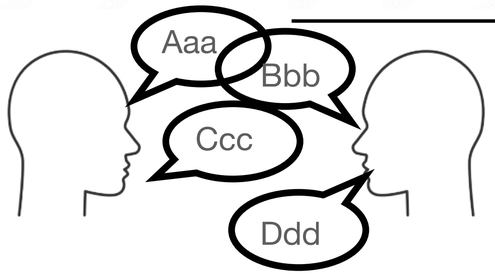
The CA-for-CxD collaboration

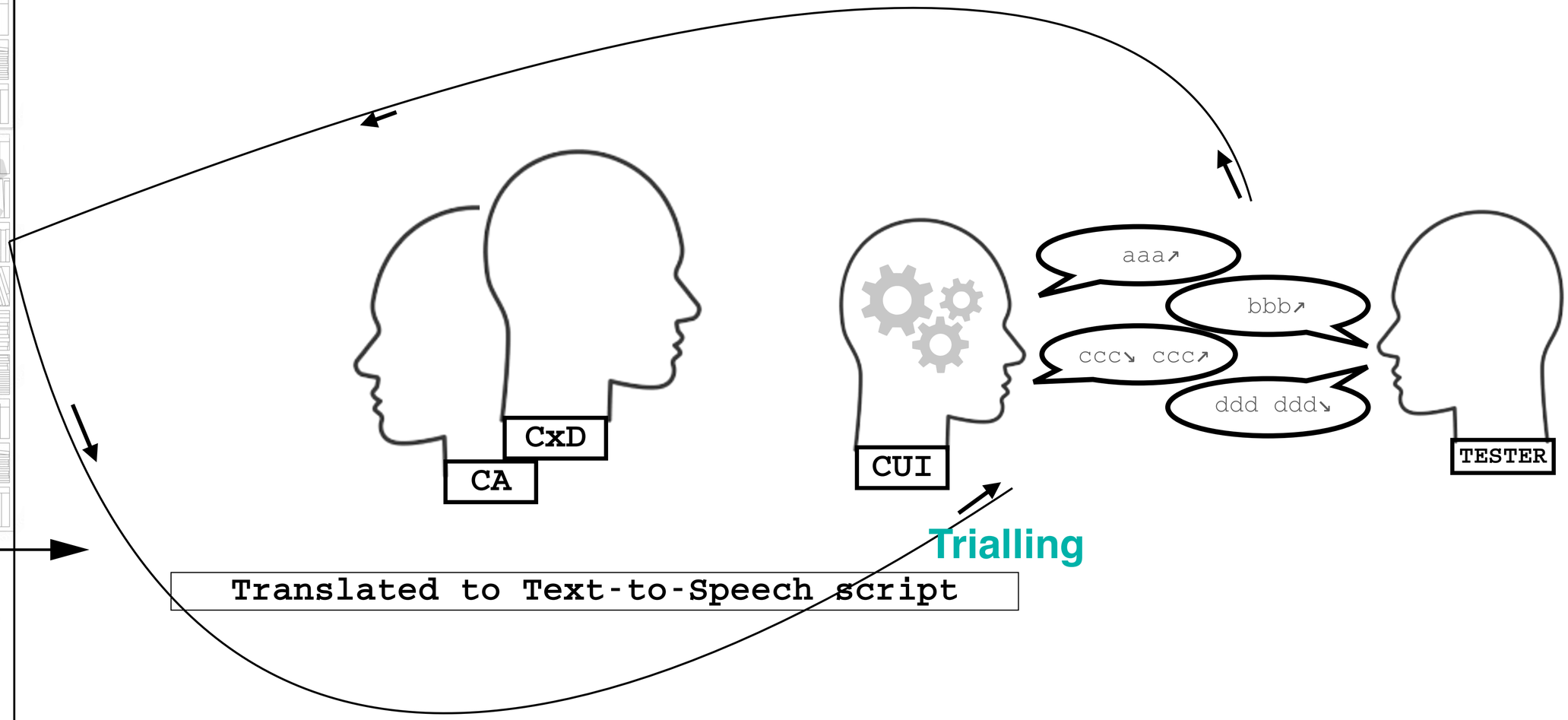
Newcastle University

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

Ufonia

Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns





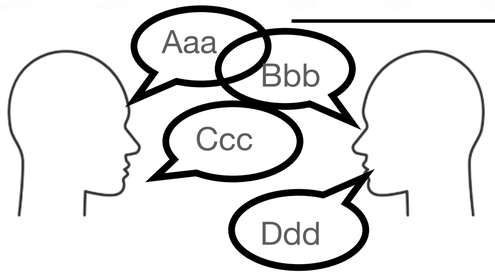
The CA-for-CxD collaboration

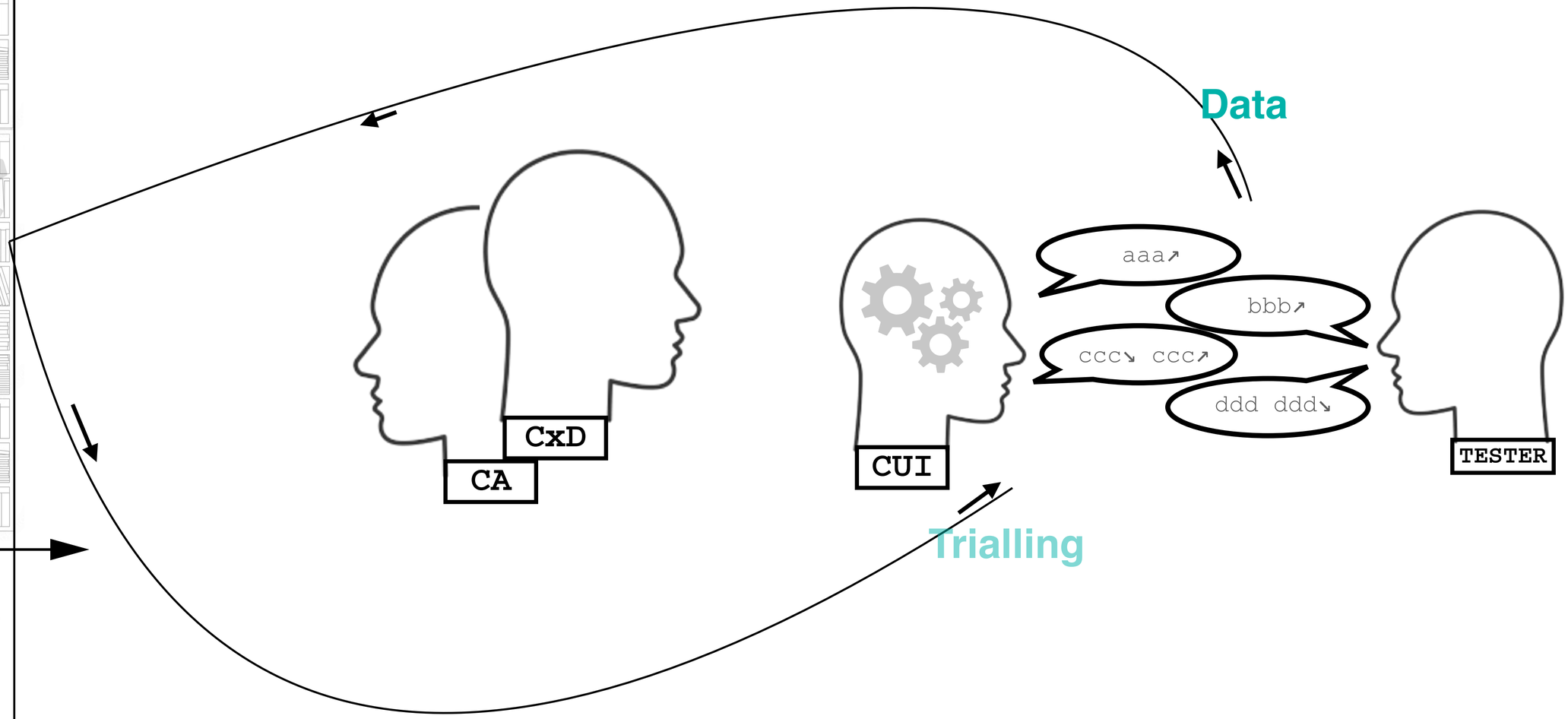
Newcastle University

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

Ufonia

Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns





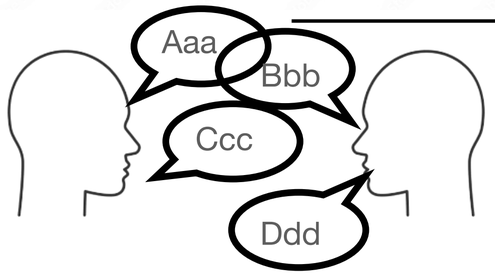
The CA-for-CxD collaboration

Newcastle University

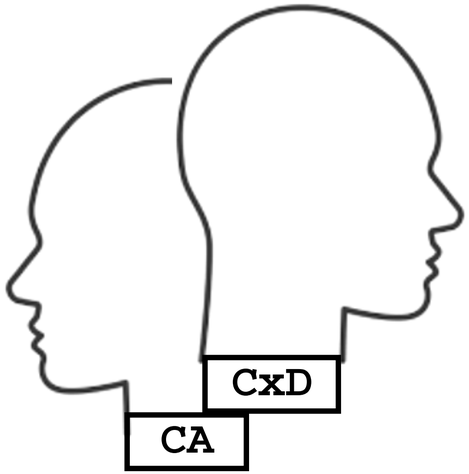
Ufonia

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

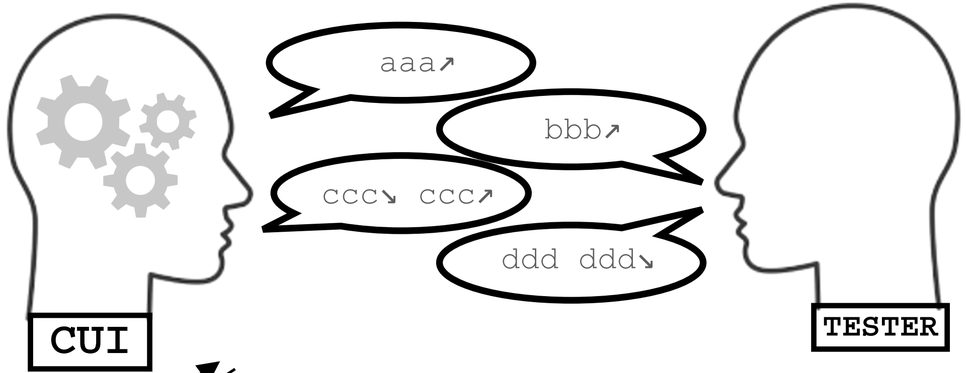
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Trialling

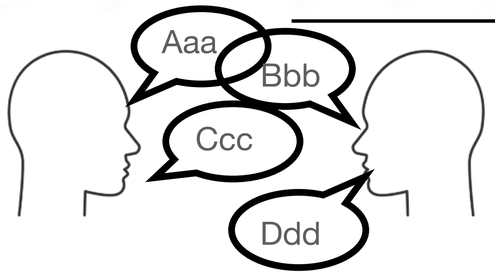
The CA-for-CxD collaboration

Newcastle University

Ufonia

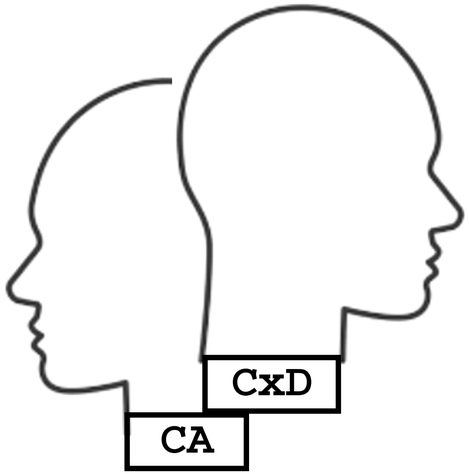
Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

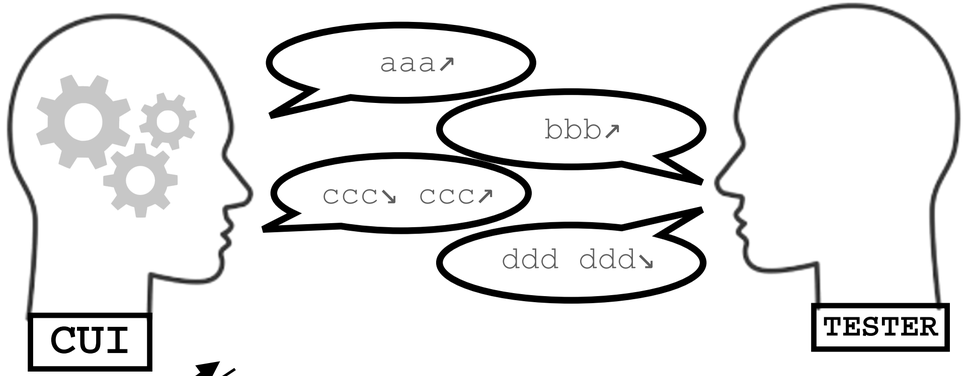
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis

Data





Trialling

Suggestions for improvement

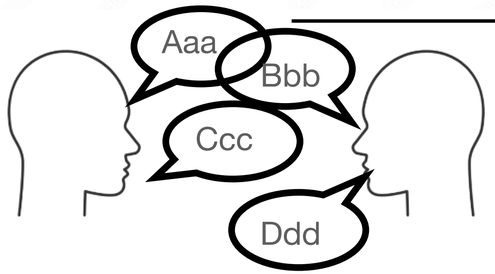
The CA-for-CxD collaboration

Newcastle University

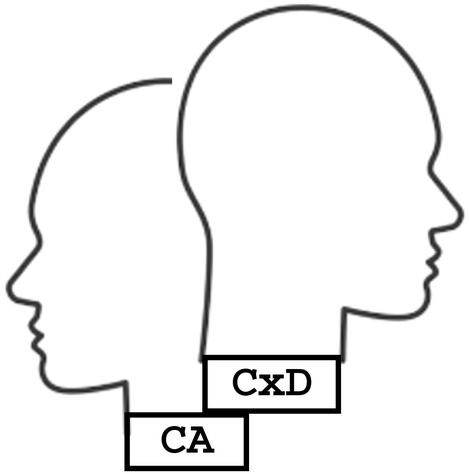
Ufonia

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

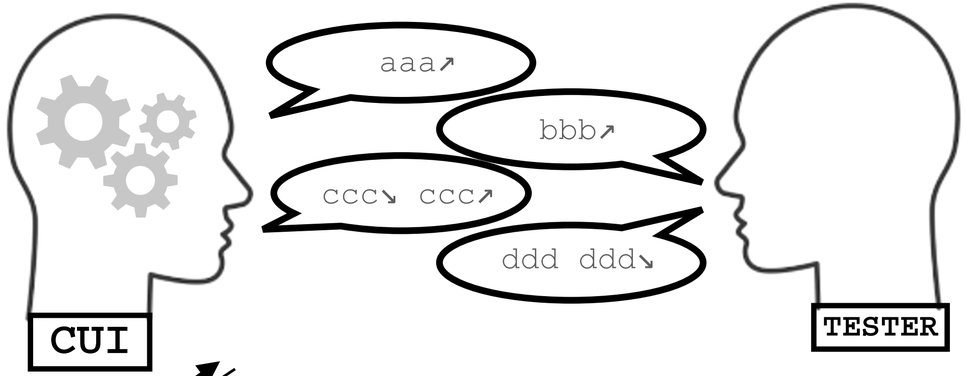
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Trialling

Suggestions for improvement

Implementation

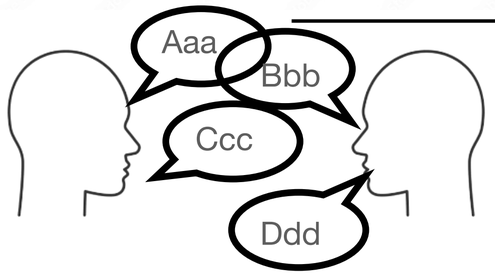
The CA-for-CxD collaboration

Newcastle University

Ufonia

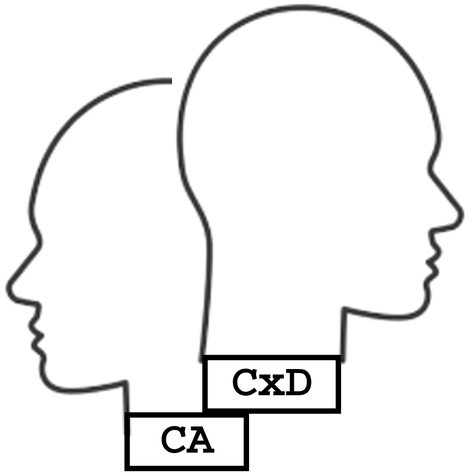
Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

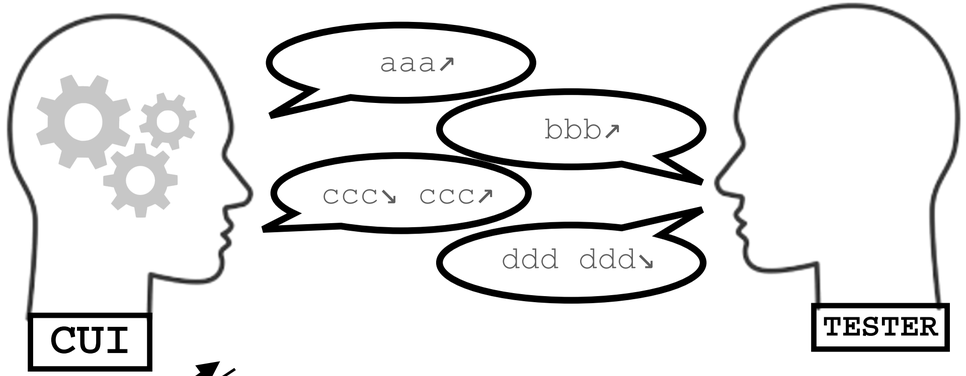
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis

Data





Trialling

Suggestions for improvement

Implementation

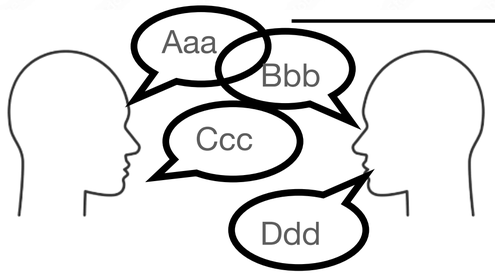
The CA-for-CxD collaboration

Newcastle University

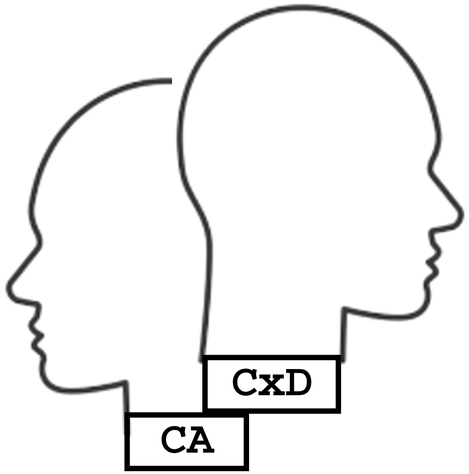
Ufonia

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

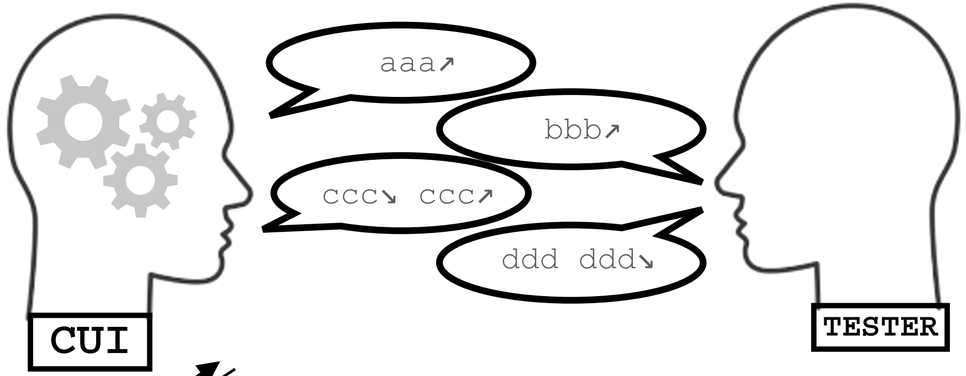
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Trialling

Implementation

Suggestions for improvement

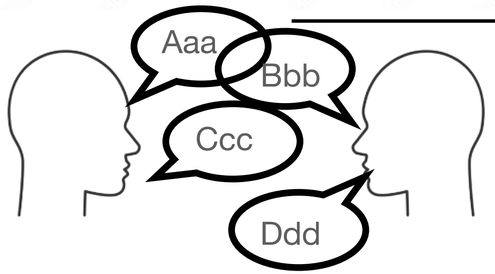
The CA-for-CxD collaboration

Newcastle University

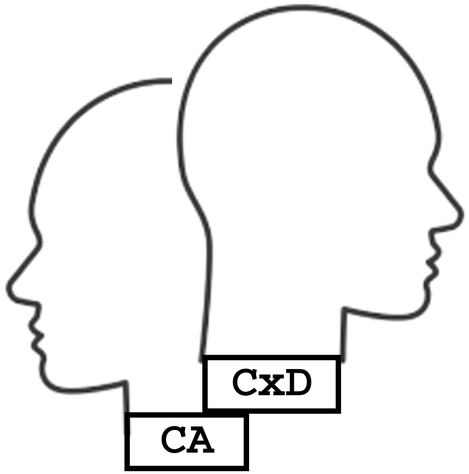
Ufonia

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

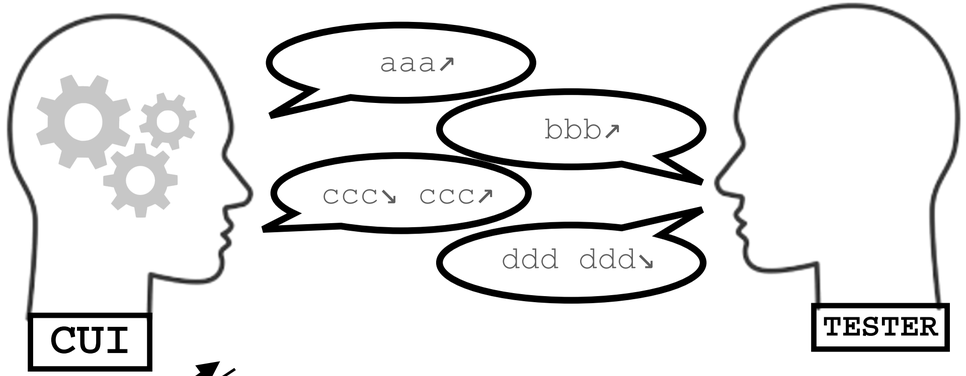
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Trialling

Implementation

Suggestions for improvement

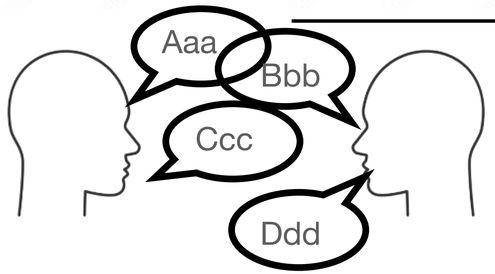
The CA-for-CxD collaboration

Newcastle University

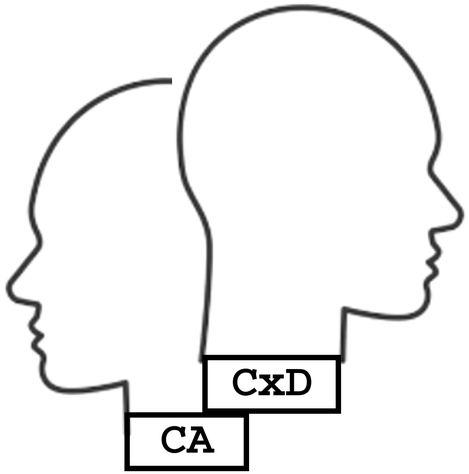
Ufonia

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

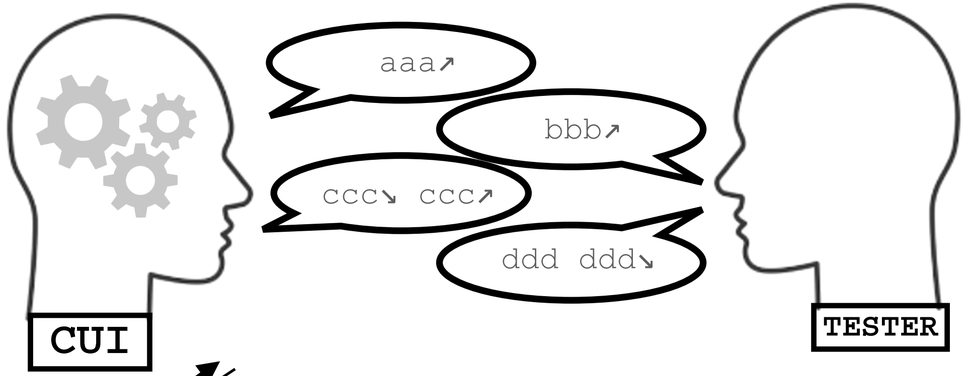
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Trialling

Implementation

Suggestions for improvement

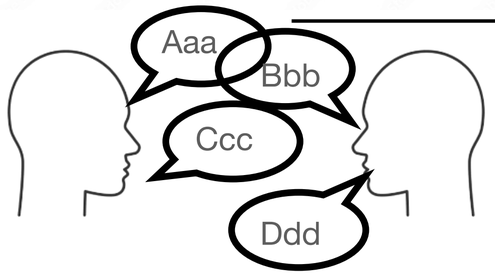
The CA-for-CxD collaboration

Newcastle University

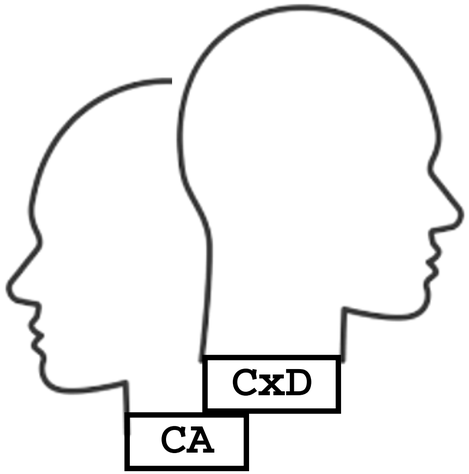
Ufonia

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

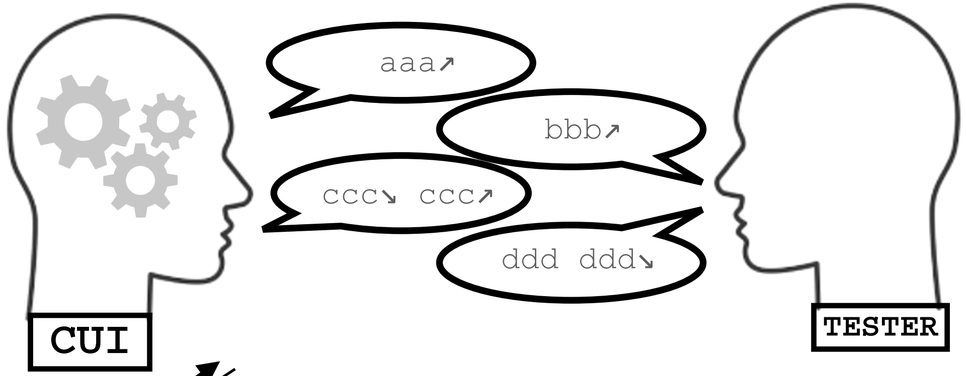
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Trialling

Suggestions for improvement

Implementation

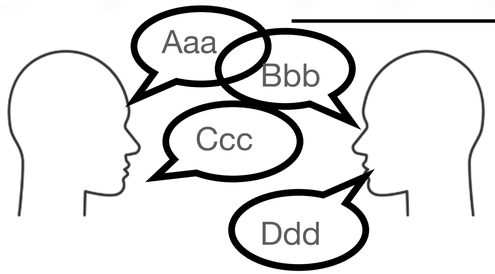
The CA-for-CxD collaboration

Newcastle University

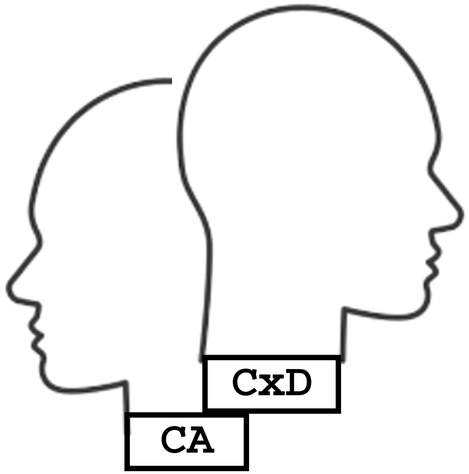
Ufonia

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

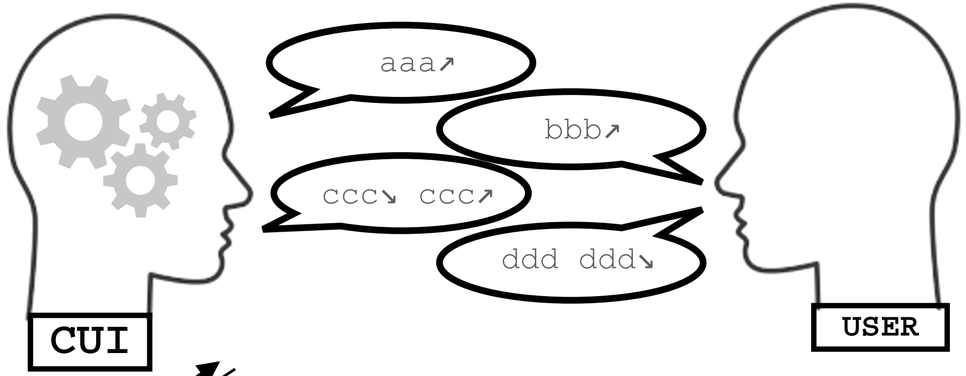
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Rollout with patients

Implementation

Suggestions for improvement

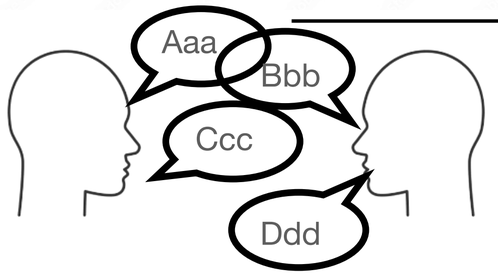
The CA-for-CxD collaboration

Newcastle University

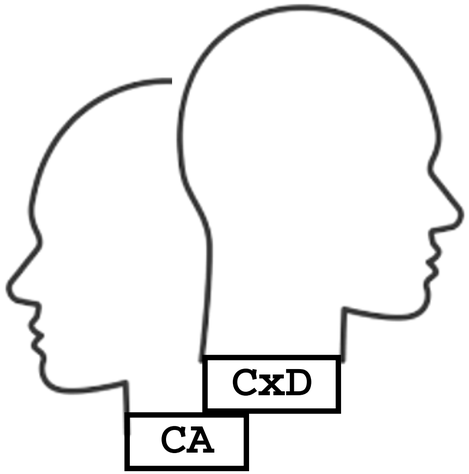
Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

Ufonia

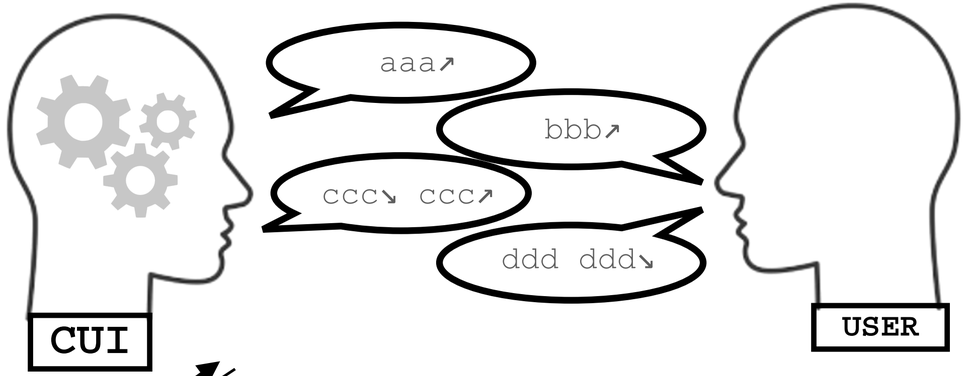
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Rollout with patients

Implementation

Suggestions for improvement

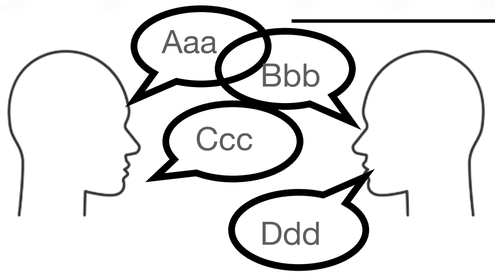
The CA-for-CxD collaboration

Newcastle University

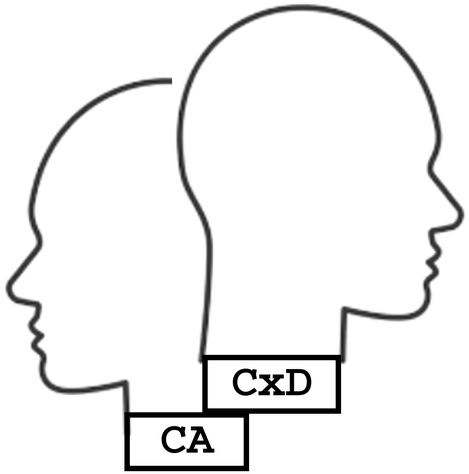
Ufonia

Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

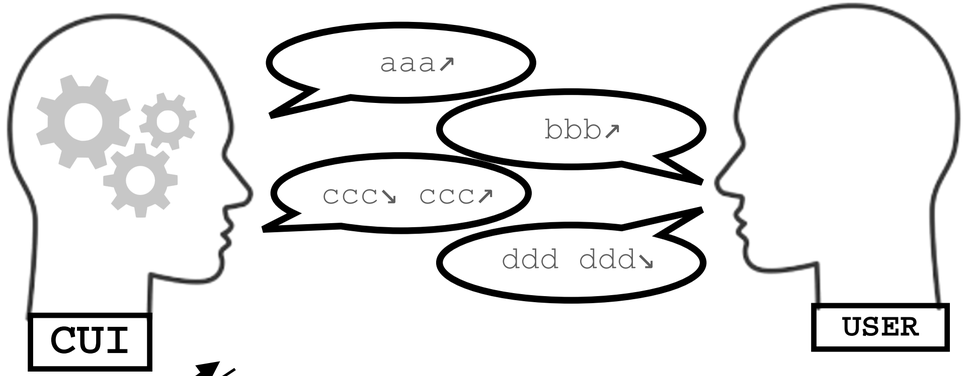
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Rollout with patients

Implementation

Suggestions for improvement

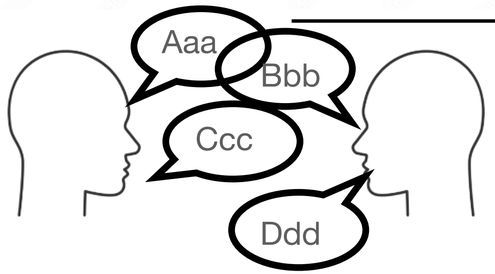
The CA-for-CxD collaboration

Newcastle University

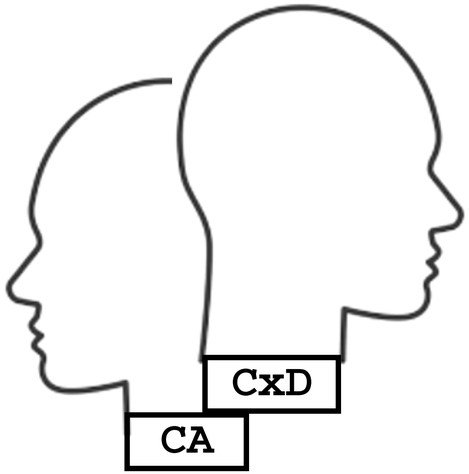
Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

Ufonia

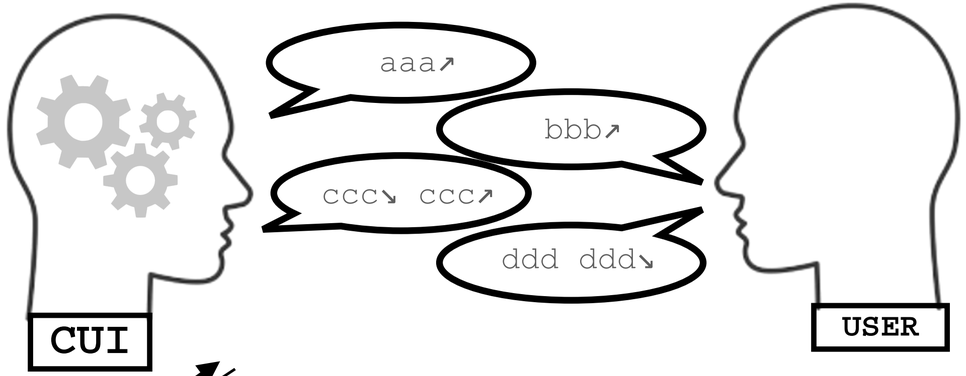
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Rollout with patients

Implementation

Suggestions for improvement

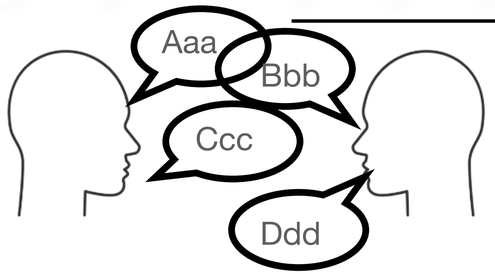
The CA-for-CxD collaboration

Newcastle University

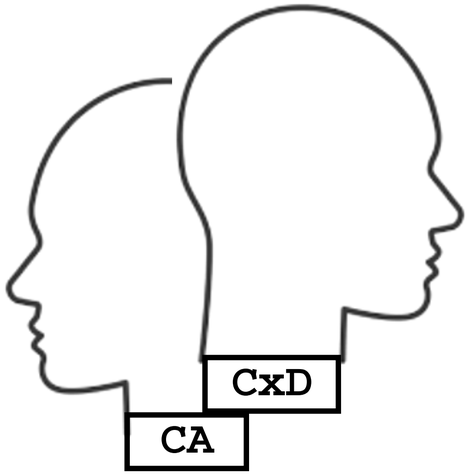
Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

Ufonia

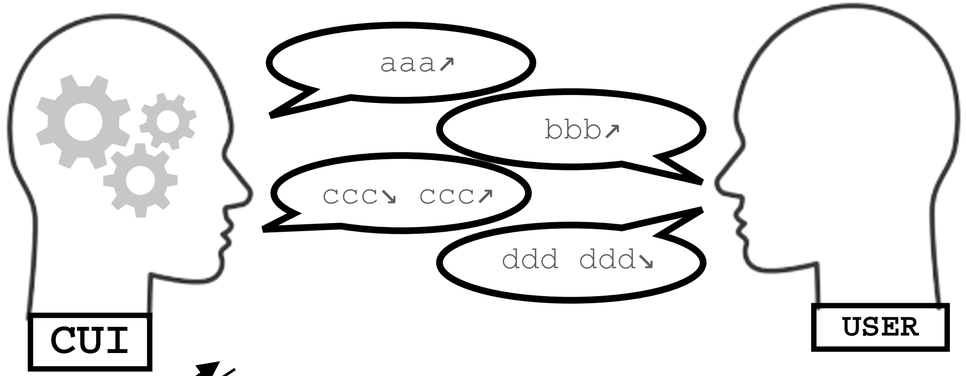
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Rollout with patients

Implementation

Suggestions for improvement

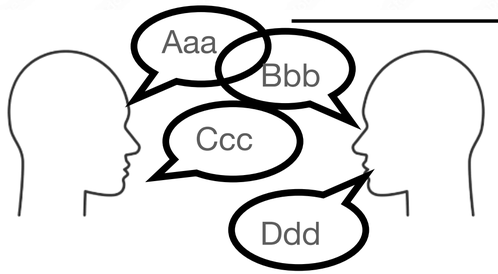
The CA-for-CxD collaboration

Newcastle University

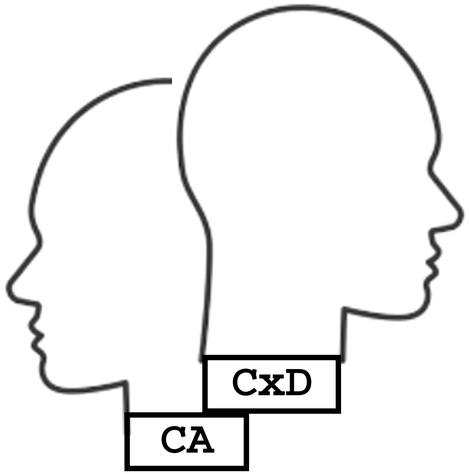
Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

Ufonia

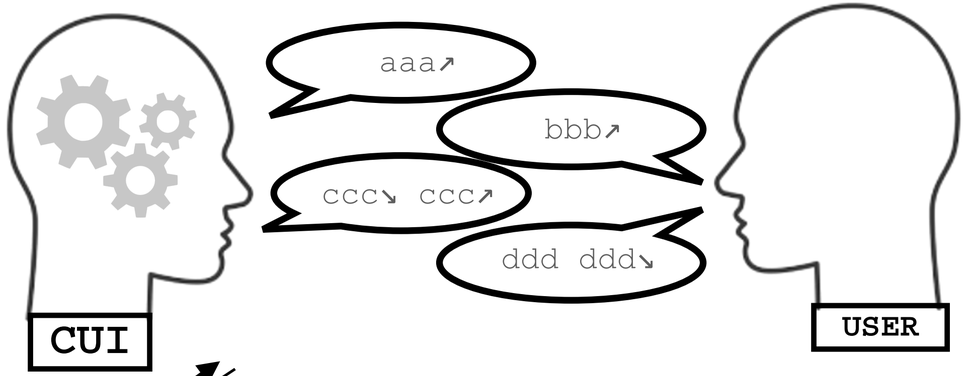
Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns



Conversation Analysis



Data



Rollout with patients

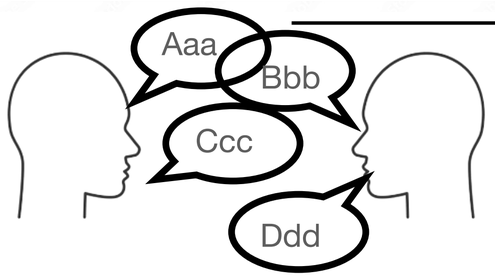
Implementation

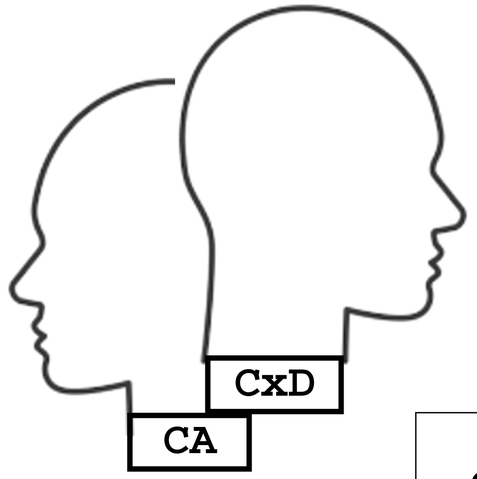
Suggestions for improvement

Natural Observation informed CUI design

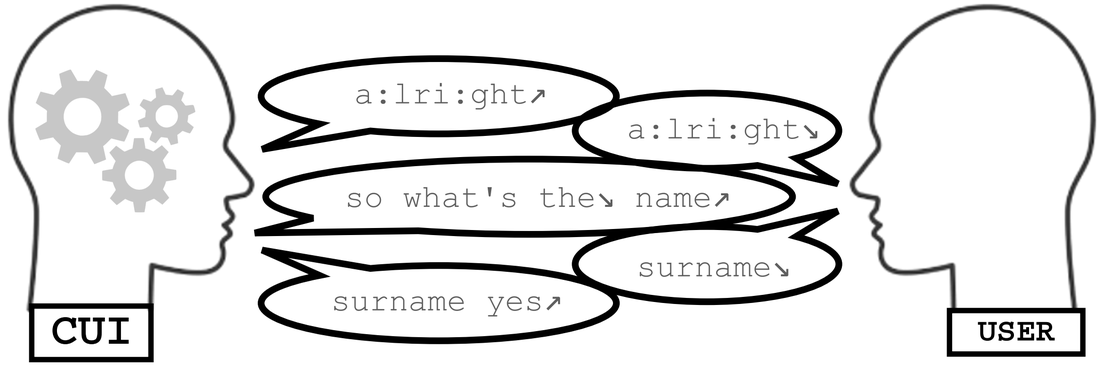
Conversation Analytic Design for an Enhanced Natural Conversation Experience (CADENCE)

Turn taking
Turn design
Intonation contouring
Pause/silence
Non-lexical vocalisations
Repair
Social norms
Normative expectancy
Institutionality
Transgression
Social norm violations
Alignment
Affiliation
Projectibility
Action sequencing
Procedural relevance
Sequential organisation
Sequence organisation
Preference organisation
Culture specific patterns





Product development

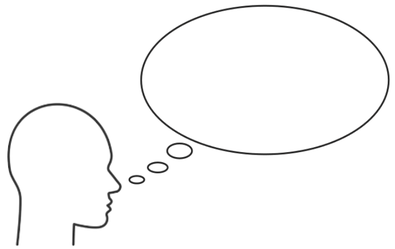


3. Second language users and conversational AI

One area we are looking into

What are some of the challenges when users speak to conversational AI systems in a second language (L2)?

第二言語（L2）の話者が会話型AIシステムと話す際の課題は何ですか？



Some challenges

1. **Automated Speech Recognition (ASR) -** 音声認識
2. **Adaptability - Recipient design -** 聞き手に合わせた話し方の設計
3. **L1 & L2 behaviour differences -** 第一言語と第二言語の行動の違い

Some challenges

1. Automated Speech Recognition - 音声認識

- Speech recognition systems are usually trained on L1 speech (e.g. for English: ‘standard’ British English or American English)
- Systems are not so successful in recognising L2 speech

L1 user

```
077  CUI:   is your eye painful↘
078         (1.0)
079  PAT:   .hh no it's not no↘
```

no it's not now (87.4%)

L2 user

```
114  CUI:   is your eye painful↘
115         (1.3)
116  PAT:   u:h no↗
```

I know (52.2%)

Second language users and conversational AI

```
117          (3.1)
118  CUI:    sorry↗ (0.3) i didn't catch that↘
119          (0.3)
120  CUI:    is your eye painful↘
121          (1.2)
122  PAT:    u::h→ (0.6) u it's not painful↗ (0.5)
123          occasionally i fee:l a bit scratch something scratch behind
             uh, it's not painful. occasionally feel a bit scratch, something scratch
             behind. (61.8%)
124          (0.7)
125  PAT:    but everything is fine↗
126          (0.9)
127  CUI:    and is it painful just some of the time or all of the time→
128          (1.3)
129  PAT:    u::h no→
             no (91.2%)
130          (2.6)
131  PAT:    ⌈it's u:h⌉
             it's (91.2%)
132  CUI:    ⌊ sorry↗ ⌋ (0.3) i didn't catch that↘
133          (0.3)
134  CUI:    and is it painful just some of the time or all of the time→
135          (2.1)
```

Second language users and conversational AI

```
117          (3.1)
118  CUI:    sorry↗ (0.3) i didn't catch that↘
119          (0.3)
120  CUI:    is your eye painful↘
121          (1.2)
122  PAT:    u::h→ (0.6) u it's not painful↗ (0.5)
123          occasionally i fee:l a bit scratch something scratch behind
             uh, it's not painful. occasionally feel a bit scratch, something scratch
             behind. (61.8%)
124          (0.7)
125  PAT:    but everything is fine↗
126          (0.9)
127  CUI:    and is it painful just some of the time or all of the time→
128          (1.3)
129  PAT:    u::h no→
             no (91.2%)
130          (2.6)
131  PAT:    ⌈it's u:h⌉
             it's (91.2%)
132  CUI:    ⌊ sorry↗ ⌋ (0.3) i didn't catch that↘
133          (0.3)
134  CUI:    and is it painful just some of the time or all of the time→
135          (2.1)
```

Some challenges

2. Adaptability - Recipient design -聞き手に合わせた話し方の設計

- Systems cannot (yet) understand the language **level** of the speaker
- Not designed to adapt to **different kinds of speaker**

Some challenges

2. Adaptability - Recipient design -聞き手に合わせた話し方の設計

Example 1

```
01 CUI:  before we start. (0.2) have you had an eye operation. (.)
02       an eyesight test. (.) a change of glasses. (.)
03       or a sudden change in eyesight in the past month.
```

Example 1

```
01 CUI:  before we start. (0.2) have you had an eye operation. (.)
02       an eyesight test. (.) a change of glasses. (.)
03       or a sudden change in eyesight in the past month.
04       (4.2)
```

Example 1

```
01 CUI:  before we start. (0.2) have you had an eye operation. (.)
02       an eyesight test. (.) a change of glasses. (.)
03       or a sudden change in eyesight in the past month.
04       (4.2)
05 PAT:  i- i'm ready only i speak english very bad.
         I am really only I speak English very bad (69%)
06       (3.5)
```

Example 1

```
01 CUI:  before we start. (0.2) have you had an eye operation. (.)
02       an eyesight test. (.) a change of glasses. (.)
03       or a sudden change in eyesight in the past month.
04       (4.2)
05 PAT:  i- i'm ready only i speak english very bad.
         I am really only I speak English very bad (69%)
06       (3.5)
07 CUI:  sorry. (0.3) i didn't catch that.
08       (0.4)
```

Example 1

```
01 CUI:  before we start. (0.2) have you had an eye operation. (.)
02       an eyesight test. (.) a change of glasses. (.)
03       or a sudden change in eyesight in the past month.
04       (4.2)
05 PAT:  i- i'm ready only i speak english very bad.
         I am really only I speak English very bad (69%)
06       (3.5)
07 CUI:  sorry. (0.3) i didn't catch that.
08       (0.4)
09 CUI:  have you had an eye operation. (.)
10       an eyesight test. (.) a change of glasses. (.)
11       or a sudden change in eyesight in the past month.
```

Fall back:
Exactly the same question!

Example 1

```
01 CUI:  before we start. (0.2) have you had an eye operation. (.)
02       an eyesight test. (.) a change of glasses. (.)
03       or a sudden change in eyesight in the past month.
04       (4.2)
05 PAT:  i- i'm ready only i speak english very bad.
         I am really only I speak English very bad (69%)
06       (3.5)
07 CUI:  sorry. (0.3) i didn't catch that.
08       (0.4)
09 CUI:  have you had an eye operation. (.)
10       an eyesight test. (.) a change of glasses. (.)
11       or a sudden change in eyesight in the past month.
12       (2.7)
13 PAT:  i (u)have a cataract uh uh operation very well.
14       (0.4)
15 PAT:  and now i uh am waiting fo:r uh operation to another eye
16       (3.0)
```

Non-type fitted answer

Example 1

Newcastle University

```
01 CUI:  before we start. (0.2) have you had an eye operation. (.)
02       an eyesight test. (.) a change of glasses. (.)
03       or a sudden change in eyesight in the past month.
04       (4.2)
05 PAT:  i- i'm ready only i speak english very bad.
         I am really only I speak English very bad (69%)
06       (3.5)
07 CUI:  sorry. (0.3) i didn't catch that.
08       (0.4)
09 CUI:  have you had an eye operation. (.)
10       an eyesight test. (.) a change of glasses. (.)
11       or a sudden change in eyesight in the past month.
12       (2.7)
13 PAT:  i (u)have a cataract uh uh operation very well.
14       (0.4)
15 PAT:  and now i uh am waiting fo:r uh operation to another eye
16       (3.0)
17 CUI:  thanks (0.3) i've made a note.
```

Question

I don’t understand

I don’t understand you

Question again

Wrong answer

Accepted

Example 1

Example 2

```
01 CUI:  so. (0.3) in the past month. (0.3)
02       how much has your eyesight interfered with your life in general.
03       (2.1)
```

Example 2

```
01 CUI:  so. (0.3) in the past month. (0.3)
02       how much has your eyesight interfered with your life in general.
03       (2.1)
04 PAT:  m::: sorry i don't you you speak very quickly
05       i don't understand.
06       (2.0)
```

Repair: speech too fast

Example 2

```
01 CUI:  so. (0.3) in the past month. (0.3)
02       how much has your eyesight interfered with your life in general.
03       (2.1)
04 PAT:  m::: sorry i don't you you speak very quickly
05       i don't understand.
06       (2.0)
07 CUI:  alright. (0.3) would you say that is. (.)
08       an extremely large amount. (.)
09       a lot, (.)
10       a fair amount. (.)
11       a little, (.)
12       hardly at all, (.) or, (.)
13       not at all.
14       (4.8)
```

Repair: speech too fast

No change of Q
No change in speed

Example 2

```
01 CUI:  so. (0.3) in the past month. (0.3)
02       how much has your eyesight interfered with your life in general.
03       (2.1)
04 PAT:  m::: sorry i don't you you speak very quickly
05       i don't understand.
06       (2.0)
07 CUI:  alright. (0.3) would you say that is. (.)
08       an extremely large amount. (.)
09       a lot, (.)
10       a fair amount. (.)
11       a little, (.)
12       hardly at all, (.) or, (.)
13       not at all.
14       (4.8)
15 PAT:  i am okay. i don't know→ i am okay (0.3) after operation.
16       (2.1)
```

Non-type fitted answer

Example 2

```
01 CUI:  so. (0.3) in the past month. (0.3)
02       how much has your eyesight interfered with your life in general.
03       (2.1)
04 PAT:  m::: sorry i don't you you speak very quickly
05       i don't understand.
06       (2.0)
07 CUI:  alright. (0.3) would you say that is. (.)
08       an extremely large amount. (.)
09       a lot, (.)
10       a fair amount. (.)
11       a little, (.)
12       hardly at all, (.) or, (.)
13       not at all.
14       (4.8)
15 PAT:  i am okay. i don't know→ i am okay (0.3) after operation.
16       (2.1)
17 CUI:  sorry. (0.3) i didn't catch that.
```

Non-type fitted answer

Example 2

Some challenges

2. Adaptability - Recipient design -聞き手に合わせた話し方の設計

- No recipient design
  - at language level
  - at pragmatic, discourse, syntax, vocabulary level

3. L1 vs L2 behaviours 第一言語と第二言語の行動の違い

- L1 speakers say they find the device easier to use than L2 speakers (Pyae & Scifleet 2018; Pyae et al 2020)

- When things go wrong with conversational AI (Wu et al 2020)
  -> L1 users blame the technology
  -> L2 users blame themselves
- So AI systems can give **L2** speakers **worse experience** AND **damage their confidence**

L1 user

```
01 CUI: okay. (0.4)
02      has your vision improved as you expected (0.2) since the surgery?
03      (0.4)
04 PAT: well it's very good yes thank you yes,
05      (3.0)
06 CUI: sorry. (0.2) I didn't catch that. (0.4)
07      has your vision improved as you expected (0.2) since the surgery?
08      (0.4)
09 PAT: yes.
10 CUI: that's good to hear.
```

L1 user

```
01 CUI: okay. (0.4)
02      has your vision improved as you expected (0.2) since the surgery?
03      (0.4)
04 PAT: well it's very good yes thank you yes,
05      (3.0)
06 CUI: sorry. (0.2) I didn't catch that. (0.4)
07      has your vision improved as you expected (0.2) since the surgery?
08      (0.4)
09 PAT: yes.
10 CUI: that's good to hear.
```

L1 user

```
01 CUI: okay. (0.4)
02      has your vision improved as you expected (0.2) since the surgery?
03      (0.4)
04 PAT: well it's very good yes thank you yes,
05      (3.0)
06 CUI: sorry. (0.2) I didn't catch that. (0.4)
07      has your vision improved as you expected (0.2) since the surgery?
08      (0.4)
09 PAT: yes.
10 CUI: that's good to hear.
```

L1 user

```
01 CUI:  can I just ask (0.4) were you expecting this call today.
02 PAT:  yes we were told it on 27th between 10 and 11
03       we going to get these calls.
04       (3.5)
05 CUI:  sorry. (0.3) i didn't catch that.
06       were you expecting this call today.
07 PAT:
```

L1 user

```
01 CUI:  can I just ask (0.4) were you expecting this call today.
02 PAT:  yes we were told it on 27th between 10 and 11
03       we going to get these calls.
04       (3.5)
05 CUI:  sorry. (0.3) i didn't catch that.
06       were you expecting this call today.
07 PAT:  yes.
```

L1 user

```
01 CUI:  can I just ask (0.4) were you expecting this call today.
02 PAT:  yes we were told it on 27th between 10 and 11
03       we going to get these calls.
04       (3.5)
05 CUI:  sorry. (0.3) i didn't catch that.
06       were you expecting this call today.
07 PAT:  yes.
```

```
01 CUI:  Would you like a quick reminder of the purpose of this call?
02 PAT:  yes I would please I believe it's about the cataract,
03       (2.7)
04 CUI:  sorry. (0.3) i didn't catch that. (0.4)
05       would you like a quick reminder of the purpose of this call?
06 PAT:
```

L1 user

```
01 CUI:  can I just ask (0.4) were you expecting this call today.
02 PAT:  yes we were told it on 27th between 10 and 11
03       we going to get these calls.
04       (3.5)
05 CUI:  sorry. (0.3) i didn't catch that.
06       were you expecting this call today.
07 PAT:  yes.
```

```
01 CUI:  Would you like a quick reminder of the purpose of this call?
02 PAT:  yes I would please I believe it's about the cataract,
03       (2.7)
04 CUI:  sorry. (0.3) i didn't catch that. (0.4)
05       would you like a quick reminder of the purpose of this call?
06 PAT:  yes please.
07 CUI:  Of course.
```

Example 3

```
01 CUI:  so. (0.3) first off (.) in the past month. (0.3)
02       have you felt that your bad eye is affecting or
03       interfering with your vision overall.
04       (1.9)
```

Example 3

```
01 CUI:  so. (0.3) first off (.) in the past month. (0.3)
02       have you felt that your bad eye is affecting or
03       interfering with your vision overall.
04       (1.9)
```

Yes / no question

But also two Qs in one

Example 3

```
01 CUI:  so. (0.3) first off (.) in the past month. (0.3)
02       have you felt that your bad eye is affecting or
03       interfering with your vision overall.
04       (1.9)
05 PAT:  i'm okay.
06       (2.4)
```

No Y/N answer

Indicates ***okay now***, so we can hear it as ***'no affect or interference'***

Example 3

```
01 CUI:  so. (0.3) first off (.) in the past month. (0.3)
02       have you felt that your bad eye is affecting or
03       interfering with your vision overall.
04       (1.9)
05 PAT:  i'm okay.
06       (2.4)
07 CUI:  just to confirm. (0.2)
08       would you say that it affects your vision. (0.2)
09       never. (0.2)
10       some of the time. (.)
11       most of the time. (.) or. (.)
12       all of the time.
13       (1.4)
```

Indicates ***okay now***, so we can hear it as ***'no affect or interference'***

Treats answer as partially understood, but needing confirmation of understanding or further detail

Example 3

```
01 CUI:  so. (0.3) first off (.) in the past month. (0.3)
02       have you felt that your bad eye is affecting or
03       interfering with your vision overall.
04       (1.9)
05 PAT:  i'm okay.
06       (2.4)
07 CUI:  just to confirm. (0.2)
08       would you say that it affects your vision. (0.2)
09       never. (0.2)
10       some of the time. (.)
11       most of the time. (.) or. (.)
12       all of the time.
13       (1.4)
14 PAT:  now i e::h see all the time.
         no I see all the time (91%)
15       (3.0)
```

Indicates ***okay now***, so we can hear it as ***'no affect or interference'***

Treats answer as partially understood, but needing confirmation of understanding or further detail

Reformulates earlier response, **adds more information**

Example 3

Fall back

```
16 CUI:  sorry. (0.3) i didn't catch that.
17       (0.4)
18 CUI:  would you say that it affects your vision. (0.2)
19       never. (0.2)
20       some of the time. (.)
21       most of the time. (.) or. (.)
22       all of the time.
23       (2.1)
```

Example 3

```
16 CUI:  sorry. (0.3) i didn't catch that.
17       (0.4)
18 CUI:  would you say that it affects your vision. (0.2)
19       never. (0.2)
20       some of the time. (.)
21       most of the time. (.) or. (.)
22       all of the time.
23       (2.1)
24 PAT:  before operation
25       i lhu-u:- was uh (.) saw (.)
26       eh very badly all the time.
27       now i look and: see very nice.
         before operation I was so
         very badly all the time
         I look and see very nice (90%)
28       (3.2)
```

Fall back

Reformulates earlier response, with **even more information**!

Example 3

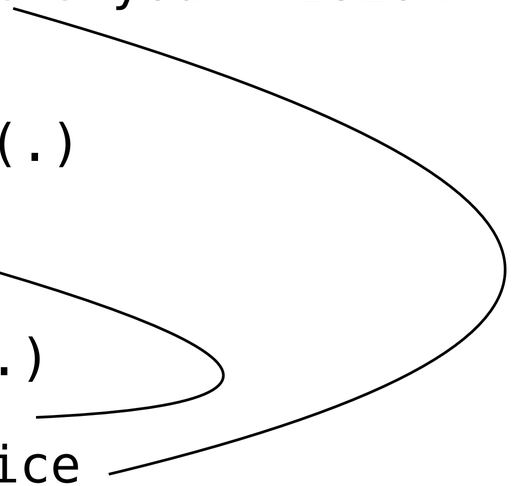
```
16 CUI:  sorry. (0.3) i didn't catch that.
17       (0.4)
18 CUI:  would you say that it affects your vision. (0.2)
19       never. (0.2)
20       some of the time. (.)
21       most of the time. (.) or. (.)
22       all of the time.
23       (2.1)
24 PAT:  before operation
25       i lhu-u:- was uh (.) saw (.)
26       eh very badly all the time
27       now i look and: see very nice
         before operation I was so
         very badly all the time
         I look and see very nice (90%)
28       (3.2)
```

Fall back

Reformulates earlier response, with **even more information**!

Example 3

```
16 CUI:  sorry. (0.3) i didn't catch that.
17       (0.4)
18 CUI:  would you say that it affects your vision. (0.2)
19       never. (0.2)
20       some of the time. (.)
21       most of the time. (.) or. (.)
22       all of the time.
23       (2.1)
24 PAT:  before operation
25       i lhu-u:- was uh (.) saw (.)
26       eh very badly all the time
27       now i look and: see very nice
         before operation I was so
         very badly all the time
         I look and see very nice (90%)
28       (3.2)
```



Example 3

```
16 CUI:  sorry. (0.3) i didn't catch that.
17       (0.4)
18 CUI:  would you say that it affects your vision. (0.2)
19       never. (0.2)
20       some of the time. (.)
21       most of the time. (.) or. (.)
22       all of the time.
23       (2.1)
24 PAT:  before operation
25       i lhu-u:- was uh (.) saw (.)
26       eh very badly all the time
27       now i look and: see very nice
         before operation I was so
         very badly all the time
         I look and see very nice (90%)
28       (3.2)
29 CUI:  okay, (0.3) i'll let the team know,
```

Acceptance of **wrong answer**

Example 3

```
16 CUI:  sorry. (0.3) i didn't catch that.
17       (0.4)
18 CUI:  would you say that it affects your vision. (0.2)
19       never. (0.2)
20       some of the time. (.)
21       most of the time. (.) or. (.)
22       all of the time.
23       (2.1)
24 PAT:  before operation
25       i lhu-u:- was uh (.) saw (.)
26       eh very badly all the time
27       now i look and: see very nice
         before operation I was so
         very badly all the time
         I look and see very nice (90%)
28       (3.2)
29 CUI:  okay, (0.3) i'll let the team know,
```

She: “all good now” (no affects)

Information passed on:
“Affects her vision all the time”

Example 3

Challenges - L1 vs L2 Behaviours

- Systems often designed for one type of speaker (L1 speaker)
  - Designed to understand only certain responses
  - Designed to look for particular answers
  - Basic structures: for example Questions -> answers

- Speakers do not always behave in the same ways
  - Differences between how they deal with trouble
  - Systems not always designed to recognise this
  - Conversation Designers often cannot imagine what a speaker will do

4. Changing usability testing to improve design

Why is Usability Testing important?

- In Healthcare you have to test a product before patients can use it
- It is an essential part of Product Development, especially in Conversational AI
- But…

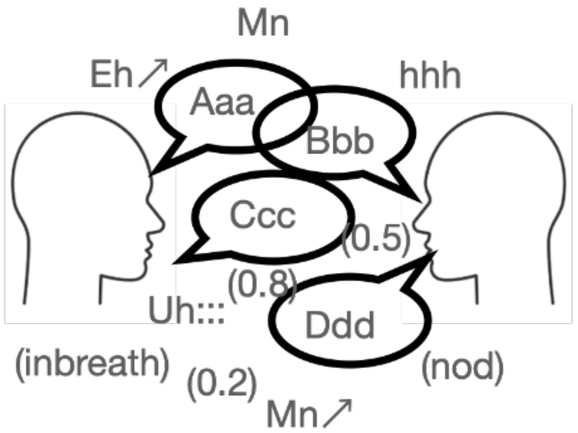
Why is Usability Testing important?

Ufonia

Newcastle University

Do we really know how the product will perform *with patients* based on how it performs *with testers*?

Conversation Analysis for usability testing?



AI+Patient vs AI+tester

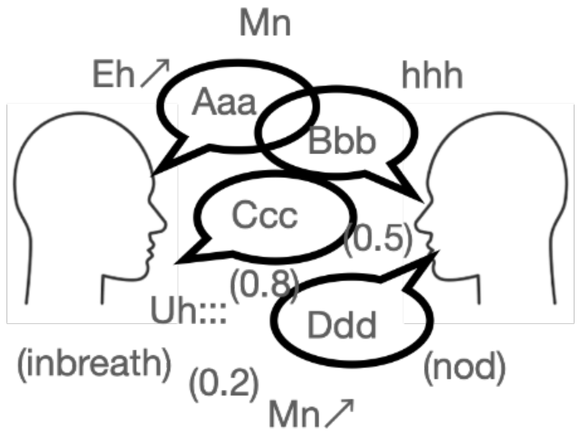
Both ‘natural’ settings

But

User-testers are testing the AI, so they think about what is asked of them, and what they need to do to fulfil their role and task

Patients have a very different set of goals

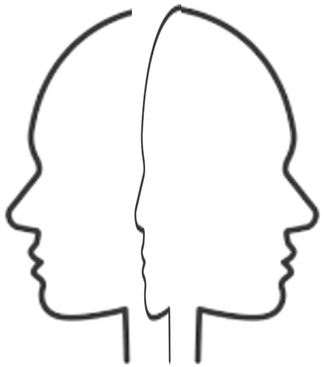
Conversation Analysis for usability testing?



Both are engaged in a pretend conversation (clinician-patient meeting), but one scenario (Tester) is a role-play of the other simulation (Patient)

Tester and Patient organise their talk differently.

Responding to a question



Imagine presenting the User with a '**question**'

What do we imagine a question invites as '**user response**'?

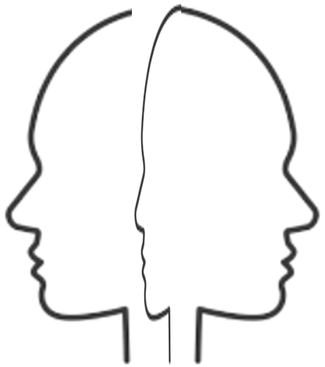
For example: a rejection, a question, an acceptance, a complaint, an answer

Either: An answer

To this question, and not to another

Or: An account for not providing an answer

Responding to a question



A question can be heard to invite more than an answer.

“before we finish, do you have any questions?”

“No” ✔

“Yes” X

“Yes, if my eye starts itching again, what should I look out for?” ✔

What testers do

Ufonia

Newcastle University

Short and to the point

Example 1:

01 DOR: before we finish↘ (0.3) do you have any questions↗
(1.8)
02 TES: **no:→**

Example 2:

01 DOR: before we finish↘ (0.3) do you have any questions↗
02 (1.3)
03 TES: **n:o not at the moment thank you**

Ufonia

Newcastle University

Short and to the point

Example 3:

01 DOR: before we finish↘ (0.3) do you have any questions↗
02 (2.3)
03 TES: **when is my next appointment↘**

What testers do

Ufonia

Newcastle University

Why?

Performing exactly as they should perform

> The role of the tester is to do just that: test the system for the designers.
>
> Here, to do the task, they have to respond to what the system invites them to do, so the designers can see if/how the system works.

So: **testers' behaviour is *in line* with designers' expectations**

So what do patients do with this question?

Many different types of response

1. Turning down the opportunity to ask a question is done differently
    - For example, hedging the response; leaving the door open; giving a reason for not having a question
2. Asking questions is done differently
    - more elaborate, questions with turn increments, multiple consecutive questions
3. Patients often use this slot to do something other than ask a question

So what do patients do with this question?

Many different types of response

1. Turning down the opportunity to ask a question is done differently
    - For example, hedging the response; leaving the door open; giving a reason for not having a question
2. Asking questions is done differently
    - more elaborate, questions with turn increments, multiple consecutive questions
3. **Patients often use this slot to do something other than ask a question**

So what do patients do with this question?

Give positive feedback (褒める)

Example 1:

01 DOR: before we finish (0.2) do you have any questions relating
02 to your operated eye↗
03 (1.8)
04 PAT: **no, i'm very happy with what's been g- done to me↘**

Example 2:

01 DOR: before we finish↘ (0.3) do you have any questions↗
02 (2.2)
03 PAT: **um no i don't think so↘ (0.6) i'm very- i'm very happy**
04 **with↘ (0.2) how the surgeries both surgeries were performed↘**

So what do patients do with this question?

Express concern (心配を示す)

Example:

01 DOR: before we finish↘ (0.3) do you have any questions↗

02 (2.4)

03 PAT: **the only question:: i: have c- concern that i have→** (0.4)

04 is that **i might run out of eye drops↘** (0.3)

05 **i've (0.4) u:h pursued this with my (0.9) u::h gee pee surgery X**

06 (0.5) **u::h and <they are taking: uh steps to uh> (0.6) see**

07 **to do to get that↘ [but that d-]**

So what do patients do with this question?

Make a request (要求する)

Example:

01 DOR: before we finish (0.2) do you have any questions↗
02 (1.5)
03 PAT: **can i talk to anybody↗**
04 (1.9)
05 DOR: i understand you'd like to speak to someone. (0.4)
06 unfortun[ate]ly=
07 PAT: [yeh]
08 DOR: =i can't transfer you right now
09 (0.4)
10 DOR: if you feel this is an urgent issue (.) please contact the
11 hospital on the phone number that you were given after
12 your surgery.

So what do actual patients do with this question?

Make a correction (修正する)

Example:

45 DOR: oh good (0.2) do you have any other questions↗

46 (1.6)

47 PAT: **one more (0.2) just to say↘**

48 (0.4)

49 PAT: **you thought i had a bit of pain↘ i don't have any pain↘**

50 (3.1)

51 DOR: okay→ (0.2) now i just need a few seconds to check next

52 steps based on your responses (.) is that okay↗

What actual patients do

Ufonia

Newcastle University

Real patients do exactly what they should do:

- provide information that needs to be considered by clinical team

- they treat this as an AOB (*any other business*) request

- as they would if they were speaking to a person.

Different from how **testers** treat this question.

What actual patients do

Ufonia

Newcastle University

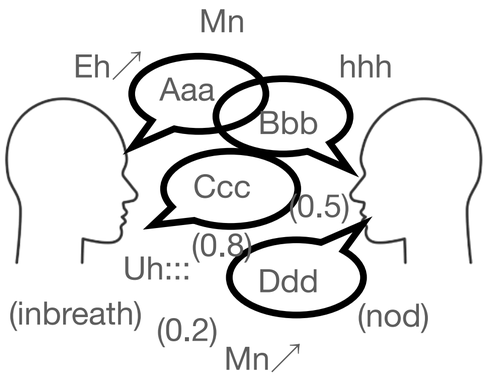
Conclusion: **real patients' behaviour** can **differ from designers' expectations**

So, how can we design for **patient** behaviour and not for **tester** behaviour?

Here, a designer can **anticipate what a user will do** by **looking at equivalent patient-clinician interactions**

同等の患者と臨床医のやり取りを参考にすることで、ユーザーがどのように行動するかを予測できます。

Suggestions



Start by looking at human-human conversations

Identify what people actually do.

Design from there.

Test from there.

5. Looking to the future

Opportunities

- Current systems: limited to knowledge of Conversation Designer
  - Language + linguacultural norms
  - Or limitations of Google Translate

- Future possibility for systems to draw upon a far wider set of knowledge than an individual Conversation Designer
  - Could potentially offer language choice
  - And adopt appropriate conduct for each speaker

Next project/s

- Large Language Models (e.g. ChatGPT)
  - Can we train LLMs to talk?
  - Conversation Designer > prompt engineer

- 'Encoding empathy' (Innovate UK 2024-26)
  - (How) can we prompt conversational agents to simulate rapport and empathy?

Publications

Adam Brandt, Spencer Hazel, Rory Mckinnon, Kleopatra Sideridou, Joe Tindale, and Nikoletta Ventoura. (2023). From Writing Dialogue to Designing Conversation: Considering the potential of Conversation Analysis for Voice User Interfaces. In ACM conference on Conversational User Interfaces (CUI ’23), July 19–21, 2023, Eindhoven, Netherlands. ACM, New York, NY, USA, 6 pages.

Adam Brandt & Spencer Hazel (2024) *Towards interculturally adaptive conversational AI*. Zhu Hua & David Wei Tai (Eds.) Forum on AI for Intercultural Communication. Applied Linguistics Review

Adam Brandt & Spencer Hazel. (2024) Coda, Zhu Hua & David Wei Tai (Eds.) Forum on AI for Intercultural Communication. Applied Linguistics Review

Spencer Hazel and Adam Brandt (2023). Enhancing the Natural Conversation Experience Through Conversation Analysis – A Design Method. In: Kurosu, M., et al. HCI International 2023 – Late Breaking Papers. HCII 2023. Lecture Notes in Computer Science, vol 14054. Springer, Cham. https://doi.org/10.1007/978-3-031-48038-6_6

Spencer Hazel, Nikoletta Ventoura & Adam Brandt (in press). Working across Boundaries – when Conversation Designers and Conversation Analysts Collaborate on Product Development. Proceedings, Beyond Boundaries Global Festival 2024, Conversation Design Institute Foundation

Adam Brandt, Spencer Hazel, Rory McKinnon, Cleopatra Sideridou, Joe Tindale,& Nokoletta Ventoura (2024). Educating Dora: Teaching a conversational agent to talk. Discourse & Communication, 18(6), 905-916.

Ufonia
ufonia.com

interactional.ai

thank you