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The use of speech technologies in translation, revision, and post-editing machine translation (PEMT)

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Outline

1. HAITrans research group
2. Speech recognition technology
3. Speech synthesis technology
4. HAITrans research projects

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HAITrans research group

- Human and Artificial Intelligence in Translation
  - Zentrum für Translationswissenschaft (ZTW)
  - University of Vienna

- Focus on translation technologies
  - Education
  - Industry
  - Research

https://haitrans.univie.ac.at/team/

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Alina Secară, MA PhD (Senior Scientist) -associate member-

Miguel Rios, PhD (Post doc)

Justus Brockmann, BA MA (Prae doc)

Raluca Chereji, BA MSc (Prae doc)

Claudia Wiesinger, BA MA MA (Prae doc)

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HAITrans research group

- Education

EMT

IAMLADP International Annual Meeting on Language Arrangements, Documentation and Publications

- Industry

European Commission

GALA Globalization & Localization Association

EDUinLOC

TRANSLATION COMMONS

HAITrans research group

- Research

R1

Speech technologies in translation, revision and post-editing (PEMT)

- Speech synthesis in revision and PEMT

R2

Technology-supported translation, revision and PEMT

- NMT engine building
- Medical MT domain adaptation

R3

Translation technology for accessibility

- Bias, lexical and structural analysis of audio introductions

R4

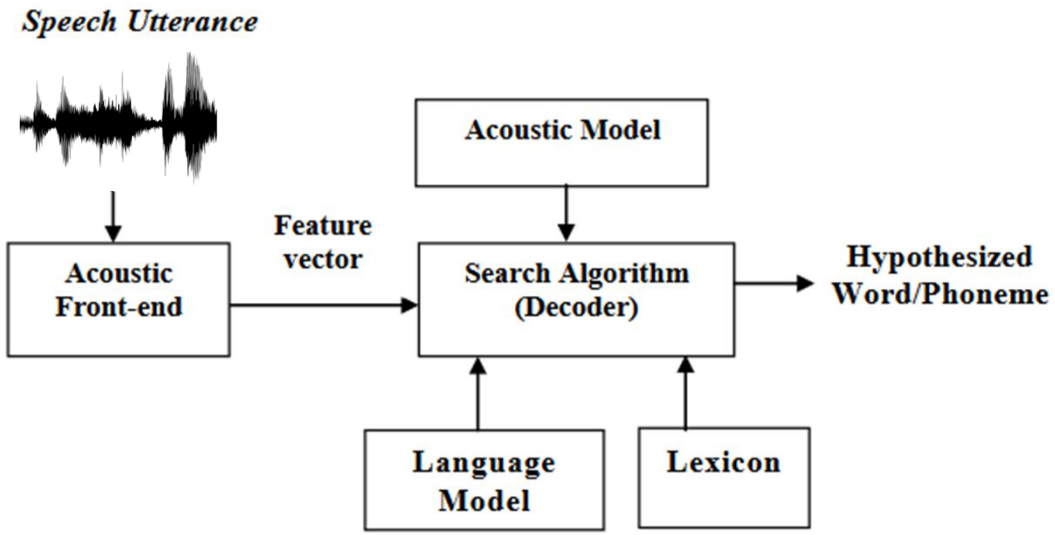
Translation technology didactics

- Improving student MT literacy levels

Automatic speech recognition (ASR)/Speech-to-text (S2T)

“allows a computer to take the audio file or direct speech from the microphone as an input and convert it into the text” (Malik *et al*., 2021: 9412)

Automatic speech recognition (ASR)/Speech-to-text (S2T)



(Karpagavalli and Chandra, 2016)

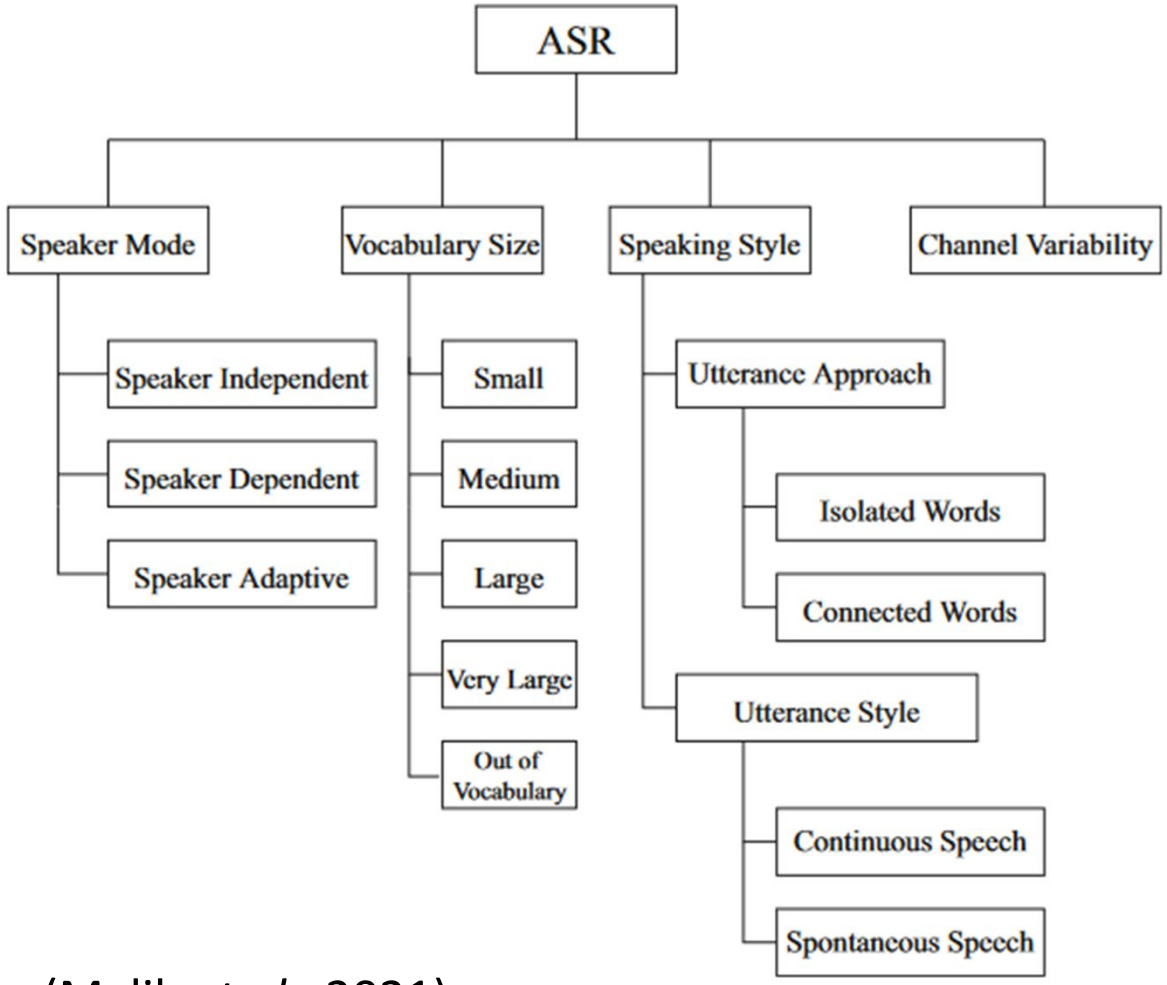
Types of ASR systems

Speaker mode

Vocabulary size

Speaking style

Channel variability



(Malik *et al.*, 2021)

ASR applications

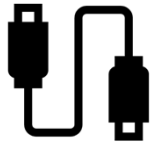
- **Wide variety of domains and industrial use cases:**

Healthcare, medical assistance and telemedicine

Telecommunications industry

Forensics and law enforcement

Defense and aviation



IT and consumer electronics

Home automation and security

Education and accessibility

(Vajpai and Bora, 2016; Kanabur, Harakannanavar and Torse, 2019; Ibrahim and Varol, 2020)

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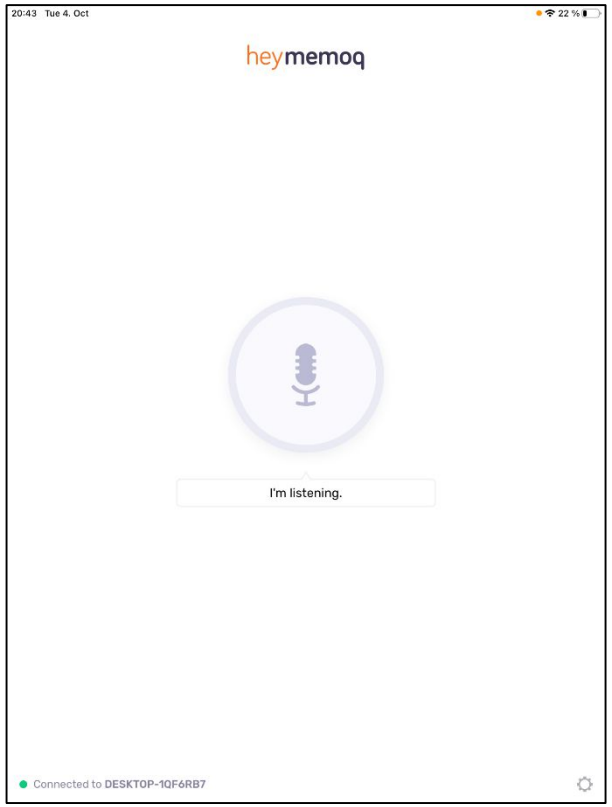
ASR applications

- **In a translation context:**
  - **Translation Process Research** on translation dictation and post-editing
    - (Ciobanu, 2014, 2016; Mesa-Lao, 2014; Zapata *et al*., 2017; Tzoukermann and Miller, 2018; Liyanapathirana, 2021)
  - ASR for **interpreting**
    - (Defrancq and Fantinuoli, 2021; Gaber and Corpas-Pastor, 2021)
  - **Respeaking** in audiovisual translation
    - (Romero-Fresco, 2020)
  - Multilingual **corpora building**
    - (Di Gangi *et al*., 2019; Iranzo-Sánchez *et al*., 2020; Salesky *et al*., 2021)

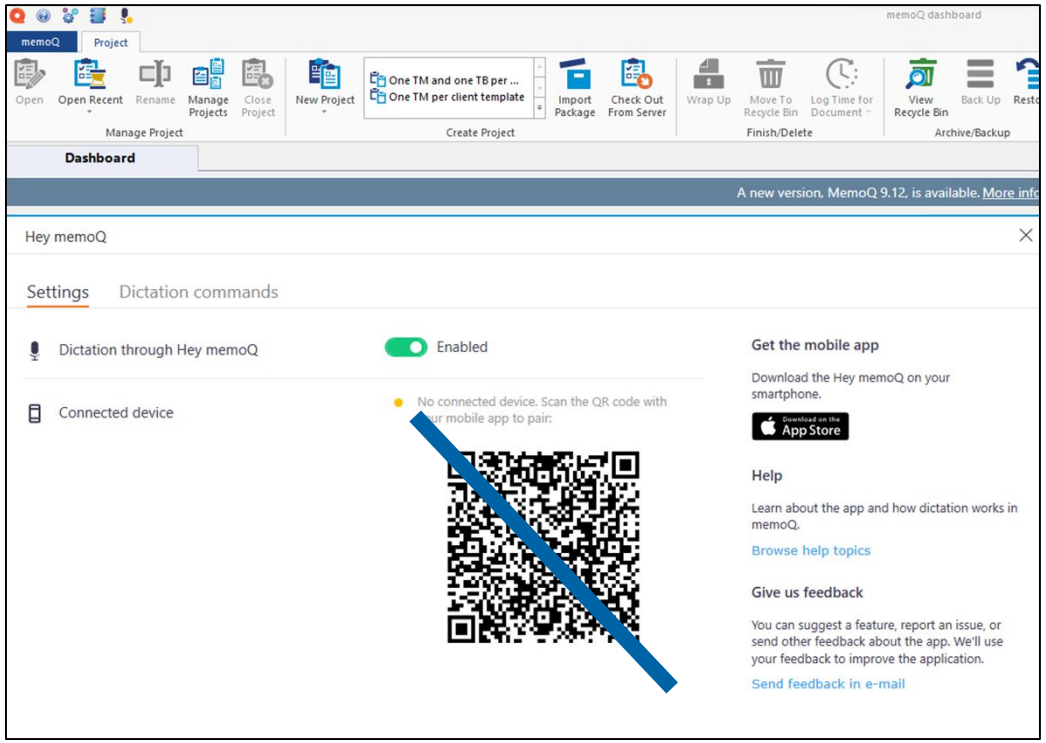
Integrating ASR into medical translation workflows – a demo

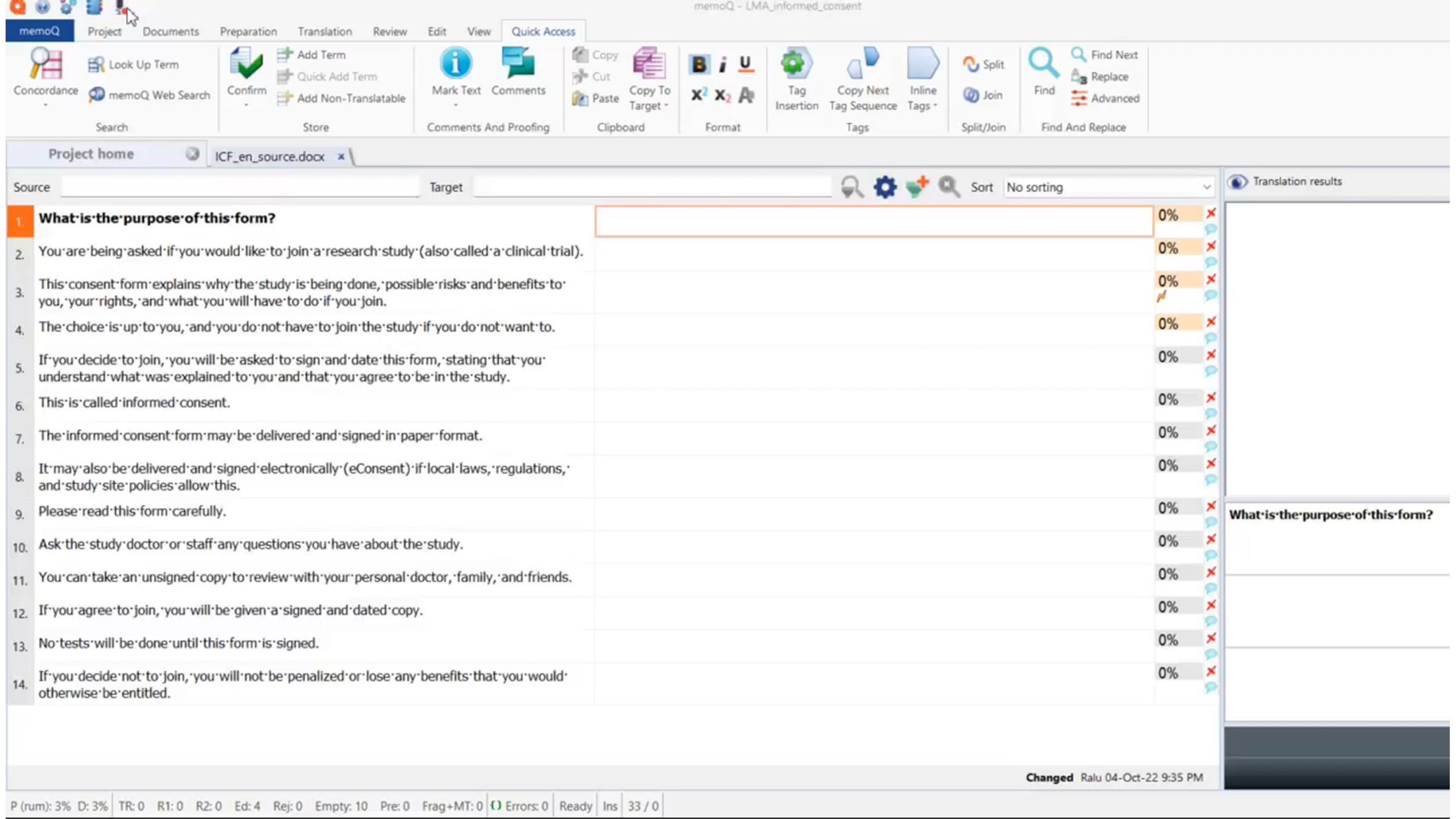
Set-up:

hey memoQ interface on iOS



hey memoQ desktop dashboard





1.	**What·is·the·purpose·of·this·form?**	0%
2.	You·are·being·asked·if·you·would·like·to·join·a·research·study·(also·called·a·clinical·trial).	0%
3.	This·consent·form·explains·why·the·study·is·being·done,·possible·risks·and·benefits·to·you,·your·rights,·and·what·you·will·have·to·do·if·you·join.	0%
4.	The·choice·is·up·to·you,·and·you·do·not·have·to·join·the·study·if·you·do·not·want·to.	0%
5.	If·you·decide·to·join,·you·will·be·asked·to·sign·and·date·this·form,·stating·that·you·understand·what·was·explained·to·you·and·that·you·agree·to·be·in·the·study.	0%
6.	This·is·called·informed·consent.	0%
7.	The·informed·consent·form·may·be·delivered·and·signed·in·paper·format.	0%
8.	It·may·also·be·delivered·and·signed·electronically·(eConsent)·if·local·laws,·regulations,·and·study·site·policies·allow·this.	0%
9.	Please·read·this·form·carefully.	0%
10.	Ask·the·study·doctor·or·staff·any·questions·you·have·about·the·study.	0%
11.	You·can·take·an·unsigned·copy·to·review·with·your·personal·doctor,·family,·and·friends.	0%
12.	If·you·agree·to·join,·you·will·be·given·a·signed·and·dated·copy.	0%
13.	No·tests·will·be·done·until·this·form·is·signed.	0%
14.	If·you·decide·not·to·join,·you·will·not·be·penalized·or·lose·any·benefits·that·you·would·otherwise·be·entitled.	0%

Automatic speech recognition (ASR)/Speech-to-text (S2T)

Advantages

- Increased **productivity**
  - (Dragsted *et al.*, 2011; García Martínez *et al*., 2014; Zapata *et al.*, 2017; Liyanapathirana and Bouillon, 2022)
- Improved **ergonomics**
  - (Ehrensberger-Dow and O'Brien 2015; Ehrensberger-Dow and Hunziker Heeb, 2016)
- Improved **accessibility**
  - (Lewis, 2015; Ciobanu and Secară, 2019; Lucía *et al*., 2020)
- Improved output **naturalness**
  - (Ciobanu, 2016)

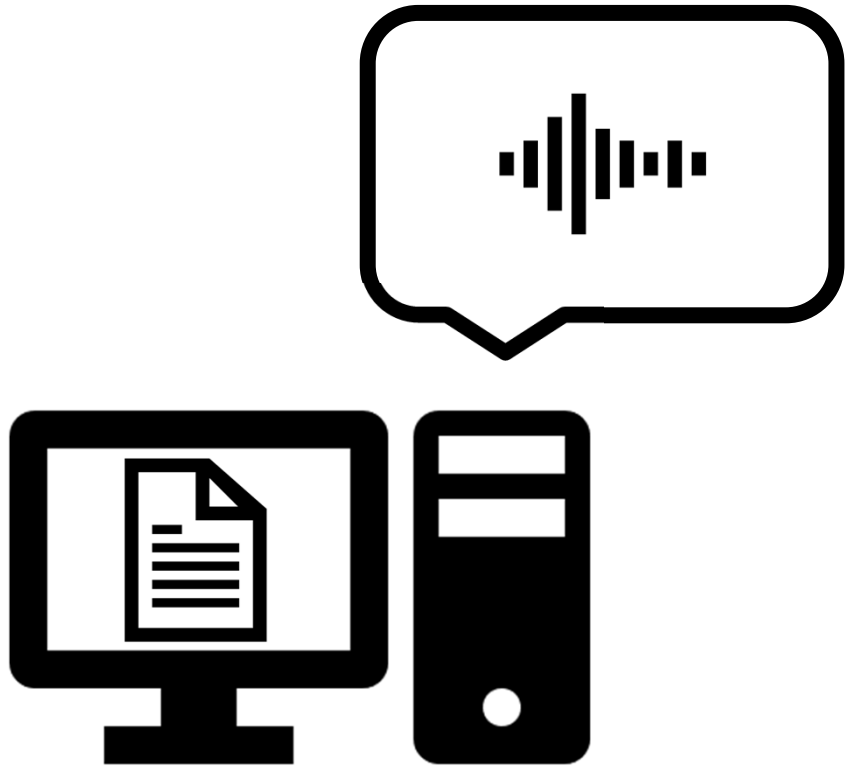
Automatic speech recognition (ASR)/Speech-to-text (S2T)

Challenges

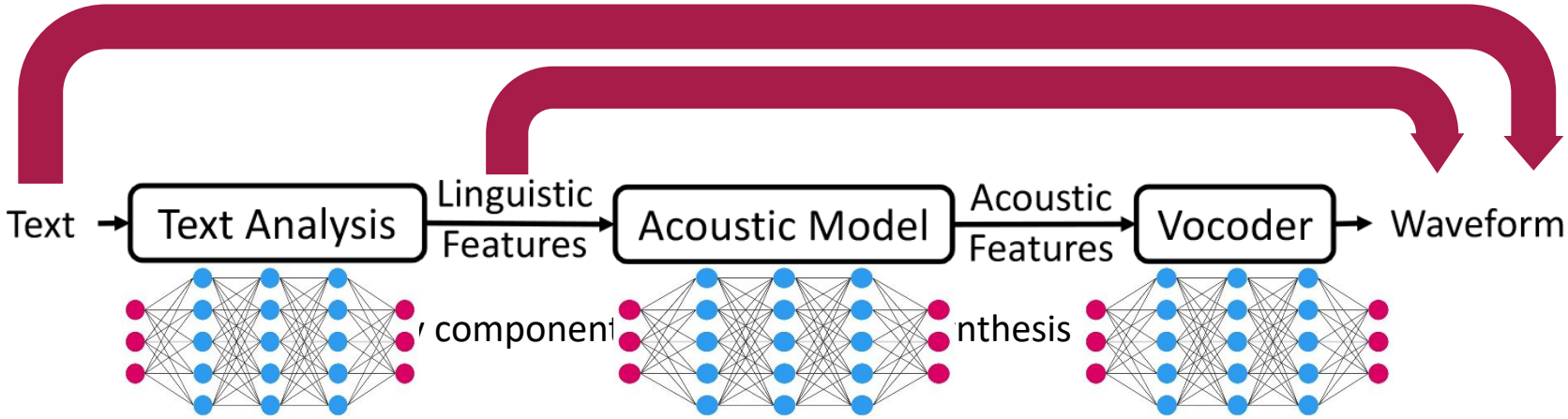
- Risk of **introducing errors**
  - ‘Speakos’ over typos (Ciobanu, 2016), e.g., homophones (Dragsted *et al*., 2011)
- **Accessibility** issues
  - (Tobin *et al*., 2022)
- Potential **increase in cognitive load**
  - (Ciobanu, 2016)
- More **colloquial and informal** translation choices
  - (Ciobanu, 2016)

Speech synthesis/Text-to-speech (T2S)

“getting computers to read out loud” (Taylor, 2009: 1)



Speech synthesis/Text-to-speech (T2S)



Advantages:

- high voice quality in terms of both intelligibility and naturalness
- less requirement on human preprocessing and feature development

(Tan et al., 2021)

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Applications

- **Variety of scenarios, including:**
  - automatic call-centre dialogue systems or announcements of travel directions (Taylor, 2009)
  - voice user interfaces in vehicles (Chen et al., 2010)
  - accessibility solutions (Freitas, 2010)
  - personal assistants (e.g. Google, n.d.)

(cf. Olohan, 2019)

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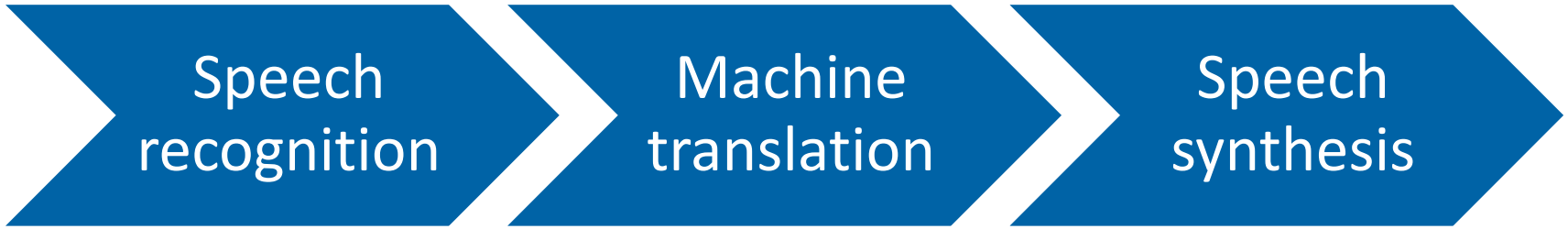
Applications

- **In a translation context:**
  - Mainly focused on automatic speech-to-speech translation (Ehsani et al., 2010; Hashimoto et al., 2011; Tan, 2014; Seligman et al., 2017)



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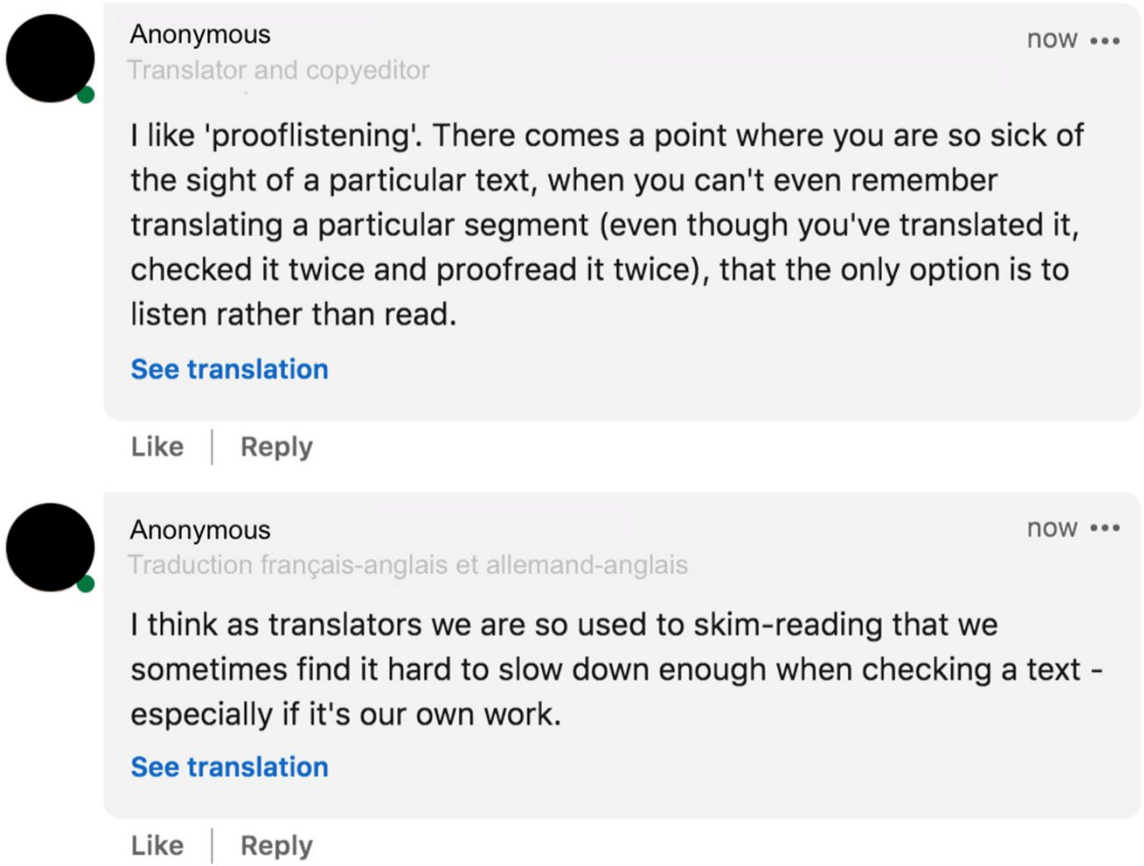
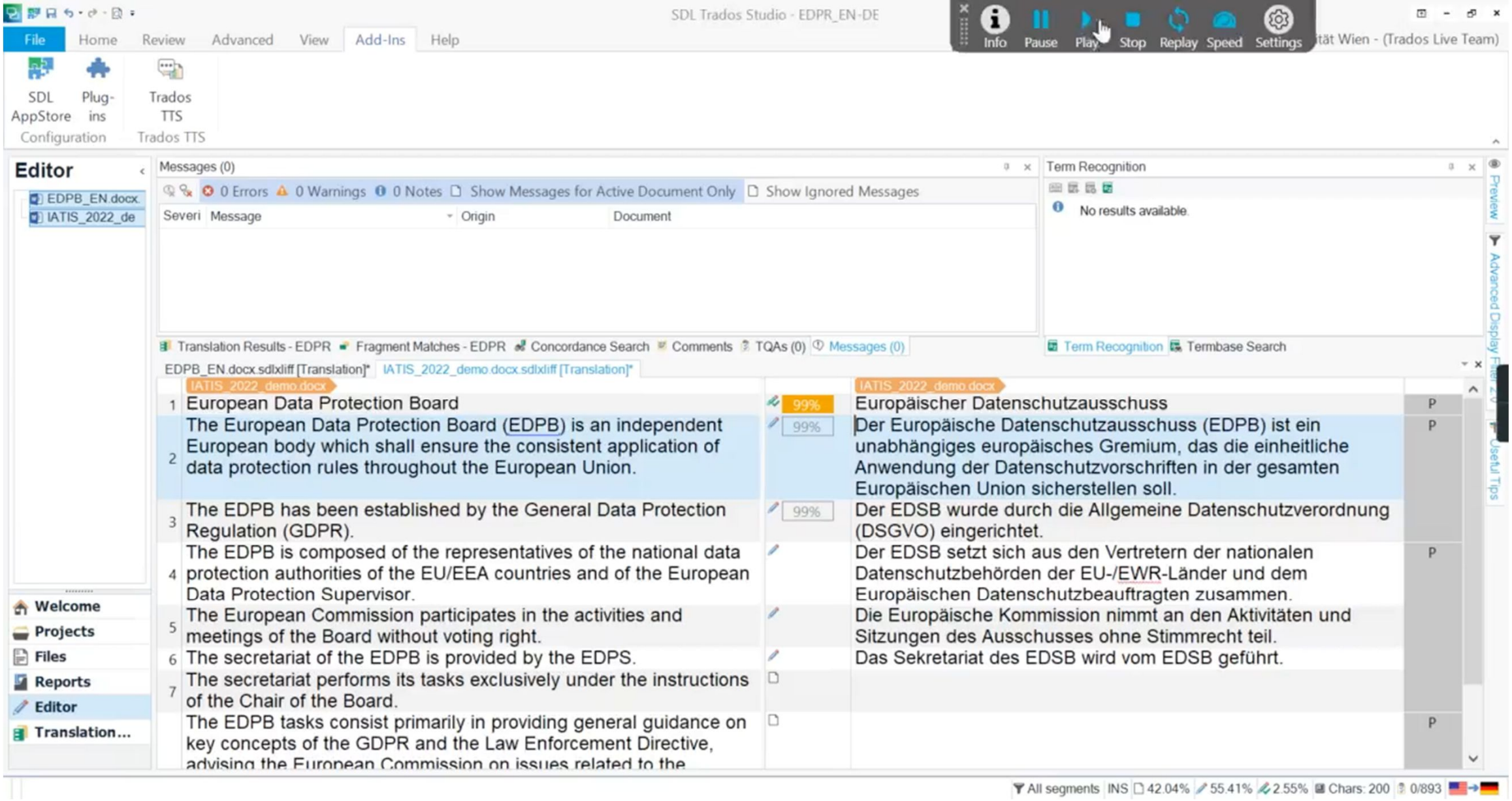
Applications

- **In a translation context:**
  - T2S used to support revision process/quality checks of dictated text (Ciobanu, 2016)
  - Practice of reading aloud in (self-)revision (Allain, 2010; Scocchera, 2017)

- **But: No default integration with CAT tools (yet)**





Trados TTS plug-in for SDL Trados Studio

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Applications

- Initial investigations of applications in human-centred revision and post-editing workflows

1. **Speech synthesis in revision (2019)**
2. **Speech synthesis in post-editing performed by students (2021)**
3. **Speech synthesis in post-editing performed by professional translators (forthcoming)**

The experiment

5 professional translators,
6 trainees (MA level)

2 FR-EN **revision** tasks
in memoQ

in silence,
with source text sound

methods include

(1) error counts,
(2) questionnaires,
(3) eye tracking

impact of sound on

(1) quality,
(2) attitudes,
(3) viewing behaviour

Ciobanu *et al*. (2019)

The use of speech synthesis in revision – Experiment (2019)

Findings

RQ1 (quality)	• Source text (ST) sound conducive to better revision quality overall ➢ Biggest difference in relation to Accuracy errors (66% vs. 37%)
RQ2 (attitudes)	• Majority of participants (7 out of 11) preferred ST sound to silence
RQ3 (viewing behaviour)	• Attention distribution (between ST, target text (TT) and external resources) is similar in both conditions • Intensity of reading ST is decreased in ST sound condition

Ciobanu *et al*. (2019)

The experiment

17 trainees (16 BA, 1 MA)

4 EN-DE **post-editing** / **error annotation** tasks in Microsoft Word

in silence,
with source text sound,
with target text sound,
with ST and TT sound

methods include

(1) error counts,
(2) error annotation analysis,
(3) post-edited words/h,
(4) questionnaires

impact of sound on

(1) quality,
(2) error annotation,
(3) productivity,
(4) attitudes

Brockmann *et al*. (2022), Wiesinger *et al.* (forthcoming)

The use of speech synthesis in PEMT – Experiment (2021)

Findings

RQ1 (quality)	• On average, the combination of ST and TT sound appeared to be most conducive to correcting errors in line with Gold Standard • Major variation between individuals
RQ2 (error annotation)	• High disparity in annotations • More 'preferential annotations', but also fewer actual errors missed using ST and TT sound, as compared to working in silence • Highest number of Accuracy errors annotated in ST sound condition
RQ3 (productivity)	• On average, productivity increase from PEMT in silence to PEMT with ST and TT sound • Major variation between individuals
RQ4 (attitudes)	• Perceived benefits of using sound in less strict set-ups

Brockmann *et al*. (2022), Wiesinger *et al.* (forthcoming)

The use of speech synthesis in PEMT – Project (forthcoming)

- Imminent Research Grants scheme 2021
- The planned experiment:

30 professional translators

4 EN-DE **post-editing** tasks in Matecat

in silence,

with ST and TT sound

methods include

(1) eye tracking,
(2) questionnaires,
(3) editing log,
(4) error counts

impact of sound on

(1) cognitive load,
(2) productivity,
(4) quality,
(5) attitudes

Practical applications – Crisis Translation (Doctoral project Claudia Wiesinger)

"**Timely** and **accurate** communication is essential for crisis management […]" (Crisis Translation, 2020; own emphasis)

- Suspected widespread use of MT in disasters and crises (Anastasopoulos et al., 2020)
- Recommendations for MT-assisted crisis translation workflows (Parra Escartín and Moniz, 2020)
- Difficulties striking a balance between quality assurance processes and timely translations

Speech-enabled PEMT – a viable solution for crisis translation?

Practical applications – Institutional Translation (Doctoral project Justus Brockmann)

In multilingual settings, **institutions govern by translation** (Koskinen, 2014)

- High quality requirements
- Increasing productivity demands
- Use of MT by institutions increasing

Can speech synthesis support the PEMT process in a translating institution?

Practical applications – Medical Translation
(Doctoral project Raluca Chereji)

Paradigmatic shift in healthcare to **patient-centrism**

- "medical knowledge and texts must be translated intralingually […] from expert language to plain language" (Brøgger and Zethsen, 2021)
- In translation, "there is a tendency to revert to expert medical language" (Montalt, Zethsen and Karwacka, 2018)
- ASR-produced translations as less literal, more creative and natural-sounding (Ciobanu, 2016)

Q: Can ASR benefit patient-facing translations and mitigate expert-to-lay bias?

Thank you and Q&A

HAITrans - Human and Artificial Intelligence in Translation

HAITrans - Human and Artificial Intelligence in Translation - is a research group based in the University of Vienna Centre for Translation Studies. It investigates the behavioural and cognitive effects which technologies such as machine translation and automatic speech recognition and synthesis have on translators, as well as their impact on the profession, practice, training and society at large.

At present, the core research areas of the Vienna HAITrans Group are:

1. Effects of speech technologies (Speech to Text and Text to Speech) on translation, revision and post-editing machine translation (PEMT) tasks (R1)
2. Technology-supported translation, revision, and PEMT practices (R2)
3. (Translation) technology for accessibility (R3)
4. Translation technology didactics (R4)

In our qualitative and quantitative investigations we use data gathered via eye-tracking, questionnaires, focus groups, corpora, and translation environment tool metrics. We also collaborate with academic partners, international organisations, language service providers, dedicated professional associations and cultural-sector partners.

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