



Humans talking to machines: towards AI critical design of interaction

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RoboLang
research group



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Talk and workshop today

Humans talking to machines

RoboLang – hands-on analysis
on human-robot language
learning sessions



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Contents

1. Introduction

2. Talking machines –
when, why and how?

3. Educational robots and
research of (language)
learning

4. Towards AI-critical
design of talk.



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1. Introduction

- Humans speaking/listening/
responding to talking machines
(Guzman & Lewis 2020)
- **Human-machine interaction**
 - The kind of **verbal interaction a machine (a robot) produces**
 - A gap human-human interaction compared with human-machine interaction, gap being narrowed
(McLoughlin & Indurkha 2023)
 - Speech recognition, LLMs



Figure 1. Robot NAO6

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Critical and ethical perspective to AI-based interaction and learning

- AI-based digital education
 - Distribution of authority and agency in the interaction with AI
 - **How epistemic authority and agency are enacted in interactions?**
 - AI/robot as a tool or a co-actor or something between?
- AI-literacy:** Construction of agency for humans (learners)
- Understanding the situated interactions
 - Nature of knowledge
 - **Reflective stance** towards AI
 - Learners' subjectivity and their **epistemic agencies**
 - Learning experience

-> These are created through design

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Aims and questions

- What kind of talk is **AI-based talk** with machines?
 - In the interaction **-agency** of the participants
- How do we encounter **understand** that talk? Or how the AI-based talk is **represented**?
- What are **educational robots** ? What kind of embodiment and materiality of robots?
- Design of talk for a robot
- Theoretical and methodological perspective: Interactional (socio)linguistics and conversational analysis

- Johansson 2021, Johansson & Honkalammi 2026
- Levinson 1992, Linell 2009



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2. Talking with machines – where, why, and how?

Basic knowledge about “talking machines”

Paradoxes between the **kind of (represented) talk**

- Cultural and technological representations of robots



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Robot

- Etymology 1924: Karel Čapek: Rossum's Universal Robots or R.U.R. de robota "labor, hard labor"
- [R.U.R. \(Rossum's Universal Robots\) FULL PLAY - NYC Performance](#)
- Film by Fritz Lang: Metropolis 1927
[Metropolis \(1927\) - English Titles, Restored Footage, Original Score](#)



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Popular culture and its embodied robots

shape understanding

- what robots "might be capable of"
- how they shape relationship and talk with humans

[bumblebee speaks original voice first time in transformers franchise](#)

Sarrica & al. 2024



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Visions of engineers: Sophia, Ameca and Tesla Optimus



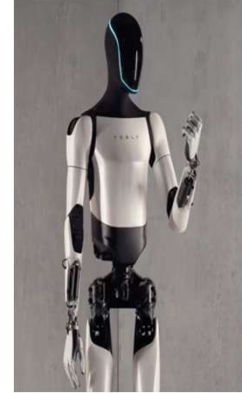
Sophia is a female social humanoid robot developed in 2016 by the Hong Kong-based company Hanson Robotics
Wikipedia



Ameca is a robotic humanoid created in 2021 by Engineered Arts.

[Interviewing the most advanced robot on Earth | 60 Minutes Australia](#)

Optimus (named after the Transformers character with the same name), also known as **Tesla Bot**, is a general-purpose robotic humanoid under development by Tesla, Inc



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Mediatization and its criticism

- Mediatizations and performances of Sophia interpreted “as a political choreography that boosts the rise of the social robot market, rather than a statement about robot citizenship or artificial intelligence”
- Parviainen & Coeckelberg 2020



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AI-conversational bots

- **Customer support bots**
 - Banks, airlines, different service providers
 - Limited voice- or text-based conversations
- **Virtual assistants:** Siri, Alexa etc.
 - Takes care of to-do's etc.
- **Various conversational bots**
 - Therapy
 - Friendship
 - Politics etc.

[How this AI chatbot is running for a political office - YouTube](#)



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Challenges of conversational AI

- **Conversational AI is**
 - **Simulation of communication**
 - **Simulation of sociality of interaction**
 - **“agency” of the machine**
 - **Type of “talk”**
- How humans create meaning in communication and verbal interaction?
- How do learners create meaning in learning situations?

• (Hepp et al. 2024; Tuncer et al. 2024; Peura & Johansson 2022; Jakonen et al. 2023)

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3. Educational robots and research on (language) learning


















- STEM-related projects
- Robots used for therapy
- Testing and experiments of robots in various contexts
- Robots and elderly people

Kaspar, 2005
University of Hertfordshire



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		low	Anthropomorphism		higher	
		Toy-like	Face or belly screens	Humanoid	Head	
Expressiveness	low	 Mindstorm (Mubin, 2013) Tool TPR, CLL, TBLT 10-12 years English-ROILA 2 hours	 IROBI (Han, 2005) Tutor MBE, ALM 12-13 years English 40 minutes	 Robosem (Park, 2011) Assistant MBE, say-after-me 10-13 years Korean-English 4 weeks x 2 hours/week	 Robosapien (You, 2006) Assistant Cheering, TPR, storytelling 10-11 years Mandarin-English 2 weeks x 2 times x 40 minutes	 Mero (Lee, 2011) Tutor ALM, pronunciation feedback 9-13 years Korean-English 8 weeks x 2 days x 2 hours
	mid	 Tega (Gordon, 2016) Peer CLL game 4 years English-Spanish 3-7 sessions	 EngKey (Lee, 2011) Tutor Role-play 9-13 years Korean-English 8 weeks x 2 days x 2 h	 Robovie (Kanda, 2004) Companion CLT 10-11 years Japanese-English 2 weeks, 31 days during 9 weeks	 Mec Willy (Mazzoni, 2015) Peer CLT, CLL 4-6 years Italian-English 45 minutes	 Farhat (Wedenborn, 2016; Lopes, 2017) Tutor, companion ALM, CLT, CLL Adults Varied-(Russian, Swedish) 1-4 times x 15 minutes
	higher	 iCat (Mubin, 2013) Partner CLL game 10-12 years English-ROILA 30 minutes	 PET (Wu, 2015) Tutor TPR, CLT, ALM 10-11 years Mandarin-English 4 times x 50 minutes	 Nao (Kennedy, 2016; Tanaka, 2012; Alemi, 2015; Balkibekov, 2016; Khalifa, 2017; Schodde, 2017) Tutor, assistant, learner, opponent TPR, CLL, ALM 3-6, 9-10, 9-10, 12-13, 18-24, $\mu=24$ years English-French, {Japanese, Persian, Kazakh, Japanese}-English, German-Vimmi 6 days, 5 weeks x 2 x 1 hour, 10 min, short lesson, 10 min, 15 min	 (Same as above)	 (Same as above)

Notes: Robots are grouped by similarity in appearance sorted in terms of human-likeness (from left to right) and expressiveness (top to bottom). They are represented by simplified drawings, their role, interaction strategies, learner age, L1-L2 language combination and interaction duration in previous studies (references abbreviated to first author).

Robots used in robot-assisted language learning (Engwall & Lopez 2020)



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NAO6

- Embodied, material humanoid **social robot**
Developed by Maxtronics (France)
- Several microphones and speakers
- Visual sensors
- Voice recognition based on NLP
- ChatGPT integration - API

58 cm,
5.8 kg



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Research on human-robot interaction

Meta-analyses:

Social robots for Education (Belpaeme et al. 2018)

Embodiment
Efficacy
Cognitive and affective outcomes

Language learning (Berghe et al. 2018)

Human-robot interaction research

- Multimodality, closings, role of a robot guide in a museum (Tuncer et al 2024; Licoppe & Rollet 2020; Pitsch 2020)
- Depictions of robots as social agents (Clark & Fischer 2023)

Meta-analysis of AI-based talk

- openings and closings
- miscommunication
- non-verbal aspects of communication (Mlynář et al. 2024).

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RoboLang research group

<https://urn.fi/URN:ISBN:978-952-02-0230-9>

Hilla-Marja Honkalammi

Honkalammi, H.-M., Veivo, O. & Johansson, M. (2022). Advice-giving between young learners in robot-assisted language learning. *FRIAS Junior Researcher Conference: Human Perspectives on Spoken Human-Machine Interaction (SpoHuMa21)*, University of Freiburg (online), 15–17 November 2021. <https://doi.org/10.6094/UNIFR/223816>

Apprendre avec et du robot: Une étude de l'interaction enfant-robot et de la littéralie robotique dans une classe de français L2

Peura, Liisa

(14.06.2025)



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4. Towards AI-critical design of talk

- Situated (learning) interactions
- Construction of meaning
- Sequences and progressivity of interaction
- Agencies in spoken and multimodal interaction?



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Example of an atypical human-to-human interaction

- In the example, you have a transcription of the ongoing interaction
 - Speaking turns
 - Question and answers
- Explanation of the
 - Type of interaction
 - How the progressivity unfolds
 - agencies



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Turns	Question-Answer sequences	
Dad: Where are we going now?	Initial question Acknowledgement of turn response Repetition of Q Answer Verbal answer to the initial question	Type of interaction: everyday, private family interaction Progressivity: smooth progressivity of the interaction maintained by dad facilitation by question repetitions no disruptions or "getting stuck" despite repetition Agencies: dad and mom: epistemic agencies baby's agency is enacted as competent and full participant in the interaction cf. Schegloff 2007; Jakonen & al. 2023; Galera & Poveda 2024
Baby: [cough]		
Dad: Where are we going?		
Baby: [babbling]		
Mom: To the forest , there we are going	Question of a new thematic sequence Answer Validation of the answer, new follow-up question Answer Repetition of the Q Answer Validation of the answer	
Dad: Are we going to the forest?		
Baby: [babbling]		
Dad: yeah is it going to be fun there in the forest?		
Baby : [pause] [babbling]		
Dad: is it going to be fun?		
Baby: [babbling]		
Dad: yeah it's going to be a lot of fun		



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5.1. Vocabulary exercise for (young) learners: emotions in French

- In the following example you have a transcription of the exercise in French and its translation
- Explanation is given for
 - Presenquence: opening and instructions
 - Questions-Answers
 - Repetition of emotion words

Software: Elias Robot



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<p>R dans cette leçon nous allons apprendre à parler des émotions <i>In this lesson we will learn to talk about emotions.</i></p> <p>R si tu veux faire un jeu appuie sur ma tête <i>If you want to play push my head [button].</i></p> <p>R si tu veux continuer appuie sur le bouton démarrer <i>If you want to go ahead push the start button.</i> +(3.2)+ a +pushes the start button +</p> <p>R je vais te montrer des images. répète après moi <i>I will show you pictures repeat after me</i> (6.0)</p> <p>R comment tu te sens aujourd'hui? <i>How are you today</i></p> <p>A comment tu te sens aujourd'hui? <i>How are you today</i></p> <p>R comment tu te sens aujourd'hui? =(1.7)= <i>How are you today</i> r nod= flashing lights = +(1.3)+ a +pushes the button +</p> <p>R je vais bien <i>I'm fine.</i></p> <p>A je vais bien <i>I'm fine.</i></p> <p>R je vais bien <i>I'm fine.</i> =(2.7)=+(2.2)+ r opening the hands=</p> <p>a +pushes the button +</p> <p>R je suis heureux ← <i>I am happy</i></p> <p>A je suis heureuse <i>I'm happy</i></p> <p>R je suis heureux <i>I'm happy</i> =(0.6)+(2.4)+ +(1.9)=+(1.6)+(4.1)+ r laughs =</p> <p>a +laughs+ +smiles + +pushes the button+</p>	<p>Pre-sequence: Robot: instructions for the learner. Indexicality -> Inclusive talk: nous (we) - tu (you) Robot: - epistemic positioning Laptop: pictures of smiles with different emotional "faces" - learner has to initiate the task</p>
	<p>Opening Q-A - Repetition robot-learner-robot</p>
	<p>Iterative repetitions of emotion words Laptop: picture of a face with emotion Robot: phrases including emotion words Learner: repetition Robot: repetition - (verbal) epistemic validations Laptop: stars Robot: multimodal epistemic and affective positioning Robot's validation: buzzing sound, flashing of the eyes -> Plays out the emotions</p>

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Software/script-based exercise

- **Iterative drilling vocabulary exercise (listen repeat) - Imitation**
- Learners can practice on their own
- robot unexpected behavior turns this into more concrete situation
- Validation, confirmation
 - **It is a simulation, playing out this script that belongs to this context**
- **This type of feedback: can give a feeling or satisfaction or success to learners. Confidence?**
- **Learner agency?**

- Mäntylä & al. 2024
- Peura & al. 2023



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Interaction design and simulation

- **Interaction design:** a problem-based speaking task of a particular working-life communicative situation, an event planning and a job interview
- **A simulation** of institutional interaction
 - **Implementation** as a training situation in a foreign language (L2) with a social robot (Honkalammi 2026)
- Aim to study AI-based verbal interaction, i.e. **robot's turns and their recipient design**



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Design objectives

- Turn and progressivity design features:
 - Formal, functional and interactional properties (De Ruiter 2012; Stivers and Rossano 2012)
 - Topics
 - Functional properties – Q-A sequentiality



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Question – answer adjacency pairs form sequence

Transcript (simplified)

R: that's great to hear that you're interested in diving deeper into german language and culture. are you considering any specific areas of focus within the german language studies

P: tsk. uhh. not totally. but then i like the applied linguistics part of it. and sociolinguistics multilingualism. and all of [them

R: that's great studying german language and focusing on germany will definitely provide you with valuable skills and knowledge. have you thought about what you would like to do for your masters thesis yet.

P: not yet. well, i'm. i'm not. uhh i don't have a final decision yet. but i'm thinking of something around code mixing code switching translanguaging.

(pause)

R: that sounds fascinating.

R: Two part turn formulation:

- Responsive towards the prior turn and orienting towards the student and their interests
- initiative with interrogative formulation
- > information-seeking questions
- Support and expansion of the topic



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Activity type: Student supervision discussion

Robot's turns

- + orientation towards student's interests
- + positive minimal response (feedback)
- + progress of the topic when talking about research process
- + turn-taking can be coordinated

Sequentiality and epistemic content

- Rigid pattern of Q-A
 - Typical for artificial agents?
 - Possible to develop further?
- Robot's general type of knowledge of language studies
 - particular socio-cultural knowledge lacking?
- Ethical consideration – are students telling enough or too much?



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Get inspired.

