

DIGITAL FUTURE CHALLENGE

DFC #6 – HRI-EU Use Case



mit Unterstützung durch

GD Giesecke+Devrient
Stiftung

| BertelsmannStiftung



DIGITAL FUTURE CHALLENGE #6

Elevator Pitch for HRI

JAZE – an AI Robot Companion for Lonely Elderly

Loneliness is a major societal challenge, especially for elderly. We propose an AI robot assistant designed to support natural, comforting conversation and give users the feeling of being heard and understood. By reducing shame and fear of judgment, it can provide psychological relief. The robot uses advanced communication features to enable smooth, engaging dialogue and offer consistent emotional support.



The robot offers research-based functions, to support the health of lonely people by enabling smooth and pleasant communication. A status lightbar reduces interruptions and misunderstandings, an AI-generated avatar on the screen builds trust and empathy through high-quality conversations. Through continuous learning from its interaction partner, the robot maintains a comfortable and accessible conversational environment, particularly for elderly.



The silent Epidemic – Loneliness under Elderly



Health Risk

COMPARABLE TO SMOKING

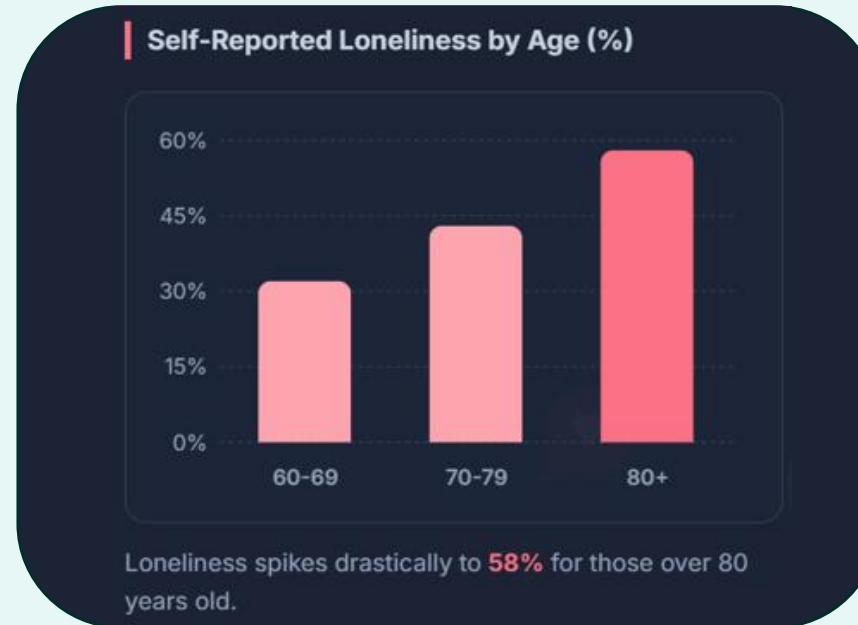
Loneliness accelerates cognitive and physical decline (Veronese et al., 2021).



Fear of Judgment

EMOTIONAL BARRIER

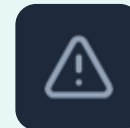
Seniors hide feelings to avoid burdening family or facing shame (Lucas et al., 2014).



Tech Gap

USER FRUSTRATION

Current AI (Siri, etc.) is task-oriented and misunderstands emotional nuance.



Privacy Trust

THE CLOUD ISSUE

Deep distrust of 'always listening' devices sending data to the cloud.



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JAZE is not a robot that tries to be human – it is a transparent, trustworthy companion that listens without judgement, shows clearly what it is doing, and respects human boundaries while helping lonely elderly feel less alone

JAZE

*Your buddy when
feeling lonely*



Non-judgemental listening:

Users often self-disclose personal problems, fears, and emotions more easily to an AI bot (Skjuve et al., 2021).



Cultural adaptation & learning:

Considers preferences, learns from every interaction



Engaging questions:

Trained to ask many questions, making the human feel understood and needed



AI-generated avatar:

Enhances conversatoin quality, builds trust, provides company without replacing humans



Status indicator:

Lights show its state:
Listening (green) → Thinking (yellow) → Talking (blue)
Detects speech to avoid interruptions.



Easy communication:

Trained to answer in short, easy language for a normal, pleasant dialogue



The challenges – and what makes our solution unique

Challenge

- ❑ Loneliness is a major psychological contributor to distress (Li et al., 2023).
- ❑ People feel ashamed and are scared by the judgement of humans (Lucas et al., 2014)
- ❑ Elderly are affected by loneliness, associated with health risks comparable to those of smoking and obesity (Veronese et al., 2021).
- ❑ A fluid, pleasant, high-quality conversation is extremely important to alleviate loneliness (Towner et al., 2022).
- ❑ Some AI companions (Replika, Siri, Google Assistant) often struggle with task-oriented conversations, sometimes misunderstanding inputs or giving irrelevant responses, which can frustrate users (Skjuve et al., 2021).
- ❑ Privacy must be ensured.
- ❑ Further development should be possible and accessible.



Our solution

- JAZE listens to people without judgement. It encourages them to talk about their feelings without shame, which helps their psychological state already.
- JAZE has different features to enable a natural conversation: Its light indicates the robot status: Listening, thinking and talking. It automatically detects if the person is still speaking to avoid interruptions. In addition, it uses short answers to ensure a good interaction with the human, not overloading the output with too much information.
- JAZE has an AI-generated face and his own voice which feels like a normal conversation partner, but never tries to replace a human relationship. He asks many questions that make the person feel needed and understood in his situation. This has a highly positive effect on their health. In addition, it promotes trust in the robot.
- Privacy of users is ensured by anonymization and aggregation. In this way, the user responses can never be traced back to the people, while the robot can learn from the answers.
- JAZE is open source and modular. Making sure that further developments are possible, including the implementation of extensions.



How our solution works – and next steps

How our solution works...



Concrete steps for implementation are...

- Develop a first prototype of JAZE
- Run a 4-week pilot with 10–20 elderly users to measure acceptance, perceived loneliness and trust

And then Enhance the concept based on the results of the study

Challenges of our solution are...

- People with hard dialects are difficult to be understood
- Some older people who are unfamiliar with technology may feel suspicious of the robot, although many would be willing to interact with one.

Resources needed are...

- | | |
|--|-----------------------------------|
| ■ Funding for the development | ■ Funding for hardware production |
| ■ Usage of existing software frameworks and an LLM | ■ Testing candidates |



Technical insights into JAZE – Hardware



- JAZE uses Edge AI Computing Power with a **NVIDIA Jetson Orin Nano** (NVIDIA, n.d.), offering comfortable conversations due to fast answering
- A safe navigation with obstacle avoidance is ensured using a **SLAMTEC RPLIDAR A2M12** (SLAMTEC, n.d.) 360° LiDAR sensor and the **Intel RealSense D435** (RealSense, n.d.) depth camera
- The drive system combines quiet and brushless **Nanotec DB42 Motors** (Nanotec, n.d.) with high-quality medical-grade **TENTE Linea** (TENTE, n.d.) wheels to ensure durability
- JAZE offers voice recognition at all time and any location with **Seeed Studio ReSpeaker Mic Array v2.0** (Seeed Studio, n.d.) far-field microphones
- The **Visaton K 50 SQ Speakers** (Visaton, n.d.) let JAZE' answers sound like a human conversation partner with high-clarity and natural voice reproduction
- The **BTF-LIGHTING WS2812B** LED strip shows JAZE' status reliably (BTF-LIGHTING, n.d.)
- The **Samsung Galaxy Tab S9** (Samsung de, n.d.) is a high-resolution display of the generated avatar
- JAZE uses **Wiferion etaLINK 3000** (Wiferion, n.d.), a wireless inductive charging system with a **RELiON RB20 (LiFePO4)** (RELiON, n.d.) battery pack for permanent support without charging during the day



Technical insights into JAZE – Software



- JAZE is a wheeled robot capable of autonomous movement. Navigation is managed using **ROS** (Robot Operating System (ROS, n.d.)), an existing open-source framework for autonomous robot localization and control, equipped with multiple sensors to detect obstacles and avoid collisions.
- JAZE can autonomously drive to its inductive charging station during periods of inactivity (e.g. overnight) when the battery monitoring detects a low state. This ensures continuous availability and assistance for human users.
- JAZE uses the Large Language Model (LLM) **SUMM AI** (SUMM AI, n.d.) for text generation. The model emphasizes safety, privacy and, most importantly, easy language for a human-conversation-like feeling.
- Generated text is converted to speech, using **ElevenLabs** (ElevenLabs, n.d.) for a natural and comforting voice, and it is displayed as an AI-driven avatar on a screen. AI video generation with **Pictory** (Pictory, n.d.) synchronizes the avatar's facial movements with the voice output. This provides an interactive and engaging user experience.
- Personal data never enters the cloud by using **Edge Computing** (Satyanarayanan, M. 2017).
- Safety by design: no physical manipulation, no medical advice, only conversational support and reminders.



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