



Managing cognitive decline through theatre therapy, Artificial intelligence and social robots driven interventions

Cognitive function stimulation using social robots



<https://engage-aal-project.eu/>



Motivation and background

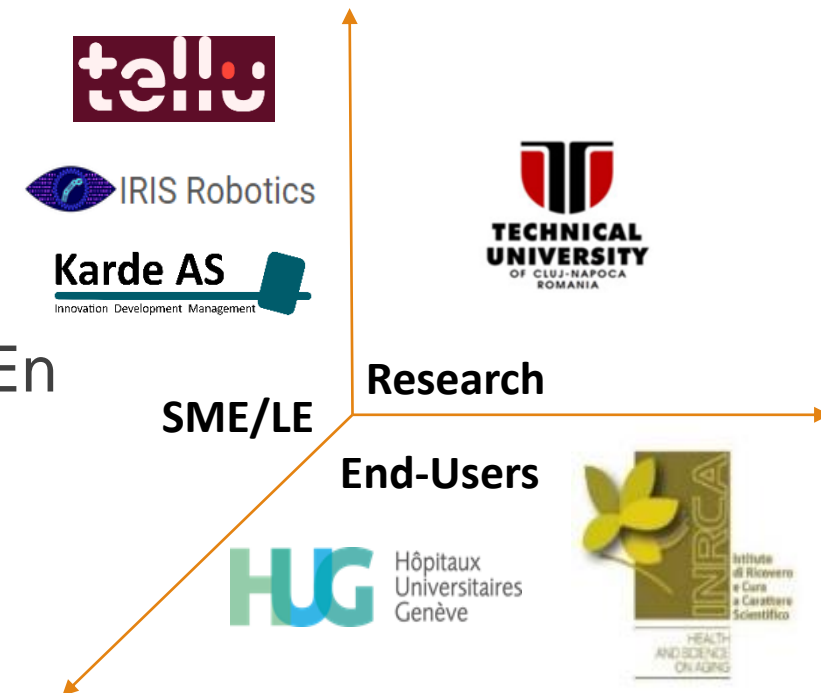
- Mild cognitive impairment (MCI) is a syndrome that affects older adults (not only) and causes changes and decline of their cognitive abilities
- There is a strong need for innovative ICT solutions to engage, support, and coach older adults in training their cognitive function in a rather personalized manner considering their cognitive state, preferences, and wishes
- Challenges addressed
 - low levels of engagement of the older adults with traditional cognitive stimulation applications which are mostly based on cognitive games and memory exercises.
 - coaching support and social interaction that is needed to allow the older adults to self-manage their cognitive decline in their homes delaying as much as possible their institutionalization
 - traditional MCI screening methods (i.e. based on genetic, neuroimaging biomarkers, questioners, etc.) are either costly and rather invasive or they lack contextual information not allowing for wider adoption

Innovative technologies for cognitive function stimulation

- Assistive services are shifting towards the use of objective monitoring using IoT sensors
 - Non-invasive monitoring of the daily life activities of the older adult with MCI
- Self-reporting for monitoring perceived health and wellbeing state
- Cognitive decline evaluation
 - Human perspective and sensors perspective data fusion
 - Machine learning to assess the cognitive decline and correlate it with activities of daily living (ADL) and wellbeing
- Social Robot coaching and cognitive stimulation
 - Coaching for older adult cognitive function self-management
 - Social interaction, engagement, and motivation
- Communication platform and intelligent personalization
 - Adaptable and personalized dashboards interfaces for non-face to face communication
 - Analytics for healthcare professionals/caregivers

engAGE project identity card

- **ID:** aal-2021-8-159-CP
- **Coordinator:** Technical University of Cluj-Napoca (DSRL)
- **Title:** Managing cognitivE decliNe throuGh theatre therapy, Artificial intelligence and social robots drivEn interventions
- **Lifetime:** 01.12.2021 – 31.05.2024
- **Program:** ACTIVE AND ASSISTED LIVING 2021 (AAL 2021) - H2020
- **Budget:**
 - 1.3 mil Euro (Total)



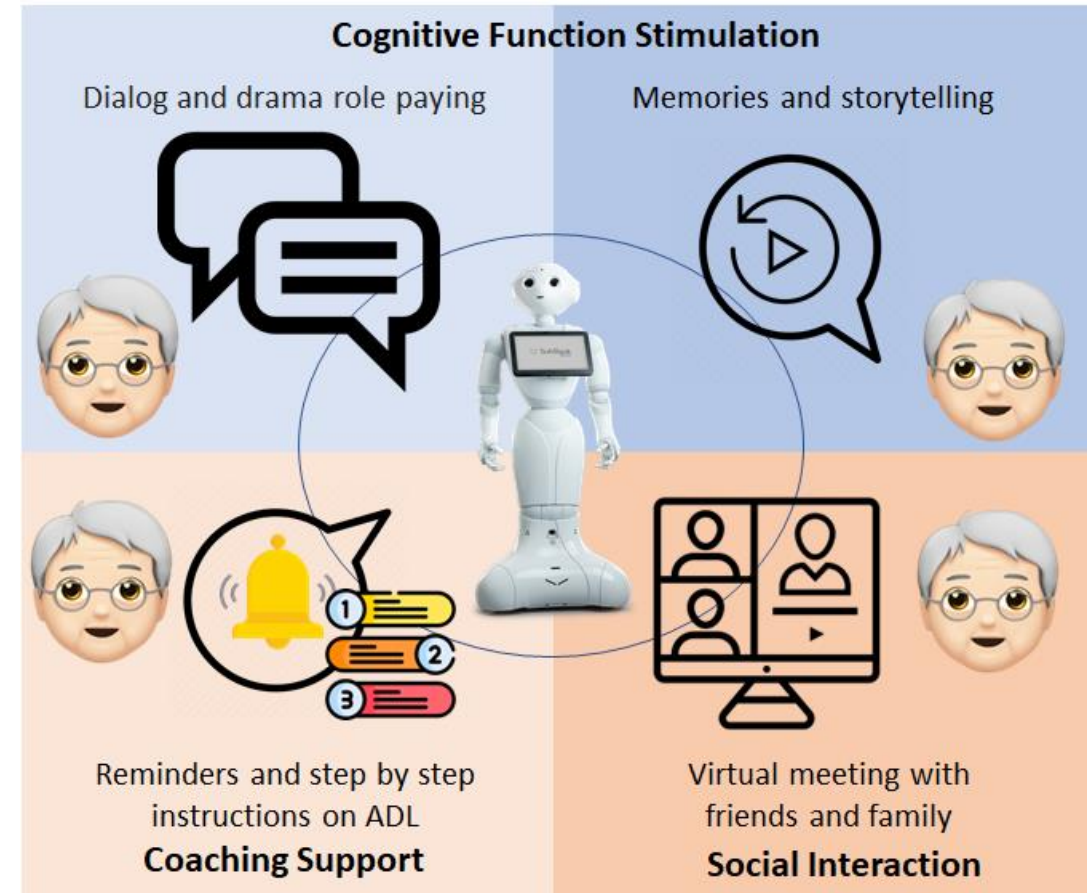
engAGE goals and objectives

- **Main objectives:**

- Combat and slow down cognitive decline progression
- Support the wellbeing of older persons with MCI

- Develop an **ecosystem of services** for:

- Holistic monitoring of ability to conduct ADL and wellbeing
- Machine learning-based cognitive decline evaluation
- Coaching, cognitive stimulation and social interaction using social robots



Targeted end-users groups

PRIMARY

- **Older adults** with MCI, living independently and supported by caregivers, male or female, over 65 years, needing care assistance to self-manage and support their cognitive function.

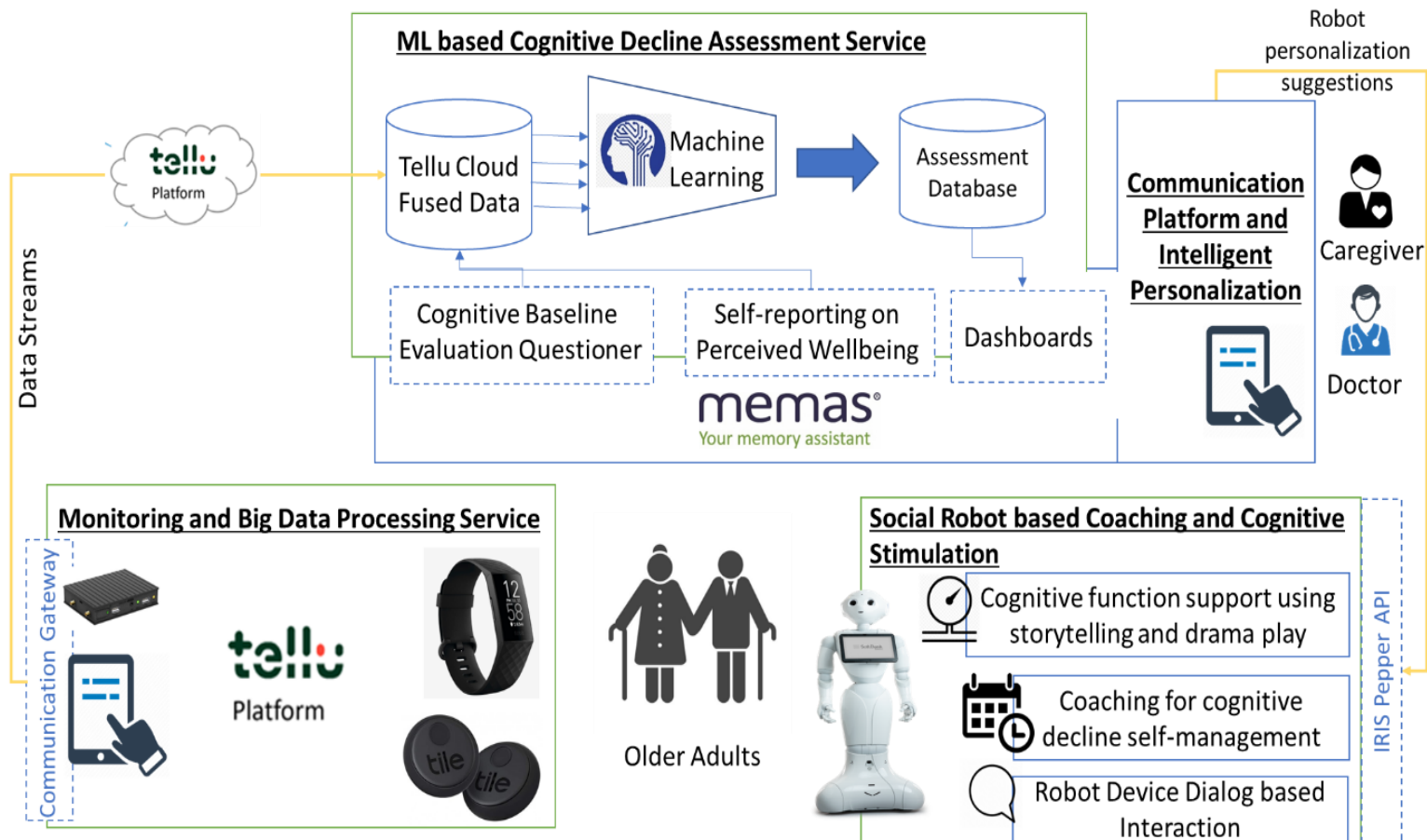
SECONDARY

- **Informal caregivers:** family carers supporting the older adult with MCI
- **Formal caregivers:** Professional caregivers such as nurses supporting older adults home care

TERTIARY

- **Healthcare organizations:** day care centres for seniors dealing with elderly with MCI

engAGE briefly



engAGE technology overview

- The engAGE system will develop **three main services** build around a social robot for self-managing and sustaining the cognitive function of older adults with MCI:
 - **(i)** holistic monitoring of daily life activities and perceived health state and wellbeing,
 - **(ii)** assessment of cognitive state and potential decline by leveraging on machine learning algorithms
 - **(iii)** personalized cognitive function support and coaching using drama or storytelling and social robots as main tools.
- engAGE will **adapt, enhance, and integrate** innovative background technologies provided by different partners
 - the cognitive and ADL monitoring infrastructure will build upon TelluCloud
 - the cognitive decline assessment will benefit from big data and machine learning platform developed by TUC
 - the communication platform will be based on MEMAS software developed by KARDE
 - the robot that will be programmed for interventions is Pepper or Temi, commercialized and personalized by IRIS.

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engAGE technology overview

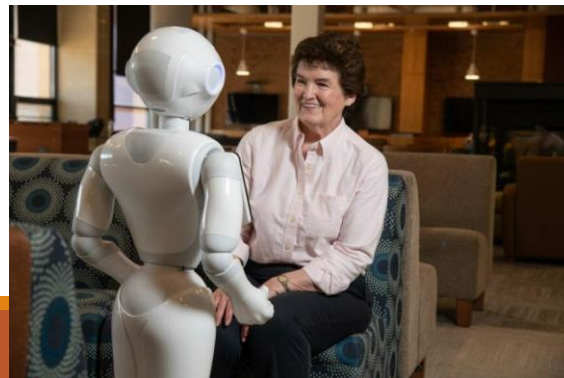
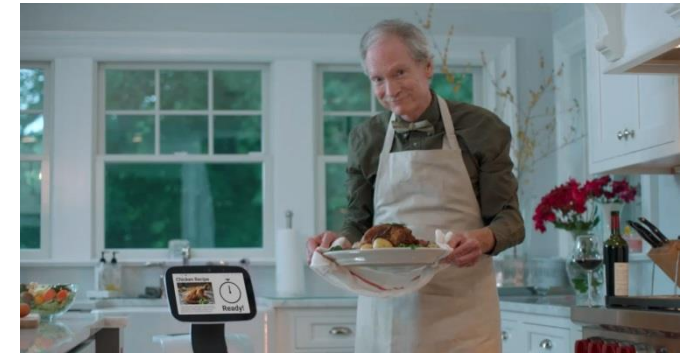
- **Monitoring and Big Data Processing Service**
 - holistic and non-invasively monitor older adults with mild cognitive impairment using easy to collect variables on their ability to conduct ADL, perceived health, and wellbeing state.
 - ADL data will be acquired using off-the-shelf commercial IoT sensors integrated with the TelluCloud infrastructure, to detect activities such as sleeping and sleep quality, physical activity, etc.
 - data on the perceived health and wellbeing state will be monitored using self-reporting (e.g. older adult mood, feelings, impressions, etc.) or reporting from family carers and formal carers.
- **ML-based Cognitive Decline Assessment Service.**
 - ML techniques will be used to analyse the older adult monitored data intending to assess the ability to carry out activities of daily living.
 - the correlations between the carried-out activities and the cognitive state will be inferred enabling to early detect the cognitive decline

engAGE technology overview

- **Social Robot Coaching and Cognitive Stimulation.**
 - provide personalized brain training in the older adults' real-life setting by employing the social robot as a tool to address important areas for a healthy brain, such as socialization, drama, and storytelling, activities of daily living, etc.
 - coaching and support activities will be seamlessly integrable into older adults' everyday life activities patterns.
 - the robot will act as a companion and will provide a wide spectrum of assistive functions such as cognitive stimulation (i.e. drama storytelling), reminding or step by step instruction on conducting ADL (e. washing, preparing meals, taking medication, drinking water, etc.), and facilitation of social interaction by creating a support network through collaborative caregivers or family members
- **Communication Platform and Intelligent Personalization.**
 - consists of several dashboards that will be developed and integrated with the defined services to show care status information concerning the cognitive baseline, ADL monitoring, self-reporting, and cognitive decline assessment and to enable interaction and communication of all types of interested actors with the system
 - the platform will be built upon the functionalities of MEMAS

Social robots: Pepper or Temi

- We will use **IRIS Robotics** experience in commercializing and personalizing robot-based solutions in Europe (official reseller of Pepper and Temi)



 Thank you

Questions?

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