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Digital Health applications through robotics and other advanced techologies: the future of integrated care

Felip Miralles - Director R+D Salut Digital

Healthcare transformation

Current and future challenges on Healthcare sector

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1 Demographic development and long-term care

The number of older persons age 80 and above is estimated to grow from 125 million in 2015 to 434 million in 2050. Demographic change will increase the number of people in need of long-term care with increasing age and longevity, the risk of chronic disease rises along with that of age-related disabilities.

As the number of older persons continues to grow along with their longevity, the need for long-term care will increase significantly for those aged 80 and over.

2 Advancing digitalization

Economies that invested early in digitalization and worked to foster trust in their digital economies have proven most resilient attitudes face the latest global challenges fostering trust and integrating connectivity into the lives of billions.

Nowadays investments in digital inclusion and trust are greater determinants of digital competitiveness. With better connectivity, the options for value-added digital services increases exponentially, and the need to build trust in the digital economy is a key aspect.

3 New regulatory requirements (medical devices)

Medical devices are products or equipment intended generally for a medical use and are regulated at Member State level. The Medical Devices and the In-Vitro Diagnostic Devices Regulations have introduced new responsibilities for the European Medicines Agency (EMA) and national competent authorities in the assessment of certain categories of medical device.

Medical devices in the EU have to undergo a conformity assessment to demonstrate that they meet legal requirements to ensure they are safe and perform as intended.

4 Increasing pressure on the healthcare systems

Healthcare systems around the world are dealing with depleting resources at a time when demand for healthcare is rapidly rising. Governments face growing pressure to reduce costs without impacting quality or access to care.

Governments are responding with healthcare reforms and recognizing the need for greater collaboration with the private sector and looking for low-cost, efficient, digital, remote solutions to reform healthcare and address their depleting resource issues.

Healthcare transformation

Solutions toward the healthcare transition

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1 Smart hospital of the future – Hospital 4.0

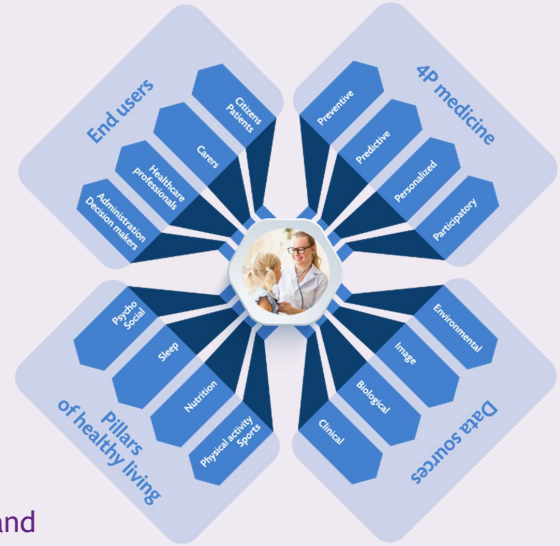
- Planning, optimization and re-engineering of healthcare processes.
- Control center with digital twins, simulation and dashboard tools for smart management of hospitals
- Liquid hospitals, home hospitalization and hyper specialization of intra-hospital services
- Healthcare robotics and Artificial Intelligence for automatization and smart support
- Medical devices to facilitate and standardize diagnosis, intervention and follow-up

2 Integrated care approach for chronic care management

- Self management tools for patients and caregivers
- Collaboration tools for professionals from different health and social tiers
- Advanced services: patient empowerments, training, communication, monitoring, workflow management
- Adaptive and flexible care plan planning and follow up
- Virtual health practice to reduce unnecessary travels and visits and optimize and prioritize added-value face-to-face visits
- Improve adherence to treatments, not only pharmacological

3 Clinical Decision Support Systems for evidence-based medicine

- Data analytics in Medicine: analysis and fusion of clinical, epidemiological image, biologic, environmental data
- Application of statistical but specially Artificial Intelligence and Machine Learning techniques
- Predictive and prescriptive models
- Clinical decision support systems for screening, diagnosis, prognosis, therapy management and personalization
- Deployments, evaluation and assessment



4 Personalized medicine, personalized nutrition

- Holistic and multi-level approach to omic sciences: genomics, transcriptomics, proteomics, metabolomics
- Understanding and interpreting complex diseases mechanisms from a deep biologic perspective
- Personalization of medicine for each individual, based on biology and the interaction with phenotype.
- Personalization of pharmacological and non-pharmacological treatments, therapies, rehabilitation
- Personalization of nutrition with a biological foundation and interaction with life-style

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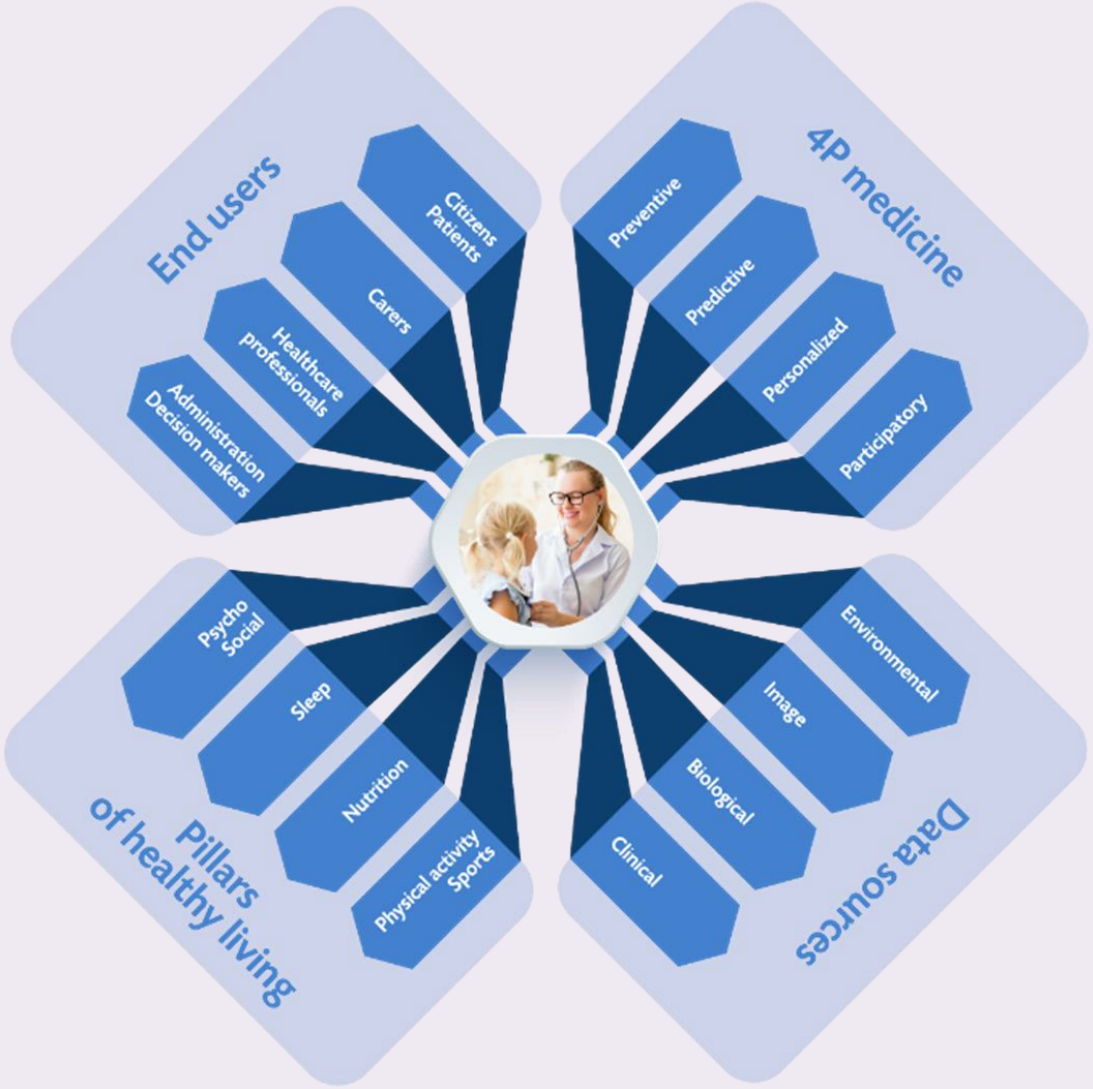
Solutions toward the healthcare transition



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Success stories

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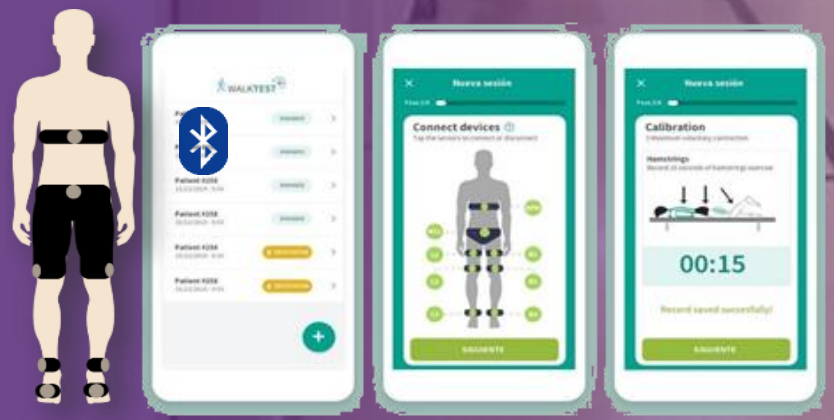
Data & Sensorics

Digital transformation of functional assessment protocols

Improvement of diagnosis and follow-up of the Six Minute Walk Test protocol, for instance used in the evolution of chronic neuromuscular diseases, through the integration of biomechanics sensors and data fusion.



EIT Health

Parc Sanitari Sant Joan de Déu

Success Stories
Robotics: Exoskeletons

able™
human motion

ABLE technology helps those living with spinal cord injury to walk

First lightweight, easy-to-use and affordable exoskeleton that restores the ability to walk of people with lower-limb paralysis

https://eithealth.eu/product-service/able-human-motion/

eit Health

Ongoing project

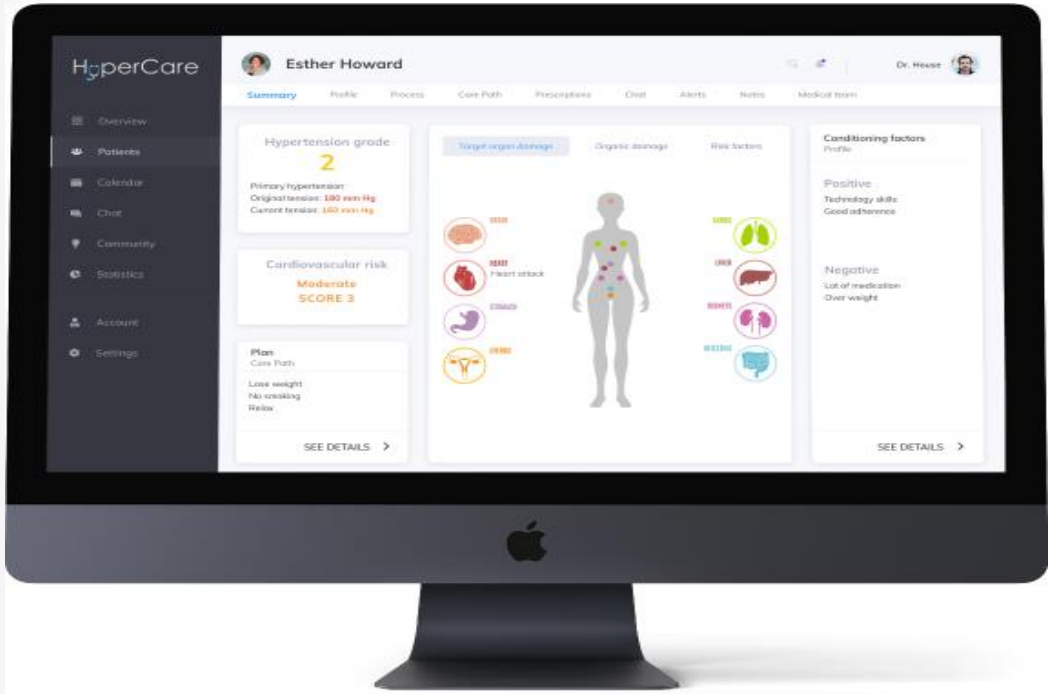
BAGESS

eHealth

Integrated Care for the Mental Health (and Cardio Rehab) patient

Multi-use case managent and self-management platform for integrated care services.

The main objective is to foster remote monitoring for patients, creating a platform that can absorb the inclusion of future customized clinical cases.



ACCIÓ Generalitat de Catalunya

Success stories

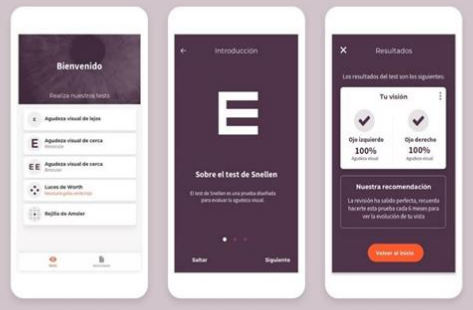
EVISIÓ

eHealth

Integrated care to oftalmologic patient

Innovative platform in Ophthalmology for the decentralization of care, online self-test and user empowerment.

The main objective is to improve the eye health of the population, facilitating the accessibility of patients to ophthalmological care and reducing referrals.



Fundació Salut Empordà

MoveCare

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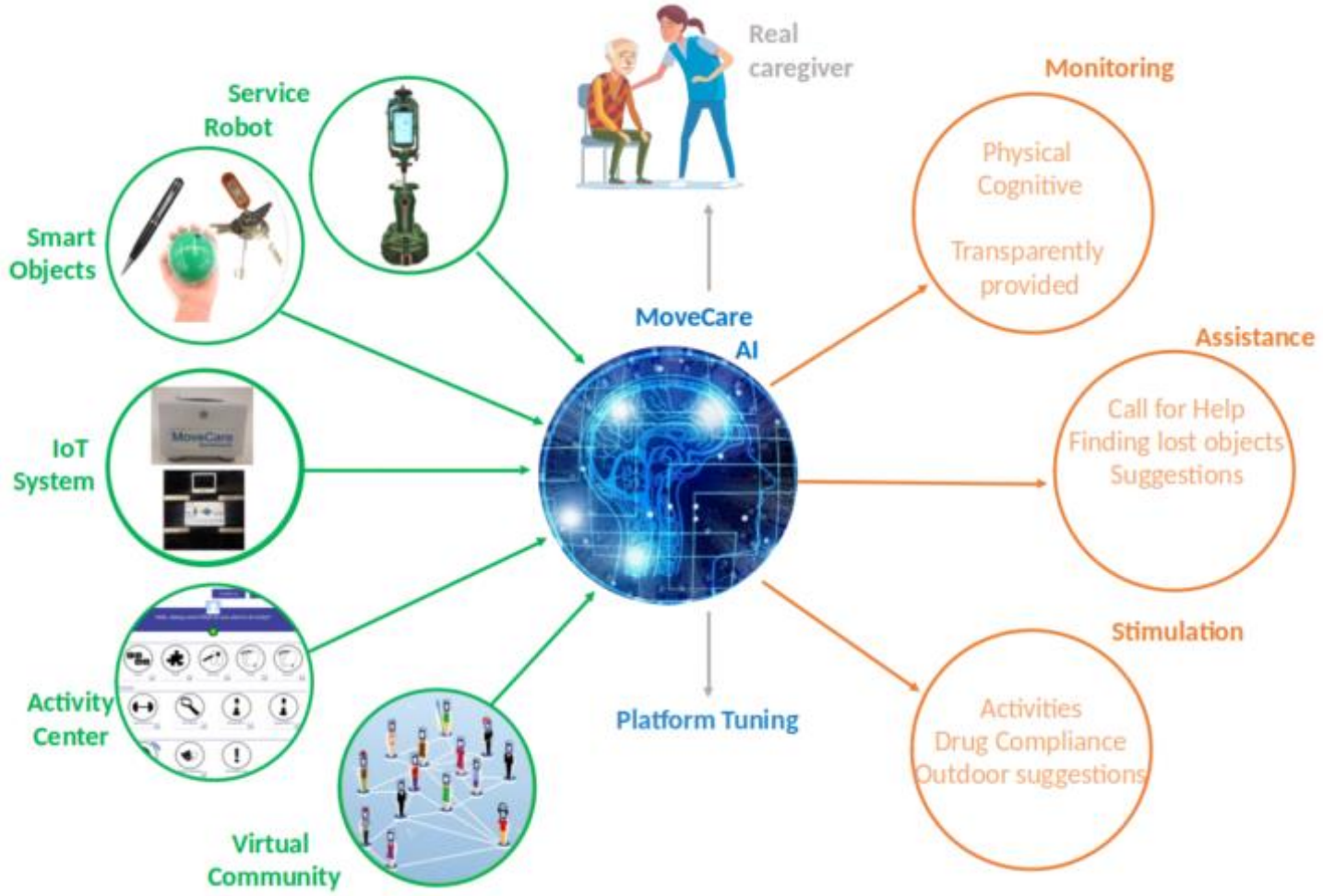
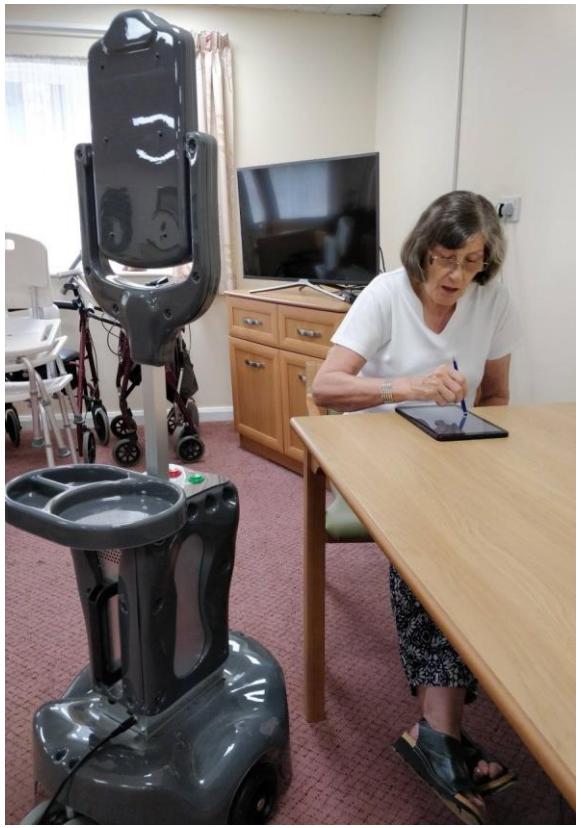
Integrating multiple actors





European Commission
Horizon 2020
European Union funding for Research & Innovation

MoveCare is a project funded by the European Commission under the H2020 Framework.
Programme H2020-ICT-26b-2016 System abilities, development and pilot installations. GA 732158

DIH HERO

DIGITAL INNOVATION HUBS IN HEALTHCARE ROBOTICS

- **Facilitating and accelerating the application of robotic technologies across healthcare.**
- **Improving outcomes and the quality of care for European citizens.**
- **Building global market potential.**

Fighting COVID-19

- 9 projects funded
- From disinfection to logistics, including telerehabilitation

Success stories

SHARK

Honda Research Institute JP

Assistive Robotics

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HRI HARU - Multimodal Assistance to psychologic, cognitive and mental health

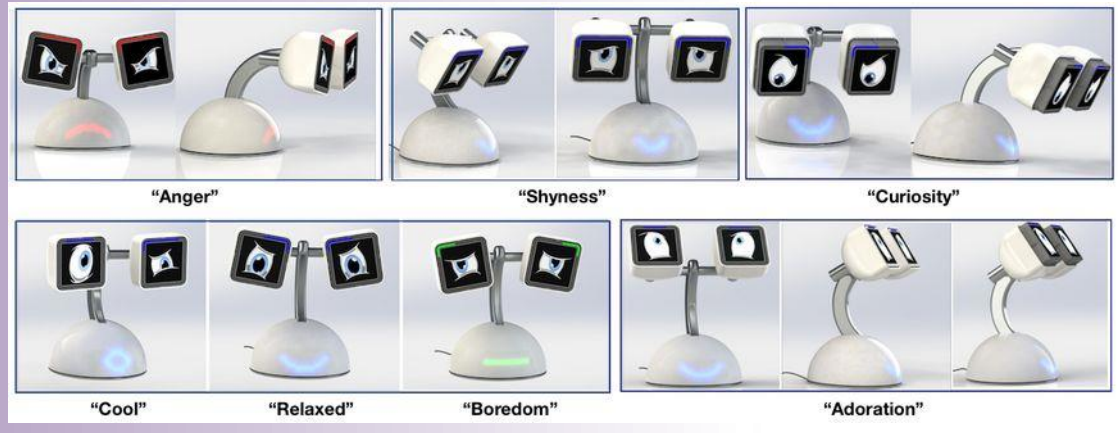
Honda Research Institute JP

SHARK - Assistive services for elderly people at risk of developing mental health and other conditions provided with **empathic** and collaborative robotic platforms at home

ACCIÓ Generalitat de Catalunya

EMPATHY – Natural language, verbal and non-verbal signs, intuitive, emotional engagement

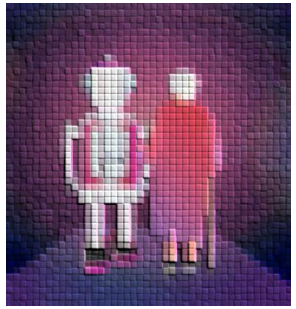
Companionship – Calmness - Cheerfulness



NHoA – Never Home Alone

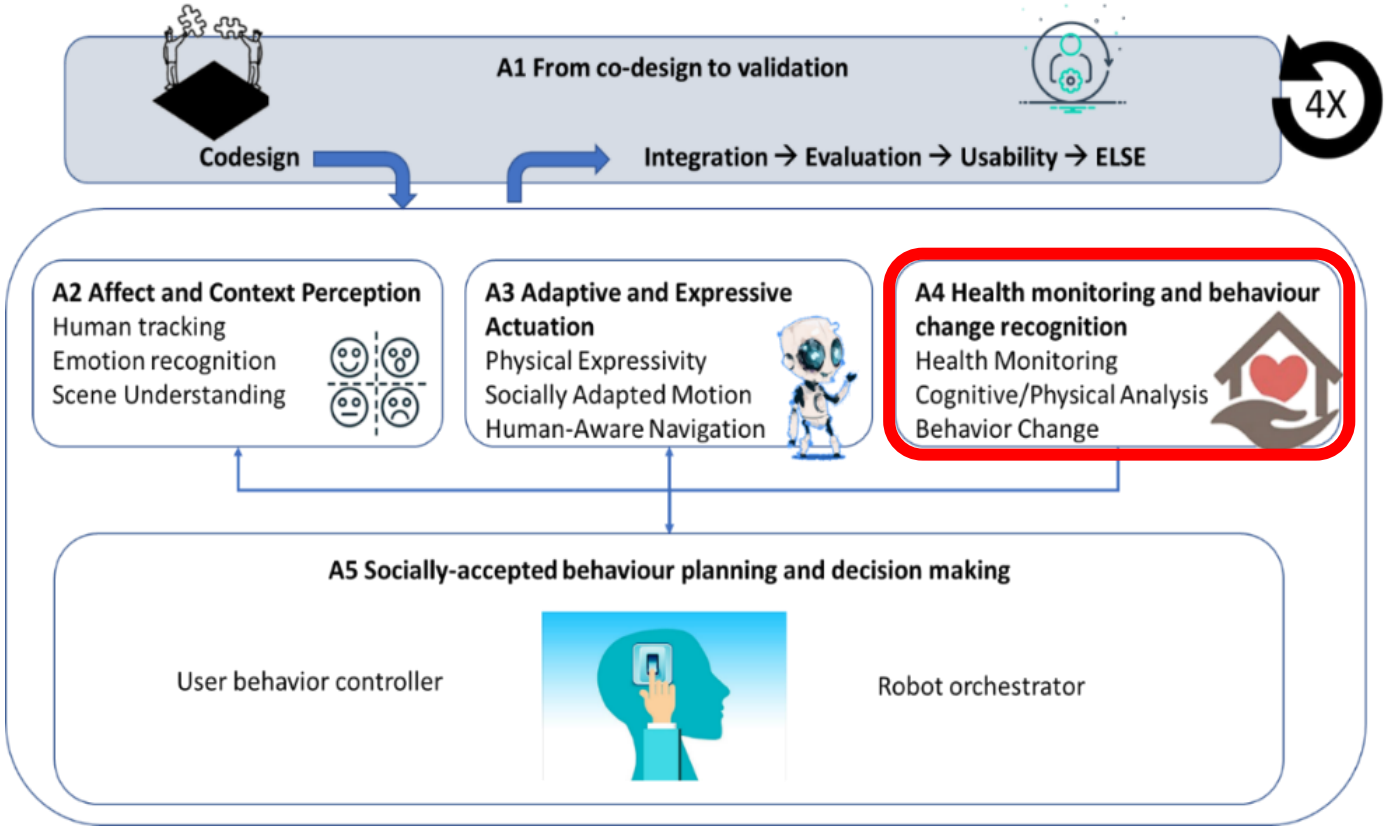
Assistive robotics to help elderly people mitigate loneliness, promoting healthy habits and social interaction

NHoA
Never Home Alone



HRI HARU Social Robot

PAL Tiago - Assistive Robot



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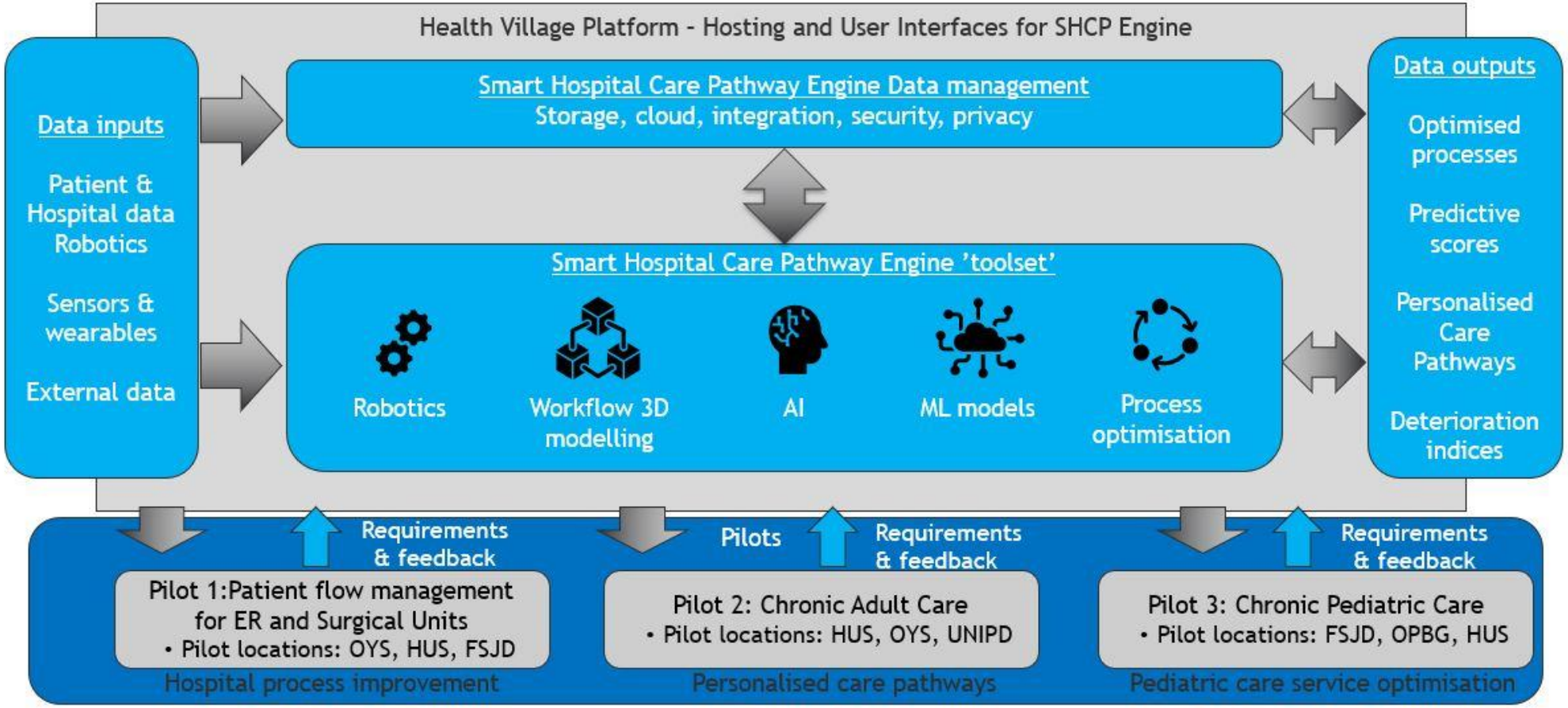
smart hospital care pathway engine

Smart Hospital Care Pathway Engine



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1 Sensing - Collecting data from patient in a continuous and unobtrusive way

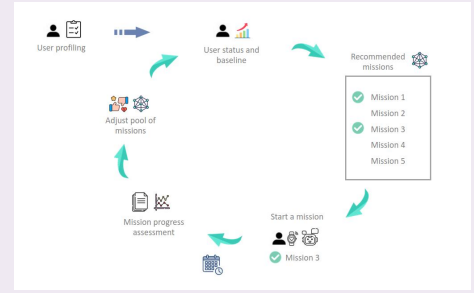
- Human-like empathic verbal interaction for cognitive status – speech recognition and synthesis
- Expression and gesture recognition for emotional status – computer vision
- Biometric sensing for physical activity: inertial, pressure and presence sensors, GPS, EMG, etc.
- Physiological sensing for health status: ECG, pulse-oximetry, blood pressure, glucometry, and a long etc.
- Environmental sensors for context: temperature, humidity, pollution, and a long etc.

2 Interacting – patient profiling and behaviour recognition to identify specific traits

- Personal context: family support, IT skills, socioeconomic, cultural, home, neighbourhood
- Physical: sedentarism, activity time, intensity, sleep, routines, food intake, nutrition, preferences
- Cognitive: autonomy, level of decline, memory, language, executive functions
- Emotional: mood, quality of life, depression,
- Social: isolation, loneliness, social bonds, social relationships, community

3 Intervening – evidence-based and personalized behavior change and therapy

- Pharmacological: support, information, reminders, routines, compliance
- Promotion of healthy habits: physical activity, good sleep, healthy nutrition
- Cognitive stimulation and emotional support: memory games, counseling, support
- Physical rehabilitation: exercises, guidance, rewards
- Gamification, missions, behavior change models, patient empowerment, communication



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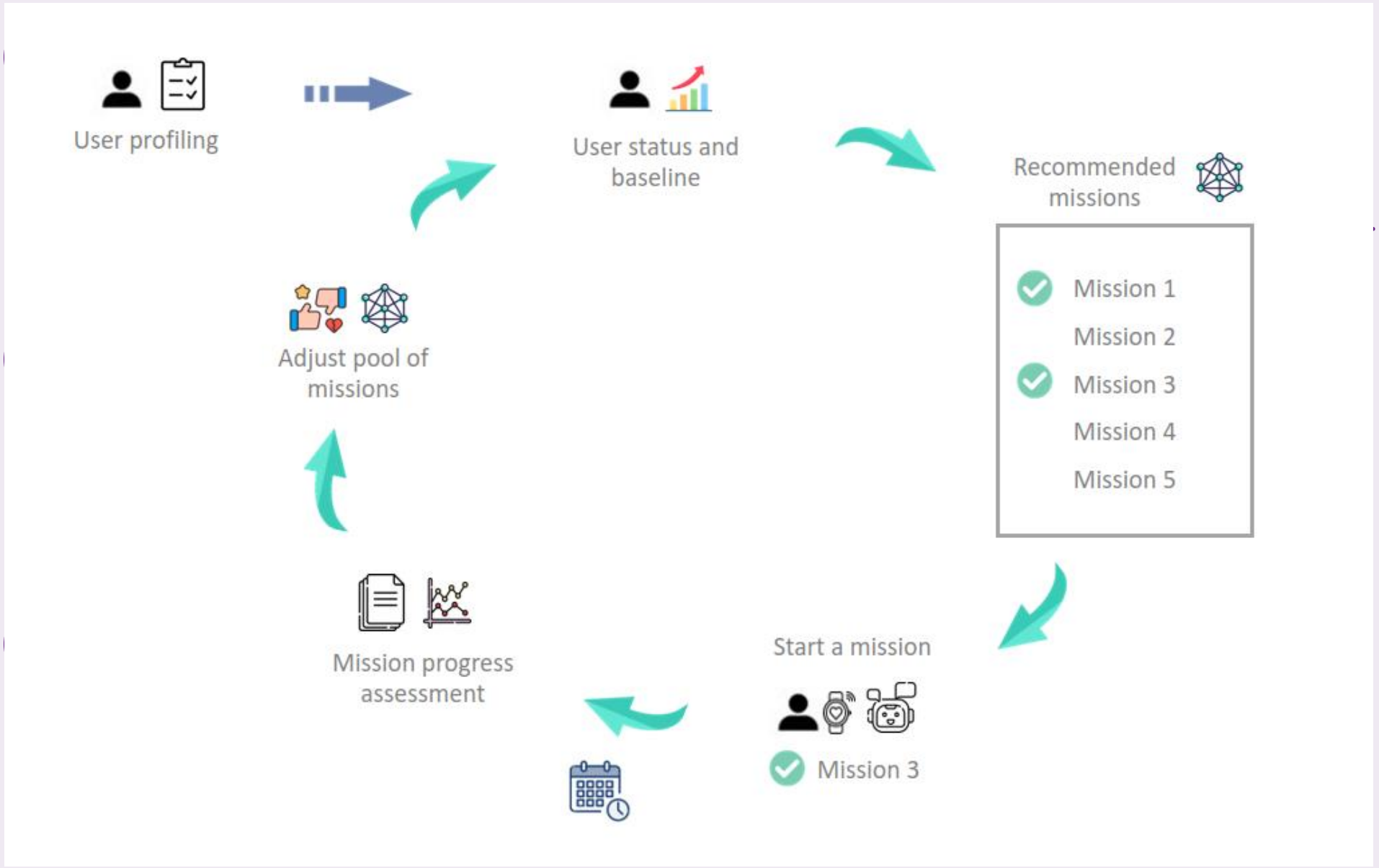

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