

Carealia: Digital Health in Everyday Life

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CENTRE FOR
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HELLAS



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Institute

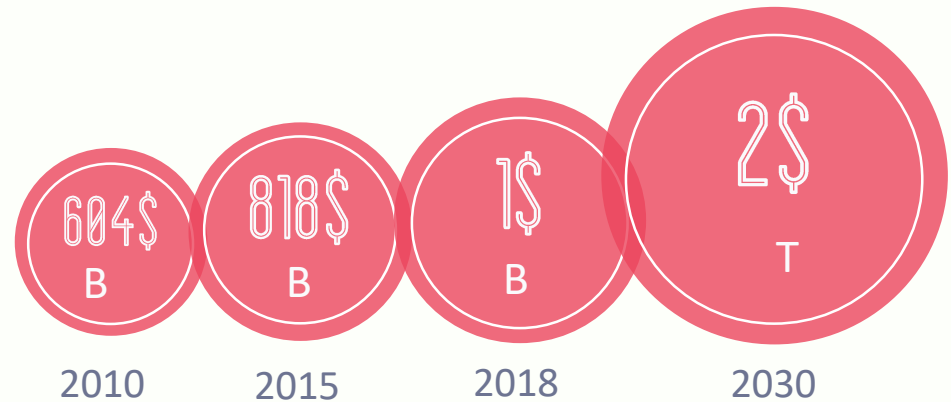
Carealia 

The Problem

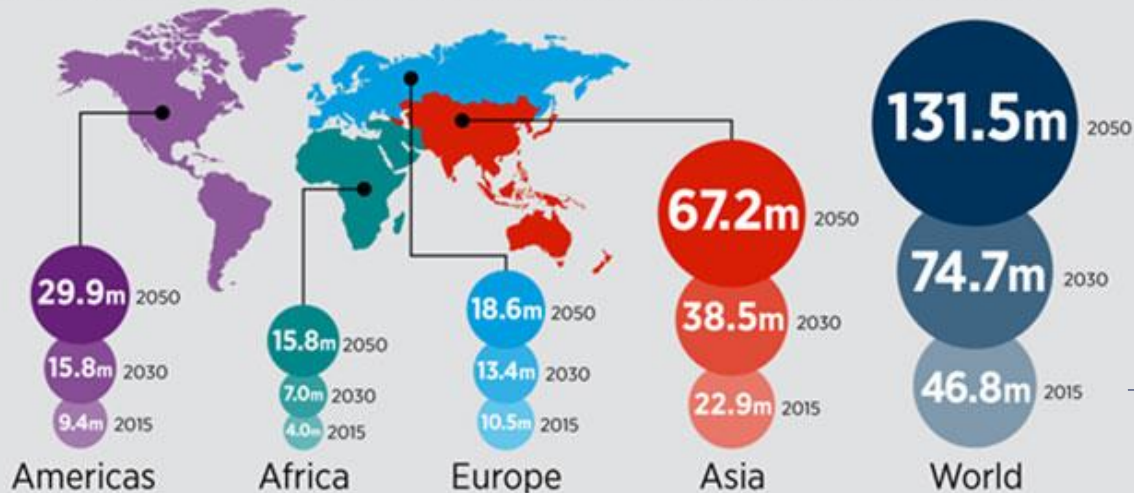
Chronic or age-related disease

- Withdraw from society
- Inaccessible/inaffordable care

Worldwide Annual Care Cost



People living with **dementia** around the world



Greece, 2014

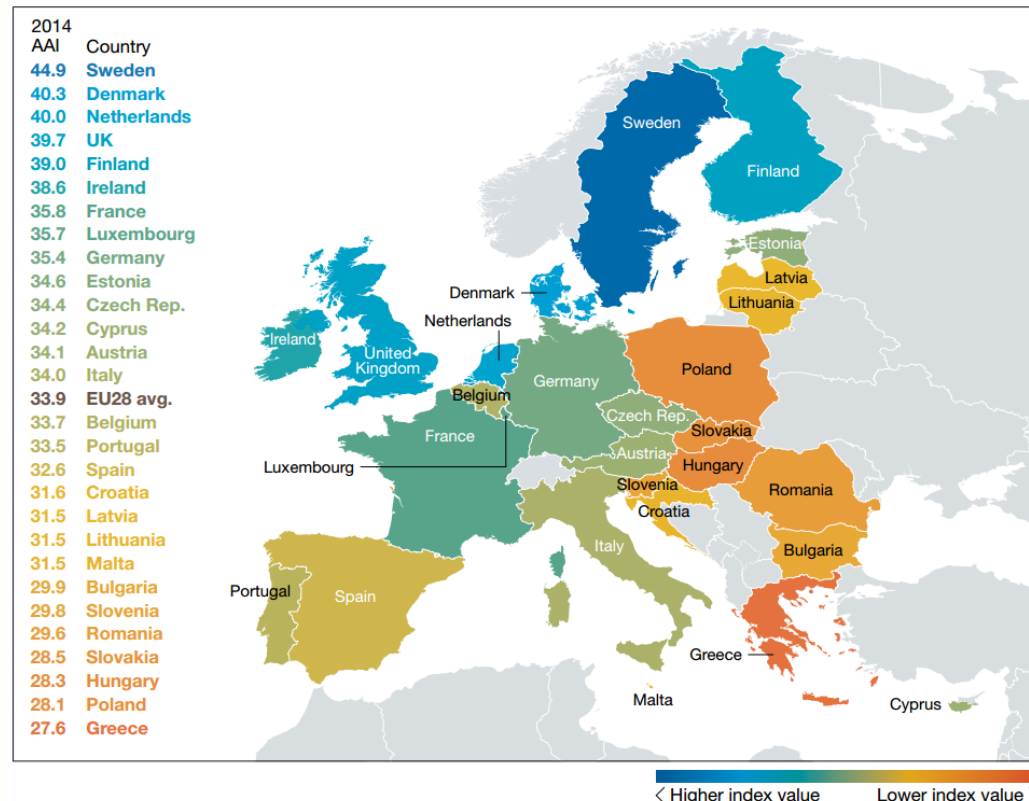
200.000 people
89% living at home

400.000 carers

6B € annual care cost

European Directives

- Highlighting the need for regulation not only technological solutions
- EUROPEAN INNOVATION PARTNERSHIP on Active and Healthy Ageing (EIPonAHA)
 - C2: Independent Living Solutions
 - Blueprint on health to collaboratively shape future strategies
 - Reference Pilot Sites
- UN/EC Mapping the current Active Age Index
 - Participation in society etc.



A Promising Solution: Digital Healthcare

The Device Market (Internet of Things – IoT)

- 5.1B \$ in 2015, 18.9B \$ in 2020

Accelerated Clinical Trials

- 60% penetration
 - Mobile apps and in-home-clinical-grade devices are most common now
- 97% will increase their usage
 - Wearable trackers will be the future focus
- 70% believe data collection will shape chronic illness treatment

Lower Healthcare Costs

- Medication adherence for diabetes, High blood pressure or cholesterol

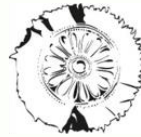
Remote Monitoring

- Avoid hospitalization for heart failure, pneumonia and more

1. An Example in Dementia Care



www.demcare.eu, 2011 - 2015



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AIRBUS



PHILIPS

sense and simplicity



Current Dementia Treatment

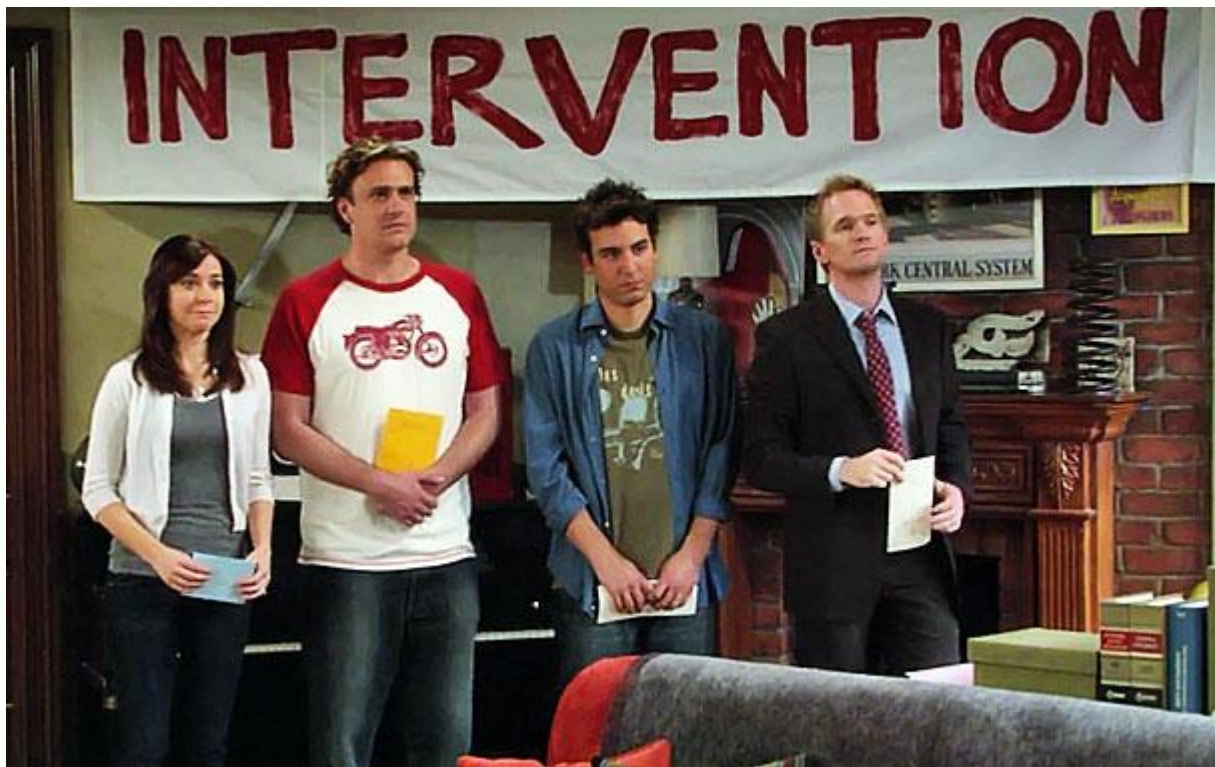
- No effective cure to this day



- Pharmaceutical Treatment
 - Delay symptoms in dementia stage – AD stage



- Non-pharmaceutical interventions (Brain Workout)
 - Delay the progress of the disease – MCI stage
 - Require psychologist-clinician presence
- Time-consuming, Subjective observation by clinicians
 - High cost and error-prone



- Speech and attention exercise
- Pen and pencil problem solving
- Brain games on the computer
- Learning new skills such as painting
- Daily physical exercise such as dance
- Cognitive Behavioral Therapy including relaxation
- Use of natural products (crocus, green tea, turmeric)

Interventions via Ambient Assisted Living

- **Reliable and affordable** monitoring behavioral patterns and symptoms related to the disease aided by technology
- Internet of Things (IoT)
 - Collection
- Artificial Intelligence (A.I.)
 - Intelligent Interpretation to meaningful information



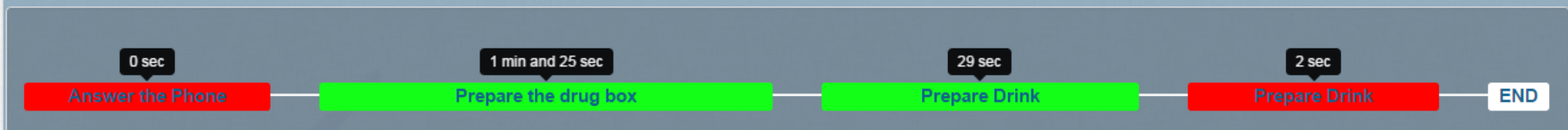
Lab Environment



New Patient
Edit Patient
Assessment
Results
Video Annotation

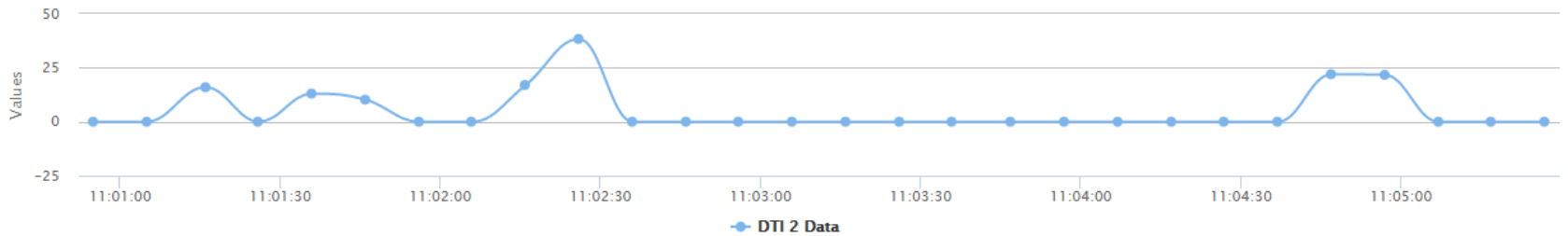
Phase 3 - Semi-directed Tasks

Task	Success	Successful Attempts	Successful Attempts Duration	Total Attempts	Total Duration
Dial Phone Number	✗	—	— sec	1	0 sec
Establish the account balance	—	—	— sec	—	— sec
Prepare Drink	✓	1	29 sec	2	31 sec
Prepare the drug box	✓	1	1 min and 25 sec	1	1 min and 25 sec

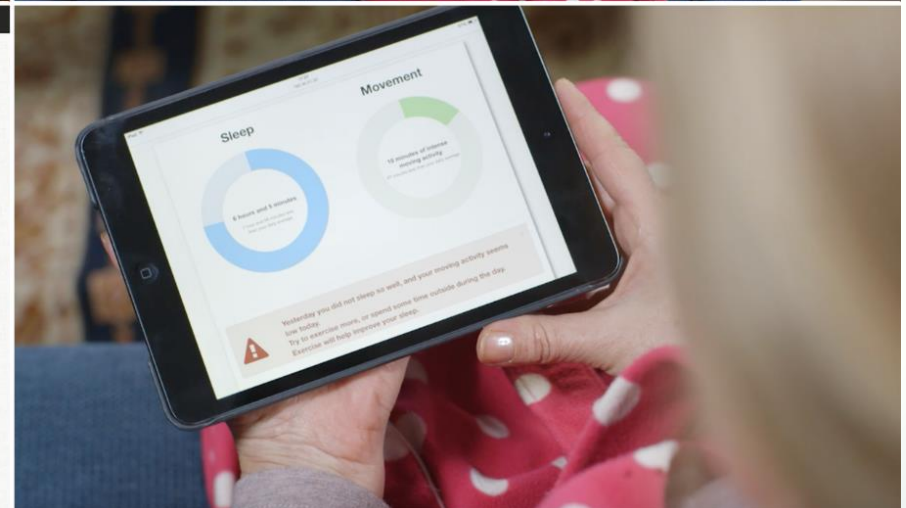
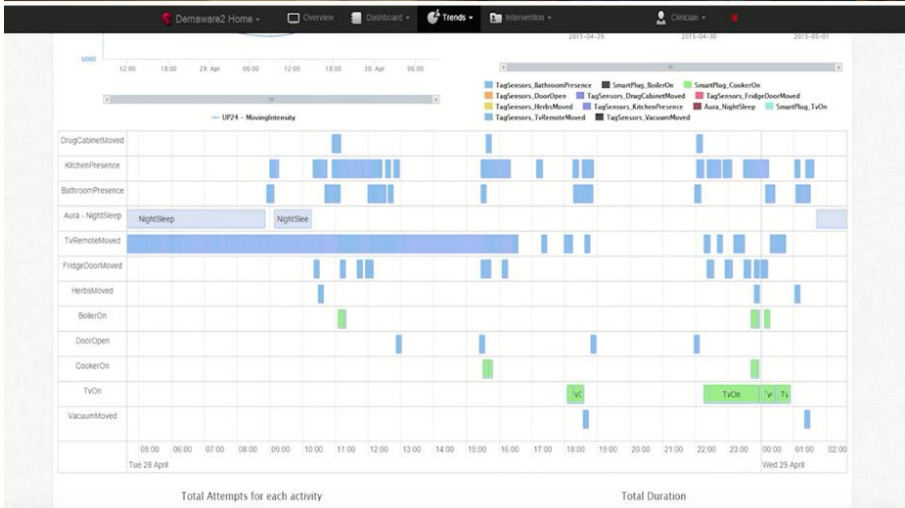


Notes for Phase 3

DTI 2



Home Environment



Everyday-Life Impact

The life of participants & technological breakthroughs



Semi-automatic accelerated lab trials
Lab Cognitive state assessment
86% accuracy

Detection of symptoms and problems
88% accuracy

Recognition of daily activities
80% accuracy

Cognitive State Improvement
75% of users
Mood, Sleep, Physical State Improvement
100% of users

- Too complex and non-portable system to reach a wide audience

2. Intelligent Sense Care

Sensing

- Ambient or Wearable
- Reliable measurements

e.g. Presence, HR, steps

Intelligent Interpretation

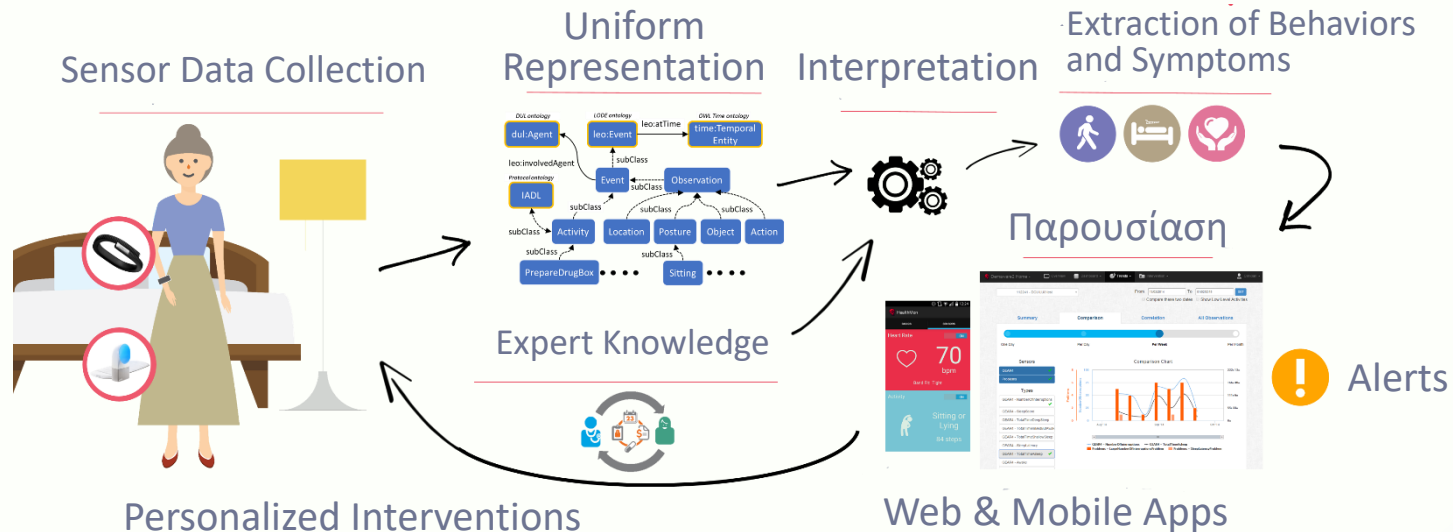
- Transform measurements to meaningful behaviors and symptoms

e.g. Stress, Sleep quality

Personalized Apps

- For end-users, carers, relatives
- For clinicians

e.g. showing trends in time



Who we are



Thanos Stavropoulos
PhD Informatics
CEO, Co-founder



Vivi Ntrigkogia
MBA, MSc Informatics
Marketing & Sales



Georgios Meditskos
PhD Informatics
CTO



Ioannis Kompatsiaris
PhD Electrical Engineering
R & D Manager,
Co-founder



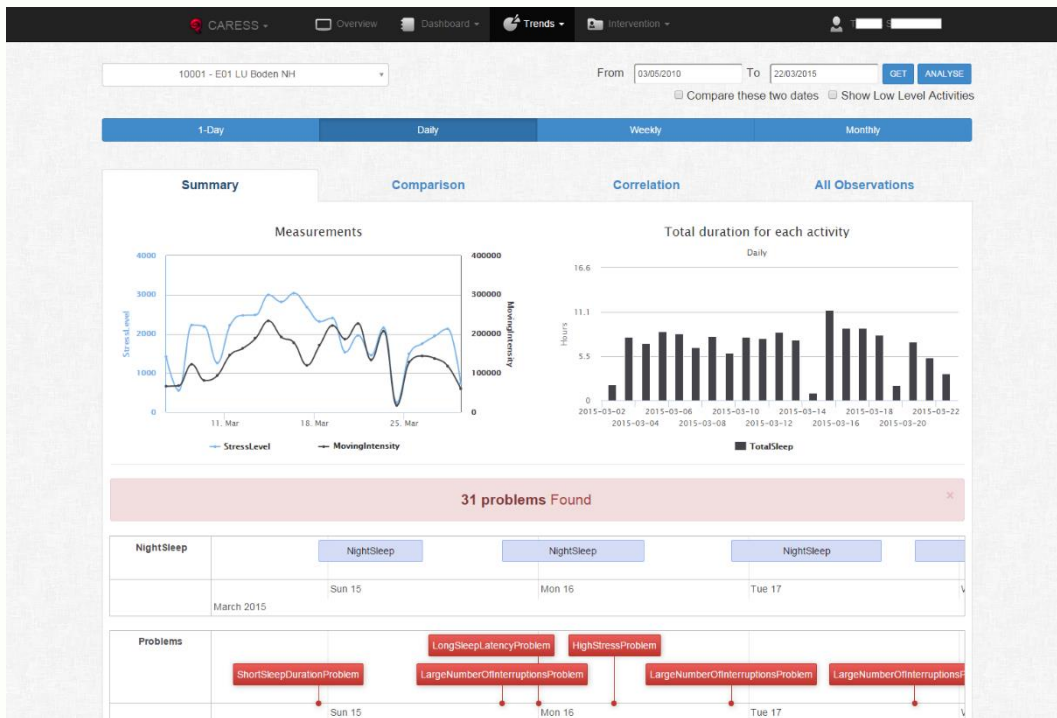
Ioulietta Lazarou
BSc Psy. MSc Neurol.
Clinical Researcher



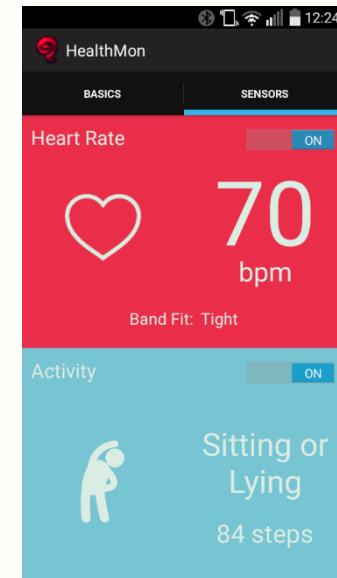
Magda Tsolaki
Prof. Neurology
Chair of Greek
Alzheimer's Federation
Advisor

Applications

- Trends and in-depth timeline to pinpoint symptoms, correlations and their causes

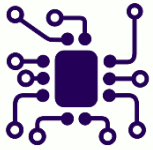


Web Application



Mobile Application

Benefits



- Interconnected
 - Devices, end-users, relatives, carers and clinicians stay connected



- Holistic Monitoring
 - All life aspects: physical activity, daily functions, sleep and problems



- Fully Tailored
 - The system adapts to spaces and people; not the other way around

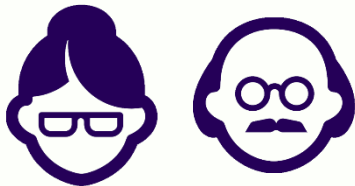


- Clinically Tested
 - Based on clinical trials from all over Europe

What - How – To whom



- Free selection of supported IoT bundles
 - Future-proof
 - Semantically interoperable and extensible



- Monthly Subscription per end-user for interpretation and support



- Target Environments
 - Homes & Nursing Homes

In action



3. IoT integration, Large Scale Pilots



- 2017 - 2020
- Integrate major open IoT platforms
 - A Marketplace to discover try and install services
 - Develop a wide developer/user ecosystem
 - Provide service discovery, matching and wide interoperability



- Large Scale Pilots (1 of the 5 EU LSPs)
 - Multiple cities in Greece, Spain, Finland plus single-sites in UK, DE, FR, IT
 - Behavioral monitoring
 - Healthcare monitoring
 - Smart mobility

4. Even More Holistic + Coaching

- One of the dominant paradigms for the future healthcare
 - European H2020 Calls
- Many wearables already offer micro-coaching on fitness, sleep etc.
- A larger idea
 - Not only monitoring & clinical decision support but also system-generated 24/7 personalized advice & end-user support

Emotion detection

One of the holy grails in Digital Healthcare – linked to Neuropsychological disorders

- Facial expression recognition from cameras
- Emotional properties such as **stress** from heart rate variability, perspiration, galvanic skin response, electrodermal activity
- **Mood** based on multiple modalities, such as wearables + audio, and strong learning



Feel greek startup tracks Happy, Sad, Angry Stressed, Satisfied



MIT social coach labels conversation tone as Happy, Neutral or Sad

Intelligent Coaching Concept

- Intelligence in every layer
- Multiple life aspects
 - Physical
 - Cognitive
 - Medical
 - Emotional
 - Social
- Human-intuitive HCI
 - Speech recognition/generation
 - Language semantics
 - Context-Emotion Awareness
- Personalized Decision Making
 - Expert knowledge & Learning



Current Work on Coaching

- Meet the girls (for some reason)
 - KRISTINA H2020
 - ΕΣΠΑ ΕΡΕΥΝΩ-ΚΑΙΝΟΤΟΜΩ «ΡΕΑ» 2018 - 2020



- **Kristina EU H2020**
Conversational agent to medically assist immigrants with language/cultural barriers



- **Entranet (GR) Housemate+**
Talking smart-home avatar

5. Beyond Disease, Into Well-Being

Active & Healthy Ageing (AHA)

What if healthcare was not **illness-driven** but **wellness-driven**?

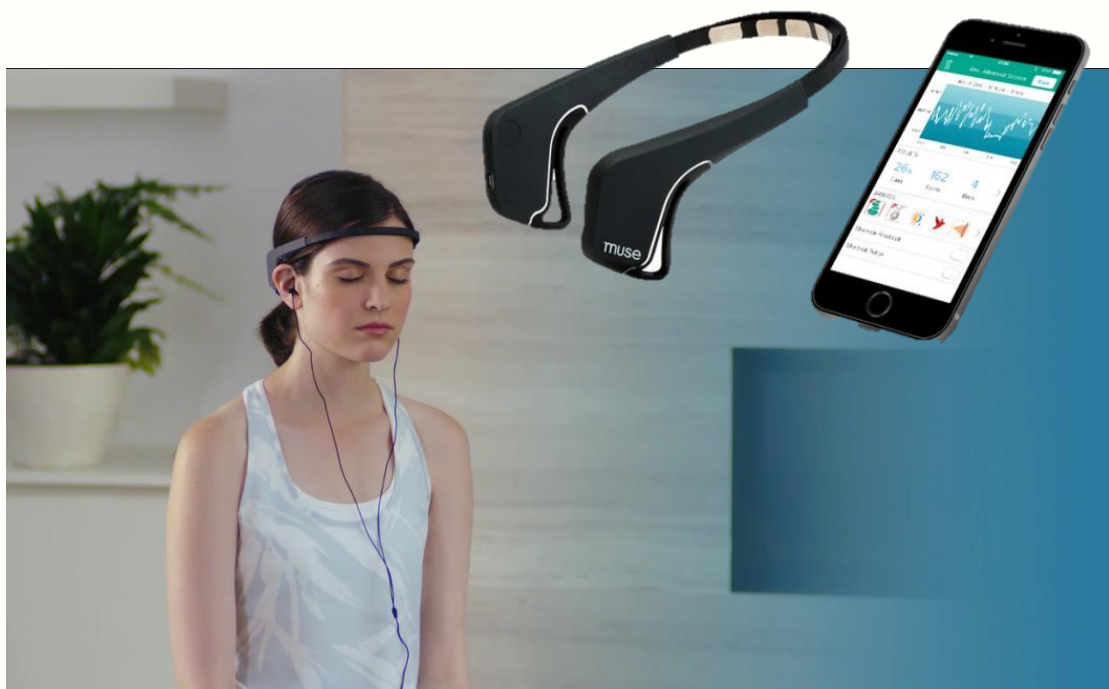
Treatment vs. **Prevention**

Instant, Targeted vs. **Chronic, Holistic**



The Importance of Being Relaxed

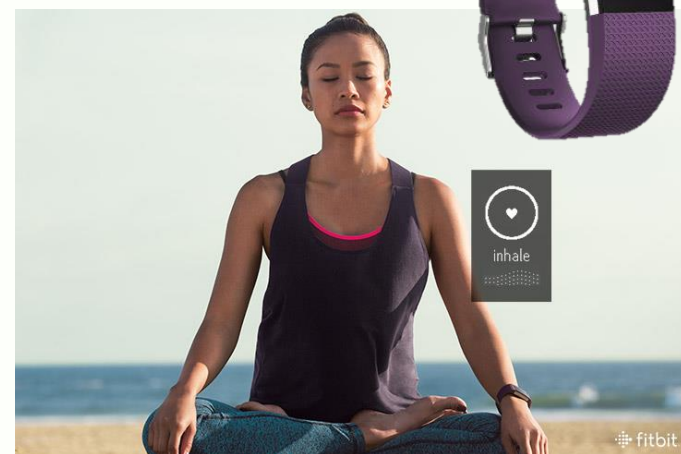
Positive impact in Neurodegenerative diseases



- MUSE

Real-time meditation sensing and tracking

- FitBit Charge 2 Guided Breathing



- Brain-Computer Interface Gaming, Meditation and more



Clinical Trial for Well-Being

- Cognitive Behavioral Treatment + Physical Exercise = Meditation + Yoga
- Rich but Comfortable Sensing
- Neuropsychological Assessment + Self-assessment
- ~10 participants from Alzheimer's Hellas



Buddha Libre

Yoga • Meditation • Well-being

<http://buddhalibre.gr>

Future Work

- ΕΣΠΑ «υποστηρίΖΩ» 2018 - 2020
 - Carealia commercial concept + telecom providers
 - CERTH, ARX .NET (Θεσσαλονίκη, Φροντίδα Ζωής (Πάτρα))
- H2020 Societal Challenges
 - Adaptive working environments for elders (Proposal this April)

For You

- Inspired to work with us?
 - email thanos@carealia.gr
 - CV + Portfolio until tomorrow 13/2!
 - Full Stack Web Developer position or more!
 - Open to suggestions
- Semantic Web lover?
 - Submit to SEMPER 2018
 - @ESWC 2018
Heraklion in June 2018
- Vote for Us!
 - @Nissan's Generation N



Thank You

thanos@carealia.gr

The Company carealia.gr

The past EU project that started it all demcare.eu

The Lab & all other scientific activity mklab.itigr

The yoga studio <http://buddhalibre.gr>

