



ICT for Health, Accessibility and Wellbeing (IC-IHAW 2021)

ICT for Health, Accessibility and Wellbeing (**IC-IHAW 2021**) is the first of the series of International Conferences on « ICT for Societal Challenges ». It is a showcase for high quality oral and poster presentations and demonstrations sessions.

This conference aims to be a platform for multi and interdisciplinary research at the interplay between Information and Communication Technologies, Biomedical, Neuro-cognitive, and Experimental research.



This research includes the design, experimental evaluation and standardization of new ICT in-silico scalable systems for new and future inclusive and sustainable technologies that benefit all: healthy people, people with disabilities or other impairments, people having chronic diseases, etc. User-centered design and innovation, new intuitive ways of human-computer interaction, and user acceptance are the topics of particular interest.

Organizers and Sponsors



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Monday, 08 November

Opening Session

10:00 – 10:15 (CET)

Keynote Speech

10:15 – 11:15 (CET)

Chair: Prof. Edwige Pissaloux

From remote care to personalized care.

Hadas Lewy

Abstract: Patient centered care challenges the traditional ways of care. Monitoring, diagnosing, and intervention as well as the relationship between care provider and patients are changing and as a result a collaborative model in which the patient is an active partner in the care process are generated. The challenges are both clinical and technological. Today, new tools\platforms and care models are being developed to acquire patient generated data (PGD); behavioral, emotional and patient reported outcomes (PROs) that can be combined with EHR clinical data and provide comprehensive information regarding the patients' condition and the care process. Using a stepwise and agile approach for research development and implementation can improve service and enable adoption and adaptation of the service in the short term while collecting data for the development of next generation – an AI based Decision Support Systems for personalized care. Some solutions designed and developed for remote monitoring and care will be presented to further demonstrate how using a multidisciplinary, agile research and development approach and incremental implementation process can overcome organizational barriers, improve quality of care and create change in healthcare delivery.

BREAK

11:15 – 11:45 (CET)

Session-1: Active Ageing

11:45 – 13:05 (CET)

Chair: Jennifer Bossement

Instrumented Activity Dice for Assessing Limitations of Physical Performance: A Pilot Study (30 minutes)

Seethu M Christopher and Rico Mockel.

Abstract: Assessment tests can be frustrating for participants and - due to a meticulous documentation load - arduous for experimentalists. Consequently, research has been done to make assessments more fun for the participants by integrating these assessments into serious games, and less demanding for the experimentalists by automating observations through computer vision or wearable sensors. However, children and elderly participants become anxious and behave differently while being observed by a camera or when asked to wear sensor-suits. Hence, we investigate a different methodology to assess the physical status of a participant - an instrumented game dice with integrated sensors. Prior research has established that throws are a measure of physical capabilities. A participant in the context of a serious game throws the instrumented dice and we demonstrate that the variables extracted from the inter-action with the dice provide us with an indication about the participant's wrist abilities.

WisdomOfAge: Designing a platform for Active and Healthy Ageing of senior experts in engineering (30 minutes)

Bogdan Gherman, Laurentiu Nae, Adrian Pislă, Eduard Oprea, Calin Vaida and Doina Pislă.

Abstract: The European population is undoubtedly ageing at an accelerating pace and by 2050; the number the elderly people will increase with almost 50% compared with 2019 numbers. Under the current legislation, the retirement age within most EU countries is 65, when many people are still able to perform within their profession at a decent level due to their knowledge and vast experience. The paper focuses on the design of a digital platform through which the retired seniors are able share their expertise with the younger generations, thus providing a useful, safe, and friendly environment that also addresses current challenges generated by the COVID-19 pandemics. The paper presents the analysis of the most important user needs and challenges that come with the age, sets the main pillars to be considered in the development of the application, both related to the overall architecture and main functions, and the user interface characteristics. A modular user focused design of the digital platform is proposed, by emphasizing its main functions, namely to provide the means of a seamless interaction and an improved user experience. Artificial intelligence agents will be integrated to improve the matchmaking process by relying on the overall experience during training sessions.

Application of a comprehensive and extendable package of personalizable digital services in supporting healthy ageing (20 minutes)

Marcin Adamski, Maciej Bogdański, Mikołaj Buchwald, Ludo Cuypers, Kinga Ćwiklińska, Michał Kosiedowski, Marcin Wiczorek and Sergiusz Zieliński.

Abstract: It is by now a long-established fact that the European population is ageing. While this trend results largely from positive phenomena, it does come with a set of societal challenges. One of these challenges is making sure that the quality of life experienced by the growing population of elderly citizens remains as high as possible. The PELOSHA project aims to tackle this challenge by developing a comprehensive, personalizable and extensible solution aiding the wellbeing and re-mote care of older adults. The solution consists of a set of tools targeting various areas of the senior's wellbeing, orchestrated by unified mobile applications dedicated for end users. Work performed on the solution included user involvement every step of the way. The design and development of the platform and its user interface take into account the user needs obtained via interviews. The resulting system undergoes validation in a series of pilot deployments in 3 countries.

LUNCH BREAK

13:05 – 14:00 (CET)

Monday, 08 November

Session-2: Brain Functions Support - 1

14:00 – 15:50 (CET)

Chair: Seethu M. Christopher

Brightening Up Brain Injuries: Design, Synthesis and Characterization of a PET Diagnostic Agent for Neuronal Trauma (30 minutes)

Jessica Allingham, Michael Campbell and Wely Floriano.

Abstract:

Concussions are an increasingly significant issue today, however, there is still no single standard, objective criterion for diagnosing them. An objective test with high sensitivity and specificity for concussions would provide a substantial advance in concussion diagnostics, which can help in the prognosis, treatment, and medical decision-making regarding the disorder. This research looks to fill the void in concussion diagnostic techniques by synthesizing a specifically designed, small molecule 18F-radiotracer capable of binding to a biomarker of neuronal trauma, thus allowing for imaging its upregulation using a PET scanner.

AI-enabled Proactive mHealth: A Review (30 minutes)

Muhammad Sulaiman, Anne Håkansson and Randi Karlsen.

Abstract:

Digital health incorporates mHealth to provide digital transformation in healthcare. AI in mHealth has a significant impact on promoting self-management. Our current healthcare system is reactive that is to react when symptoms emerge a crisis occurs and then take steps. Proactive health in contrast is to predict risks and prevent them with supportive actions promptly. This allows people to take control of their health and be aware of their surrounding and wellbeing. To achieve proactive mHealth with the capability of predictions and preventions. AI can contribute by applying reasoning and negotiation to the available health data and recognizing patterns to automate processes and augment healthier behaviors. In this paper, we systematically reviewed existing research with AI in mHealth to establish proactive mHealth. This paper also explores the level of proactiveness in existing systems. Our review identified that digital interventions and recommender system form the basis of proactive mHealth. We found nine targeted groups most of them are for chronic disease management. With this review, we also evaluated AI-techniques and data sources used in modelling these systems.

eSticky – An advanced remote reminder system for people with early dementia (30 minutes)

Lisa Fixl, Stefan Parker, Joanna Starosta-Sztuczka, Christos Mettouris, Alexandros Yeratziotis, Stavroulla Koumou, Michalis Kaili, George A. Papadopoulos and Valerie Clarke.

Abstract:

While the European population is aging, the number of people with dementia is dramatically rising. With this comes an increased need for products that help affected people to be more independent and able to live in their own home for as long as possible. ESticky addresses this need by providing a sophisticated reminder system that replaces the old-fashioned sticky-notes by electronic versions thereof, which can be programmed from near and far in a device-independent manner via the internet and using a standard web browser. For this purpose, a set of low-cost ePaper-displays are used, accompanied by a small and unobtrusive base station. The displays can be placed at several strategically useful places in a user's home, to enable users and/or care persons to place reminders that will, based on the user's daily routines, most probably be read. Active displays even enable the user to press a confirmation button to show that he or she has actually read the reminder. The system is developed using a user centred de-sign approach, to take all stakeholders' wishes and needs into account, in order to come up with a system that is easy to use and provides good service to many people.

Support for informal carers of those affected by stroke employing crowdsourcing and natural language processing techniques (20 minutes)

Petr Saloun, Lenka Krhutová and David Andrešič.

Abstract:

For a long time, both professionals and the lay public showed little interest in informal carers. Yet these people deal with multiple and common issues in their everyday lives. As the population is aging we can observe a change of this attitude. And thanks to the advances in computer science, we can offer them some effective assistance and support. In this work we describe an information system which uses means of artificial intelligence, text document classification and crowdsourcing further improving its accuracy. It also provides means of effective visualization and navigation over the content made by most by the community itself and personalized on a level of informal carer's phase of the care-taking timeline.

BREAK

15:50 – 16:20 (CET)

Monday, 08 November

Session-3: ICT & Wellbeing - 1

16:20 – 17:30 (CET)

Chair: Jessica Allingham

Using Force-Feedback haptic effects to develop serious and entertainment games accessible for Visually Impaired People (30 minutes)

Simon L.Gay, Ngoc-Tan Truong, Katerine Romeo and Edwige Pissaloux.

Abstract:

Nowadays, serious and entertainment games are developed with the latest technologies for sound and graphical content. However, they are often not accessible to Visually Impaired People (VIP) as they frequently are based on a visual interface. This paper proposes to overcome this limitation via the implementation of the force-feedback principle. The Force Feedback Tablet (F2T) is designed as a 2D actuated support with a mobile thumbstick mounted on it. F2T allows the exploration of a tactile environment with original haptic force feedback applied on the finger. Based on the advantages of these effects, F2T is used to create different 2D interactive virtual environments such as paintings, maps, text, and especially to develop unique gameplay elements, which may be combined with spatialized audio cues. As a result, this paper proposes to explore possibilities offered by a new force feedback based device to develop serious and entertainment games accessible to VIP.

The Living-Lab methodology for the prevention of falls in the Elderly (20 minutes)

Jennifer Bassement, Christine Selvez, Philippe Pudlo, Perinne D'Hont and Fanny Blondiau.

Abstract:

The present work describes the initiative of the Centre Hospitalier de Valen-ciennes (CHV) and the Pôle de Recherche et Innovation en Mobilité et Handicap (PRIMOH) which create a joined Living-Lab for the prevention of falls in the elderly. Local authorities, social services and networks, companies, local associations, elderly structures, researchers, health practitioners and elderly people have started cooperating within the Living-Lab in order to propose new health protocol, new technologies, new methods to support the prevention of falls in the elderly population. This approach focuses on the real needs of the users, taking into account the experiences of each participant, professional or individual. Elderly people, physicians, nurses, helpers, services, experts discuss and share knowledge and feedbacks to improve the care associated with falling. The originality of the method is that users are involved from the very beginning of each project, they even decide which project the Living-Lab should carry out. The paper provides an overview of the methodology that was followed and describes the current projects centered on the reduction of fall in the elderly.

Tackling the Sustainability of Digital Aging Innovations through Design Thinking and Systems Thinking Perspectives (20 minutes)

Mexhid Ferati, Marco Bertoni, Fisnik Dalipi, Arianit Kurti, Päivi Jokela, Peter Anderberg and Anita Mirijamdotter.

Abstract:

The digitalization of society brings many opportunities and challenges, especially on how we organize the welfare society in the future. This becomes especially pertinent as we are heading toward a global increase of older people, which will strain healthcare and bring the challenge of building sustainable solutions. In this paper, we argue that the unsustainable solutions within healthcare are due to them being defined and 'solved' with a single approach or approaches used in silos. We advocate that a more sustainable solution could be achieved by combining systems thinking and design thinking perspectives throughout the entire process; from problem definition to solution offering. A benefit of such combined perspectives is the ability to develop a shared context among all stakeholders, which helps uncover unique tacit knowledge from their experience. This will serve as a solid foundation to generate unconventional ideas that will lead to sustainable and satisfactory solutions.

Tuesday, 09 November

Keynote Speech

10:00 – 11:00 (CET)

Chair: Dr. Achilleas Achilleos

AI Hears Your Health: Audio as the Wonderbiomarker?

Björn W. Schuller

Abstract:

Acoustic sounds produced by the human body reflect changes in our mental, physiological, and pathological states. A deep analysis of such audio that are of complex nature can give insight about imminent or existing health issues. For automatic processing and understanding of such data, sophisticated machine learning approaches are needed that can extract or learn robust features. In this paper, we introduce a set of machine learning toolkits both for supervised feature extraction and unsupervised representation learning from audio health data. We analyse the application of deep neural networks (DNNs), including end-to-end learning, recurrent autoencoders, and transfer learning for speech and acoustic health monitoring and provide state-of-the-art results for each area. As show-case examples, we pick three well-benchmarked examples for body-acoustics and speech, each, from the popular annual Interspeech Computational Paralinguistics Challenge (ComParE). In particular, the speech-based health tasks are COVID-19 speech analysis, recognition of upper respiratory tract infections, and continuous sleepiness recognition. The acoustic health tasks are COVID-19 cough analysis, speech breath monitoring, heartbeat abnormality recognition, and snore sound classification. The results for all tasks demonstrate the suitability of deep computer audition approaches for health monitoring and automatic audio-based early diagnosis of health issues.

BREAK

11:00 – 11:30 (CET)

Session-4: Assistive Devices

11:30 – 13:10 (CET)

Chair: Bogdan Gherman

CARIOT+ Care Coach – An Ambient Assisted Living Ecosystem for Supporting Open Data and Open Science Projects (30mins)

Stefan Wagner

Abstract:

Europe faces a demographic shift towards a population with more elderly and less working age people. This necessitates the development of relevant technology-based care services utilizing ambient assisted living (AAL) concepts and technologies. AAL products often rely on third-party vendor services and cloud hosting, storing and retrieving measurements from these using application programming interfaces (API). This strategy is prone to breaking changes when the third-party vendor changes interfaces or licensing agreements, and also presents legal data privacy and security problems for many healthcare organizations. Open and independent components is an alternative allowing the systems to work autonomously together with third-party systems, thereby securing data privacy and security and allowing for easy replacement of components and services from other vendors. Technology, components, and services that support open standards and open data approaches allows for reuse in new settings, using new algorithms, and for hosting them at the individual healthcare service provider organization. The aim of this paper is to present the CARIOT+ Care Coach ecosystem for supporting open data and open science. The technical components forming the ecosystem is presented based on its experience gained from three AAL programme projects, the CAMI project, the HELP ME BRUSH project, and the ORASTAR project. The center piece is the CARIOT gateway which is designed for easy collection of ambient sensor data in the home setting, allowing third party systems full control of the data flow and storage. The paper presents the preliminary experiences gained during the projects and discusses future relevant developments, including how third-party organizations can build on the CARIOT+ Care Coach ecosystem. Finally, the paper discusses how other projects can use the ecosystem to build new and open ambient assisted living systems in the future.

GUIDed: An Augmented Reality Assisted-Living and Social Interaction Platform for Older Adults (30 minutes)

Kale Strahinja Lazic, Achilleas Achilleos, Stefan Parker, Christos Mettouris, Alexandros Yeratziotis, George Papadopoulos, Charalambos Theodorou and Karol Pecyna.

Abstract:

The demographic trend causes a rising pressure on health and care systems. Information and communications technology (ICT) provides many appliances that may support older people in prolonging independence while reducing the pressure on health and care systems. Research provides insights into the needs of older people as well as insights into the suitability and usability of ICT appliances for older people. As a result, this work presents the GUIDed system that aims at supporting the independence and quality of life of older people by using augmented reality as the central element of the user's interaction, whereby the paper's focus is placed on the technical development. The system is comprised of five services that are related to older people's daily activities or issues and social needs. These include the intake of medication, navigation, communication, smart home control and safety. Finally, a mobile application is included that allows older people to access all the services in an Augmented Reality (AR) interaction mode, while a conventional accessible user interface (UI) is also provided in the case an older adult prefers this as an interaction method.

Co-designing software and co-building inclusive territories: experimentation on a campus as a decisive space for empowerment (20 minutes)

Bodin Franck and Laidebeur Marie-Lavande.

Abstract:

The mobilization of all expertise (digital, scientific, users with various profiles) and the co-design of a digital application on the "Cité Scientifique" campus (University of Lille) aims at the co-construction of an innovative digital tool for data visualization and interactive mapping as a vector for optimizing spaces, mobility, equality, and inclusion of all populations. The design process, like the ITC tool itself, must increase and combine the skills of groups as individuals, and improve their interactions with spaces. The final goal is to allow the dissemination of the tool within civil society with a constantly increasing demand and users awaiting solutions. GEVU (Global Evaluation and Visualization of Uses) is a multimodal assistive ICT device to empower people and the outcome of a new participatory method with end users. GEVU can be used by all, especially people with sensory, cognitive, motor, balance and spatial impairments.

Detection and Monitoring of the Destructive Impacts in the Social Networks using Machine Learning Methods (20 minutes)

Elena Doynikova, Alexander Branitskiy and Igor Kotenko.

Abstract:

With the growing importance of the digital world, it becomes more and more important to ensure people's, especially young people's, security in the digital world as a whole and in the social networks, particularly. In this paper the authors introduce for the first time the developed full-cycle methodology for detection and monitoring of the presence of destructive impacts via their manifestation in young people profiles in the social network. The research uses information technology methods together with psychological methods. The paper describes the proposed methodology and the techniques included in it as well as the results of the experiments. The methodology should help to determine the features of destructive impacts for further development of recommendations for young people on how to identify and resist them.

Tuesday, 09 November

LUNCH BREAK

13:10 – 14:00 (CET)

Session-5: Brain Functions Support - 2

14:00 – 15:30 (CET)

Chair: Ngoc-Tan Truong

Bibo the dancing cup: Reminding people suffering from dementia to drink (30 minutes)

Avgi Kollakidou, Kevin Lefeuvre, Christian Sønderskov Zarp, Oskar Palinko, Norbert Krüger and Eva Hornecker.

Abstract:

We present the concept and technical realisation for a cup that moves and lights up so as to bring itself to the attention of a person with dementia, to trigger taking a sip as a response. The concept is aimed at people with dementia in home or resident care who still have the ability to act, but tend to mentally drift away and thus require external impulses and triggers. The cup moves and lights up in regular intervals if it has not been picked up recently. Once it is emptied, it alerts a caregiver to refill. Moreover, the degree or level of movement and light can be configured, depending on the person's needs and reactions. This paper describes the core idea and focuses on the technical aspects of building a prototype on Technology Readiness Level (TRL) 3.

Don't be afraid! Design of a playful cleaning robot for people with dementia (30 minutes)

Sophie Grimme, Avgi Kollakidou, Christian Sønderskov Zarp, Eva Hornecker, Norbert Kruger and Emanuela Marchetti.

Abstract:

Robot technologies for care homes and people affected by dementia has become a popular research field. However, such technologies have not become mainstream in care homes yet, due to specific issues related to the wellbeing of their residents. For instance, although existing robot vacuum cleaners can provide meaningful support to hygiene practices in care homes, their appearance and loud noise can negatively affect residents. Building on these insights, we developed a playful alternative design. By testing our design in a care home, we have found that a robotic vacuum cleaner can be accepted by residents affected by dementia, when it has a playful appearance and movement pattern, to elicit positive feelings and provide predictability of its actions.

An Engineering Approach towards Multi-Site Virtual Molecular Tumor Board Software Support (30 minutes)

Richard Henkenjohann, Benjamin Bergner, Florian Borchert, Nina Bougatf, Hauke Hund, Roland Eils and Matthieu-P. Schapranow.

Abstract:

Molecular tumor boards are an emerging platform for multidisciplinary oncology care specialists to assess treatment options based on the patient's individual molecular tumor profile. However, they require complex manual preparation, e.g., data retrieval from widespread knowledge bases. We define clinical process models and a software prototype supporting the adoption of virtual molecular tumor boards across multiple clinical sites. Together with real-world experts, we created software prototypes to optimize the individual steps of preparing, conducting, and follow-up after molecular tumor boards. Thus, our Web-based prototype supports oncologists in selecting individual treatment options more effectively.

BREAK

15:30 – 16:00 (CET)

Tuesday, 09 November

Session-6: ICT & Wellbeing – 2

16:00 – 17:10 (CET)

Chair: Avgi Kollakidou

What Are IBD Patients Talking About on Twitter? (30 minutes)

Maya Stemmer, Yisrael Parmet and Gilad Ravid.

Abstract: In recent years, social networking sites and online communities have served as alternate information sources for patients, who use social media to share health and treatment information, learn from each other's experiences, and provide social support. This research aimed to investigate what patients with Inflammatory Bowel Disease (IBD) are talking about on Twitter and to learn from the experiential knowledge of living with the disease they share online. We collected tweets of 337 IBD patients who openly tweeted about their disease on Twitter and used the Natural Language Understanding (NLU) module by IBM Cloud to apply category classification and keywords extraction to their tweets. To evaluate the results, we suggested a method for sampling the general population of Twitter users and forming a control group. We found statistically significant differences between the thematic segmentations of the patients and those of random Twitter users. We identified keywords that patients frequently use in the contexts of health, fitness, or nutrition, and obtained their sentiment. The results of the research suggest that the personal information shared by IBD patients on Twitter can be used to understand better the disease and how it affects patients' lives. By leveraging posts describing patients' daily activities and how they influence their wellbeing, we can derive complementary knowledge about the disease that is based on the wisdom of the crowd.

A Wearable Device to Overcome Post-Stroke Learned Non-Use. The Rehabilitation Gaming System for wearables.

Methodology, Design and Usability (20 minutes)

Javier de la Torre Costa, Belén Rubio Ballester and Paul F.M.J. Verschure.

Abstract: After a stroke, a great number of patients experience persistent motor impairments such as hemiparesis or weakness in one entire side of the body. As a result, the lack of use of the paretic limb might be one of the main contributors to functional loss after clinical discharge. We aim to reverse this cycle by promoting the use of the paretic limb during activities of daily living (ADLs). To do so, we describe the key components of a system that is composed of a wearable bracelet (i.e., a smartwatch) and a mobile phone, de-signed to bring a set of neurorehabilitation principles that promote acquisition, retention and generalization of skills to the home of the patient. A fundamental question is whether the loss in motor function derived from learned-non-use may emerge as a consequence of decision-making processes for motor optimization. Our system is based on well-established rehabilitation strategies that aim to reverse this behaviour by increasing the reward associated with action execution as well as implicitly reducing the expected cost of using the paretic limb, following the notion of the reinforcement-induced movement therapy (RIMT). Here we validate an accelerometer-based measure of arm use, and its capacity to discriminate different activities that require increasing movement of the arm. The usability and acceptance of the device as a rehabilitation tool is tested using a battery of self-reported and objective measurements obtained from acute/subacute patients and healthy controls. We believe that an extension of these technologies will allow for the deployment of unsupervised rehabilitation paradigms during and beyond the hospitalization time.

The Design of Novel Cellular Biomedical Technologies: Implications for Responsibility, Transparency and Patient Wellbeing (20 minutes)

Beth Strickland Bloch

Abstract: There are many novel cell-based technologies currently under development in university laboratories across the United States. These technologies fall under the labels of genetic engineering, synthetic biology, and nano-sized drug delivery, and are intended to treat patients at the cellular level. The early-stage designers of these technologies are often researchers working in laboratory groups associated departments of biomedical engineering. Although these groups play a critical role within the context of healthcare, they are rarely considered as having a fiduciary relationship with patients and a duty to provide trustworthy technologies. In this short paper, part of the results of a laboratory ethnography of cellular biomedical engineers is presented. Based on observations, interviews, and document analysis, the design practices of laboratory groups developing novel cellular technologies is considered. Using the conceptual tenets of Value Sensitive Design (VSD), the values of responsibility, transparency, and wellbeing are implicated in this analysis. The relationship cellular biomedical engineering laboratories have with the principles of translational medicine are also found to strongly influence laboratory activities.

Closing Session

17:10 – 17:30 (CET)