POLISH NATIONAL AGENCY FOR ACADEMIC EXCHANGE

STER PROGRAMME

name of the unit:		symbol:
DIVISION OF DATA SCIENCE AND HUMAN COMPUTER INTERACTION Institute of Information Technology, Lodz University of Technology		I-72 http://www.it.p.lodz.pl
head of the unit:	potential promoters:	contact person:
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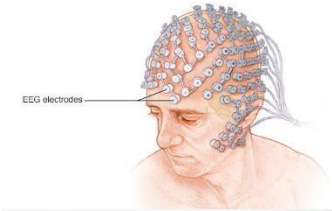
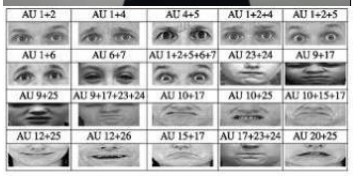
scope of activities:

The main areas of research include contemporary challenges in the intelligent analysis of medical, sensory, or statistical data, but also the creation of natural, affective user interfaces and immersive visualization in virtual and augmented reality environments. In particular:

- processing and analysis of biophysiological data, including EEG data using statistical methods, machine learning techniques, or feature selection. Research concerns both the analysis of mental states and brain-computer interfaces,
- processing and analysis of environmental data in the problem of control of HVAC systems and rationalization of energy consumption,
- processing and analysis of sensory data in human-machine interaction,
- affective user interfaces, affective computing, facial image analysis, eye tracking,
- creation of immersive virtual environments and augmented reality environments for computer games and simulations, visualization of architectural heritage, or cognitivemotor rehabilitation.

graphic material





present activities:

Research in the field of analysis and processing of EEG signals aims to increase the effectiveness of classification of mental states: valence, arousal, dominance and to create methods for efficient detection of imaginary motor tasks in the context of BCI.

Independent research concerns modelling of environmental phenomena in office buildings, hotels, schools and offices to create methods for effective control of HVAC systems, rationalization of energy consumption, anomaly detection.

Research in the field of virtual environments and augmented reality focuses on the creation of ergonomically correct, stimulation environments, both in the area of computer games and serious games in the tasks of neuro-rehabilitation, cognitive and motor rehabilitation in the elderly and popularization of cultural heritage.

A derivative element is the creation of natural methods of human-computer interaction that ensure effective implementation of immersive tasks. Research in the area of user interfaces, on the other hand, consists mainly in the search for marker and marker less methods for analysing images from video cameras and stereo pairs. Natural communication through voice and facial movement analysis is also not negligible.

Future activities:

Each of the research threads is actively working to improve existing solutions and create new ones.

The portfolio of research groups was created as part of the Programme "STER" – Internationalisation of doctoral schools" as part of the realization of the project "Curriculum for advanced doctoral education & taining – CADET Academy of Lodz University of Technology".

Keywords:

Machine learning, regression, classification, feature selection, EEG, HRV, affective computing, face analysis, micro expressions, eye tracking, VR, AR, gaming, stereoscopy, HVAC, HCI, BCI

List of internship proposal in this research team:

- Wojciechowski, A., Wiśniewska, A., Pyszora, A., Liberacka-Dwojak, M., & Juszczyk, K. (2021). Virtual reality immersive environments for motor and cognitive training of elderly people–a scoping review. *Human Technology*, *17*(2), 145-163.
- Dura, A., Wosiak, A., Stasiak, B., Wojciechowski, A., & Rogowski, J. (2021, June). Reversed Correlation-Based Pairwised EEG Channel Selection in Emotional State Recognition. In *International Conference on Computational Science* (pp. 528-541).
- Opałka, S., Stasiak, B., Wosiak, A., Dura, A., & Wojciechowski, A. (2021, June). EEG-Based Emotion Recognition–Evaluation Methodology Revisited. In *International Conference on Computational Science* (pp. 525-539). Springer, Cham.
- Project NCBR pt. „Predictive energy management system EnMS", 01.07.2020 - 30.06.2023 r., POIR.01.01.01-00-0281/20
- Project NCBR pt. „Grydsen-innovative psychological therapies for seniors using VR technology", 01.10.2020-30.09.2022 r., POIR.01.01.01-00-0951/19-00
- Project CHISTERA pt."ReHaB - Towards an ecologically valid symbiosis of BCI and head-mounted VR displays: focus on collaborative post-stroke neurorehabilitation", Nr: CHIST-ERA-20-BCI-004, 2022-2024

List of attachments:

Each research area has an open list of post-doctoral fellowships and post-doc positions, as well as a wide range of graduate degrees that can be completed through projects or collaborations with industry.