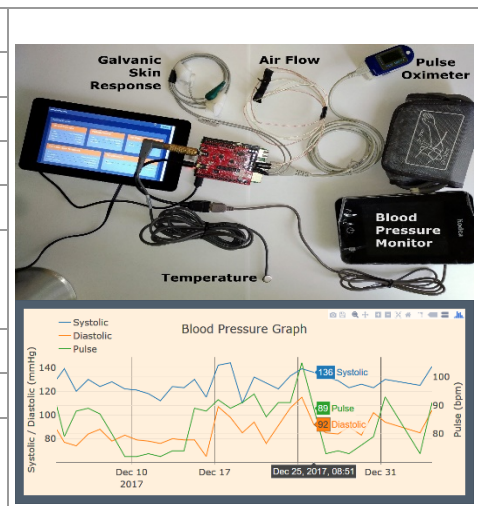


INTELLIGENT EMBEDDED SYSTEMS

Contact details

Name	Intelligent Embedded Systems
Acronym	IES
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Areas of expertise

IES laboratory research topics are both fundamental (basic) and applied researches. The main topics for the theoretical research are learning systems, machine learning and for the applied research are wearable computing, mobile robotics, neural networks hardware implementation and ambient intelligent systems development.

Main research topics

- Implementation of Intelligent embedded systems with learning capacity and adaptive behaviour using field programmable gate areas (FPGA)
- Deep Learning Inference Acceleration using Adaptable accelerator cards
- Hardware implementation of artificial neural networks in FPGA circuits
- Assistive robots and automated guided vehicles (AGV)
- Activity and health status monitoring platform development
- e-Health and Ambient assisted living systems
- Human computer interfaces
- Intelligent sensors devices, adaptive interfaces with hardware implemented artificial neural networks

Team

Prof. Dr. Eng. Oniga Ștefan, Assist. Prof. Dr. Eng. Buchman Attila, Assist. Prof. Dr. Orha Ioan, Assist. Prof. Dr. Lung Claudiu, Assist. Prof. Dr. Sabou Sebastian, PhD. Students: Alexan Anca, Alexan Alexandru, Pap Iuliu, Vancea Alexandru, Pop Adrian, Costea Marius, Sandor Roxana.

Representative projects

CRIMIGE: "Regional Center for Training and Monitoring of the Environmental Impact of Electrical Installations", 2020-2022
 Human Activity Recognition (HAR) and Physiological Parameters Monitoring Systems, 2018-2020
 Theoretical and experimental contributions in the field of orientation and navigation of intelligent systems, 2017
 Solutions regarding Intelligent Embedded Systems for Active and Assisted Living, 2016
 Electromagnetic field simulation of capacitive touch sensors, 2015
 Human activity recognition and physiological parameters monitoring systems, 2015
 Intelligent embedded systems with learning capability and adaptive behaviour, 2013
 "Research regarding the implementation of a neural network used to process signals generated by the muscular and nervous system." CNCSIS Contract No. 171/02.10.2007, TD-11.
 Electronic Nose, "Contributions regarding the study, the synthesis and the implementation of certain applications using systems with intelligent sensors" CNCSIS Contract No. 602/2007, code TD-277.
 Sensorial system for hand gesture recognition using artificial neural networks, 2002-2005

Significant results

The most representative publications of the past 5 years

1. Pap, I.A.; Oniga, S. A Review of Converging Technologies in eHealth Pertaining to Artificial Intelligence. *Int. J. Environ. Res. Public Health* 2022, 19, 11413. DOI: 10.3390/ijerph191811413
2. Xie, Y.; Majoros, T.; Oniga, S. FPGA-Based Hardware Accelerator on Portable Equipment for EEG Signal Patterns Recognition. *Electronics* 2022, 11, 2410. DOI: 10.3390/electronics11152410
3. Majoros, T.; Oniga, S. Overview of the EEG-Based Classification of Motor Imagery Activities Using Machine Learning Methods and Inference Acceleration with FPGA-Based Cards. *Electronics* 2022, 11, 2293. DOI: 10.3390/electronics11152293

4. A. Alexan, A. Alexan and Ş. Oniga, "Smartwatch activity recognition feature comparison using ML.net," 2022 IEEE International Conference on Automation, Quality and Testing, Robotics (AQTR), 2022, pp. 1-6, DOI: 10.1109/AQTR55203.2022.9801919.
5. A. Alexan, A. Alexan and S. Oniga, "Activity recognition using unsupervised learning," in 2022 IEEE International Conference on Automation, Quality and Testing, Robotics (AQTR), Cluj-Napoca, Romania, 2022 pp. 1-6. DOI: 10.1109/AQTR55203.2022.9801956
6. X. Yu, T. Majoros, S. Oniga, "Hardware Implementation of CNN Based on FPGA for EEG Signal Patterns Recognition," 2021 International Conference on e-Health and Bioengineering (EHB), 2021, pp. 1-4, DOI: 10.1109/EHB52898.2021.9657679
7. Majoros Tamás, Oniga Stefan, Xie Yu, Motor imagery EEG classification using feedforward neural network, ANNALES MATHÉMATIQUES ET INFORMATIQUES 53 pp. 235-244, 10 p. (2021), DOI: 10.33039/ami.2021.04.007
8. T. Majoros and S. Oniga, "Comparison of Motor Imagery EEG Classification using Feedforward and Convolutional Neural Network," IEEE EUROCON 2021 - 19th International Conference on Smart Technologies, 2021, pp. 25-29, DOI: 10.1109/EUROCON52738.2021.9535592.
9. T. Majoros and S. Oniga, "Activity recognition using consumer-grade EEG device," 2021 13th International Conference on Electronics, Computers and Artificial Intelligence (ECAI), 2021, pp. 1-6, DOI: 10.1109/ECAI52376.2021.9515106.
10. Suto, J., Oniga, S., Lung, C. et al. Comparison of offline and real-time human activity recognition results using machine learning techniques. Neural Comput & Applic 32, 15673–15686 (2020).DOI: 10.1007/s00521-018-3437-x (IF: 4.774)
11. I. A. Pap, S. Oniga and A. Alexan, "Machine Learning EEG Data Analysis For eHealth IoT System," 2020 IEEE International Conference on Automation, Quality and Testing, Robotics (AQTR), 2020, pp. 1-4, DOI: 10.1109/AQTR49680.2020.9129966.
12. A. Alexan, A. Alexan and O. Stefan, "SoC based IoT sensor network hub for activity recognition using ML.net framework," 2020 IEEE 26th International Symposium for Design and Technology in Electronic Packaging (SIITME), 2020, pp. 184-187, DOI: 10.1109/SIITME50350.2020.9292278.
13. A. Alexan, A. Alexan and O. Ştefan, "Machine learning activity detection using ML.Net," 2020 IEEE 26th International Symposium for Design and Technology in Electronic Packaging (SIITME), 2020, pp. 188-191, DOI: 10.1109/SIITME50350.2020.9292294.
14. J Suto, S Oniga, Efficiency Investigation from Shallow to Deep Neural Network Techniques in Human Activity Recognition, Cognitive Systems Research, Volume 54, May 2019, Pages 37-49, (IF: 1.425)
15. Suto, Jozsef; Oniga, Stefan, Efficiency investigation of artificial neural networks in human activity recognition JOURNAL OF AMBIENT INTELLIGENCE AND HUMANIZED COMPUTING Volume: 9 Issue: 4 Special Issue: SI Pages: 1049-1060 Published: AUG 2018, (IF: 1.91)
16. Alexan, Alexandru; Alexan, Anca; Oniga, Stefan; et al., Assisted living personal tracker framework 2018 IEEE INTERNATIONAL CONFERENCE ON AUTOMATION, QUALITY AND TESTING, ROBOTICS (AQTR) Book Series: IEEE International Conference on Automation Quality and Testing Robotics Published: 2018
17. Suto, Jozsef; Oniga, Stefan, Music Stimuli Recognition in Electroencephalogram Signal ELEKTRONIKA IR ELEKTROTEHNIKA Volume: 24 Issue: 4 Published: 2018
18. Pap, Iuliu Alexandru; Oniga, Stefan; Orha, Ioan; et al., IoT-Based eHealth Data Acquisition System 2018 IEEE INTERNATIONAL CONFERENCE ON AUTOMATION, QUALITY AND TESTING, ROBOTICS (AQTR) Book Series: IEEE International Conference on Automation Quality and Testing Robotics Published: 2018
19. Suto, Jozsef; Oniga, Stefan; Sitar, Petrica Pop, Music Stimuli Recognition from Electroencephalogram Signal with Machine Learning Conference: 7th International Conference on Computers Communications and Control (ICCCC) Location: Oradea, ROMANIA Date: MAY 08-12, 2018, Pages: 260-264 Published: 2018
20. Suto, J.; Oniga, S.; Sitar, P. Pop, Feature Analysis to Human Activity Recognition INTERNATIONAL JOURNAL OF COMPUTERS COMMUNICATIONS & CONTROL Volume: 12 Issue: 1 Pages: 116-130 Published: FEB 2017

Oniga Stefan – AGEPI Medal - International Fair of Inventions and Practical Ideas "INVEST-INVENT SIR 21" – Gesture recognition system.

Oniga Stefan, Pap Iuliu, Diploma of excellence of the Society of Inventors from Romania, for: "E-Health platform for measurement and monitoring physiological parameters" at the Maramures Inventors Salon, 2019.

The offer addressed to the economic environment

Research & development	Hardware implementation of artificial neural networks in FPGA circuits. Intelligent sensors network Adaptive interfaces with learning capabilities able to adapt to the input signals changes Development of an intelligent platform (with learning capabilities and adaptive behaviour) for health condition monitoring of elderly or persons with disabilities, using wearable wireless sensor Mobile applications
Consulting	Embedded systems with microcontrollers and FPGAs Data acquisition systems
Training	Design with microcontrollers Design with FPGA circuits

Last updated: January 2023