

MEDICAL ENGINEERING RESEARCH GROUP

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Acronym	ME	
Logo		
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Areas of expertise

Laboratory of **Biomedical instrumentation, Applied medical electronics, Clinical engineering, Digital biosignal processing, Biometry**

Laboratory of **Biomedical Signal Processing, Biomedical Measurements, Biomedical Data Transmission, Medical Physics, Physiological modelling, Reverse engineering of cardiovascular devices, Medical Image Analysis**

Team

Prof. Dr. Eng. Radu Vasile Ciupa, Prof. Dr. Eng. Nicolae Marius Roman, Prof. Dr. Eng. Dan Rafiroiu, Prof. Dr. Eng. Mihai Munteanu, Assoc. Prof. Dr. Eng. Simona Vlad, Assoc. Prof. Dr. Eng. Rodica Holonec, Lecturer Dr. Eng. Anca Nicu, Lecturer Dr. Eng. Angela Lungu, Assoc. Prof. Med. Elena Gligor, Assoc. Prof. Dr. Med. Adrian Iancu, Senior Researcher Dr. Eng. Stefan Gergely, Dr. Eng. Vasile Pompas, Prof. Dr. Eng. Math, Dan Doru Micu, Drd. Eng. Ciprian Mugurel Fort

Representative projects

„**Sistem suport decizional pentru planificarea interventionala a pacientilor CTEPH bazat pe modelare multi-scara si inteligenta artificiala**”, PN-III-P1-1.1-PD-2021-0601 (2022-2024)

“**COST Action MyWAVE CA17115**”, www.cost.eu/COST_Actions/ca/CA17115?management (2018-2023)

“**Wheelchair for People with Locomotor Disabilities**”, (2019-2022)

“**Burse doctorale si postdoctorale pentru cercetare de excelenta**”, POSDRU/159/1.5/S/134378 UTCN, (2014-2015)

“**VIPRO Platform**”, PN-II-PT-PCCA-2013-4-2009, (2013-2016)

“**Advancing University Education in Biomedical Engineering and Health Management in Kyrgyzstan**”, KyrMedu (2016-2019)

“**Medical Devices Design in Cardiovascular Applications (MeDDiCA)**”, European FP7 project, www.meddica.eu

“**Sensors and equipment for the quality control of various food supplies**”, PN II, (2007-2013)

“**Complex architecture for monitoring and medical data transmission**”, Exploratory research project, (2009-2012)

SPINSTIM, “**Functional stimulation of the spinal cord**”, Romanian-Austrian bilateral contract, (2009-2011)

“**Neural magnetic stimulation**”, PNII-IDEI, (2007-2010)

Significant results

The most representative publications of the past 5 years:

1. Baraikan, A.A.; Czechowicz, K.; Morris, P.D.; Halliday, I.; Gosling, R.C.; Gunn, J.P.; Narracott, A.J.; Williams, G.; Garg, P.; Malawski, M. Van de Vos F., Lungu A, Rafiroiu D, Hose R; et al., “*Modelling The Hemodynamics of Coronary Ischemia*”, *Fluids* (2023), 8, 159. <https://doi.org/10.3390/fluids8050159>
2. Djoumessi, R.T., Rafiroiu, D.-V., Pelap, F.B., “*Thermoelectric model to study the cardiac action potential and arrhythmias*”, *AIP Advances*, 2022, 12(5), 055107
3. Ianovici M., Vlad S., Lungu A., “*Classification of Hemorrhagic Stroke Lesions Based on CT Images and Machine Learning Algorithms. A Study on a Highly Imbalanced Dataset*”, 8th International Conference on Advancements of Medicine and Health Care through Technology; 20–22 October 2022, *IFMBE Proceedings*, vol 102 (2024), ISBN 978-3-031-51119-6, pp.30-39, Springer Nature
4. Ciaca OC., Vlad S., “*Cataract Diagnosis Using Convolutional Neural Networks Classifiers. A Preliminary Study*”, 8th International Conference on Advancements of Medicine and Health Care through Technology; 20–22 October 2022, *IFMBE Proceedings*, vol 102 (2024), ISBN 978-3-031-51119-6, pp.60-68, Springer Nature

5. Adela Pop, Alexandra Fanca, Honoriu Valean, Dan-loan Gota, Ovidiu Stan, Marius Nicolae Roman, Iulia Clitan, and Vlad Muresan, "eHealth Mobile Application Using Fitbit Smartwatch", 8th International Conference on Advancements of Medicine and Health Care through Technology; 20–22 October 2022, *IFMBE Proceedings*, vol 102 (2024), ISBN 978-3-031-51119-6, pp.115-125, Springer Nature
6. Cosmin Dîrzu, Mihai Munteanu, „Evaluation of an Electrical Modified Surgical Circular Stapler: A testing and validation study”, in Proceedings of the 10th International Conference on Modern Power Systems MPS 2023, Cluj-Napoca, 2023
7. Djoumessi, R.T., Rafiroiu, D.-V., Pelap, F.B., "Thermoelectric model to study the cardiac action potential and arrhythmias", *AIP Advances*, 2022, 12(5), 055107
8. D R Hose, PV Lawford, I Halliday, D Rafiroiu and A Lungu,(2022), "Challenges and progress in the application of physiological models for clinical decision support in cardiovascular medicine", IOP Conf. Ser.: Mater. Sci. Eng. 1254 012005, DOI 10.1088/1757-899X/1254/1/012005
9. Michal K. Grzeszczyk, Tadeusz Sattawa, Angela Lungu, Andrew Swift, Andrew Narracott, Rod Hose, Tomasz Trzcinski and Arkadiusz Sitek (2022). „Noninvasive Estimation of Mean Pulmonary Artery Pressure Using MRI, Computer Models, and Machine Learning”, In: Groen, D., de Mulatier, C., Paszynski, M., Krzhizhanovskaya, V.V., Dongarra, J.J., Sloot, P.M.A. (eds) Computational Science – ICCS 2022. ICCS 2022. Lecture Notes in Computer Science, vol 13352. Springer, Cham. https://doi.org/10.1007/978-3-031-08757-8_2
10. Holonec R., Vlad S., Roman N.M., Rapolti L. "Smart House Control using Hand Gestures Recognition LabVIEW Applications", 7th International Conference on Advancements of Medicine and Health Care through Technology; 13–15 October 2020, *IFMBE Proceedings*, vol 88 (2021), ISBN 978-3-030-93563-4, pp.240-249, Springer Nature
11. Puscasiu A., Fanca A., Valean H., Gota D.I., Stan O., Roman N.M., Citan I., Muresan V., "Indoor Air Quality Monitoring System Applied in Healthcare Facilities", 7th International Conference on Advancements of Medicine and Health Care through Technology; 13–15 October 2020, *IFMBE Proceedings*, vol 88 (2021), ISBN 978-3-030-93563-4, pp.399-408, Springer Nature
12. Danciu A.S., Vlad S., Leordeanu M., "Automatic Liver and Hepatic Tumors Segmentation in CT Images Using Convolutional Neural Networks", 7th International Conference on Advancements of Medicine and Health Care through Technology; 13–15 October 2020, *IFMBE Proceedings*, vol 88 (2021), ISBN 978-3-030-93563-4, pp. 207-216, Springer Nature
13. Rapolti L., Holonec R., Grindei L., Vitman O., "Automated Sorting of Pharmaceutical Waste Using Machine Vision Technology", 7th International Conference on Advancements of Medicine and Health Care through Technology; 13–15 October 2020, *IFMBE Proceedings*, vol 88 (2021), ISBN 978-3-030-93563-4, pp.409-4016, Springer Nature
14. Nicu A.I., Martis C.S., "Current Trends in Assistive Upper-Limb Rehabilitation devices", 7th International Conference on Advancements of Medicine and Health Care through Technology; 13–15 October 2020, *IFMBE Proceedings*, vol 88 (2021), ISBN 978-3-030-93563-4, pp.355-361, Springer Nature
15. Daniel Ivaşcu, Mihai Munteanu, „Low Cost Environmental Monitoring System for the Incubators used in Maternity Hospitals”, in Proceedings of the 9th International Conference on Modern Power Systems MPS 2021, Cluj-Napoca, 2021

Significant solutions:

- High efficiency solution for medical telemetry ECG. Proved method in pathological PCG analysis.
- Efficient mathematical algorithms used in biomedical signal processing.
- A data read algorithm based on ZACwire, the protocol for temperature precision sensor TSic 306
- Development of portable biomedical instrumentation.
- Smart solutions and low cost systems for medical and biomedical signal processing and transmission;
- Smart solutions to assess the patient rehabilitation in post-traumatic periods;
- High accuracy reconstruction of the 3D geometry of vessels, cavities and cardiovascular devices;
- Development of a multiscale CFD-FSI double-valve model of the left ventricle to study the valve-valve interaction;
- Experimental and computational study of the hemolytic and cavitation effects of bileaflet mechanical heart valves;
- Computational analysis of thrombus absorption efficiency for different commercial catheter designs;
- Image based and artificial intelligence solutions for patients diagnosis
- Computational assessment of high frequency electromagnetic (cell phone) field effects on implanted carotid stents;

Products and technologies:

- Low consumption battery powered DSP devices for ECG and PCG signal analysis
- Wheelchair for people with locomotor disabilities

The offer addressed to the economic environment

Research & development	National Institute for Research and Development of Isotopic and Molecular Technologies www.itim-cj.ro Military Emergency Hospital Dr. Constantin Papilian, Cluj-Napoca, www.smucluj.ro The Sano – Centre for Computational Personalised Medicine – International Research Foundation, Cracovia, Polonia County Emergency Hospital Bistrita-Nasaud, http://spital.bistrita.ro/ S.C. Comelf S.A. Bistrița Datronix Computer Ltd., Cluj-Napoca, www.datronix.ro
Consulting	Consulting in the areas of medical signal measurements, medical signal processing and data transmission, medical image processing, FDA regulations of cardiovascular devices.
Training	CFD-FSI analysis, Multiphysics and multiscale modelling, Computational methods for cardiovascular devices design, Computational methods for electromagnetic dosimetry

Last update on January 2024