

Odjel elektrotehnike i elektronike

Zagreb, 8. prosinca 2025.

IZVJEŠTAJ O RADU ODJELA ELEKTROTEHNIKE I ELEKTRONIKE ZA 2025. GODINU

U 2025. godini članovi Odjela su nastavili rad na znanstvenim projektima:

- Projekt Sveučilišta u Rijeci financiranog iz EU kroz Nacionalni plan opravka i otpornosti: "Duboko učenje u upravljanju pametnim energetske sustavima," (no. uniri-mzi-25-1)(2025-2029)
- Bilateralni hrvatsko-kineski projekt "Adaptivni postupci za integraciju sažetog uzorkovanja i dubokog učenja" (2025-2026)
- Bilateralni hrvatsko-slovenski projekta "Predviđanje anomalnih putanja pomoću strojnog učenja" (2025-2026)
- Potpore Sveučilišta u Rijeci: "Napredna analiza podataka korištenjem tehnika digitalne obrade signala i strojnog učenja" (br. UNIRI-ISKUSNI-TEHNIC-23-11)(2024-2026)
- Potpora Sveučilišta u Rijeci: "Složene poplave u priobalnim rijekama u sadašnjoj i budućoj klimi" (br. UNIRI-ISKUSNI-TEHNIC-23-83) (2024-2026)
- Inozemnom crnogorski projekt Data Processing on Graphs (Obrada podataka na grafovima), (2024-2027)
- EU Horizon (Clean Hydrogen Partnership) projekt "Dolina vodika Sjeverni Jadran" (1.9.2023.-31.8.2029.)
- Potpora Sveučilišta u Rijeci "Razvoj računalnih algoritama temeljenih na metodama digitalne obrade signala i umjetne inteligencije uz primjenu u suvremenim prometnim sustavima" (UNIRI-ZIP-2103-4-22)
- EU Horizon projekt „INNO2MARE: Strengthening the Capacity for Excellence of Slovenian and Croatian Innovation Ecosystems to Support the Digital and Green Transitions of Maritime Regions“ (br. 101087348),(2023-2026)
- EU projektu European Digital Innovation Hub „EDIH Adria“, (2023-2026)
- Istraživački projekt - Alat za preventivni redišpeč elektroenergetskog sustava temeljen na optimalnim izmjeničnim tokovima snaga, NPOO 2021.-2026., voditelj: prof. dr. sc. Hrvoje Pandžić
- “Maximising Impact of Multidisciplinary Research in Early Diagnosis of Neonatal Brain Injury” (projekt: CA20124), European Cooperation in Science and Technology (COST); član MC i suradnik
- “Poboljšanje i rekonstrukcija slike temeljena na uvjetu prorijeđenosti s adaptivnim izračunom praga” (projekt: UNIRI-ISKUSNI-TEHNIC-23-90), Sveučilište u Rijeci; suradnik
- “Distribuirane modulacijske metode u višerazinskim elektroničkim energetske pretvaračima” (projekt: UNIRI-MZI-25-9), Sveučilište u Rijeci; suradnik
- Projekt STRES s tvrtkom ams-OSRAM (Austrija, Njemačka) vezan za analizu mehaničkog stresa u čipovima i utjecaju stresa na CMOS sklopove.

- Projekt CANFD s tvrtkom ams-OSRAM (Austrija, Njemačka) vezan za projektiranje IP blokova kao npr. CAN-FD, SPMI, te Arm, ARC i RISC-V procesira te potrebnih periferija i veznih sklopova.
- Projekt AMSPAD s tvrtkom ams-OSRAM (Austrija, Njemačka) vezan za projektiranje test blokova za određivanje parametara tehnologije koja se koristi u tvrtki ams-OSRAM.
- Projekt Important Project of Common European Interest on Microelectronics (IPCEI ME) u suradnji s tvrtkom Infineon (Austrija) vezan za razvoj kapaciteta u području energetske elektronike.
- Projekt RePowerFER (NPOO-IIP-2025) vezan za Otporne samoobnavljajuće energetske sustave budućnosti
- Koordinacija i nadzor provede Strategije digitalizacije Grada Osijeka (financirano izravno od strane Grada Osijeka)
- TruPS - Enhancing Trusted Transatlantic Data Processing and Storage with Fully Homomorphic Encryption (trups.eu)
- Fundamental principles of sensor network metrology (<https://www.funsnm.eu/>)
- Support for standardisation of sample-by-sample waveform uncertainty computation (<https://www.ptb.de/epm2023/sbsuncert/home>)
- Automated, Adaptive and Uncertainty-aware Smart Measurements using Machine Learning (<https://www.a3smartml.ptb.de/about>)
- Istraživanje naprednih algoritama i rješenja inovativne poslovne inteligencije u oblaku - NPOO.C3.2.R3-I1.04.0128
- heptabit CLOAK&DAGGER - IP.1.1.03.0006

Sudjelovalo se:

- na panelu događanja „Future Labs, Automation & Technology Europe“ (London) https://www.linkedin.com/posts/kruno-milicevic-60760521_congratulations-to-the-amg-world-and-all-activity-7402240252951728128-KyB
- na Future Labs Live (Basel): https://www.linkedin.com/posts/kruno-milicevic-60760521_today-may-28-kruno-milicevic-the-vice-chair-activity-7334112037960138752-1smc
- IEEE TC-10 "Waveform Generation, Measurement and Analysis Committee"
- IEC TC85 Working Group 22 "Measuring equipment for electrical and electromagnetic quantities"
- IMEKO TC-6 „Digitalization“, voditelj radne skupine „Software“
- Upravnog odbora Hrvatskog mjeriteljskog društva, voditelj Radne grupe „Digitalizacija“ Hrvatskog mjeriteljskog društva
- Voditelj WG Digitalization Eurolaba
- Član AIQI Consortiuma

Bili su i:

- gost urednik jednog WoS časopisa - Sensors (Special Issue „Sensors and Machine-Learning Based Signal Processing“) indeksiranog u Current Content, 2023-2025

Objavljeni su i radovi:

1. Elmazi, K.; Elmazi, D.; Lerga, J.: Proactive Context Aware Task Offloading in Digital Twin Driven Federated IoT Systems with Large Language Models, *Internet of Things*, 2026, vol. 35, no. 101826. *Internet of Things: Q1 (Scimago)*, *Q1 (Thomson Reuters)*, impact factor: 7.6
2. Elmazi, K.; Elmazi, D.; Lerga, J.: XDT-FMARL: An Explainable Federated Multi-Agent Reinforcement Learning Framework for Energy-Efficient IoT Task Offloading, *International Journal of Web and Grid Services*, 2025, vol. 21, no. 3-4, pp 398-423. *International Journal of Web and Grid Services: Q3 (Scimago)*, *Q3 (Thomson Reuters)*, impact factor: 1.4
3. Žužić, L.; Hrzić, F.; Li, X.; Lerga J: Class-Specific Image Segmentation Across Multiple Domains Using Customized U-Net Pipelines, *Expert Systems with Applications*, vol. 296, part D, 2026, no. 129203. *Expert Systems with Applications: Q1 (Scimago)*, *Q1 (Thomson Reuters)*, impact factor: 7.5
4. Elmazi, K.; Lemazi, D.; Lerga, J.: Digital Twin-Driven Federated Learning and Reinforcement Learning-Based Offloading for Energy-Efficient Distributed Intelligence in IoT Networks, *Internet of Things*, 2025, vol. 32, no. 101640. *Internet of Things: Q1 (Scimago)*, *Q1 (Thomson Reuters)*, impact factor: 6.0
5. Žužić, L.; Hrzić, F.; Lerga, J.: Forecasting the Trajectory of Personal Watercrafts Using Models Based on Recurrent Neural Networks, *Expert Systems with Applications*, 2025, vol. 284, no. 127964. *Expert Systems with Applications: Q1 (Scimago)*, *Q1 (Thomson Reuters)*, impact factor: 7.5
6. Vrsalović, I.; Lerga, J.; Ivašić-Kos, M.: A System for Real-Time Detection of Abandoned Luggage, *Sensors*, 2025, vol. 25, no. 9, no. 2872. *Sensors: Q1 (Scimago)*, *Q2 (Thomson Reuters)*, impact factor 3.4
7. Žužić, L.; Dražić, I.; Simčić, L.; Hrzić, F.; Lerga, J.: A Bayesian and Markov Chain Approach to Short-Term and Long-Term Personal Watercraft Trajectory Forecasting, *Journal of the Franklin Institute*, 2025, vol. 362 (3), no. 107509. *Journal of the Franklin Institute: Q1 (Scimago)*, *Q1 (Thomson Reuters)*, impact factor 3.7
8. Mihel, A. M.; Lerga, J.; Krvavica, N.: Regression-Based Machine Learning Approaches for Estimating Discharge from Water Levels in Microtidal Rivers, *Journal of Hydrology*, 2025, vol. 646, no. 132276. *Journal of Hydrology: Q1 (Scimago)*, *Q1 (Thomson Reuters)*, impact factor 5.9
9. Severinski, Karlo; Lopac, Nikola; Lerga, Jonatan Advancing Sea State Estimation: Current Techniques and Emerging Methodologies // *Book of Abstracts of the 9th Annual PhD Conference on Engineering and Technology MFC 2025 / Jurković, Damjan; Gržić, Marta Marija; Škec, Leo (ur.). Rijeka: University of Rijeka, Faculty of Civil Engineering, Rijeka, Croatia, 2025. str. 22-22*
10. Žužić, Lucija; Lerga, Jonatan A Versatile Image Annotation and Masking Tool // *Book of Abstracts of the 9th Annual PhD Conference on Engineering and Technology MFC 2025 / Jurković, Damjan; Gržić, Marta Marija; Škec, Leo (ur.). Rijeka: University of Rijeka, Faculty of Civil Engineering, Rijeka, Croatia, 2025. str. 25-25*
11. katić, višnja; gašparović, boris; lerga, jonatan; šimac pavičić, doris 3D Facial Soft Tissue Changes After Orthodontic Treatment // *Proceedings of the Conference on Computational and Artificial Intelligence for Mechanics and Biomechanics / Belinha,*

- Jorge; Pais, Ana Isabel; Rodrigues, Daniel et al. (ur.). Porto: Instituto Superior de Engenharia do Porto (ISEP), 2025. str. 5-5
12. Žužić, Lucija; Lerga, Jonatan A Web-Based Card Game Simulation for Optimal Strategy Development // 48th ICT and Electronics Convention MIPRO 2025 / Skala, Karolj (ur.). Rijeka: Croatian Society for Information, Communication and Electronic Technology – MIPRO, 2025. str. 1465-1470. doi: 10.1109/mipro65660.2025.11131986
 13. Severinski, Karlo; Lopac, Nikola; Lerga, Jonatan; Integrating Large Language Models Into Maritime Operations: Enhancing Automation and Decision-Making // Book of Extended Abstracts : 17th Baška GNSS Conference: Global Navigation Satellite Systems and Green Navigation and Smart Systems / Brčić, David; Valčić, Marko (ur.). Baška: University of Rijeka, Faculty of Maritime Studies, 2025. str. 167-172
 14. Lopac, Nikola; Severinski, Karlo; Krljan, Tomislav; Lerga, Jonatan; Computer Vision-Based Real-Time Vessel Detection and Tracking in Marinas // Book of Extended Abstracts : 17th Baška GNSS Conference: Global Navigation Satellite Systems and Green Navigation and Smart Systems / Brčić, David; Valčić, Marko (ur.). Baška: University of Rijeka, Faculty of Maritime Studies, 2025. str. 131-136
 15. Lorincz, Josip; Levarda, Krešimir; Čagalj, Mario; Kukuruzović, Amar; A Comprehensive Analysis of LoRa Network Wireless Signal Quality in Indoor Propagation Environments // Journal of sensor and actuator networks, 14 (2025), 6; 1-35. doi: 10.3390/jsan14060111
 16. Lorincz, Josip; Čusto, Edin; Begušić, Dinko; A Comprehensive Analysis of Methods for Improving and Estimating Energy Efficiency of Passive and Active Fiber-to-the-Home Optical Access Networks // Sensors, 25 (2025), 19; 1-39. doi: 10.3390/s25196012
 17. Lorincz, Josip; Kukuruzović, Amar; Blažević, Zoran Pregled primjene koncepta mrežnog rezanja za poboljšanje energetske učinkovitosti mobilnih mreža // Godišnjak Akademije tehničkih znanosti Hrvatske 2024 / Mornar, Vedran (ur.). Zagreb: Akademija tehničkih znanosti Hrvatske, 2025. str. 21-50
 18. Lorincz, Josip; Klarin, Zvonimir Improving the Energy Efficiency of Mobile Networks: Strategies for 5G and 6G Technologies. Boca Raton (FL): CRC Press/Taylor & Francis Group, LLC, 2025. doi: 10.1201/9781003615866
 19. I. Hrgović, I. Pavić: Sizing and Implementation of Phase-Shifting Transformer for Congestion Management in Renewable-Rich regions: A Case Study of the Croatian Power Grid, IEEE Transactions on Power Systems, Vol. 40, No. 4., Pages: 3465-3473, July 2025, doi: 10.1109/TPWRS.2025.3526264
 20. N. Vukadinović, I. Pavić, T. Alinjak: Transmission power system planning under new generation insecurity, Tehnički vjesnik – Technical Gazette, Vol. 32, No. 5, Pages: 1912-1920, <https://doi.org/10.17559/TV-20250107002247>
 21. I. Volaric and V. Sucic, “Analysis of the Image Tiling Influence in its Sparse Reconstruction,” The 31st IEEE International Conference on Telecommunications (ICT), 5 pages, Budva, Montenegro, April 2025.
 22. Ivan Porin Tolić, Michael Kleinschuster, Gregor Schatzberger, Tvrtko Mandić, Adrijan Barić, “Smart Temperature Sensor Using Ring Oscillators and All-Digital

Sigma-Delta Modulator in 180-nm Technology”, *International Journal of Circuit Theory and Applications*, vol.53, no. 12, pp. 7271 - 7280, Dec. 2025, <https://doi.org/10.1002/cta.4549>.

23. A. Žamboki, L. Gočan, J. Mikulić, G. Schatzberger, T. Mandić and A. Barić, "Stress-dependent MOSFET Model Valid in All Operating Regions For Use in Circuit Simulations," 2025 IEEE International Symposium on Circuits and Systems (ISCAS), London, United Kingdom, 2025, pp. 1-5, doi: 10.1109/ISCAS56072.2025.11043307.
24. L. Gočan, A. Žamboki, J. Mikulić, G. Schatzberger, T. Mandić and A. Barić, "CMOS-Based Wheatstone Bridge Stress Sensors Sensitive and Insensitive to Mechanical Stress," 2025 IEEE International Symposium on Circuits and Systems (ISCAS), London, United Kingdom, 2025, pp. 1-5, doi: 10.1109/ISCAS56072.2025.11044020.
25. J. Kundrata and A. Baric, "Architectural and Post-Silicon Evaluation of RISC-V vs. Cortex-M0+ SoCs," 2025 MIPRO 48th ICT and Electronics Convention, Opatija, Croatia, 2025, pp. 1773-1778, doi: 10.1109/MIPRO65660.2025.11132003.
26. L. Gočan, A. Žamboki, J. Mikulić, G. Schatzberger, T. Mandić and A. Barić, "Signal Conditioning Circuit for CMOS-Based Wheatstone Bridge Stress Sensors," 2025 MIPRO 48th ICT and Electronics Convention, Opatija, Croatia, 2025, pp. 1768-1772, doi: 10.1109/MIPRO65660.2025.11131868.
27. A. Žamboki, L. Gočan, J. Mikulić, G. Schatzberger, T. Mandić and A. Barić, "Reducing Mechanical Stress Sensitivity of Integrated Circuits Through Component Rotation in Layout," 2025 MIPRO 48th ICT and Electronics Convention, Opatija, Croatia, 2025, pp. 1762-1767, doi: 10.1109/MIPRO65660.2025.11131912.
28. Scharenberg, L., Alozy, J., Angelis, Y., Aune, S., Ballabriga, R., Bortfeldt, J., ..., Kovacic, M,... & Zhou, Y. (2025). Integration of the FastIC front-end electronics into the Picosec MicroMegs detector. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 1076, 170496.
29. Meng, Y., Aleksan, R., Angelis, Y., Bortfeldt, J., Brunbauer, F., Brunoldi, M.,..., Kovacic, M, ... & Zhou, Y. (2025). PICOSEC Micromegas precise-timing detectors: development towards large-area application and integration. *Journal of Instrumentation*, 20(03), C03015.
30. Lisowska, M., Aleksan, R., Angelis, Y., Aune, S., Bortfeldt, J., Brunbauer, F.,..., Kovacic, M, ... & Zhou, Y. (2025). Photocathode characterisation for robust PICOSEC Micromegas precise-timing detectors. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 1072, 170151.
31. Paleško, Josip; Kovačić, Marinko; Ivaniš, Tomislav; Pravica, Luka; Thermal Modelling of Multi-Layer Inverter PCB DC Link Using Orthogonal Current Excitation and Scaling Laws in 3D FEA, *IEEE 37th International Conference on Electrical Drives and Power Electronics (EDPE)*, 2025
32. Draženović, Karla; Kovačić, Marinko; Overview of on-state voltage measurement circuits for in-situ characterization of power semiconductors, *IEEE 37th International Conference on Electrical Drives and Power Electronics (EDPE)*, 2025

33. Ivaniš, Tomislav; Kovačić, Marinko; Makar, Martin; Jakopović, Željko; Hardware Implementation of Cycle-by-Cycle Optimized Active Gate Driver, IEEE 37th International Conference on Electrical Drives and Power Electronics (EDPE), 2025
34. Vedurmudi, Anupam Prasad; Miličević, Kruno; Kok, Gertjan; Yong, Bang Xiang; Xu, Liming; Zheng, Ge; Brintrup, Alexandra; Gruber, Maximilian; Tabandeh, Shahin; Zaidan, Martha Arbayani et al. Automation in sensor network metrology: An overview of methods and their implementations // Measurement. Sensors, 38 (2025), 101799, 7. doi: 10.1016/j.measen.2024.101799
35. Tabandeh, Shahin; Vedurmudi, Anupam Prasad; Söderblom, Henrik; Pourjamal, Sara; Harris, Peter; Luo, Yuhui; Gruber, Maximilian; Vaa, Michael.; Johansen, Mads; Koval, Martin et al. Sensor network metrology: Current state and future directions // Measurement. Sensors, 38 (2025), 101798, 7. doi: 10.1016/j.measen.2024.101798
36. Štajnbriker, Matej, Valek, Igor, Matić, Tomislav, Vranješ, Mario, FPGA-Based Deep Neural Network Implementation for Handwritten Digit Recognition, Advances in Multimedia, 2025, 8901861, 14 pages, 2025. <https://doi.org/10.1155/am/8901861>

Članovi Odjela su sudjelovali i u organizacijama međunarodnih konferencija i recenziranju radova:

- Baška SIF Forum 2025, Baška, Croatia, 21. – 24. rujna 2025. (predsjednik međunarodnog programskog i organizacijskog odbora)
- 21st International Conference on Computer Vision Theory and Applications (VISAPP 2026), Marbella, Spain, 9. – 11. ožujka 2026. (programski odbor)
- 20th Conference on Computer Science and Intelligence Systems FedCSIS 2022 - Topical Area 1: Advanced Artificial Intelligence in Applications (AAIA'25), Krakow, Poljska, 14. – 17. rujna 2025. (programski odbor)
- 28th European Conference on Artificial Intelligence (ECAI-2024), Bologna, Italija, 25. – 30. listopada 2025. (programski odbor)
- međunarodni Simpozij na temu: "16th Symposium on Green Networking and Computing (SGNC2025)" u okviru međunarodne znanstvene konferencije SoftCOM 2025.
- Science and Technology 2025, Vienna, Austria, September 2025.
- Član tehničkog programskog odbora međunarodne znanstvene konferencije 14th International Conference on Modern Circuits and Systems Technologies - MOCAS 2025.

Izrađeni su i stručni projekti:

- I. Pavić, A. Barta: Statistika pogonskih događaja u prijenosnoj mreži Hrvatske za 2024. godinu, FER Zagreb, lipanj 2025.
- I. Pavić, I. Hrgović: Analiza priključka baterijskih spremnika električne energije na prijenosnu mrežu Hrvatske, FER Zagreb, studeni 2025.
- I. Pavić, I. Hrgović: Proračuni tokova snaga i analize sigurnosti N-1 za potrebe priključka baterijskih spremnika električne energije na prijenosnu mrežu sjeverozapadne i istočne Hrvatske, FER Zagreb, prosinac 2025.

- I. Pavić: Proračun tokova snaga u dijelu prijenosne mreže PrP-a Zagreb nakon priključenja postrojenja Tvornice transformatora Končar D&ST na prijenosnu mrežu, FER Zagreb, prosinac 2025.

Članovi Odjela su, kao i do sada, radili kroz razne tehničke odbore i stručne udruge kojih su članovi.

PLAN RADA ODJELA ELEKTROTEHNIKE I ELEKTRONIKE ZA 2026. GODINU

U 2026. godini članovi Odjela planiraju početi i nastaviti rad na znanstvenim i stručnim projektima:

- Nastavak rada na istraživačkom projektu NPOO 2021.-2026: Alat za preventivni redispeč elektroenergetskog sustava temeljen na optimalnim izmjeničnim tokovima snaga, voditelj: prof. dr. sc. Hrvoje Pandžić
- Nastavak rada na stručnom projektu: Statistička izvješća o pogonskim događajima, prekidima napajanja i neraspoloživosti jedinica u prijenosnoj mreži, Okvirni sporazum FER-HOPS 2024-2026.
- Početak rada na novome znanstvenom projektu u okviru Znanstvenog centra izvrsnosti za znanost o podacima i kooperativne sustave (ACROSS-DataScience)
- Projekt STRES
- Projekt CANFD
- nastavak projekta AMSPAD koji će započeti od 01.01.2026. i za koji upravo ovih dana traju pregovori o detaljima
- nastavak rada na projektu IPCEI ME
- nastavak rada na projektu RePowerFER,
- te početak rada na projektu Intercharger (IRI S3) koji će započeti u 2026.
- projekta CROCCS: CROatian Competence Centre for Semiconductors,
- institucionalni istraživački projekta „Pametni sustavi temeljeni na umjetnoj inteligenciji u ugradbenim sustavima za primjenu u poljoprivredi, biomedicini i autonomnoj mobilnosti (ABA-AI)“, financiranog iz izvora 581 – Mehanizam za oporavak i otpornost.

Planiraju se i sudjelovanja na sljedećim skupovima:

- 17. Simpoziju HRO CIGRE 2026, studeni 2026.

Kao i do sada, članovi Odjela nastavljaju rad kroz razne tehničke odbore kojih su članovi.

Tajnik Odjela elektrotehnike i elektronike

Prof. dr. sc. Mario Vražić