TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA

EUROPEAN UNIVERSITY OF TECHNOLOGY

Faculty of Electronics, Telecommunications and Information Technology

May 24, 2024

Student Symposium on Electronics and Telecommunications

19th edition

NOVICE INSIGHTS IN ELECTRONICS AND TELECOMMUNICATIONS

SSET 2024

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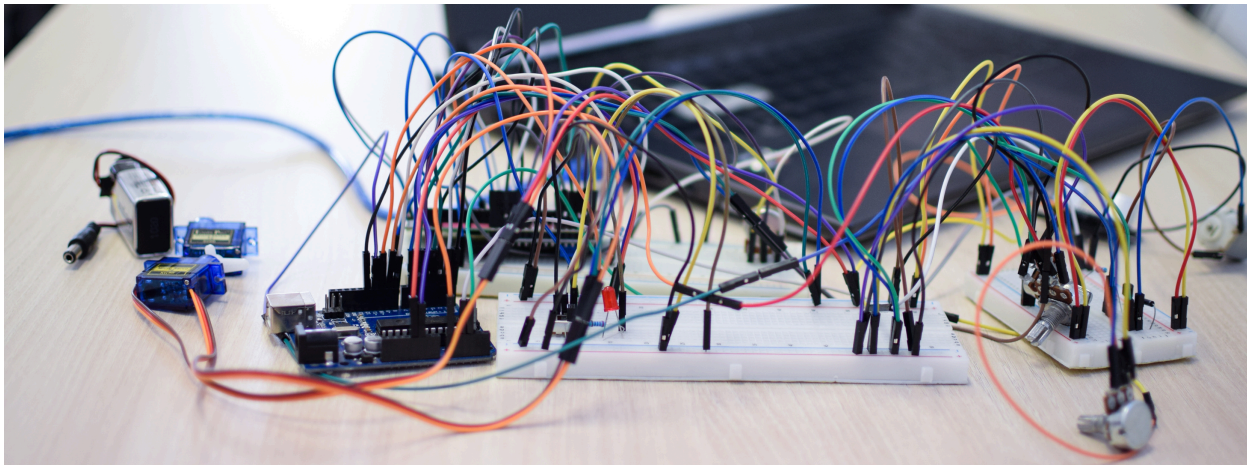

Foreword

The Faculty of Electronics, Telecommunications and Information Technology has established a tradition by organizing the **Student Symposium on Electronics and Telecommunications (SSET)**, whose 19th edition is held on the 24th of May 2024. This annual event has become a cornerstone for fostering innovation, collaboration, and professional development among students, academics, and industry professionals.

Since the beginning, SSET has been dedicated to promoting the creativity and originality of our students, by providing a platform for them to present their most significant achievements and research results. This symposium serves not only as a showcase for their hard work, but also as an opportunity for students to develop and refine their presentation and communication skills in front of a discerning and knowledgeable audience and an environment where students can engage with industry experts, receive valuable feedback, and explore potential career opportunities.

The 19th edition of the SSET promises an exciting lineup of presentations and discussions that cover a wide range of topics in electronics and telecommunications. From the latest developments in wireless communications and signal processing to cutting-edge research in microelectronics and artificial intelligence, this symposium offers something for everyone. Participants will gain insights into the current trends and future directions of our field and have the chance to network with peers and professionals alike.

Our faculty is committed to advancing knowledge in electronics, telecommunications, and information technology through rigorous research and high-quality education. The SSET is a vital component of this mission, as it directly contributes to the professional growth of our students and the overall enhancement of the educational process. By engaging in this symposium, students are better prepared to develop, design, implement, and utilize electronic and telecommunications systems across various industrial, research, and domestic applications.

We extend our deepest gratitude to the organizing committee, our industry partners, and the faculty teaching staff for their unwavering support and dedication. Their collective efforts have made this symposium possible and ensure its continued success.

We are confident that the 19th edition of the Student Symposium on Electronics and Telecommunications will be a resounding success, offering a rich and rewarding experience for all participants. Thank you for joining us, and we look forward to an inspiring and productive event.

Prof. Ovidiu POP, PhD
Dean of ETTI

Bachelor, Master and PhD Programs at ETTI

The **Faculty of Electronics, Telecommunications and Information Technology** offers educational programs at three levels:

Bachelor programs (4 years, 240 ECTS):

- Applied Electronics (in Romanian and English)
- Telecommunications Technologies and Systems (in Romanian and English)
- Microelectronics, Optoelectronics and Nanotechnologies (in Romanian)
- Economic Engineering in the Electric, Electronic and Energetic Field (in Romanian)

Master programs (2 years, 120 ECTS):

- Integrated Circuits and Systems (in Romanian)
- Electronics Engineering (in Romanian)
- Artificial Intelligence and Signal Processing in Electronics and Telecommunications (in English)
- Traitement du Signal et des Images (in French)
- Integrated Communications Systems with Special Applications (in Romanian)
- Multimedia Technologies (in Romanian)
- Technologies, Systems and Applications for e-Activities (in Romanian)
- Telecommunications (in Romanian)

PhD program (4 years):

- Electronics, Telecommunications and Information Technologies

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OPPORTUNITIES

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- Embedded software
- Digital design
- Software applications

INTERNSHIP POSITIONS

Internships in all the departments

- part time: 4h/day
- up to 1 year period

SUMMER INTERNSHIP

- 6-week program
- 8h/day
- project based and instructors led program
- students develop a fully functional device from scratch

Check the available positions:

SSET 2023 Awards

Student TST-IM

1st Prize - **Natalia-Liliana CIOLTE, Răzvan-Andrei VIDROIU**
"Nano LabCar: A HIL Testing System Using Raspberry Pi Pico and Arduino Every Nano"
Coordinators: **Assoc.prof. Raul MĂLUȚAN, Assist.prof. Iustin IVANCIU**

2nd Prize - Gabriel-Mihai OLTEAN
"Fast-Reroutable Networks with P4 Programmable Switches"
Coordinator: **Prof. Virgil DOBROTĂ**

3rd Prize - Valentin-Dimitrie POPESCU
"Optimizing Speech Emotion Recognition with Exhaustive Feature Selection and a Deep Convolutional Recurrent Neural Network"
Coordinator: **Prof. Mircea GIURGIU**

1st Special Award - **Paul-Cristian IONESCU**
"Motion Detection System Using Android and Amazon Web Services"
Coordinator: **Assist.prof. Iustin IVANCIU**

2nd Special Award - Teodor SAVA
"Network Slicing with Open Source MANO and OpenStack"
Coordinator: **Assist. Robert BOTEZ**

3rd Special Award - Diana-Elena MIRCEA
"mmWave System Precoding Using Hybrid Beamforming and MIMO Transmitter Arrays"
Coordinator: **Prof. Emanuel PUȘCHIȚĂ**

Student EA-IM

1st Prize - **Elena MARIAN**
"Comparison of three over current protection circuits for LDOs"
Coordinators: **Mădălina FARCAȘ, Assist.prof. Raul ONEȚ**

2nd Prize - Cătălin OPRIȚA
"Forklift prototype implemented with Mechanum wheels"
Coordinator: **Assoc.prof. Liviu VIMAN**

3rd Prize - Leonard-Gabriel DUMITRU
"Synchronous Buck converter development board"
Coordinator: **Assoc.prof. Botond KIREI**

1st Special Award - **Sergiu-Andrei PARFENOV**
"Over/Under Voltage and Thermal Shutdown protections for LDOs used in PMICs: Design techniques"
Coordinators: **Assist.prof. Raul ONEȚ, Gabriel SIMEON**

2nd Special Award - Valentin CRISTEA
"Model Based Design of a PMSG Wind Turbine"
Coordinator: **Assist.prof. Laura IVANCIU**

3rd Special Award - Raluca ARDELEAN
"Digital FIR filter implementation and analysis using Arduino UNO board"
Coordinator: **Assist.prof. Ervin SZOPOS**

Master-Doctor

1st Prize - **Mihnea-Antoniu COVACI**
"Feedback Loop Improvement of Constant Current Regulators for High Power Laser Applications"
Coordinators: **Prof. Ramona GĂLĂȚUȘ, Assoc.prof. Lorant SZOLGA**

2nd Prize - Ioana-Adriana POTÂRNICHE
"Citric and ascorbic acid classification system"
Coordinators: **Codruța SAROȘI, Prof. Romulus TEREBEȘ, Prof. Ramona GĂLĂȚUȘ, Assoc.prof. Lorant SZOLGA**

3rd Prize - Alessandro BATTIGELLI
"Comparative analysis of symmetrical OTA improvement techniques used for voltage regulators"
Coordinators: **Cosmin PLEȘA, Assist.prof. Raul ONEȚ, Assoc.prof. Marius NEAG**

1st Special Award - **Gergő KOVACS , Alexandru OPREA**
"Wideband RF Front-end Modeling in MATLAB"
Coordinator: **Assoc.prof. Botond KIREI**

2nd Special Award - Vlad-Claudiu HANĂȘ
"Implementation and testing of a Class D audio power amplifier"
Coordinator: **Prof. Ovidiu POP**

Special Awards

National Instruments - **Flaviu-Cristian MOLDOVAN (Student EA-IM)**

Analog Devices - **Valentin-Dimitrie POPESCU, Diana-Elena MIRCEA (Student TST-IM)**
Mihai LĂCĂTUȘ (Student EA-IM)
Gergő KOVACS, Alexandru OPREA (Master-Doctor)

SSET 2024

Program at a glance

Time	Event	Section		
		Student TST	Student EA-IM	Master-Doctor
8.00 - 8.30	Opening ceremony	room 359		
8.30 - 10.30	Presentations	room 359	room 367	room S01
10.30 - 10.45	Coffee break			
10.45 - 13.15	Presentations	room 359	room 367	
13.15	Partners presentations and awards ceremony	room 359		

SSET 2024

Committees

Scientific committees

Section 1 - Student TST

Chairman: Prof. Virgil DOBROTĂ, PhD
Members: Prof. Petre POP, PhD
Assist.prof. Camelia FLOREA, PhD
Assist.prof. Andra PĂSTRĂV, PhD
Assist.prof. Ioana ILEA, PhD

Section 2 - Student EA-IM

Chairman: Prof. Dorin PETREUȘ, PhD
Members: Assoc.prof. Marius NEAG, PhD
Assoc.prof. Albert FAZAKAS, PhD
Assoc.prof. Liviu VIMAN, PhD
Assist.prof. Călin FĂRCAȘ, PhD

Section 3 - Master-Doctor

Chairman: Prof. Corneliu RUSU, PhD
Members: Prof. Emanuel PUȘCHIȚĂ, PhD
Prof. Ramona GĂLĂTUȘ, PhD
Assoc.prof. Gabriel CHINDRIȘ, PhD
Assoc.prof. Botond KIREI, PhD

Organizing Committee:

Assoc.prof. Anca APATEAN, PhD
Assoc.prof. Lorant SZOLGA, PhD
Assist.prof. Rajmond JÁNÓ, PhD
Assist.prof. Laura IVANCIU, PhD

Chairman (coordinator): Prof. Ovidiu POP, PhD

Co-chairman: Assoc.prof. Nicolae CRIȘAN, PhD

Financial officer: Eng. Angela RUSU

SSET 2024

Detailed program

Section 1 - Student TST - room 359

8:30 – 8:45: Andrei AXENTE, Prof. Mircea GIURGIU – "An End-to-End Pipeline for Handwritten Text Recognition using Word Segmentation and Attention-based DNN"

8:45 – 9:00: Ioana Anamaria POSTOȘ, Assoc.prof. Mihaela GORDAN – "CT Medical Image Retrieval by Cross-focus LBP Descriptors"

9:00 – 9:15: Sebastian-Adrian BABICIU, Assist.prof. Iustin IVANCIU – "The Implementation of a CI/CD Pipeline Using AWS and Terraform"

9:15 – 9:30: Anamaria-Alexandra LASCU, Prof. Virgil DOBROTĂ – "Preliminary Evaluation of a Four-Node Emulab Testbed Environment"

9:30 – 9:45: Alex BULZAN, Assist. Robert BOTEZ – "Implementing Blockchain-as-a-Service: Deployment if a Private Hyperledger Network on Kubernetes"

9:45 – 10:00: Lucian Florinel Cosmin GÎDĂR, Assoc.prof. Nicolae CRIȘAN – "Extending the reading domain of an UHF RFID Reader"

10:00 – 10:15: Vladimir GIUSTACCHINI, Assoc.prof. Anca APĂTEAN – "Generating identity document photos using Python and a Raspberry Pi-based cloud service"

10:15 – 10:30: Roxana GHEJAN, Assoc.prof. Mihaela GORDAN – "Facial Microexpression Recognition Using Local Spatial-Temporal Binary Pattern Descriptors"

10:30 – 10:45 Coffee break

10:45 – 11:00: Mihai-Tudor MUNTEANU, Prof. Virgil DOBROTĂ – "Network Traffic Analysis Using NetFlow"

11:00 – 11:15: Raluca-Andreea TRANDAFIR, Assist.prof. Ioana ILEA – "Polarimetric Synthetic Aperture Radar Image Classification based on Improved Local Quinary Patterns"

11:15 – 11:30: Gheorghe Cristian BINDEA, Assist.prof. Iustin IVANCIU – "Implementation of CI/CD Workflows for the Cross-Platform Distribution of Scopy"

11:30 –11:45: Valentin-Dimitrie POPESCU, Prof. Mircea GIURGIU – "Advancing Drone Capabilities for Multifunctional Aerial Applications"

11:45 – 12:00: Tiberiu ȘERBĂNOIU, Assoc.prof. Nicolae CRIȘAN – "Prototyping a Solar Tracking System"

12:00 – 12:15: David OROIAN, Prof. Virgil DOBROTĂ – "First Steps in Telecommunications Traffic Classification with Machine Learning"

12:15 – 12:30: Daniela TOADER, Assoc.prof. Mihaela GORDAN, Dan-Cristian SÂMPETREAN – "An Interactive Python GUI-Based System for Underwater Image Enhancement and Restoration"

12:30 – 12:45: Daniela MARTE, Assist.prof. Iustin IVANCIU – "Automatic Application Deployment System for AWS and Kubernetes"

SSET 2024

Detailed program

Section 2 - Student EA-IM - room 367

8:30 – 8:45: Răzvan-Andrei TERHEȘ, Prof. Ramona GĂLĂTUȘ – "Image-based Temperature Measurement with Fiber Optics"

8:45 – 9:00: Cristina-Elena BOGĂTEAN, Assoc.prof. Mihaela GORDAN – "A Visually Self-Explainable Interactive System for Retinal Image Retrieval"

9:00 – 9:15: Vlad-Andrei CRISTESCU, Assoc.prof. Liviu VIMAN – "PCB temperature controller for automated soldering"

9:15 – 9:30: Vlad VELICIU, Assoc.prof. Liviu VIMAN – "System for Automatic Greenhouse"

9:30 – 9:45: Denisa-Ionela PETRARU, Assoc.prof. Septimiu POP – "Smart tiltmeter using image sensors"

9:45 – 10:00: Victorina LUPOI, Tomina Fabiola SĂLĂJAN, Assist.prof. Raul ONEȚ – "Current Recycling-Based LDO for Large Load Applications"

10:00 – 10:15: Octavian-Constantin AXINTE, Assist.prof. Mihai DĂRĂBAN – "Signal Integrity Analysis on eMMC Interface"

10:15 – 10:30: Nicolae-Adrian POP, Assoc.prof. Liviu VIMAN – "Self-Driving Car"

10:30 – 10:45 Coffee break

10:45 – 11:00: Iulian-Teodor GOIA, Iulian CÂMPANU, Assist.prof. Raul ONEȚ – "Comparative study on minimizing noise in bandgap voltage references in CMOS technology"

11:00 – 11:15: Petru-Rareș MOLDOVAN, George-Gabriel SIMEON, Assist.prof. Raul ONEȚ – "Feedback Buffer Architectures for LDO Voltage Regulators"

11:15 – 11:30: Daniel-Andrei BULUGHEANĂ, Assist.prof. Toma PĂTĂRĂU – "SPWM Signal Generator for Single Phase Inverter"

11:30 – 11:45: Lucas Ștefan MANCIU, Assist.prof. Toma PĂTĂRĂU – "Development of Single Phase Modular Inverter"

11:45 – 12:00: Ștefan Alexandru TĂNASĂ, Assoc.prof. Botond KIREI - "On Hardware Acceleration of Artificial Reverberators"

12:00 – 12:15: David-Gabriel COMBEI, Assoc.prof. Adriana STAN – "Multimodal emotion recognition using pretrained self-supervised text and speech models"

12:15 – 12:30: Giovanny Orlando Giuliano DÎLJA, Viorela-Ligia VĂIDEAN, Prof. Șerban MEZA – "The Impact of Technology on Labor Productivity – Past, Present and Future"

12:30 – 12:45: Marian-Nicolae CAP, Assist.prof. Iustin IVANCIU – "Automatic Deployment of a Java Application in AWS Using Jenkins"

12:45 – 13:00: Emanuel POP, Assist.prof. Iustin IVANCIU – "Mobile Android Application for Organising Airsoft Games"

13:00 – 13:15: Ana-Maria GHERHEȘ, Sergiu ROMANIUC, Priscilla-Gențiana RUS, Assist.prof. Aurelia CIUPE – "Creating Building-Scale 3D Virtual Tours: A Case Study of Research Laboratories at Technical University of Cluj-Napoca"

SSET 2024

Detailed program

Section 3 - Master-Doctor - room S01

8:30 – 8:45: Alin-Tudor SFERLE, Prof. Virgil DOBROTĂ – “SOAICPhishing Implementation: A Bot-Powered Consultant Approach”

8:45 – 9:00: Cătălin-Ionuţ OPRIŢA, Assoc.prof. Liviu VIMAN – “Workflow Implementation and Signal Integrity Simulation of a PCI Express Gen3 High-Speed Digital Interface using CST Studio”

9:00 – 9:15: Róbert-Jenő KOVÁCS, Assoc.prof. Albert FAZAKAS – “KO – RESET Uninterruptible power supply (UPS) power state monitoring and control device”

9:15 – 9:30: Alexandru OPREA, Assoc.prof. Botond KIREI – “Method to Expand Spectrum Analyzer Range”

9:30 – 9:45: Emilia GHEORGHIȚĂ, Iulian CÂMPANU, Assist.prof. Raul ONEȚ – “Innovative automated approach for sizing essential basic building blocks in CMOS submicronic nodes”

9:45 – 10:00: Sergiu-Andrei PARFENOV, Iulian CÂMPANU, Emilia GHEORGHIȚĂ, Assist.prof. Raul ONEȚ – “An automatic approach on sizing current limitation circuitry for linear regulators used in PMICs”

10:00 – 10:15: Mihnea-Antoniu COVACI, Prof. Ramona GĂLĂTUȘ, Assoc.prof. Lorant SZOLGA – “Micro-adjustable Pulsed Laser Cavity Prototype for Electromagnetic Propagation Mode Study”

10:15 – 10:30: Mihnea-Antoniu COVACI, Prof. Ramona GĂLĂTUȘ, Assoc.prof. Lorant SZOLGA – “Performance Improvement for Analog Regulators in Sustainable Energy Grid Systems”

Paper abstracts

Section 1 – Student TST

1: Andrei AXENTE, Prof. Mircea GIURGIU – "An End-to-End Pipeline for Handwritten Text Recognition using Word Segmentation and Attention-based DNN"

Abstract - This research presents an approach to create an end-to-end pipeline for handwritten text recognition which combines two components: segmentation of the input image into individual word images, and a Deep Neural Network to recognize the text from these images. The segmentation of the input image uses an Anisotropic Filter Kernel, while the neural network contains several residual layers and attention combined with transfer learning. The benefits of this pipeline are to automate, standardize, and simplify the entire process of handwritten text recognition.

2: Ioana Anamaria POSTOȘ, Assoc.prof. Mihaela GORDAN – "CT Medical Image Retrieval by Cross-focus LBP Descriptors"

Abstract - Medical image retrieval is an active research field, with significant benefits for the medical diagnosis/decision making process. Computer tomography (CT) is especially suited for retrieval using texture descriptors, especially when the input images are small size regions of interest (ROI) inside an organ, that may suffer changes in texture if affected by different pathologies. A class of conceptually simple, yet powerful texture descriptors are the local binary patterns (LBP) histograms and their extensions. Inspired by the recent work in the field, this paper presents a medical content-based image retrieval system using a variant of local binary patterns (cross-focus LBP) applicable on ROIs from CT scans, which exhibit distinctive texture patterns depending on the pathology. We apply the proposed solution on a publicly available pulmonary CT dataset, and the results are comparable to the state-of-the art in the field, proving its applicability for CT image retrieval.

Keywords—medical image retrieval, cross-focus local binary patterns, histogram matching, multi-focus image.

3: Sebastian-Adrian BABICIU, Assist.prof. Iustin IVANCIU – "The Implementation of a CI/CD Pipeline Using AWS and Terraform"

Abstract—This paper explores the implementation of a software delivery pipeline using AWS CodePipeline, a managed CI/CD service. Terraform is employed to automatically provide the entire underlying infrastructure for services such as CodeCommit, CodeBuild, CodeDeploy and CloudWatch, ensuring seamless integration of the pipeline within the AWS ecosystem.

Keywords—AWS, CI/CD, CloudWatch, CodeBuild, CodeCommit, CodeDeploy, CodePipeline, EC2, Terraform.

4: Anamaria-Alexandra LASCU, Prof. Virgil DOBROTĂ – "Preliminary Evaluation of a Four-Node Emulab Testbed Environment"

Abstract—This paper examines the value of Emulab, a real hardware testbed, for educational and research purposes, in the field of computer networking and distributed systems. We point out the value of a testbed in conducting reliable experiments and evaluations. Emulab proved to be a versatile platform that encourages collaborative learning and the development of practical skills. It is well-known for its resource isolation and experiment integrity. However, we experienced its limitations (at least for the trial version we had access to), such as resource availability and mainly the experiment duration (less than 16 hours). The four-node testbed was selected to demonstrate the procedural steps for working in Emulab, such as resource reservation and topology configuration. In the next phases of the implementation, we want to involve switches and routers in a more complex topology.

Keywords—Emulab, real-time testbed, resource isolation.

5: Alex BULZAN, Assist. Robert BOTEZ – "Implementing Blockchain-as-a-Service: Deployment if a Private Hyperledger Network on Kubernetes"

Abstract—Public blockchain networks as Bitcoin or Monero often fall short for enterprise applications due to low throughput, high fees, inefficient consensus protocols, and inadequate data privacy. With increasing market demand for analytical and efficient data processing solutions at the transactional level, blockchain technology has gained traction across diverse sectors, especially finance. This shift has stimulated the development of various blockchain models. Permissioned blockchain frameworks, such as Hyperledger Fabric, enable the creation of private networks. This article examines Hyperledger Fabric, focusing on its deployment via Command Line Interface tools on-premise or over different cloud service providers, architecture, and transaction processes. We explore its consensus mechanisms, privacy measures, and overall performance, noting the need for honest node operation and prudent privacy feature use.

Keywords—Blockchain Architecture, Cloud Services, Consensus Mechanisms, Docker, Hyperledger Fabric, Kubernetes, Permissioned Blockchain.

6: Lucian Florinel Cosmin GÎDĂR, Assoc.prof. Nicolae CRIȘAN – "Extending the reading domain of an UHF RFID Reader"

Abstract—In this paper we will present the implementation of an UHF RFID system. The main aim of this project was to extend the reading domain of a RFID Reader using an external antenna that helps the detection range extension. After some hardware and software modifications we were able to achieve a reading range of roughly one to two meters, starting with a reading distance of only 10-20 centimeters without the external antenna. Also, for a better understanding of which RFID tag is activated, a LCD Display is attached to be able to display every single tag ID and each step of the whole process.

Keywords— RFID, antenna, tag, system.

7: Vladimir GIUSTACCHINI, Assoc.prof. Anca APĂTEAN – "Generating identity document photos using Python and a Raspberry Pi-based cloud service"

Abstract—This paper describes an application which is meant to generate an identity document photo, without having to search for a photographic studio or having to master advanced editing software such as Adobe Photoshop or Corel Draw. The application takes a portrait picture from any kind of device with a camera, passes it through a series of Python algorithms, and saves it into a cloud service hosted by a Raspberry Pi 4 Model B. The purpose of passing the picture through these algorithms is to obtain a good quality square image, containing a face with realistic details and no background behind.

Keywords—digital image processing, Python, Raspberry Pi, cloud, machine learning.

8: Roxana GHEJAN, Assoc.prof. Mihaela GORDAN – "Facial Microexpression Recognition Using Local Spatial-Temporal Binary Pattern Descriptors"

Abstract— Facial micro-expression recognition represents a very challenging task, as the emotions do not manifest as clear as in the general expression recognition framework. This paper proposes to investigate the discriminatory power of some recent generalizations of local binary pattern (LBP) descriptors, applicable on video shots (capable of describing dynamic local texture patterns) to the problem of micro-expressions classification into positive and negative expressions. The spatial-temporal LBP descriptors are extracted for the video dataset CASME 2; each individual shot is described by a feature vector representing the concatenated spatiotemporal histogram of its modified LBP descriptor. Two types of classifiers are trained on the resulting feature space: linear support vector machines (SVM) and K nearest neighbors (K-NN). The recognition performance is assessed in terms of the overall accuracy and per-class accuracies/errors, and it shows that especially the K-NN classifier can achieve a rather good performance in discriminating between the two types of micro-expressions (around 73%, whereas the literature average is 60%).

Keywords—micro-expression recognition, SVM, K-NN, LBP, spatiotemporal LBP.

9: Mihai-Tudor MUNTEANU, Prof. Virgil DOBROTĂ – "Network Traffic Analysis Using NetFlow"

Abstract—This paper presents a smart model for analyzing NetFlow traffic captured through a Cisco virtual router CSR1000V. The network information acquired was exported through a traffic flow exporter to another computer from the same LAN. The collected traffic was organized, parsed, and interpreted to identify possible issues, i.e., suspect connections or packets. The analysis provided a general overview and rating of the flow management in that specific network: source and destination IP addresses, ports, protocols, packet sizes and time stamps for the exchanged data.

Keywords—NetFlow, Python, traffic analysis, virtual router.

10: Raluca-Andreea TRANDAFIR, Assist.prof. Ioana ILEA – "Polarimetric Synthetic Aperture Radar Image Classification based on Improved Local Quinary Patterns"

Abstract—The aim of the presented paper is to study an enhanced texture information extraction technique – the Improved Local Quinary Patterns algorithm – and to emphasize the capabilities of this descriptor in the context of classifying Polarimetric Synthetic Aperture Radar (PolSAR) images of maritime pine forest stands.
Keywords—texture image classification, Local Quinary Patterns, feature extraction, PolSAR, maritime pines.

11: Gheorghe Cristian BINDEA, Assist.prof. Iustin IVANCIU – "Implementation of CI/CD Workflows for the Cross-Platform Distribution of Scopy"

Abstract—This paper presents the Continuous Integration and Continuous Delivery workflows used in the development of the Analog Devices Scopy graphical application. The application is written in C++ with the Qt Framework, thus making it a platform independent software. Taking advantage of this, Scopy is packaged for multiple platforms and operating systems. The paper explains the main steps taken during the build and package workflow as well as the checks used in the development process.
Keywords—CI/CD, cross-platform, software distribution, Scopy, workflows.

12: Valentin-Dimitrie POPESCU, Prof. Mircea GIURGIU – "Advancing Drone Capabilities for Multifunctional Aerial Applications"

Abstract - This paper reports on the designing, implementation and validation of a prototype system using multiple drones cooperating on several tasks: video surveillance, auto-positioning in closed spaces, autonomous flying to predefined destinations, stability control, and automatic object detection. The system contains multiple drones which communicate with a microcontroller-based central station using ultra-wideband radio signals, connected to a web server to allow user interfaces and to program the tasks from the drones. This prototype has been successfully tested in several indoor and outdoor scenarios and it proved its robustness and potential to effectively apply in various scenarios.

13: Tiberiu ȘERBĂNOIU, Assoc.prof. Nicolae CRIȘAN – "Prototyping a Solar Tracking System"

Abstract— In this paper, we present an innovative two-axis tracking system for photovoltaic panels, which integrates precise measurement of ambient light levels. The proposed system aims to optimize the performance of photovoltaic panels by tracking the position of the sun in the sky and adjusting the tilt and orientation angles of the panel in real time. This is achieved using a control algorithm that receives real-time information about the position of the sun and the light level. In addition to precise alignment of the panel with the sun, our system can also adjust the tilt of the panel based on the ambient light level, ensuring optimal electricity production under any lighting conditions.
Keywords— Solar Energy; Prototype; Dual Axis System; Tracking system; Solar Panel.

14: David OROIAN, Prof. Virgil DOBROTĂ – "First Steps in Telecommunications Traffic Classification with Machine Learning"

Abstract—Network Intrusion Detection Systems (NIDS) play a crucial role in safeguarding digital infrastructures against cyber threats. In this paper we analyze the performance of a Multi-Layer Perceptron (MLP)-based NIDS trained on two widely used datasets: KDDCUP99 and UNSW- NB15. Consistent with others' prior research, our evaluation confirms the substantial impact of dataset selection on NIDS performance. While achieving commendable results with KDDCUP99, the model's outcomes notably declined when tested on the UNSW-NB15 one. Furthermore, we describe the experimental setup using Docker containers and Cisco's TRex Traffic Generator, coupled with packet capture with tcpdump and feature extraction via Zeek. Overall, this work contributes to the understanding of NIDS performance evaluation and underscores the importance of dataset choice and feature selection in achieving robust intrusion detection systems.
Keywords—Anomaly detection, Deep Learning, KDDCUP99 dataset, UNSW-NB15 dataset.

15: Daniela TOADER, Assoc.prof. Mihaela GORDAN, Dan-Cristian SÂMPETREAN – "An Interactive Python GUI-Based System for Underwater Image Enhancement and Restoration"

Abstract—This paper presents a complete solution for underwater color image enhancement and restoration, developed in Python, designed to facilitate the user intervention in the image processing chain through parameters tuning and selection of the operations according to the step-by-step image enhancement results. Inspired by some

classical color restoration algorithms and by a recent image fusion based underwater image dehazing, the proposed system implements a cascade of color image enhancement algorithms devoted particularly to underwater images, using standard Python packages. Besides the visualization capabilities provided by the implemented solution, it also computes and displays numerical metrics describing the resulting image quality, thus allowing in the future an automatic selection of the best parameters to optimize these metrics. The capabilities of the system were evaluated on a standard dataset of color underwater images, with good qualitative and numerical results.
Keywords—underwater image, color restoration, Python GUI application, image dehazing.

16: Daniela MARTE, Assist.prof. Iustin IVANCIU – "Automatic Application Deployment System for AWS and Kubernetes"

Abstract—This paper presents a system for the automatic deployment of a Java application, both in the Amazon Web Services cloud environment and in a local Kubernetes cluster. The designed system integrates two Jenkins pipelines, one focusing on deploying the application to a Tomcat server on an EC2 instance implemented using Terraform, while the other is responsible for directly uploading the Docker image to Docker Hub and then running it as a container in a Kubernetes environment. The entire process has been automated using Jenkins, Ansible, Docker, and Kubernetes.
Keywords—Ansible, AWS, Docker, Jenkins, Kubernetes, Maven, Terraform, Tomcat.

Section 2 – Student EA-IM

1: Răzvan-Andrei TERHEȘ, Prof. Ramona GĂLĂTUȘ – "Image-based Temperature Measurement with Fiber Optics"

Abstract— Fiber optic sensors offer significant advantages for temperature measurement due to their immunity to electromagnetic interference and suitability for harsh environments. This paper explores a fiber-optic sensor for temperature prediction that leverages specklegram patterns and convolutional neural networks (CNNs). The proposed sensor utilizes specklegram variations caused by temperature changes. A CNN architecture, inspired by the LeNet-5 architecture, analyzes these speckle patterns to estimate the fiber's temperature. The model achieves promising performance with a minimum error of 0.01°C. This sensor offers several advantages, including compactness, lightweight design, distributed sensing capability, and a linear response to temperature. These features make it a promising candidate for various temperature sensing applications with IoT capabilities.
Keywords—fiber optic sensor, CNN, specklegram, temperature measurement, LeNet-5, deep-learning.

2: Cristina-Elena BOGĂTEAN, Assoc.prof. Mihaela GORDAN – "A Visually Self-Explainable Interactive System for Retinal Image Retrieval"

Abstract—Retinal imaging is a fundamental tool used by physicians to detect and diagnose ophthalmic diseases even in early stages. Since the retinal fundus color images are sometimes low quality, their enhancement, segmentation and numerical quantification by automatic algorithms is of great help for the ophthalmologist. This paper presents the integration of such algorithms, commonly used in retinal fundus image analysis, into a retinal image retrieval system, implemented in Python, in the form of a Windows GUI application. Compared to other existing implementations, the system adds visualization functionalities, allowing the user to decompose the retinal image analyzed and the retrieved ones into vessels layers, exudates layers, assess visually the vessel/exudate connectivity. The system functionality is assessed on the STARE database, on three disease classes: Diabetic Retinopathy (DR), Coats and Choroidal Neovascularization (CNV). The retrieval performance is close to the reported state of the art in the literature. The main benefits of the proposed system are its easily extendable architecture and its visually self-explanatory facility, which adds greatly to its assistive diagnostic value as compared to other existing systems.
Keywords—retinal image retrieval, vascular features, exudate features, image segmentation, visually explainable CBIR.

3: Vlad-Andrei CRISTESCU, Assoc.prof. Liviu VIMAN – "PCB temperature controller for automated soldering"

Abstract—This paper presents the design and layout of a Printed Circuit Board (PCB) that implements a closed-loop temperature control system for automated soldering. The PCB is equipped with a copper meander track serving as

a Hot-Plate, and a connector for external boards that contain a similar track on one of the inner layers which can be heated by applying a voltage across it, resembling a reflow oven that ensures optimal soldering by following the industry standards' thermal profile of the solder paste.
Keywords—PCB, soldering, temperature control, hot-plate.

4: Vlad VELICIU, Assoc.prof. Liviu VIMAN – "System for Automatic Greenhouse"
Abstract—This paper proposes an implementation of a system for automatic greenhouses, exposing a solution for both monitoring and controlling major parameters. It consists of an ATmega64A microcontroller, five sensors, two control parts and a Wi-Fi module, all being embedded on a PCB. For safety reasons, galvanic isolation between the components that must be connected outside the PCB and the ones soldered on it, was designed to avoid hazards on the lines outside the board to get to sensitive components. Communication is achieved via the Wi-Fi module that uses the MQTT protocol to exchange information between ATmega64A and an IoT platform – Thingsboard.
*Keywords—greenhouse, control system, IoT platform, PCB***.**

5: Denisa-Ionela PETRARU, Assoc.prof. Septimiu POP – "Smart tiltmeter using image sensors"
Abstract—We showcase a tangible model for monitoring the exact position of a plumb wire on x and y axis, fit to detect horizontal movements. This prototype is meant to be used in tracking any shift in position of dams and otherwise large structures and help maintain their structural integrity. The placement of the pendulum is detected using two image sensors, based on CCD technology, and corresponding parallel sources of light. We compute the position of the lead wire based on the shadow detected by the sensors. The "brain" of the system is ensured by a microcontroller. For precisely measuring the position of the shadow, we applied different filtering methods on the output signals of the sensors using Python. A comparison between median filtering and Savitzky-Golay smoothing method is presented. The electronic ensemble is constructed on a printed circuit board, with different means of communication and supply.
Keywords—tiltmeter, pendulum position, optical method, charge-coupled device (CCD), noise filtering.

6: Victorina LUPOI, Tomina Fabiola SĂLĂJAN, Assist.prof. Raul ONEȚ – "Current Recycling-Based LDO for Large Load Applications"
Abstract—This paper presents two essential factors in designing a High Power Automotive Low Dropout Regulator (LDO): sizing the power stage and ensuring low current consumption. The power stage was sized based on minimizing heat dissipation on the area of the chip, which is a different approach compared to standard strategy based on minimizing the dropout voltage. Low quiescent current has been obtained by a current recycling technique, needed in the case of load current up to 1A.
Keywords— LDO, high power, current recycling, power stage.

7: Octavian-Constantin AXINTE, Assist.prof. Mihai DĂRĂBAN – "Signal Integrity Analysis on eMMC Interface"
Abstract—This paper addresses the design challenges of a High-Performance Embedded System-on-Module (SoM) for compute-intensive edge processing. It focuses on optimizing signal integrity through pre-layout routing strategies and post-layout simulations, ensuring compliance with electrical specifications for flawless functionality in edge computing applications.
Keywords—signal integrity, crosstalk, high speed, eMMC, ibis.

8: Nicolae-Adrian POP, Assoc.prof. Liviu VIMAN – "Self-Driving Car"
Abstract—A self-driving car is a vehicle that can detect obstacles around it and drive around them on its own with little or no human intervention. The car is controlled using Arduino Mega 2560 development boards in which an obstacle avoidance algorithm is loaded. In addition to obstacle avoidance, a PID controller is implemented to maintain constant speed when certain disturbances occur in the movement process. The device is equipped with an ultrasonic sensor to maintain a distance from the intervening obstacle, two infrared sensors to assist in obstacle detection and avoidance and two speed sensors to maintain constant speed.
Keywords—Arduino Mega 2560, self-driving car, obstacle avoidance, speed sensors, PID.

9: Iulian-Teodor GOIA, Iulian CÂMPANU, Assist.prof. Raul ONEȚ – "Comparative study on minimizing noise in bandgap voltage references in CMOS technology"
Abstract—This paper presents a comparative study on noise minimization of three bandgap voltage references: Kujik, Banba and an improved Kujik topology. The study examines essential parameters which are crucial to voltage

reference operation, with a focus on noise behavior, but also quiescent current, area efficiency, PSRR, and precision. A noise analysis for each topology was performed while a sizing strategy for the improved Kujik topology is proposed, facilitating its practical implementation in integrated designs, focusing on minimizing noise. The circuits were implemented in a standard CMOS submicronic technology.
Keywords—bandgap voltage reference (BGR), low noise, low power, CMOS technology.

10: Petru-Rareş MOLDOVAN, George-Gabriel SIMEON, Assist.prof. Raul ONEŢ – "Feedback Buffer Architectures for LDO Voltage Regulators"

Abstract—This article presents various buffer topologies tailored for low dropout (LDO) regulators that ensure stable LDO operation under light and heavy loads, up to 100mA. The buffers employing series-shunt feedback can achieve very low output impedances and allow high discharging currents of the gate capacitance of the power transistor in load step scenarios.
Keywords—low-dropout regulator (LDO), buffer, stability, frequency compensation, series-shunt feedback, feedback buffer.

11: Daniel-Andrei BULUGHEANĂ, Assist.prof. Toma PĂTĂRĂU – "SPWM Signal Generator for Single Phase Inverter"

Abstract—This paper presents a driver circuit that generates sinusoidal pulse width modulation (SPWM) signals, fully autonomous, necessary for a single-phase inverter, with the possibility of modifying modulation parameters by the user through potentiometers. With the expansion of renewable energy sources (DC voltages), the demand for modern inverters with high efficiency and low total harmonic distortion (THD) has also increased. These parameters depend primarily on the power transistors used and the technique used to control them. Given the importance of the control signal applied to the transistors that make up an inverter, controlling with a sinusoidal pulse width modulation (SPWM) signal is superior compared to controlling with a signal with only variable duty cycle.
Keywords—SPWM, sinewave, dead-time, Bubba oscillator, logic gates.

12: Lucas Ştefan MANCIU, Assist.prof. Toma PĂTĂRĂU – "Development of Single Phase Modular Inverter"

Abstract — This piece discusses a newly created inverter with a unique modular structure. The device is composed of H-Bridges modules joined together, indicating increased reliability and fault tolerance. Moreover, it is effective for diverse applications such as green energy and minor power networks. The inverter combines several micro power components in parallel to produce the appropriate level of electricity. The paper presents a comprehensive description of the inverter's design. Experiments were conducted to examine the performance of the inverter under different conditions. The flexibility of the modular design allows for easy part replacement and repairs, enhancing the inverter's dependability and fine-tuning power management. The innovation of this inverter represents a significant advancement in the power electronics field. It also assists in integrating renewable energy resources with the power network, thereby boosting the grid's dependability and stability.
Keywords — Inverter, SiC MOSFET, PCB layout structure.

13: Ștefan Alexandru TĂNASĂ, Assoc.prof. Botond KIREI - "On Hardware Acceleration of Artificial Reverberators"

Abstract—This paper presents an overview of artificial reverberators with emphasis on their structural design, aimed at identifying common components and potential hardware implementations. The study delves into the diverse types of reverberators and discusses their respective architectures. Utilizing Simulink and Matlab, the design process is detailed, highlighting the synthesis of these reverberation models within a computational framework. By dissecting the intricacies of each algorithm, this paper provides insights into the underlying principles guiding the creation of artificial reverberators, laying the foundation for further research and practical application in audio signal processing.
Keywords—room impulse response, artificial reverberators, comb/all-pass/nested all-pass filters, Simulink/Matlab, signal processing.

14: David-Gabriel COMBEI, Assoc.prof. Adriana STAN – "Multimodal emotion recognition using pretrained self-supervised text and speech models"

Abstract—The task of speech emotion recognition (SER) poses significant challenges due to the complex nature of human emotions and the difficulty computers face in understanding them. This paper presents multiple techniques for data preprocessing using pretrained self-supervised models aimed to extract high-quality embeddings from text and audio representations of human interaction. Additionally, we built and trained multiple deep learning architectures using extracted embeddings, tailored to comprehend the complex representations present in emotional data efficiently. We tested all the techniques and models on MELD dataset, which is one of the most imbalanced datasets. Through this comprehensive approach, we seek to achieve state-of-the-art results in emotion recognition by providing robust techniques and solutions.

Keywords—speech emotion recognition, self-supervised models, MELD, BERT, wav2vec.

15: Giovanny Orlando Giuliano DÎLJA, Viorela-Ligia VĂIDEAN, Prof. Şerban MEZA – "The Impact of Technology on Labor Productivity – Past, Present and Future"

Abstract—The purpose of this research is to estimate the direct impact the rapid development of Information and Communication Technologies (ICTs), particularly Artificial Intelligence (AI), has on the labor productivity of worldwide countries. Using multiple ordinary least squares regressions, we find that ICT development directly and positively impacts labor productivity, with the magnitude of this impact being the largest for developed countries compared to nations with lower development levels. Our results are important for governments and institutions in order to tailor policies that promote labor productivity growth and boost economic prosperity, considering investments in the development of ICTs and AI.

Keywords—labor productivity, economic development, information and communication technology, digitalization, artificial intelligence.

16: Marian-Nicolae CAP, Assist.prof. Iustin IVANCIU – "Automatic Deployment of a Java Application in AWS Using Jenkins"

Abstract—This paper presents a system for the automatic deployment of a Java application in the Amazon Web Services cloud. Two Jenkins pipelines are employed, one for launching the infrastructure, and the other for deploying the application to a Tomcat server. Terraform and Packer are used to create the complete infrastructure, while Jenkins, Ansible, and a Github webhook are used to automate the processes.

*Keywords—Ansible, AWS, Jenkins, Packer, Terraform, Tomcat, webhook***.**

17: Emanuel POP, Assist.prof. Iustin IVANCIU – "Mobile Android Application for Organising Airsoft Games"

Abstract—The activities that we enjoy doing most of the time provide us with the energy and drive to push through another week or get over an obstacle and it gets even better when you enjoy them with friends. Unfortunately airsoft is niche sport and it might be difficult to find people to share this hobby with. This paper presents a solution for the stated situation, namely a mobile application that would help people organize games and find people with similar interests. The application, designed for Android mobile devices and developed using Kotlin, consists of two main sections: the onboarding, displayed when a user registers, and the main screen that provides the specific functionalities of the application.

Keywords—Airsoft, Android, Kotlin.

18: Ana-Maria GHERHEȘ, Sergiu ROMANIUC, Priscilla-Gențiana RUS, Assist.prof. Aurelia CIUPE – "Creating Building-Scale 3D Virtual Tours: A Case Study of Research Laboratories at Technical University of Cluj-Napoca"

Abstract— This paper presents the project we started last summer, the 3D scanning of certain halls within our university with a Matterport camera working with structured light. With the help of these 3D scenes we will take a virtual tour using the Unity platform. This article will help to create a clearer and more accurate idea of what a 3D virtual tour means. It will also help develop other virtual tours to use for museums, real estate or other high interest locations.

Keywords—3D virtual tour, Immersive experience, Digital Twin, Interactive Navigation, HEI.

Section 3 – Master-Doctor

1: Alin-Tudor SFERLE, Prof. Virgil DOBROTĂ – "SOAICPhishing Implementation: A Bot-Powered Consultant Approach"

Abstract—One possible benefit of using generative AI-related models could be related to artificial text. However, strong security concerns grow due to the possibility of involving it in a negative way, e.g., in phishing. This paper presents SOAICPhishing, an initial consultant to users from educational or corporate environments, victims of AI-generating phishing. The solution is based on Azure Web-App Service and on Bot Framework, combined with the power of SaplingAI's logic for AI-generated phrases detection. This could give to the end-users the capability to self-verify if the received messages were not generated by human persons. The classical phishing attempts are done by using mail-based messaging, and different apps in which someone can be redirected, for instance, to verify personal information and finally run out of money. The proposed implementation was just a proof-of-concept, as a lot of work is needed to make it an initial market-ready product.
Keywords—AI-generated text, chatbots, Generative AI, phishing.

2: Cătălin-Ionuţ OPRIŢA, Assoc.prof. Liviu VIMAN – "Workflow Implementation and Signal Integrity Simulation of a PCI Express Gen3 High-Speed Digital Interface using CST Studio"

Abstract— In the past decades, one can identify significant development in the digital data transmission. This fact can be noticed by simply looking at one main parameter of signals, which is the clock frequency. As the technology of semiconductor manufacturing progresses, integrated circuits can host more and more transistors in their package, eventually leading to an increase in clock frequency. One of the most popular serial data transmission standards is PCI (Peripheral Component Interconnect) Express, and since it is a high-speed standard, it can`t escape some potential signal integrity issues, which need to be analyzed through simulations and measurements, this being the center point of this paper focused specifically on the 3rd generation. All the steps to obtain the results are presented in the form of a workflow which can be followed for similar projects.
Keywords—high-speed, workflow, SI&PI, PCI Express, simulation, losses, interconnect.

3: Róbert-Jenő KOVÁCS, Assoc.prof. Albert FAZAKAS – "KO – RESET Uninterruptible power supply (UPS) power state monitoring and control device"

Abstract— The KO – reset is a device connected between a critical IT equipment (ex. server) and UPS and it eliminates an identified deficiency so the server will turn on after a possible power outage, also it has some remote functionalities available to the end user.
Keywords— UPS, deficiency, power state, remote, critical.

4: Alexandru OPREA, Assoc.prof. Botond KIREI – "Method to Expand Spectrum Analyzer Range"

Abstract— This research aims to address challenges in radio frequency (RF) signal processing, particularly focusing on the design and simulation of an RF front-end circuit to enhance the capabilities of spectrum analyzers. Limitations arise in systems involving modulation with a signal from the local oscillator (LO) to shift the RF to an intermediate frequency (IF) close to the baseband, such as mirroring, harmonics, or nonlinearities. To overcome these limitations, the research proposes some approaches in frequency planning and signal modulation. The study presents a technique for reducing ambiguity in down-conversion processes through a double modulation strategy. Validation is performed through Python simulations.
Keywords—front-end design, frequency planning, down-conversion, synthesizer modeling, Python simulations.

5: Emilia GHEORGHIȚĂ, Iulian CÂMPANU, Assist.prof. Raul ONEȚ – "Innovative automated approach for sizing essential basic building blocks in CMOS submicronic nodes"

Abstract—This paper presents an analog generator following AnaGen methodology, dedicated for automatic sizing of a symmetrical Operational Transconductance Amplifier (OTA) implemented in a CMOS technology. The proposed flow is using specific tools for automating the repetitive steps in the design process, like sizing, schematic generation, verification and circuit optimization. The sizing is based on gm/Id design technique, which is enabling a set of accurate solutions searched in the device database. The main benefit of this type of generator is the time-to-market reduction for basic building blocks in integrated circuits' (ICs) design for automotive industry, this way providing accurate and reliable solutions for the input set of requirements.
Keywords—Operational Transconductance Amplifier (OTA), analog design automation, analog generator, gm/Id technique, sizing strategy, integrated circuits (ICs), circuit optimization.

6: Sergiu-Andrei PARFENOV, Iulian CÂMPANU, Emilia GHEORGHIȚĂ, Assist.prof. Raul ONEȚ – "An automatic approach on sizing current limitation circuitry for linear regulators used in PMICs"

Abstract—This paper presents a sizing strategy together with an automatic procedure for a widely used overcurrent protection in CMOS linear LDOs. Nowadays, more and more linear regulators are implemented in silicon, but they have a wide range of specifications, due to various applications. One crucial specification is the maximum current, that sets the current limit value for the circuit presented within this paper. Automated generators and optimizers can be very efficient in redesigning a specific circuit topology for various sets of specifications or for migration from one design kit to another, having the advantages that once the sizing strategy and limits are imposed, the presented tool results can be obtained much faster than a manual design procedure, as it will be shown within this paper.

Keywords—automation, CMOS, regulator, PMICs, current limitation.

7: Mihnea-Antoniu COVACI, Prof. Ramona GĂLĂȚUȘ, Assoc.prof. Lorant SZOLGA – "Micro-adjustable Pulsed Laser Cavity Prototype for Electromagnetic Propagation Mode Study"

Abstract—The increased need for sustainable infrastructure has been recently highlighted. During previous studies, alternative adaptations of the current infrastructure couldn't meet the energy demands. Therefore, a custom-length pulsed laser cavity was designed as part of a hypothetical energetic infrastructure for infrared pulsed lasers. The propagation mode for several micro-adjustment cases will be evaluated following the present study.

Keywords—Solid state pumping, infrared laser, sustainability, energetic infrastructure.

8: Mihnea-Antoniu COVACI, Prof. Ramona GĂLĂȚUȘ, Assoc.prof. Lorant SZOLGA – "Performance Improvement for Analog Regulators in Sustainable Energy Grid Systems"

Abstract—Alternative grid connections have recently gained interest for the recently emerged new energy storage technologies. Conversion unit sustainability is also crucial in preventing environmental issues. Therefore, a performance improvement covering analog power supplies is presented in this study. It follows the design of a closed-loop regulator used in microgrid systems as a battery management unit, allowing sustainable energy storage.

Keywords—Stability, closed-loop regulation, sustainability, analog circuit.

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