

CONTENTS

The Inception of Electronic Digital Computing

Vladimir Getov 19

CYBERSECURITY

Probabilistic Corporate Cybersecurity Stack

Willian Dimitrov, Dragostin Tsekov and Valentin Rujenov 24

A Simulation Tool for ZigBee Application Layer Security

Marieta Yordanova, Aydan Haka, Veneta Aleksieva and Hristo Valchanov 28

Attack and Hack with Padding Oracle

Ivan Ivanov and Mariyana Dimitrova 34

Exploring the Possibilities of Geocoding Systems with Equal Area Tessellation

Pavel Petrov 40

MEASUREMENT AND MONITORING

Development of a Measuring System for Studying the Force Load of Tillage Machinery in the Precision Agriculture using a Strain Resistance Integrating Period-Meter

Svilen Stoyanov, Desislava Mihaylova, Asparuh Atanasov and Steliyana Hristova 46

Precise Ambient Air Temperature Data Logging and Data Processing

Panayot Petrov and Valentin Mollov 51

Evaluating the Performance and Optimizing the Flow Measurement of a Vortex Flowmeter Using Specialized Software

Pavel Dimitrov and Mariela Alexandrova 56

CONTROL THEORY AND APPLICATIONS

Controllability and Observability Gramians for the Circular Membrane with Radial Symmetry

Kamen Perev 60

Replacing the coefficient of the PID controller with a mathematical function

Petar Panayotov and Goran Goranov 66

From Automation Pyramid to Industry 4.0: Transitioning Process and Practical Applications

Pavel Dimitrov and Mariela Alexandrova 71

Optimal geometrical synthesis of cylindrical gear transmissions	
Dimitrinka Dahterova and Ina Nikolova	76

MODELING AND SIMULATION

Study of the Processes in Double Star Ship's Synchronous Propulsion Motor	
Nikolay Djagarov and Zhivko Grozdev	82
Study of Operating Modes of a Synchronous Motor without Damper Winding	
Nikolay Djagarov and Zhivko Grozdev	88
Evaluating computer software model adequacy of electromagnetic processes	
Marin Marinov and Rosen Dimitrov	95
Supply Chain Logistics Marine Simulator	
Bozhidar Dyakov, Milena Karova , Aneta Varbanova, Ivaylo Penev, Ivan Grigorov and Danail Dimitrov	101
Camera calibration for robotic lab setup	
Zhivko Zhekov and Elena Vasileva	107

OPTIMIZATION OF COMMUNICATION SYSTEMS

Optimisation models and algorithms for wireless communications within an office building	
Zlatan Ganev	112
Multi-hop transmission model for optimization of wireless communications and WSNs	
Zlatan Ganev	116
Spam Detection System Based on Hybrid Scoring	
Stefka Popova, Hristo Nenov and Donika Stoyanova	120
An Automatic Spam Detection System Based on Hybrid Scoring Models	
Stefka Popova, Hristo Nenov and Velislav Kolesnichenko	126

SOCIAL ASPECT OF ENGINEERING

Conversational AI for Students with Hearing Disabilities: Approach to the Text Quality Evaluation	
Radka Nacheva	130
Social Engineering Threats in Cybersecurity: Risk Mitigation through Behavioral Insights	
Ivaylo Tsanov	136

The Role of Social Psychology in the Creation of Ethical AI Systems	
Ivaylo Tsanov	142
Evaluating the Accessibility of Electronic Educational Resources in PDF Format	
Bonimir Penchev and Latinka Todoranova	148

COMMUNICATION NETWORKS AND SYSTEMS CHAIR

Behavior of Voice Codecs QoS Metrics in the IP Network Overload Zone	
Vladimir Vichev and Todorka Georgieva	152
IP Network Performance Analysis in VoIP Environment	
Vladimir Vichev and Todorka Georgieva	158
Technical overview & performance evaluation of Virtio-loopback	
Timos Ampelikiotis, Alvise Rigo and Daniel Raho	164
Implementing a High-Precision Boat Navigation System Using Raspberry Pi with RTK and GPS Integration via ESP32	
Ivan Grigorov, Nasko Atanasov, Nikola Nikolov and Dian Dzhibarov	170

MODELING AND CONTROL IN INDUSTRY

Enabling SME Participation in Cross-Border Agricultural Futures: A Tokenized Pooling Model with OTC Clearing Integration	
Deyan Paroushev and Petko Ruskov	174
Algorithmic model for complex assessment of the competitiveness of an industrial enterprise	
Krasimira Dimitrova.....	180
IoT system for AQI monitoring and control	
Ivan Ganchev and Zhanlin Ji	185
Sensor data processing methodology based on flexible architecture and secure data storage	
Valentin Mollov and Panayot Petrov	191

OPTIMIZATION

Evaluation of Energy Efficiency of Si and GaN FET for Power Electronic Converters	
Angel Marinov, Kristiyan Mihalev, Firgan Feraodv and Svetlozar Zahariev.....	195
Minimum Complete Pareto Front of a Biobjective Minimum Spanning Trees Problem	
Lasko Laskov and Marin Marinov	199

ENERGY EFFICIENT CONTROL

Prospects of Intelligent Techniques for Energy Efficient Control of Drying Process	
Desislava Delicheva and Snejana Yordanova	205
Modeling and Analysis of a Real Residential Heating System	
Nikolay Komitov and Margarita Terziyska.....	212
Smart IoT-Based Home Automation System	
Nikolay Komitov and Margarita Terziyska.....	217
Implementation of ESD in automatic temperature, pressure and level control system in raw gypsum calcination plant	
Viktor Tsolov and Nikola Nikolov	223

INTELLIGENT ROBOTICS

Generative AI-Driven Personnel Training in Industrial Robotics through Intelligent HXM	
Stela Stoykova and Nikola Shakev.....	228
Distributed 3D camera distance measurement system for intelligent mobile robots	
Radoslav Vasilev, Nayden Chivarov and Maya Staikova	233
Cascade Control of PMDC Motor on FANUC M-430iA/4FH Robot	
Vesela Karlova-Sergieva and Nina Nikolova.....	240
Automated control of a stand for determining the critical angles of static stability of agricultural robots	
Veselin Mengov, Vladimir Kotev, Georgi Komitov and Evgeni Kehayov	245

COMPUTING 2

Hardware implementation of lightweight cryptographic algorithms: An overview	
Dilyana Dimitrova and Ivaylo Dimitrov	249
Exploring Web3 Challenges: Implications for Investigative Techniques and Evidence Acquisition in Digital Forensics	
Blerim Krasniqi and Eliza Petrova Stefanova	254
Text Mining Student Comments for Teaching Performance Evaluation using VADER and Latent Dirichlet Allocation Algorithm	
Jenny Resuello, Larmie Feliscuzo and Cheryl Pantaleon	260
Features of FDM printing of test specimens	
Miglena Paneva and Peter Panev	266

ADVANCED METHODS IN LEARNING AND TEACHING 1

Comparative Analysis of Generative AI Models for Improving Learning Process in Higher Education	
Nurassyl Kerimbayev, Zhanbota Menlibay, Magdalena Garvanova, Saltanat Djaparova and Vladimir Jotsov	271
Effective management of educational resources – Automated scheduling of lectures	
Boris Stoykov, Mariyan Apostolov, Simeon Arnaudov and Nikolay Nichev	277
Review Using AI Learning Models to Develop E-Learning Platforms	
Lyazzat Zhaidakbayeva, Makpal Dildabayeva and Raushan Sambetova	283
The Impact of a Web Platform with Motivational Elements on Student Engagement in the Learning Process	
Nikolay Nikolov	289

ADVANCED METHODS IN LEARNING AND TEACHING 2

Emerging technologies: focus on distance learning	
Boris Stoykov, Mariyan Apostolov, Simeon Arnaudov and Nikolay Nichev	295
Streamlining Feedback Processes in Virtual Educational Systems	
Nurassyl Kerimbayev, Aliya Akramova, Zhanat Umirzakova and Karlygash Adamova	301
Exploring the Impact of Educational Serious Game in a Gamified LMS	
Milen Sotirov, Valentina Petrova and Donika Nikolova-Sotirova.....	307
Learning through Gamification: A Case Study on the Development and Integration of a University Educational Serious Game	
Milen Sotirov, Valentina Petrova and Donika Nikolova-Sotirova.....	313

CONTROL THEORY

Adaptive Gradient Time Delay Estimator-Based Model-free Fast Nonsingular Terminal Sliding Mode Control for Upper-Limb Exoskeleton Driven by PAMs	
Penghao Li, Haoping Wang and Yang Tian.....	319
Fractional Order Ultra-Local Model-Based Sliding-Mode-Assisted Disturbance Observer and Model-Free Control	
Liuchang Zhang, Haoping Wang and Yang Tian.....	326
Linearization of the algebraic Riccati inequality for continuous and discrete-time descriptor systems	
Andrey Yonchev.....	331

Phase Root Locus - Application in Internal Model Control Systems Vesela Karlovavasergieva, Nina Nikolova, Boris Grasiani and Georgi Stefanov	335
--	-----

APPLICATION OF MACHINE LEARNING

Intelligent Automated Testing Frameworks for IoT Networks Utilizing Machine Learning for Advanced Anomaly Detection Marian Ileana and Maria Miroiu	341
A Deep Learning Framework for Memory Retrieval from Lifelogging Data Mohd Aman, Musfira Jilani, Cristina Muntean, Pramod Pathak and Paul Stynes	353
Robust UAV Image Stitching via Multiscale Feature Matching and Local Homography Matrix Estimation Rou Li and Wei Xue	358

COMMUNICATION AND CYBER SECURITY 1

Flogista: audio encryption with filtered triple Logistic map Borislav Stoyanov, Tsvetelina Ivanova, Dimitar Dobrev and Plamen Ribarski	364
Signal Detection in Impulse Interference Ivan Garvanov, Magdalena Garvanova, Georgi Tsonkov, Desislava Garvanova, Maria Mindova and Daniela Borissova.....	368
Analysis and processing of certificates for various purposes Maleyka Abbaszade Vugar Akbarov and Khatayi Mammadov	373
Rapid Deployment of Low-Cost Wireless Monitoring Solution for Smart Building Radu-Nicolae Pietraru, Robert-Alexandru Craciun and Daniel-Marian Merezeanu	377

ANALYSIS AND DESIGN OF ELECTRICAL AND ELECTRONIC DEVICES 1

Synthesis and Analysis of Low-Pass and High-Pass Voltage-Controlled Voltage Source Active Filters for Educational Purposes in the Communication Circuits Course Adriana Borodzhieva and Snezhinka Zaharieva	381
A New Method for Synthesis of Complementary Pairs of Sequences and Mismatched Filters Borislav Bedzhev and Dilyan Dimitrov	387
Two Recursive Methods for Synthesis of Complementary Pairs and Quads of Sequences with Odd Lengths Borislav Bedzhev and Dilyan Dimitrov	393
Modeling a microprocessor with RISC architecture	

Ilian Varbov, Petar Minev, Matyo Dinev and Valentina Kukenska	399
---	-----

AI APPLICATION METHODS

Image compression-then-encryption model based on A1 attractor

Tsvetelina Ivanova, Dimitar Dobrev, Borislav Stoyanov and Plamen Ribarski	403
---	-----

Handwritten Alphabet Recognition Using Convolutional Neural Networks

Nafeesath Parappurath Puthiyapurayil, Meera Karunanithi, Yasir Jamal, Sakina Juzar Neemuchwala, Rand Kouatly and Ahmed Hassan.....	408
--	-----

Binarization via Local Gradient-like Differences in four Directions

Stefan Panov and Svetlana Panova.....	414
---------------------------------------	-----

The Serbian Retrieval Augmented Generation System based on Hybrid Search

Aleksandar Cenić, Suzana Stojković and Martin Jovanović	420
---	-----

COMPLEX INDUSTRIAL SYSTEMS CONTROL

Future Enterprise as a self-organizing Complex system

Simona Iuliana Caramihai, Dragos Constantin Popescu and Ioan Dumitache	455
--	-----

Modelling of the Deployment of ERP Systems

Radoslav Hrischev, Nikola Shakev and Sevil Ahmed-Shieva	461
---	-----

Smart Manufacturing Integration of Heterogeneous Information Systems via OPC UA. A Case Study

Plamen Vasilev, Ani Boneva, Veronika Ivanova and Tsetso Tsvetanov	466
---	-----

Risk and quality in the test production stage of the rapid prototyping process

Svilen Simeonov.....	472
----------------------	-----

AI APPLICATION IN SOCIO-PROBLEMS

Application of Machine Learning Agriculture Between Developing and Developed Countries : A Systematic Literature Review

Mario Leonardi, Muhammad Resnandy Rafif, Nicholaus Putra and Ali Gunawan	478
--	-----

Neural Classifier of Honey Plants Pollen Using a Combination of Textural and Geometric Features

Lyubomir Zaykov and Diana Tsankova	483
--	-----

Supporting Digitization of a Cultural and Historical Heritage Platform	
Iliya Nedelchev, Veneta Tabakova-Komsalov, Ivan Stoyanov, Stanimir Stoyanov, Vanya Ivanova and Tsvetomira Kazashka	490

Adaptive Neuro-Fuzzy Inference System for Beverage Identification Based on VIS/NIR Spectral Analysis	
Mariyana Sestrimska, Veselin Nachev, Tanya Titova and Plamen Nikovski	494

COMMUNICATION AND CYBER SECURITY 2

Android Agile Test-Driven Development	
Manish Kaushik, Rand Kouatly and Mohammed Nazeh Alimam	500

A comparative analysis of Jenkins as a data pipeline tool in relation to dedicated data pipeline frameworks	
Angel Georgiev, Vladimir Valkanov and Penyo Georgiev	508

Longitudinal and Lateral Stability of Mobile Wheeled Robots - Method of the Surrounding Pyramidal Surface	
Stoyan Lilov.....	513

COMPUTING 1

IoT Continuum for Energy Management	
Simeon Tsvetanov, Dimitar Chalamov and Stela Ruseva	519

Laboratory set-up for the research of roller conveyors for logistics warehouses	
Vladimir Hristov and Ivan Chekurov	525

A Systematic Review on Detection of Aortic Dissection by Utilizing Deep Learning	
Hatice Koç, Nilgün Bozbuğa and Sevinç Gülseçen	531

SWOT Analysis Of The Possibility Of Using AI For Education	
Nikolay Yanev, Iglika Getova, Teodora Hristova, Iva Kostadinova, Georgi Dimitrov and Elizabet Mihaylova	539

ANALYSIS AND DESIGN OF ELECTRICAL AND ELECTRONIC DEVICES 2

Program module for spectral analysis of continuous periodic signals	
Radoslava Gabrova, Hristina Andreeva and Kamen Toromanov	546

A modular approach of PV-systems modelling using real meteorological data	
Svetlozar Zahariev	552

Algorithm for Maritime Target Detection	
Ivan Garvanov and Magdalena Garvanova	558

Development and Practical Application of a Small Laser Engraving Machine	
Stanislav Simeonov, Marin Zhilevski and Mikho Mikhov.....	563

COMMUNICATION AND CYBER SECURITY 3

Some Cybersecurity Issues in Artificial Intelligence Systems	
Vassil Sgurev and Lyubka Doukovska.....	569

Preserving Privacy and Security in Online Assessment Process: Exploration and Analysis	
Iskra Trifonova and Malinka Ivanova	574

Using Reed-Solomon codes to securely transmit data over radio frequencies using broadband communications	
Alla Levina and Nikita Galkin	580

Performance and Accuracy Assessment of Detecting Network Intrusions with eSOM-Based Techniques	
Dimitrios Simeonidis, Pavel Petrov, Georgi Penchev, Stefka Petrova, George Dimitrov and Volodymyr Petrivskyi	586

PROCESS MEASUREMENT AND CONTROL

Switching Multi-regulator Control of Electro-Hydraulic Servo System	
Georgi Mihalev, Stanimir Yordanov and Krasimir Ormandzhiev	592

Application of a Modified Multiparametric PID Controller for Control of an Electrohydraulic Servo System	
Stanimir Yordanov, Georgi Mihalev, Krasimir Ormandzhiev and Stefan Ivanov	598

Single-channel ultrahigh frequency moisture meter with direct measurement of moisture content of bulk materials	
Palvan Kalandarov, Shakhnoza Ubaydullaeva, Nikola Nikolov and Mariela Alexandrova	604

In-Situ Optical Emission Spectroscopy for Process Monitoring and Material Identification in Laser Powder Bed Fusion	
Ema Vasileska, Mite Tomov, Xiaoshuan Zhang and Valentina Gecevska	608

AI APPLICATION IN HEALTH CARE

Methods and Applications of Artificial Intelligence In Mental Health Care	
Vitali Atias and Katerina Atias.....	614

Enhancing Model Robustness Using Differential Debugging in Jupyter Notebooks: A Case Study with Noisy Breast Cancer Data	
Martin Vassilev and Alexander Penev	621
Malaria Cell Classification Using CNN: A Deep Learning Approach	
Nafeesath Parappurath Puthiyaputayil, Meerah Karunanithi, Muhammad Qasim Ali, Rand Kouatly, Ali Vaisifard and Ahmed Hassan.....	627
Classifying Human Emotions through EEG data with Machine Learning	
Gaganjot Kaur, Meenu Gupta and Rakesh Kumar	632

PROCESS CONTROL

Design and Development of a 3D printed gripper	
Damjan Pecioski, Albion Shaipi and Dejan Shishkovski.....	637
Comparative analysis of different forms of grinding bodies and media, including innovative ones in ball mill	
Miglena Paneva, Peter Panev and Nikolay Stoimenov	641
Methodology for Predicting and Optimizing Process Parameters and Accuracy Indicators of Complex Plastic Parts Through Virtual Prototypes	
Todor Todorov, Georgi Todorov and Yavor Sofronov.....	646
Rapid prototyping of process-driven applications using low-code development platforms: A case study from the Greek public sector	
Marios Konstantinos Gialitakis, Nikolaos Nousias, George Tsakalidis, and Kostas Vergidis	650