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Organizers Foreword

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I. WELCOME MESSAGE

We are very glad to welcome our colleagues – young scientists, researchers and practitioners to the 8-th IEEE Open Conference of Electrical, Electronic and Information Sciences (eStream'2021), held in Vilnius, Lithuania, 22 April 2021. The eStream conferences aim to disseminate the research achievements between worldwide groups of scientists and engineers working in a different areas of sciences in order to reach more tight relationship and generate new ideas for joint projects or other means of collaboration.

The technical program of eStream'2021 was attended by 58 participants and contained 2 keynote speeches, 29 oral presentations delivered during 2 regular sessions. Each technical paper has been peer reviewed by several independent referees of the international Technical Program Committee comprised from 24 members and, based on the recommendation of the reviewers, 22 papers are finally accepted for publication in the proceedings. We express our sincere thanks to the invited speaker and article authors, track chairs and reviewers who have made this conference a success. Finally, we sincerely hope that you will find our conference and all contributions presented in the proceedings a valuable resource in your professional and research activities whether you are academic, researcher, or a practicing professional!

II. INSIDE PROCEEDINGS

In order to help orienting in a diverse area of research presented in the eStream'2021 proceedings, in the rest of this foreword we will very briefly introduce invited speakers and all papers generously classified into keynote speech and oral session.

A. Keynote Speech

Dr. Nuno Escudeiro, Mário Cruz and Paula Escudeiro from Polytechnic Institute of Porto, Portugal, and ATHENA European University, delivered a keynote speech on sustainable education involving not only the conservation of our natural ecosystem, biodiversity and the development of a sustainable society but also promoting equity and ensuring life-long learning opportunities for all regardless of any handicaps or adverse circumstances. UNESCO, through its Sustainable Development Goals, and the European Commission through several programs, push the society and the universities to promote Quality Education as a core asset in the digital era. ATHENA as a European University aimed at nurturing the development of all-inclusive green digitalization of societies. The educational model of ATHENA is based on several initiatives and novel pedagogies to advance green education and inclusion at the European Higher Education Area. At this presentation the general architecture of ATHENA was described focusing on concrete activities directly linked to sustainable education such as competence clusters, an embedded mobility culture and assistive technology. ATHENA will set all these in place in order to become by 2023 a renowned brand in higher education, a unified, yet distributed, campus underpinning a global value-chain for education and research services.

Dr. John C. Liobe from Department of Electrical and Computer Engineering School of Engineering, University of Rochester, USA and Department of Computer Science and Communications Technologies, Vilnius Gediminas Technical University (VILNIUS TECH), Lithuania, delivered a keynote speech on the high-speed, low-light, low-power vision systems.

B. Oral Sessions

In the first paper Ieva Jonaitytė from Faculty of Mathematics and Informatics and Linas Petkevičius from Institute of Computer Science, Vilnius University, Lithuania, present the methods for extraction of significant information from medical breast cancer images for survival analysis. In breast cancer diagnostics as well as in the analysis of other medical images it is still common to employ manual assessment by medical

staff, which needs a lot of prior professional knowledge. Unfortunately, such feature engineering is difficult to manage, reproduce and it also depends on each specific task and expert experience. The analysis how high-level features can be used for survival models is presented. The unsupervised learning models for information compression to bottlenecks via convolutional neural networks and autoencoders to obtain the informative covariates are created and these image-related covariates used in Cox proportional hazards regression. The ability of unsupervised methods to allow extracting meaningful covariates that are significant for survival analysis without using explicit feature engineering or image labeling is demonstrated. The experiments are based on the Cancer Genome Atlas breast cancer dataset.

The second paper is coming from Kirill Smelyakov, Anastasiya Chupryna, Oleksandr Bohomolov and Nikita Hunko from Department of Software Engineering, Kharkiv National University of Radio Electronics, Ukraine. The article discusses an estimation of the effectiveness of the use of modern convolutional neural networks for face detection and face recognition. On standard and custom datasets, learning of neural networks and comparison of the effectiveness of their functioning are carried out. An algorithm and recommendations are proposed regarding the practical application of the neural networks for detecting faces on digital photographs.

In the third paper, Hidayat Ur Rehman and Amjad Ullah Khattak from Department of Electrical Engineering UET Peshawar, Pakistan, present an analysis of exponential growth in necessities of limiting DC fault current and instant restoration of High Voltage DC power systems. The investigated Half Bridge Modular Multilevel Converter is unable to clear DC fault current due its free-wheeling diodes, therefore it is indispensable to confine DC fault current. For limiting DC fault current and instant restoration of system, Thyristor based DC fault current limiter and Saturated Iron Core Superconductor fault current limiter (SI-SFCL) is analyzed with Hybrid DC Circuit Breaker (HDCCB). The Thyristor based fault current limiter consists of thyristor, resistor and an inductor. SI-SFCL consists of primary, secondary and superconducting coil. The Thyristor based DC fault current Limiter confine fault current to 2.5 kA from 14 kA which show 82% suppression of DC fault current, while SI-SFCL confine fault current to 3.5 kA from 14 kA which shows 75% suppression of DC fault current. The restoration time achieved from TB-FCL with HDCCB is 28 ms and from SISFCL with HDCCB is 140 ms. A PSCAD/EMTDC is used for the design and simulation.

The fourth paper is coming from Aliaksei Kolesau and Dmitrij Šešok from Department of Information Technologies, VILNIUS TECH, Lithuania. Paper discusses the proposed practical method to improve the false rejection rate of a voice-activated system. The users of such systems tend to repeat the activation word in the case of the false rejection. In the proposed method a decoder of a phoneme-based voice-activated system is modified for detecting such repeats which allows to catch 14.6% of previously undetected cases, while not increasing the false alarm rate, and 79% while adding less than 1% of false alarm rate. The fact that the repeat of the activation word consists of twice as many phonemes than the single pronunciation is used, which allows more reliable detection.

The fifth paper is coming from Muhammad Usman Naseer, Bilal Asad, Payam Shams Ghahfarokhi, Ants Kallaste, Toomas Vaimann and Anton Rassõlkin from Department of Electrical Power Engineering and Mechatronics, Tallinn University of Technology (TalTech), Estonia. This article presents the basic experimental procedures and calculations for determining the equivalent-circuit parameters of a small-scale commercial synchronous generator. The tests performed, are based on IEEE guide for synchronous generator test procedures and the IEC standards.

In the sixth paper, Yuliya Popova from Faculty of Information Technologies and Robotics, Belarusian National Technical University (BNTU), Belarus, reviews a new learning management system called EduCATS. The proposed system covers all the components of the educational process, monitor the progress and the process of studying the educational material by students, check the completed tasks for plagiarism. The EduCATS system has been introduced into the educational process at the Faculty of Information Technologies and Robotics of Belarusian National Technical University and is actively used to train software engineers. The intellectual component in the EduCATS learning management system creates a unique training program that is based on the existing knowledge and the level of perception of the training material by students. As mathematical methods, it is proposed to use the analysis of expert systems, as well as artificial neural networks. By formalizing the intellectual processes that are carried out by both the teacher and the student, it is possible to automate a certain part of the teacher's functions, reduce the cost of manual labor, which will make it easier to monitor the educational process, and make the learning process more efficient.

The seventh paper is coming from Darius Chmieliauskas and Šarūnas Paulikas from Department of Computer Science and Communication, VILNIUS TECH, Lithuania. This paper is focused on increase of video streaming services popularity leading it to become the main contributor to LTE network load. Loaded mobile network by 3rd party applications bring cost for Mobile Network Operators to build new base stations or add additional carriers. This paper presents a short description of OTT video delivery methods, used transport protocols and typical video codecs. Also measurements of video streaming over mobile networks. Equivalent bitrate requirements for video stream measured in different LTE RF signal quality areas. It allows to evaluate LTE network capacity requirements in terms of physical resource blocks utilization.

In the eight paper, Anastasiya Burmakova and Diana Kalibatiene from Department of Information Systems, VILNIUS TECH, Lithuania, report on an Adaptive Neural Fuzzy Inference System (ANFIS) based model to predict the oil spill consequences on the ground. Considering the randomness and complexity of oil spill accidents on the ground, the oil spill volume, the spilled oil density, the spreading coefficient of oil product on the surface layer and ground thickness, were taken as the initial influencing attributes for the prediction of oil contamination into the ground. Based on the study of the ANFIS, a nonlinear fuzzy model to evaluate oil spill damage to the ground was established. Combined with the oil spill on the ground data obtained from the linear oil spill model and opinions of experts, the ANFIS-based prediction model for oil spill contamination to the ground has been proposed

in this paper. Study results show that the proposed model is able to predict the oil spill contamination into the ground with reasonable accuracy. Its performance was assessed through the correlation coefficient, the coefficient of determination and the root-mean square error.

The ninth paper is coming from Justė Rožėnė, Laisvidas Striška, Vaiva Trečiokaitė, Ernestas Šutinys, Andrius Dzedzickis, Inga Morkvėnaitė-Vilkončienė, Vincas Žičkus, Mantas Makulavičius and Vytautas Bučinskas from Department of Mechatronics, Robotics and Digital Manufacturing, VILNIUS TECH, Lithuania. Scanning probe microscope (SPM) positioning system quality depends on the design of the positioning system, environmental factors, frictional forces, and load. The aim of the research is to determine the accuracy and repeatability of a homemade micropositioning system for sample positioning in the experimental SPM setup. For the design of the micropositioning system, micrometric resolution ball-screw drives with stepper motors were used. Axes parameters, such as positioning errors, repeatability, and accuracy, were evaluated using the ISO 230-2 standard methodology. The results from experimental research show positioning accuracy of X-axis 113.67 μm, and repeatability 13.68 μm. Although the accuracy value mainly contains a systematic positioning error 103.5 μm, therefore, this can be compensated using features available in LinuxCNC control software. The achieved positioning accuracy of the Y-axis was 6.86 μm, and repeatability 6.72 μm.

In the tenth paper, Viktar Atliha and Dmitrij Šešok from Department of Information Technologies, VILNIUS TECH, Lithuania, present methods related to natural language processing problems using vector representations of words. These can be either representations learned for a specific task or pretrained vector representations learned from a huge corpus of texts. Image captioning is not an exception. Mostly pretrained vector representations are not used, but they are trained along with the rest of the model during the training models that generate a textual description of an image. In this work, the use of pretrained vector representations for words to improve the quality of the model is investigated. The research shows that the use of such representations as Word2vec and GloVe improves the quality of the model, while GloVe embeddings are even more suitable for this task. Moreover, even greater gain is obtained if they are used as an initial approximation and fine-tuned in the process of training the entire model.

The eleventh paper is coming from Vygantas Ušinskis, Ernestas Šutinys, Karolina Lapkauskaitė, Emilijus Vaišnoras, Andrius Dzedzickis, Darius Viržonis and Vytautas Bučinskas from Department of Mechatronics, Robotics and Digital Manufacturing, VILNIUS TECH, Lithuania. This article discusses automation of the structural health monitoring. Automation of such processes is mainly limited by the lack of suitable sensors, such situation is especially noticeable in industrial solid-fuel boilers applications. There is huge lack of cheap and reliable sensors for internal concrete stress measurements in high-temperature. This research proposes a resistive pressure sensor prototype for measuring internal concrete stresses in a high temperature range. During the experiment sensor was integrated into concrete sample which was heated up to 600°C. During experiments sensor resistance varied from 700 kΩ to 24 Ω, obtained results proves functionality of developed sensors and its sensitivity for internal stress variation.

The twelfth paper is coming from Giruta Kazekeviciute-Januskeviciene, Edgaras Janusonis and Romualdas Bausys from Department of Graphical Systems, VILNIUS TECH, Lithuania. The evaluation of remote sensing imagery segmentation results plays an important role in further image analysis and decision-making. The search for the optimal segmentation method for a particular data set and the suitability of segmentation results for the use in satellite image classification are examples where the proper image segmentation quality assessment can affect the quality of the final result. There is no extensive research related to the assessment of the segmentation effectiveness of the images. The designed objective quality assessment metrics that can be used to assess the quality of the obtained segmentation results usually consider the subjective features of the human visual system. A novel approach is used in the article to estimate the effectiveness of satellite image segmentation by relating and determining the correlation between subjective and objective segmentation quality metrics.

In the thirteenth paper, Yaroslav Navrotsky and Natallia Patsei from Department of Software Engineering, Belarusian State Technological University (BSTU), Belarus, studied one of the most innovative directions in the Internet – the Information Centric Networks, in particular the Named Data Network. This approach should make it easier to find and retrieve the desired information on the network through name-based addressing, intranet caching and other schemes. This article presents Named Data Network modeling, results and performance evaluation of proposed caching policies for Named Data Network research, taking into account the influence of external factors on base of Zipf's law and uniform distribution.

The fourteenth paper is coming from Kestutis Pakrijauskas and Dalius Mažeika from Faculty of Fundamental Science, VILNIUS TECH, Lithuania. The research is related to containers what are becoming the primary platform to run microservices because of their flexibility and light weight. Container orchestration frameworks – like Kubernetes or Docker Swarm – enable companies to stay on competitive edge by keeping the velocity of code deploys high. While containers are ideal for stateless workloads, using orchestrated containers for stateful services is also an option. Being a commodity and crucial to any business, state or, in other words, data has to be protected and be available. This research raises questions on what the reliability challenges of running stateful microservices are, and what are the recent approaches to increase reliability of stateful services in orchestrated container systems. A literature review was performed to answer the questions.

The fifteenth paper, by Natallia Patsei from Department of Software Engineering, BSTU, Belarus, and Ksenia Tsybulka from Department of Information System Software, Belarusian State University of Informatics and Radioelectronics, Belarus, analyzes the problem of object classification and introduces a software model for the multi-class classification of image objects based on machine learning algorithms. The results of two modes model operation: OneVsRest and Error Correcting Output Codes are presented. Satellite images of the earth's surface were used as datasets for classification. A comparative analysis of precision, recall, accuracy, hamming loss and classification duration has been carried out. Optimal code rates for Error Correction Output Codes are experimentally determined to achieve increase classification accuracy.

The sixteenth paper is coming from Marius Šumanas, Algirdas Petronis, Darius Urbonis, Tomas Januškevičius, Tadas Rasimavičius, Inga Morkvėnaitė-Vilkončienė, Andrius Dzedzickis and Vytautas Bučinskas from Department of Mechatronics, Robotics and Digital Manufacturing, VILNIUS TECH, Lithuania. The paper discusses the automation techniques for controlled job execution in the excavation process, what are extremely useful for excavator tool trajectory generation, digging process simulation, and new tools or machines' developmental testing. Proper choice of sensors for excavator tool position determination is crucial for the successful implementation of automated systems. An industrial robotic arm is used to simulate excavator operation and determine the characteristics of available sensors. Four inertial measurement units sensors mounted on the industrial robotic arm are used to estimate the joints positions and compare results with data from internal robot sensors. The obtained findings suggest that the chosen sensors are appropriate for the estimation of joint angle. It was found that the X axis error should be less than 2.27 degrees. If the Z axis is inevitable for some control task, additional sensors can be used to establish reference points for yaw angle calculation.

The seventeenth paper is coming from Šarūnė Sielskaitė and Diana Kalibatienė from Department of Information Systems, VILNIUS TECH, Lithuania. This paper focuses on Software systems project failure, which has been a recurring problem for decades. One of the main factors of project success is appropriately chosen project management methodology and its adaption to the project type, company, and its employees. Although some methods have been proposed to address this problem, the number of failed projects shows that the problem is still relevant. Means, that new and more efficient solutions are needed. This article proposes a new approach to simulate a project management flow and anticipate its shortcomings in the initial stages. It is based on dynamic case management model and notation software systems project management process modelling and simulation. The proposed method is evaluated with industry case study.

In the eighteenth paper, Daniil Valme, Karolina Kudelina, Anton Rassõlkin from Department of Electrical Power Engineering and Mechatronics, TalTech, Estonia, present and discuss the development of autonomous vehicles. Such technologies and innovative approaches can help to facilitate people's life in different. However, practical implementation of autonomous vehicles requires innovation in different spheres such as regulations, cybersecurity, and ethics. The demand for applying autonomous vehicles in rugged terrain conditions is growing, bringing new challenges for both obstacle overcoming and detection. This paper describes a process of preliminary sensors selection obstacle detection in an autonomous continuous track robot. Different sensors are studied and chosen for a particular case. The initial algorithm for robot navigation is proposed.

The nineteenth paper is coming from Dmitrij Melkov and Šarūnas Paulikas from Department of Computer Science and Communications Technologies, VILNIUS TECH, Lithuania. Security elements of data communication networks such as packet filters, firewalls, intrusion detection and prevention systems are in first line of defense against cyber security threats and various attacks such as DDoS and many others. With constantly increasing demand of compute power and grow of various cloud services, complexity of traditional networks makes it more difficult to maintain security policies in fast and safe manner. To simplify management and overcome limitations of traditional networks concept of software-defined networking (SDN) was proposed. The main idea of SDN is separation of control and data planes of devices. Combined control plane into network controller brings intelligence into network and open wider possibilities for automation. Separated data plane makes it possible for devices to run in headless mode during critical situations when control plane is not functioning. SDN also simplifies managing of security policies, it helps to ensure intime deploying and minimize possibility of mistake. However, SDN architecture has some places which can be used as main point of cyber-attack. Purpose of this paper is to describe security benefits and drawbacks of software-defined network.

The twentieth paper is coming from Karolina Kudelina, Toomas Vaimann, Anton Rassõlkin and Ants Kallaste from Department of Electrical Power Engineering and Mechatronics, TalTech, Estonia. This paper describes possibilities for reduction of bearing currents in induction motors. Growing usage of motors running with variable speed drives, the problems of bearing currents and related damages have become a significant issue in industry. Bearing currents cause a higher portion of faults in induction machines. Therefore, the maintenance question is getting a great importance. The paper addresses a problem of bearing currents and lists different methods for their avoidance. This study gives a comparison of the methods, discussing advantages and disadvantages of each of them.

In the twenty-first paper, Roma Rinkeviciene, Brone Mitkiene and Dainius Udris from Department of Electrical Engineering, Vilnius College of Technologies and Design and VILNIUS TECH, Lithuania, present the model of field-oriented control six-phase induction drive with fuzzy controllers. Two types of fuzzy controllers were designed and implemented in the model. PD and PI fuzzy controllers, with the same per unit membership functions and 49 rules were used to replace conventional PI controller. Simulation results of controlled parameters indicate that both controllers create robust systems.

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