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- INTERNATIONAL CONFERENCE
- OF APPLIED SCIENCES, ENGINEERING
- AND MATHEMATICS (ICASEM 2020)



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Engineering and Mathematics**

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Conference Topics

Computer and communication engineering

Service oriented computing
Intelligent systems
Artificial intelligence and robotics
Software platforms and middleware
Big data, database systems, cloud computing and platforms
Internet modeling, semantic web and ontologies,
Mobile wireless networks
Communication and information theory
Computer networks
Wireless and mobile communications
Wireless sensor networks
E-learning / mobile learning

Electrical and electronics engineering

Sensor nodes, circuits, devices
Parallel and distributed processing architectures and systems
Image, speech and video processing
Signal processing
Electrical circuits and systems
Semiconductor devices
Integrated circuits
Electric drives and application
Electrical machines, power electronics and industry applications
Power electronics and power drives
Power system modeling, simulation and analysis
Power systems and energy
Renewable energy

Industrial engineering

Operations research
Operations management
Artificial intelligence
Project management
Decision analysis
Production planning and control
Manufacturing and service systems
Simulation
Intelligent manufacturing
Ergonomics

Architecture

Architecture engineering
Urban planning regulations and participation;
Urban planning and social inclusion
Sustainable architecture/design
Building/cultural heritage in architecture
(reconstruction and revitalization of buildings)
Green cities
Urbanization of public space
Ethics in architecture

Civil and structural engineering

Construction materials
Engineering structures, liability and durability
Geo-technical engineering
Seismology
Structure safety and prevention of disasters
Hydraulic and hydro-power engineering

Chemistry, chemical and environmental engineering

Bio and food technology
Advanced materials and technology
Medical and pharmaceutical chemistry and technology
Separation processes
Process safety and loss management
Chemical reactor engineering
Fuel and energy
Waste and waste water management
Air pollution control
Environmental sustainability

Protein engineering

Biophysics
Genetic engineering
Cancer genome biology
Protein engineered biomaterials
Applications of genetic and protein engineering
Novel approaches for genetic and microbiology
Structure and function of proteins and DNA
Gene expression analysis
Pharmacogenomics and pharmacoproteomics

Mathematics, education and application

Mathematical analysis
Geometry and topology
Graph theory and combinatorics
Probability and statistics
Applied mathematics: numerical analysis, algebra and computational mathematics
Teaching Mathematics

Scientific Program Committee

- Aleksandra Porjazoska Kujundziski, PhD, International Balkan University, North Macedonia
- Andrej Stefanov, PhD, International Balkan University, North Macedonia
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- Jeta Ilijazi, MSc
- Kefajet Edip, MSc
- Damir Rahmani
- Merjem Hoxha
- Albina Miftari
- Zani Dida
- Eda Rada



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KEYNOTE SPEAKERS



Prof. Dr. Ali Ghayeb



Prof. Dr. Nicholas Kathijotes

Texas A&M University, Qatar

Utilizing Machine Learning for
Planning Unsupervised Future
Cellular Networks

International Ocean
Institute, Cyprus

Climate Change and Rainwater
Management – Rain Cities

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Utilizing Machine Learning for Planning Unsupervised Future Cellular Networks

Reducing the cost of deploying cellular networks is of great interest to all concerned parties, including service providers and users. Such cost can be associated with operation (OPEX) or capital (CAPEX). Towards achieving this goal, the wireless industry is moving towards zero-touch cellular networks, i.e., zero human intervention. The need for having unsupervised (i.e., automated) cellular networks is aligned with the vision of having a dynamic cellular architecture, enabled by the use of mobile equipment (e.g., unmanned aerial vehicle base stations), which gives the architecture flexibility to adapt quickly and frequently to service demands. To this end, the concept of self-organizing network (SON) has been established and added to the list of 5G/6G key enabling technologies that aim at automating the processes of planning, configuration, management, and healing cellular networks. Among these processes, radio access network (RAN) planning has received special attention, since it decides on the required radio resources and the equipment to deploy, which directly affects CAPEX. Motivated by the above, we present in this talk a framework that aims at developing an unsupervised planning process that provides the essential planning parameters of cellular networks, including the minimum number of required base stations (BSs), their positions, coverage, and antenna radiation patterns, while taking into consideration the inter-cell interference and satisfying capacity, coverage and transmit power constraints. We make use of the statistical machine learning (SML) theory to solve the problem at hand. The core idea of SML is that the planning parameters are treated as random variables. The parameters that maximize the corresponding joint probability distribution, conditioned on observation of users' positions, are learned or inferred using Gibbs sampling theory and Bayes theory. The inference process involves linking the observations and the planning parameters through a probabilistic model (i.e., a problem formulation) which yields a Dirichlet process. Through several numerical examples, we show that the performance of the proposed framework is superior to two existing main planning approaches, including the k-mean based approach. We also demonstrate how our approach can leverage existing cellular infrastructures into the new design.

Biography

Ali Ghayeb received the Ph.D. degree in electrical engineering from The University of Arizona, Tucson, AZ, USA, in 2000. He is currently a Professor with the department of Electrical and Computer Engineering, Texas A&M University at Qatar. Prior to his current position, he was a tenured professor in the Electrical and Computer Engineering Department, Concordia University, Montreal, QC, Canada. He has co-authored two books and published over 200 journal and conference papers. His research interests include wireless and mobile communications, physical layer security, massive MIMO, wireless cooperative networks, and visible light communications. He was a recipient/co-recipient of several best paper awards. He served as an instructor/co instructor in many technical tutorials at several major IEEE conferences. He served as the Executive Chair of the 2016 IEEE WCNC Conference. He currently serves as a member of the IEEE ComSoc Conferences Council, a member of the IEEE GITC Committee, and a member of the IEEE WCNC Steering Committee. He served in different editorial capacities for a number of IEEE transactions journals. He is an IEEE Fellow.

Climate Change and Rainwater Management – Rain Cities

Climate change is already having wide-ranging consequences for human health, the environment and economies across Europe. Southern and central Europe are seeing more frequent heat waves, forest fires and droughts. The Mediterranean area is becoming drier, making it even more vulnerable to drought and wildfires. Most of the water problems due to climatic changes such as floods, droughts and water shortages are related to rainwater. This concludes that proper rainwater management promises a huge potential for the control or the solution of these problems. As many countries suffer from floods and drought, such disasters can become a blessing with proper rainwater management. This presentation outlines the development of water management technologies from the ancient times up to the most modern smart methods.

Biography

Dr. Nicholas Kathijotes is an experienced International senior consultant and academic with a demonstrated history of working in the higher education industry. Skilled in Water Resources and Wastewater Management, Blue Economy infrastructure, Ocean protection and Climate Change. Strong US education professional with a Doctorate focused in Environmental Engineering from the University of Architecture, Civil Engineering and Geodesy (UACEG) BG. Numerous keynote invitations to international events on topics of interest with emphases on Blue Economy, Blue Technology management and Blue infrastructure. Dr. Nicholas Kathijotes received his first degree in Civil Engineering (BSCE), from the University of Massachusetts (USA). After a Fulbright scholarship he received his Master's degree in Environmental Engineering from the University of New Haven (USA). His Doctorate research was carried at the University of Architecture, Civil Engineering and Geodesy in Sofia (BG), and was obtained with the highest distinction. He investigated the effects of irrigation with treated wastewater on various soils of Cyprus. He attended professional courses on pollution management and lysimetry at the Harvard School of Public Health (Boston, USA), and at the Universitat Autònoma De Barcelona (SP), respectively. He represented Cyprus as member of the management committee of European research programs (various COST Actions), and is a member of The Lysimetry Research Group in Austria. He is a Member of the Cyprus Scientific and Technical Chamber (ETEK), and currently Member of the Management Committee of European Action 15217. He participated as partner and associate in various EU and national research projects and is a member of Editorial Boards and numerous conference scientific committees globally. He presented about 100 articles in scientific journals, as book chapters and Conference proceedings. Invited internationally as keynote speaker, UNDP consultant and invited EU (ERA) expert as research project evaluator and monitor. Since 2008, he is the Focal Point for Cyprus of the 'International Ocean Institute', with intense involvement in issues of Blue Economy and emphasis on the Blue Growth of Developing Countries (Thailand, Philippines, Malaysia, Vietnam).

Decision Tree and Basic Concepts and Algorithms

Lindita Loku¹, Hekuran Nikçi²

¹lindita.loku@unt.edu.mk ²hekuran@linknyreality.com

ABSTRACT

Through this work with the decision tree and basic concepts and algorithms, we tried to address the following goals:

1. Become an access with modern methods that mentioned today.
2. To have an implementation of data base in different fields of application.
3. To enable connection of the concepts of decision tree and algorithms in such a way and extent so they should be able to use the programming language that help using practical work.

Matter under consideration is divided into 3 basic parts, shortly with this content:

The first part: in general introduce basic concepts of Decision tree, Basic algorithm decision tree algorithms, algorithm function and information gain.

Data Mining, or Knowledge Discovery in Databases (KDD) as it is also known, is the non-trivial extraction of implicit, previously unknown, and potentially useful information from data. This encompasses a number of different technical approaches, such as clustering, data summarization, learning classification rules, finding dependency networks, analyzing changes, and detecting anomalies.

In this section some of the basic concepts of Data Mining in general and Data Mining tools will be discussed. To be able to do a Data Mining task, a dataset is required. This set will contain records (or instances). Each record is defined by a number of values for some specific attributes.

In the second part: we have data mining ,definitions continued, knowledge discovery from data, concept/class description: characterization and discrimination.

In the third part: in general reviewed association analysis basic concepts and algorithms, frequent item set generation, a priori principle, a priori algorithm, algorithms to find frequent pattern, Fp- tree size and result.

Keywords: *Data mining; Algorithms; Concepts decision tree*

Topic: *Computer and communication engineering*

User Modeling Approaches in Adaptive Learning Systems

Neslihan Ademi¹, Suzana Loshkovska², Ivan Chorbev³

¹*neslihan@ibu.edu.mk*, ²*suzana.loshkovska@finki.ukim.mk*, ³*ivan.chorbev@finki.ukim.mk*

¹ International Balkan University, Skopje, North Macedonia

^{2,3} University of Ss. Cyril and Methodius, Skopje, North Macedonia

ABSTRACT

Adaptive learning systems have potential for accommodating student differences in a diverse population. Adaptive learning can be used both in blended learning settings and flexible learning methods by adjusting to the pace of student, allowing the flexibility in learning styles, different sequence of curriculum and customized presentation. Adaptive system architecture consists of three essential parts; user model, domain model and interaction/adaptation model. As one important feature of any adaptive system is the user model that represents information about each user/student, this paper focuses on user model by overviewing the existing approaches in user modeling in terms of used data types, model initializing methods and implementation of the models.

Keywords: Adaptive learning systems (ALS), adaptive eLearning, user modeling, learner model.

Topic: Computer and communication engineering

Design of a Virtual Classroom for Engineering Students: Application of a Web-Based Service and Machine Learning

Merjem Hoxha¹ and Hiqmet Kamberaj²

¹*merjem.hoxha@ibu.edu.mk*, ²*hkamberaj@ibu.edu.mk*

^{1, 2}International Balkan University, Department of Computer Engineering, Skopje, R. of North Macedonia

ABSTRACT

The virtual classroom laboratory is another alternative that may be offered to the engineering students to avoid the use of wet-classroom labs. This presentation aims to provide a design of such classroom laboratory for engineering students. In particular, we will discuss a new methodology for accurate predictions of different thermodynamic properties of the (bio)molecular systems using the machine learning approaches.

This study aims to introduce a database management system of a large dataset that can be used to automate the prediction of (bio)molecular properties using a newly developed machine learning approach. Also, we aim to discuss the efficiency of data mining through web pages and datasets.

Keywords: *Machine Learning; Automation; Database systems; Virtual laboratory*

Topic: *Computer and communication engineering*

Cavity Quantum Electrodynamics Model to Study Quantum Fluctuations in Vacuum: Application to Quantum Information Processing

Hiqmet Kamberaj

hkamberaj@ibu.edu.mk

International Balkan University, Department of Computer Engineering, Skopje, R. of North
Macedonia

ABSTRACT

Quantum optics is a field of physics dealing with the interaction of the light with the matter. The studies in this field are also driven by the progress made in the development of micro-scale technologies and its application in quantum communication and quantum information processing.

This study aims to discuss the quantization of the electromagnetic field and its quantum states. Also, interactions of the quantum system with the environment considered as a bath of quantum oscillators in the context of the quantum electrodynamics field (QED) confined inside a cavity. As an illustration, we will discuss the behavior of the atoms and semiconductor quantum dots placed in a cavity QED, as the cases of the QED formalism used in quantum information processing.

Keywords: *Quantum Electrodynamics; Cavity; Quantum Information Processing*

Topic: *Computer and communication engineering*

Impact of ARQ on the Distortion Performance of Underwater Acoustic Mobile Networks

Andrej Stefanov

andrejstefanov@ieee.org

Faculty of Engineering

International Balkan University, Skopje, MK

ABSTRACT

Underwater acoustic mobile networks consisting of autonomous underwater vehicles (AUV's) are considered. Such networks are appealing due to their ability to perform sensing and surveying of underwater areas for environmental, scientific, and/or commercial objectives. The AUV's transmit the information along multihop routes through the network. The focus is on the average route distortion. The automatic repeat request (ARQ) protocol is implemented on a hop-by-hop basis. The mobility model is direction persistent. Each AUV-to-AUV channel is subject to frequency dependent path loss, Ricean fading and interference. Numerical examples that illustrate the impact of ARQ on the average route distortion are presented.

Keywords: *underwater acoustic networks; mobility; distortion; ARQ.*

Topic: *Computer and communication engineering.*

Determining Seven Different Brain-Computer Interface Commands using Fourier Transform and Machine Learning Methods from SSVEP

Ebru Sayilgan^{1,*}, Yilmaz Kemal Yuç², Yalcin Isler³

¹ebru_drms@hotmail.com, ²yilmazkemalyuce@gmail.com, ³islerya@yahoo.com

¹Izmir Katip Celebi University, Institute of Science, Department of Biomedical Technologies, Cigli, Izmir, Turkey

²Alanya Alaaddin Keykubat University, Faculty of Engineering, Department of Computer Engineering, Antalya, Turkey

³Izmir Katip Celebi University, Faculty of Engineering and Architecture, Department of Biomedical Engineering, Cigli, Izmir, Turkey

*Corresponding author.

ABSTRACT

Steady-state visually-evoked potentials (SSVEPs) is a signal that occurs in the visual cortex of the brain when the subject focuses on the visual stimuli that flicker at a certain frequency. Compared to other brain-computer interfaces (BCI) techniques based on electroencephalogram (EEG) signals, SSVEP has been preferred thanks to its higher signal-to-noise ratio and information transfer rates. However, the main challenge of the SSVEP-based BCI system is to detect the stimulus frequency from the brain signals among many fundamental frequencies where each frequency is dedicated to a specific command. Only a few studies are investigating the multiple frequencies, which are more than 3 commands, using SSVEP signals at the same time. In this study, we aimed to determine 7 different commands from the SSVEP signals in a single classifier. For this purpose, we used the AVI SSVEP Dataset that was recorded when subjects looked at a flashing box at seven different frequencies (6-10Hz). After applying the Fourier Transform, features of energy, entropy, and variance were extracted for each of the EEG subbands. These features were applied to the inputs of six basic classifiers (Decision Tree, LDA, k-NN, SVM, Naive Bayes, Ensemble Learning). The classification was analyzed by the 5-fold cross-validation model. As a result, the highest performance was 57.10% for the Ensemble Learning classifier.

Keywords: *Brain-computer interface; electroencephalogram; steady-state visually-evoked potentials; Fourier Transform; machine learning*

Topic: *Computer and communication engineering*

Investigation of the Effect of Normalization Techniques on Discriminating Patients with Paroxysmal Atrial Fibrillation Patients

Murat Surucu^{1,4}, Yalcin Isler^{2,*}, Resul Kara³

¹msurucu@gmail.com, ²islerya@yahoo.com, ³resulkara@duzce.edu.tr

¹Republic of Turkey Ministry of Natural Education, Ankara, Turkey

²Izmir Katip Celebi University, Faculty of Engineering and Architecture, Department of Biomedical Engineering, Cigli, Izmir, Turkey

³Duzce University, Faculty of Engineering, Department of Computer Engineering, Duzce, Turkey

⁴Duzce University, Institute of Science, Department of Electrical, Electronics, and Computer Engineering, Duzce, Turkey

*Corresponding author.

ABSTRACT

Paroxysmal Atrial Fibrillation (PAF) has been defined as the early stage of atrial fibrillation that is one of the most common cardiac rhythm disorders. It affects approximately 6% of the US population over the age of 65. Heart rate variability (HRV) has become popular in diagnosing many types of cardiovascular system problems especially. Only a few studies inquired about the elimination of the possible effect of inevitable cardiac speed from the HRV data. In this study, we investigated the effect of heart rate normalization (HRN) and different feature normalization methods on discriminating patients with PAF from normal subjects using k-Nearest Neighbors (KNN) classifiers and online dataset from PhysioNet. The selected features extracted from HRV and HRN (by fixing the heart rate 75) data were applied to KNN. Before the feature selection process using Genetic Algorithms, features were also normalized by min-max and z-score methods. As a result, we reached accuracies of 75%, 81%, and 80% by applying no, min-max, and z-score feature normalization methods using HRV data, respectively. On the other hand, the accuracies became 80%, 85%, and 86% using HRN data. In conclusion, heart rate normalization and any feature normalization method should be used in HRV studies on investigating PAF.

Keywords: Paroxysmal atrial fibrillation; heart rate variability; heart rate normalization; *machine learning*

Topic: *Computer and communication engineering*

Some Results in Effectiveness of Online Learning in Case of International Balkan University

Skofiar Kamberi¹, Damir Rahmani², Amra Feta³

¹skofiar.kamberi@ibu.edu.mk, ²damir.ibu@ibu.edu.mk, ³amra.feta@ibu.edu.mk

¹International Balkan University

²International Balkan University

³International Balkan University

ABSTRACT

Online learning, very often known as e-learning, refers to education which takes place in a virtual environment. Because of the pandemic crisis which has affected numerous countries around the world, many schools and universities had to convert from traditional to online education; International Balkan University had to adapt to long-distance teaching and learning as well. This research is intended to gather information about the online education process at International Balkan University in this period, as this is the first time this university has faced (has experienced) such circumstances (or happening). The main purpose of this study is to investigate the effectiveness of the process of online education in the case of International Balkan University by collecting information from students' feedback, i.e. their thoughts and experience regarding online learning. The participants in this research involve students of International Balkan University, regardless of their faculty or year of study.

Keywords: *online, learning, long-distance;*

Topic: *Computer and communication engineering*

Computational Approach to Law

Maciej Troć¹

¹*m.troc@wpia.uw.edu.pl*

¹Faculty of Law and Administration, University of Warsaw, Poland

ABSTRACT

Artificial intelligence is about using technology to automate tasks that normally require human intelligence. In that spirit, artificial intelligence is used to automate various legal tasks that are thought to involve intelligence when people perform them. This Paper explains the opportunities and limitations of computational law – a branch of legal informatics concerned with the mechanization of legal analysis. This Paper argues that computational law should be approached cautiously as it seems that automatically modeling the complexity of legal reasoning is far beyond the reach of current and maybe also future algorithms. As legal reasoning combines sophisticated domain expertise with cognitive and emotional competence, the dream (or nightmare) of robot judges seems impossible. There are, however, certain legal tasks, such as information retrieval or case summarization, that can be successfully performed by AI-powered algorithms.

Keywords: *law; artificial intelligence; computational law; machine learning*

Topic: *Computer and communication engineering*

Cybercrime Prevention

Buen Bajrami

buen.bajrami.st@uni-gjilan.net

Master of E-Governance, Public University Kadri Zeka, Gjilan, Kosovo

ABSTRACT

Internet is going to be day by day irreplaceable for every kind of profession. Starting with education, health, architecture, banking transactions and more. All of these are made easier today thanks of internet. Every day we give our personal data on various web pages, whether to make any payments, to use studying literature, to play games, etc. We often come across suspicious sites, or receive random emails from unknown sources for us. So, there are individuals and organized groups that use different methods to steal our data and misuse them. We will deal with cybercrime attacks and methods of how to protect from them.

Keywords: *cybercrime, malware, security*

Topic: *Computer and communication engineering*

Design of a Low-Cost Arduino-Based Respiratory and Sleep Apnea Detection System

Samet Ciklacakdir^{1,*}, Yalcin Isler²

¹samet.cikla@gmail.com, ²islerya@yahoo.com

^{1,2}Izmir Katip Celebi University, Faculty of Engineering and Architecture, Department of Biomedical Engineering, Cigli, Izmir, Turkey

*Corresponding author.

ABSTRACT

Oxygen is required to perform daily activities and to keep all the body alive. The oxygen is supplied to the lungs by breathing; however, breathing can be stopped especially during sleeping. If this break takes more than 10 seconds, this is called sleep apnea (SA). This may be fatal and must be detected comfortably. Different respiratory-detection and alarming methods have been developed in state-of-the-art. Nonetheless, these systems have many disadvantages such as being quite expensive, requiring technical staff, and staying in the laboratory environment of the patient overnight. In this study, a portable sleep apnea detection system, which provides visual and auditory alarms with an accelerometer attached to an Arduino Uno board, is implemented. In case of normal breathing or breath-interruption for less than 10 seconds, the system stands by. Whereas, it generates visual and auditory alarms to notify the people around and the subject himself/herself whenever it detects a stopped breathing longer. The proposed system works by attaching the chest or backbone. While it detects a move-away event, it resets the internal timer. As a result, the device was able to detect the SA events with 98% of accuracy. Besides, its implementation costs less than 9.45\$ only.

Keywords: *Arduino; biomedical signal processing; respiratory detection; medical device; sleep apnea*

Topic: *Electrical and electronics engineering*

Discriminating Aggressive Physical Activity from Surface EMG Signals

Mustafa Berkant Selek^{1,*}, Yalcin Isler²

¹*mbselek@hotmail.com*, ²*islerya@yahoo.com*

¹Ege University, Ege Vocational School, Department of Telecommunications, Bornova,
Izmir, Turkey

²Izmir Katip Celebi University, Faculty of Engineering and Architecture, Department of
Biomedical Engineering, Cigli, Izmir, Turkey

*Corresponding author.

ABSTRACT

This study aimed to discriminate aggressive physical activities from normal activities using k-nearest neighbors (kNN) classifiers. Three male and one female subjects (age 25 to 30), who have experienced aggression earlier. Surface EMG signals were recorded while subjects had been performing ten normal and ten aggressive physical activities. EMG signals were acquired 15 times from eight distinct channels: right-arm biceps, right-arm triceps, left-arm biceps, left-arm triceps, right-leg thigh, right-leg hamstring, left-leg thigh, and left-leg hamstring. All EMG channels include 10.000 samples. All data were split into two groups: normal and aggressive.

Linear discriminant analysis (LDA) was applied to compute the within groups and between groups scatter matrices by selecting 10 eigenvectors having the top 10 biggest eigenvalues. The resulting data were classified using kNN classifiers. The accuracies were 85.00% for k=1, 72.27% for k=2, 72.83% for k=3, and 73.11% for k=5. These values were validated by the leave-one-out cross-validation method. As a result, the nearest neighbors (k=1) gave the highest accuracy among classifiers. In conclusion, kNN with LDA together may be an alternative to determine aggression of physical activities. Hence, it may be a decision criterion to select the move category and the speed of a prosthetic hand, for example.

Keywords: *electromyogram; aggressiveness; physical activity; pattern recognition; k-nearest neighbors; linear discriminant analysis*

Topic: *Electrical and electronics engineering*

Investigation of the Effect of Histogram Equalization Method on the Classifier Performance of the Convolutional Neural Network for COVID-19 Chest Radiography Images

Ali Narin¹, Yalçın İşler²

¹alinarin@beun.edu.tr, ²islyera@yahoo.com

¹Bulent Ecevit University, Faculty of Engineering, Department of Electrical and Electronics Engineering, Incivez Mahallesi, 67100, Zonguldak - Turkey

²Izmir Katip Celebi University, Faculty of Engineering and Architecture, Department of Biomedical Engineering, Balatcik Campus, Cigli, 35620, Izmir - Turkey

ABSTRACT

The coronavirus (COVID-19) outbreak started in China and affected all over the world. The rapid spread of the outbreak among people caused governments to take very strict measures. The first of these measures was the correct detection and control of people who got the COVID-19 virus. In this study, we proposed a computer-aided detection system for automatic detection and prevention of the COVID-19 outbreak. For this, we carried out this study with 219 COVID-19 chest radiography images and 1341 healthy chest radiography images. The results were compared with both their original state and histogram equalized using the 3-fold cross-validation method. Pre-training ResNet50 deep convolutional neural network (CNN) was used as a classifier. Besides, being a classifier that we can use data directly without manual attribute extraction provides ease of use. As a result, an accuracy of 99.3%, a sensitivity of 96.8%, and specificity of 99.7% were obtained without using the histogram equalization method in the classification of COVID-19 and healthy images. Using the histogram equalization method, an accuracy of 98.8%, a sensitivity of 97.3%, and specificity of 99.1% were obtained. The application of the histogram equalization method increases the detection of patients with COVID-19. On the other hand, the correct detection performance of healthy people decreased, albeit slightly. According to the obtained results, we think this proposed method will provide convenience to the experts for the detection of COVID-19 in clinical applications.

Keywords: *covid-19; classification; chest radiography image; resnet50*

Topic: *Electrical and electronics engineering*

Design of Smart Water Valve with LoRa Wireless Communication Network and Artificial Neural Network Model for Demand/Forecast and Pricing System

Ata Aybars Gök^{1✉}, Bahadır Yeşil², Savaş Şahin¹

¹ İzmir Katip Çelebi University, Department of Electrical and Electronic Engineering, İzmir, Turkey

² Baylan Water & Energy Meters Company, Department of R&D, 10032 St. No.16, A.O.S.B İzmir, Turkey

✉ Corresponding Author E-mail: ata-1995@hotmail.com

ABSTRACT

This study presents a 32bit-ARM microcontroller based smart water valve design with a long-range and low-power (LoRa) wireless communication module and the obtained data from the heat meter is used for the artificial neural network (ANN) model of the amount of heat consumed forecasting. The developed smart water system might provide different temperature for each room indoor applications so that overall heat energy consumption might become less than usual. ARM based microcontroller and LoRa module of the developed smart water valve system are communicated with one another smart valves for of internet-of-things network. By taking data from the heat meter, the obtained data set is used to forecast amount of heat usage of each room via ANN. The developed interface of the smart water valve system having physical layer using LoRa was designed for remote control and data acquisition. Moreover, demanding and forecasting results of the obtained data set are presented with using ANN. The obtained results of forecasting are performed with fitness as $R^2 = 0.95$.

Keywords: *Heating system; ARM microcontroller, Smart water valve, LoRa*

Topic: *Electrical and Electronics Engineering*

High Power Efficiency Design Approach of a LLC Resonant Converter for UPS Battery Charger Application and Battery Charge-Discharge Regression Model

Turhan Can Kargin^{1,*}, Fırat Deveci², Savaş Şahin¹

¹Electrical – Electronics Engineering, Izmir Katip Celebi University, Izmir, Turkey

²Department of Research and Development, Tescom Elektronik A.Ş., Izmir, Turkey

*Corresponding author: turhancan.kargin@gmail.com

ABSTRACT

In this study, an optimal design procedure of inductor-inductor-capacitor (LLC) resonant DC-DC converter is developed for uninterruptible power supply (UPS) battery charge applications based on high power efficiency. The LLC resonant converters have many advantages such as high power efficiency and less switching losses when compared with other converters features. It is also capable of operating in narrow switching frequency where zero voltage switching can be provided. The DC-DC converter with 400V input and 48V/3.1A output has been selected as an experimental setup. In order to reach optimal design of LLC resonant converter and required output values, switching frequency might be determined as above of resonance frequency, based on theoretical calculations and Power Electronics Simulation package program. The obtained maximum power efficiency with the proposed method was measured as 95.22%. Besides, charge-discharge models of the battery were obtained from the battery data obtained via deriving regression models with machine learning algorithms where battery electrical energy consumptions, battery status, and temperature data can be analyzed. R^2 score tests are performed for nine different regression models. Random forest regression is determined as the best model among regression models for the obtained data set.

Keywords: *Energy; UPS battery charge; LLC resonant converter; regression models*

Topic: *Electrical and electronics engineering*

ARM Microcontroller Based Indoor Lighting Control System with Power Line Communication for Electrical Energy Consumption

Bertan Kayakiran^{1✉}, Bahadır Yeşil², Savaş Şahin¹

¹Department of Electrical and Electronics Engineering, Izmir Katip Celebi University,
Izmir, Turkey

²Baylan Water & Energy Meters Company, Department of R&D, 10032 St. No:16, A.O.S.B
İzmir, Turkey

*Corresponding author: bertanko@hotmail.com

ABSTRACT

In this study, 32-bit ARM microcontroller electronics card based ESP8266 wireless communication module is implemented to provide remote indoor lighting control over power line communication (PLC) protocol. It is used for observing the amount of electrical energy consumption with the device language messages system/companion specification for energy metering (DLMS/COSEM) software protocol system. This system provides trans-receiving the electrical energy consumption data with the smart electrical meter reading device used in smart building systems. The developed ARM microcontroller based indoor lighting control system devices were coded with PLC for communicate with another one using universal asynchronous receiver-transmitter. The amount of electrical energy was monitored and saved with the DLMS/COSEM software used in the smart meter reading system.

Keywords: *Power-Line-Communication protocol, Remote control, DLMS/COSEM*

Topic: *Electrical and electronics engineering*

Determination the Number of Passengers in Public Transport Vehicles by Image Processing and Deep Learning Algorithm Using ARM Microcontroller

Mehmet Sefa Senbani^{1,*}, Mehmet Uğur Soydemir¹, Alkım Gökçen¹, Yusuf Gürkan Ömür², Savaş Şahin¹

¹Department of Electrical and Electronics Engineering, Izmir Katip Celebi University, Izmir, Turkey

²Department of Research and Development, Kent Kart Ege Elektronik A.Ş., Izmir, Turkey

*Corresponding Author E-mail: msefasenbani@gmail.com

ABSTRACT

In this study design a module that computes the number of passengers in the public transport vehicle by evaluating the embedded system-based image processing algorithms and a deep learning database which is created, is realized. It is planned to prevent the problem of children and/or old passengers who might be forgotten in transport vehicles. In order to determine the number of people in the vehicle, images from passengers' overhead are taken and an image dataset is created to use in deep learning training for different deep learning algorithms. Algorithms are generated in a Python environment and the results of them are compared to each other in terms of accuracy. Then, the number of passengers in the vehicle might be determined by the developed code implemented with a Raspberry Pi3.

Keywords: *Deep learning, ARM microcontroller, public transportation*

Topic: *Electrical and electronics engineering*

Flood Prediction Model: A Review

**Wong Wei Ming¹, Farah Shahnaz Binti Feroz², Siva Kumar A/L Subramaniam³,
Rose Lew Ai Fen**

¹wongweiming5351@gmail.com, ²shahnaz@utem.edu.my, ³siva@utem.edu.my,
⁴roselew89@gmail.com

¹²³⁴ Universiti Teknikal Malaysia Melaka

ABSTRACT

Flood is among the most destructive natural disaster in many countries including Malaysia. Annually, flood happens in Malaysia at two different states, which is either in the form of flash flood or seasonal flood. One way to know or forecast the incoming flood is by developing a flood prediction model that is accurate and has long prediction duration. With the availability of the flood prediction model, emergency response team will have more time to respond. The main contribution of this paper is to demonstrate a state of the art flood prediction model. In these recent years in Malaysia, researchers have investigated four main types of flood prediction models which will also be discussed in this paper. The models are the autoregressive integrated moving average (ARIMA), seasonal ARIMA (SARIMA), machine learning, and Nonlinear Autoregressive Exogenous Artificial Neural Network (NARX). This study also shows that the accuracy of the flood prediction model is important, and these few factors need to be considered which are the root mean square (RMSE), best fit, and R^2 . As a result, this paper introduces the most promising flood prediction model to be use in Malaysia. This study can be used as a guideline to choose the proper flood prediction model for predicting flood.

Keywords: *Flood, Prediction, Forecast, Flash, Seasonal,*

Topic: *Electrical and electronic engineering*

Compatibility Between Knowledge Management and Organizational Design

Ivana Marinović Matović¹

¹*ivana.m.matovic@gmail.com*

¹Addiko Bank AD Belgrade, Serbia

ABSTRACT

Constant changes in the business environment, business processes or products, are forcing organizations to reorganize, to search for new organizational forms, but also to establish clever *market* positioning that creates a *competitive advantage*. Organizational design becomes important in order to find the most effective structure, which would cope with ever-changing business environment; and knowledge management maximizes the utilization of knowledge as one of the main sources of competitive advantage in the market. The purpose of the paper is to explore the importance of compatibility between knowledge management and organizational design. Knowledge management is recognized as an essential element of business, and extensive efforts are being made to build and develop this process. Numerous improvements are possible in the area of organizational design, such as redesigning existing models and developing new ones so that knowledge management practices can be applied as easily as possible. The research findings would most benefit managers, who can analyze their businesses and determine areas where change is needed, regarding organizational design and knowledge management, which influences business performances.

Keywords: *business organization; organizational design; organizational structure; knowledge management*

Topic: *Industrial engineering*

Radiation from Welding Processes, Health and Safety Precautions

Aleksandra Porjazoska Kujundziski¹, Isein Ajdari²

¹[aporjazoska @ibu.edu.com.mk](mailto:aporjazoska@ibu.edu.com.mk), ²isein.ajdari@elem.com.mk

¹International Balkan University, Skopje, R. North Macedonia

²JSC Power Plants of North Macedonia, Skopje, Subsidiary MPC “Oslomej”, Kicevo

ABSTRACT

The most common hazards accompanying welding operations are fires, explosions, burns, fumes, electric shocks, compressed gases, hazardous substances, toxic gasses, suffocation, radiation, heat stress, dust, noise, vibration, manual handling, etc. Two types of radiation associated to the welding operations are: ionizing radiation, such as X-rays and nonionizing radiation, such as ultraviolet, visible and infrared light. Radiation is often silent and undetected, yet injury occurs. Hence, the need to understand the influence of radiation on human health is of big importance. The effects of radiation depend on the wavelength, intensity, and the time of exposure. The most common injuries occurred in radiation exposure are skin burns and eye damage. The brilliance of the high intensity visible light (wavelength 0.4 to 0.75 µm) produced by an electric arc is about 10 000 times the safe glare of the eyes. This paper deals with the effects of radiation hazards of welding processes on humans and the definition of the necessary protection measures required to reduce and/or prevent their impact.

Keywords: *Welding process, radiation, protection measures.*

Topic: *Industrial Engineering*

Effects of Automation on Labor Markets in the Emerging Countries

Gunter Merdzan¹, Ervin Domazet², Bilal Sucubasi³, Berkan Imeri⁴

¹*guntermercan10@gmail.com*, ²*ervin.domazet@ibu.edu.mk*, ³*bsucubasi@hotmail.com*,
⁴*berkanimeri@gmail.com*

¹Teaching Assistant at the Chair of Economy at University Ss "Cyril and Methodius" in Skopje, Faculty of Economics – Skopje

²Assistant Professor at the International Balkan University and Chief Executive Officer of Technoperia – Skopje

³Chief Executive Officer of HalkBank AD Skopje

⁴Director of Financial Management, Accounting and Credit Analysis Division of Halkbank AD Skopje

ABSTRACT

Europe and the Atlantic region has been the main attraction for the economic migration flowing all over the world. This migration results in a common fear and anxiety within the Western world, due to the high possibility of losing their jobs or working for fewer wages. However, the main factor that would shake the labor markets would be automation, rather than migration. Current developments in the automation field indicate that the peak point of automation could increase the employment problems of both local people and immigrants as well. As the machines gradually replace man-power (workers), this would result in massive unemployment scenarios. This concern existed during and after the Second World War, however, it gained speed with the introduction of the Fourth Industrial Revolution at the Hannover Fair in 2011. The purpose of this paper is to examine the effects of digitization and automation to the economy and especially to labor markets, in the period when the use of the physical and mental capacity of people is minimized and in the world where machines and systems such as "artificial intelligence", "Internet of Things", "new information technologies" are interconnected and intertwined. Countries that were mostly affected by the automation are the Far East countries, mainly China, due to the cheapest production, cheap labor and tax, and other conveniences. We will discuss the effects of automation by developing statistical and econometric models on the labor market, in the countries that are most affected and especially in the emerging Western Balkan countries, which attracted the attention of foreign investors, thanks to the opportunities they provide.

Keywords: *Automation; Digitization; The Fourth Industrial Revolution; Emerging Countries; Labor Markets.*

Topic: *Industrial Engineering.*

BIM-Based Information Management for Sustainability Assessment of Buildings

Rumela Atanasova¹, Neli Banishka², Jolina Cenkova³

¹ rumela.atanasova@gmail.com, ² nbanishka@abv.bg, ³ cenkova@abv.bg

¹ PhD student at the Department of Construction organization and economics, University of architecture, Civil Engineering and Geodesy (UACEG), Sofia, Bulgaria

² Associate Professor at the Department of Construction organization and economics, University of architecture, Civil Engineering and Geodesy (UACEG), Sofia, Bulgaria

³ Chief Assistant Professor at the Department of Construction organization and economics, University of architecture, Civil Engineering and Geodesy (UACEG), Sofia, Bulgaria

ABSTRACT

The construction industry is one of the largest consumers of natural resources but with the growing concerns about climate change, construction companies aim at reducing their projects' environmental impact.

Companies normally achieve that by implementing sustainability certification schemes like BREEAM, DGNB, etc. However, the implementation of such schemes requires the allocation of more time, money, people etc. One of the biggest challenges is how to reduce the higher costs when using such schemes. Higher costs arise due to the usage of more eco-friendly and expensive construction materials, but also, time delays due to the bad management of information.

Information management is crucial for the sustainable assessment of buildings and takes central part of Building Information Modelling (BIM). Building sustainability assessments require the collection of data from dozens of processes, construction products, etc., collected from many different actors.

The report will have a look at some of the most used certification schemes in Europe and will point out some of the major issues related to the management of sustainability assessment and certification processes. The authors will put this in the context of the recommended framework from EN ISO 19650 and will propose a method for structuring information required in such processes.

Keywords: *sustainability certification, BIM, EN ISO 19650, information management*

Topic: *Architecture*

Evaluating Prishtina's Master Plans in Terms of Smart City Characteristics

Adelina Tahiri Nela¹, Bujar Demjaha²

¹adelina.tahiri@universitetiaab.com, ²bujar.demjaha@universitetiaab.com

AAB College, Prishtina, Kosovo

ABSTRACT

Smart city is a fairly new city concept that has been used extensively in scientific literature and international policies in the past two decades. Reflecting contemporary city developments, smart city has entered various professional discourses, and has brought enthusiasm in regards to the advanced ways of addressing present urban challenges. On the other hand, it has raised skepticism as it is still considered a vague concept, with future unknown consequences. The aim of this paper is to provide an extensive literature review of the smart city definitions and models, to be followed with an evaluation of current Prishtina master plans, through six dimensions of the smart city model: smart environment, smart mobility, smart living, smart governance, smart economy and smart people. The research materials are drawn from research articles and published analyses, urban master plans from municipality of Prishtina and other official reports. Lacking dimensions of smart city which are crucial for the future spatial development of the city will be addressed. Considering that the current city plans will expire in 2022, the recommendations from this article can be used as a contribution for future smart(er) planning of Prishtina and other cities.

Keywords: *smart city; smart planning; Prishtina master plans; urban challenges*

Topic: *Architecture*

Architectural Development – How we can Build Towards a Sustainable Future

Vangjel Dunovski, Olivera Stojanovska

vduni@mt.net.mk, oliverastojanovska20@gmail.com

MIT University - Skopje

ABSTRACT

Since the dawn of time, the purpose of architecture has been to create a suitable space that would satisfy our needs. Buildings provide protection from the climate, sounds and distractions of the outside world. In today's modern world, the interior and exterior space of the building are created with the same amount of dedication. We admire the exteriors, but the interior space is where we spend the majority of our time. The walls create a safe space where we can live and thrive, a space we can call home.

Through analyzing ancient buildings and modern architectural achievements, many important messages on architectural development and urbanism can be drawn. These messages serve the purpose of finding the basic principles on which a continuity made with positive contacts between the contemporary and the heritage can be built. Finding those basic principles is a prerequisite for creating the culture of space whose most important part is the architecture. It can be created only in cultural ground where healthy architectonic critics exist and the criteria for evaluating the architecture are clear.

Keywords: *Sustainability, Architecture, Contemporary architecture*

Topic: *Architecture*

Contemporary Tendencies in International Residential Buildings

Viktorija Mangaroska¹, Kosta Mangaroski²

¹viktorija.mangaroska@ibu.edu.mk

¹International Balkan University, Faculty of Engineering / Architecture

²International Balkan University, Faculty of Engineering / Architecture

ABSTRACT

Architectural design of contemporary residential buildings is one of the most interesting part of architectural design. Contemporary residential buildings contribute to the urban character, context and vitality of the cities. They need to be integrated with their architectural design to the urban context, local character, size and development in order to create architectural design responses in strategic level and form the urban identities of the cities of tomorrow. Designing of contemporary residential building focuses on specific analysis of the building form, layout, functionality, landscape design, environmental performance and residential amenity.

Architects have a responsibility to the future generations to enrich and design the contemporary residential buildings, to understand the significance of a place and respond to it. Contemporary residential buildings should create a response to their cultural, social, historical, political, economic and physical environments.

Specific attention in this research will be given to analysis of contemporary tendencies and different design approaches in residential apartment buildings with consideration of their urban context, adequate public access and architectural space. The expected outcome results in this scientific paper is to identify the contemporary design approaches in residential buildings and create application at the international education processes.

Keywords: *architectural design, typology, contemporary residential buildings*

Topic: *Architecture*

New Possibilities in the Post Pandemic Era in the Design of Public Spaces

Aleksandar Andovski

a.andovski@ibu.edu.mk

International Balkan University, Skopje, Macedonia

ABSTRACT

We are the witnesses of extraordinary pandemic crisis due to Covid 19 virus in the whole planet. One of the most important measures to protect from this invisible enemy is creating bigger social distance. Also, increasing the usage of individual eco transport options like bicycles or electric scooters will diminish the usage of common public transportation which represents bigger risk for public health. Our task as urbanists is to propose several possible options in order to increase the space for pedestrian communication, to stretch the width of bicycle lanes and to create new zones and paths for its users. The lessons that we have learned during this crisis could be used not only as a temporary planning solutions. The changes in urban landscape should be implemented as permanent urban improvements. The process of pedestrianization and car banning in centers of towns was already started in more developed countries decades ago. But now, even these countries are reconsidering the public space in order to make it even more cars free, more pedestrian and more bicycles friendly. The challenging question that is imposing nowadays considering Macedonian towns is related to capability of our authorities to enable this urban necessity into our car congested and air polluted cities in order not only to defend ourselves from Covid 19, but also to provide much more sustainable prosperity of our towns.

Keywords: *pedestrian; urban; transport; sustainable;*

Topic: *Architecture*

Post COVID-19 Urbanism: Establishing Modular Dimensions when Designing New Urban Spaces

Damjan Balkoski¹

¹damjanbalko@gmail.com

¹M. Arch. Faculty of Architecture, MIT University, Skopje

ABSTRACT

Because of the global pandemic caused by the COVID-19 virus, many countries around the world are facing the negative consequences of this virus on the health of people. Apart from healthcare, the negative consequences also affect the overall economic and social aspects of the life in the cities. Proposed measures to prevent the spread of the virus include restricting the movement of people in the cities, personal protection and social and physical distancing between people. All this leads to a change in the way cities function as urban centers, the use of buildings and public space.

Urbanism and architecture, at the time of the corona virus, have the primary task of organizing the functioning of cities as well as the buildings and spaces in them. This is a challenge for future city planning in order to provide a quality and safe way of life for the residents of the city and the emergence of a new "post COVID-19" urbanism.

This paper will present possible solutions for the transformation of urban architectural conditions when designing a given space, specifically through a project for a new modular tourist camp. The solution of the project before the onset of the pandemic will be subject to analysis from the aspect of new dimensioning caused by the recommendations for protection of people. The aim of this paper is to offer modular models in the design of tourist camps by re-dimensioning the micro-urban elements of the camp in the existing dimensioned space.

The expected results of this paper will provide an opportunity to apply new modular dimensions of open spaces in order to enable the health safety of citizens and enable the proper functioning of urban spaces.

Keywords: *COVID-19, Module, Urbanism.*

Topic: *Architecture.*

Circularity in the Construction Industry, Building Materials and Construction Waste Management

Jeta Iljazi¹

¹jeta.iljazi@ibu.edu.mk

Assistant MSc. Faculty of Engineering, International Balkan University, Skopje, MK

Ph.D. candidate Institute of Earthquake Engineering & Engineering Seismology, Skopje, MK

ABSTRACT

Construction industry and environment are linked, and it finds itself at the center of concerns regarding environmental impact, whether it is effects of the building itself or processes related to the materials used in the buildings during their lifecycle. Problems associated with resource consumption and life cycle of materials have been extended from the local to the global scale, from harvesting to production, usage and transportation. A moment that leaves its effects to the environment in all stages.

Waste that is left from construction and demolition is the largest waste stream effecting environment. This waste management requires preparedness of the users, designers, public authorities, policy makers, construction product manufacturers, as well as all involved parties in waste treatment, logistics, recycling, including environmental and quality certification authorities.

This paper is concerned with policies strategies and lessons from developed countries in construction waste management, proceedings in phases of lifecycle of materials, aspects that define circularity in construction industry, and methods for reducing footprint in the environment, starting as early as with stages of design process: planning of building erection, and material consumption. Methods include planning of building demolition, construction material waste management as well as resource usage, selection and documentation of each building element and material lifecycle, as well as disassembly process.

Added efforts in design process for construction waste management in the beginnings by involved parties, gives opportunity for improvement regarding footprint to the environment and closing the loop in material lifecycle. From harvest to use of raw materials, maintenance and renovation, and also emission of harmful substances throughout the building's and materials lifecycle in construction. This gives raw material and energy potential for recovery, as well as less waste is left in the environment to be managed from the construction industry.

Keywords: *circularity; building materials; recovery; architecture; waste management; construction; building elements.*

Topic: *Architecture.*

Influence of the Cross Section Width on Fire Resistance of RC Beams According to Eurocode 2

Almir Rushiti¹, Meri Cvetkovska²

¹almir.rushiti@unt.edu.mk, ²cvetkovska@gf.ukim.edu.mk

¹University "Mother Teresa" - Skopje, Faculty of Civil Engineering and Architecture

²Ss. Cyril and Methodius University in Skopje, Faculty of Civil Engineering

ABSTRACT

A parametric analysis of two span continuous reinforced concrete beam exposed to standard ISO 834 fire curve is presented in this paper. The influence of the width of the cross section on the fire resistance of the beam exposed to fire only from three sides is analyzed.

The analysis of the reinforced concrete beam is conducted by using the Reduced Cross Section method, given in Eurocode 2-1-2. Temperature dependent mechanical and thermal properties of the constructive materials (concrete and steel) are adopted according to the recommendations given in Eurocode 2-1-2.

The analysis has shown that the width of the cross section has positive effect on the fire resistance of the analyzed RC beam. Due to the wider cross section the temperature penetration is slower. The concrete temperature in the middle of the section and the reinforcement temperature are slightly lower, consequently a higher fire resistance is achieved.

Based on the results of the conducted analysis the behavior of the reinforced concrete beam exposed to fire has been defined and recommendations for increasing the fire resistance are given.

Keywords: *Continuous RC beam; Standard fire curve; Thermal analysis; Fire resistance*

Topic: *Civil and structural engineering*

Concepts and Features of Seismic Isolation

Mikayel G. Melkumyan

mmelkumi@yahoo.com

Armenian Association for Earthquake Engineering

Melkumyan Seismic Technologies, LLC

ABSTRACT

To date there are 55 seismic isolated residential, medical, hotel, airport, and business center buildings in Armenia newly constructed or retrofitted by base or roof isolation systems. 48 projects were accomplished due to the works of the author of this paper. As it is stated by Martelli A., Forni M. & Clemente (2012): "Armenia remains second, at the worldwide level, for the number of applications of such devices per number of residents, in spite of the fact that it is still a developing country". Also, the seismic isolation laminated rubber-steel bearings (SILRSBs) different by their shape, dimensions, and damping (low, medium, and high) were designed and more than 5000 SILRSBs were manufactured in the country, tested locally, and applied in construction. Several remarkable projects on construction of new and retrofitting of existing buildings by base or roof isolation are described to demonstrate the experience accumulated in Armenia. Exceptional features of the seismic isolation systems give the opportunity to apply them to steel, stone, reinforced masonry, reinforced concrete frame, braced frame, and large panel (1 to 20 story) buildings with regular or asymmetric plans. In seismic isolated buildings the approach suggested by the author on installation of the clusters of small rubber bearings instead of a single large bearing was used. Analyses of base isolated buildings carried out by the Armenian Seismic Code and the time histories show that structural elements below and above the seismic isolation planes are working mainly in the elastic phase. Input acceleration of 0.4g-0.5g at the foundation bed get damped about 2.5-3.0 times in the superstructures, confirming the high effectiveness of the created structural concepts. Comparative analyses have shown that suggested seismic isolation strategies are reducing the consumption of concrete by about 2 times and steel – 2.7 times, and, finally, the cost of construction of new seismic isolated buildings on 35-40% in comparison with the cost of conventional construction. This includes the cost of manufacturing of SILRSBs. Unique seismic isolation strategies developed by the author are also reducing the cost of retrofitting by base or roof isolation of existing buildings from 3 to 5 times, and operations are made without interruption of the use of the buildings.

Keywords: *seismic isolation.*

Topic: *Civil and structural engineering.*

Seismic Resistance Assessment of Existing Bridge Structure

Jelena Ristic¹

¹*jelena.ristic@ibu.edu.mk; jelena.ristic.ibu@gmail.com*

¹Department of Civil Engineering, Faculty of Engineering, International Balkan University,
Skopje

ABSTRACT

The main goal of this paper is assessment of the level of seismic resistance of selected representative existing bridge in Republic of N. Macedonia under the impact of the earthquake from Ulcinj-Albatros, common for the Balkan region. Formulated is nonlinear model with assigned concentrated plasticity regions, where highest values of the internal forces are expected in the structural members. The plastic hinges for the bridge piers are defined with inclusion of variation of the axial forces. Carried out is iterative nonlinear analytical procedure, applying successively in small increments different levels of PGA of the earthquake, and analyzing the real behavior of the bridge, with aim to detect the maximal PGA level to which the bridge does not collapse. It was concluded that since the bridge was designed with dated regulations, it has very low and non-satisfactory seismic resistance, and seismic improvements are extremely necessary.

Keywords: *RC bridge, seismic resistance, nonlinear analysis, nonlinear behavior*

Topic: *Civil and structural engineering*

Advanced Seismic Protection of Buildings with New GOSEB-SK Seismic Isolation System

Danilo Ristic¹, Kadri Morina², Jelena Ristic³

¹*daniло.ristic@gmail.com*; ²*kadrimorina1@hotmail.com*, ³*jelena.ristic@ibu.edu.mk*,
jelena.ristic.ibu@gmail.com

¹Prof. Dr., Institute of Earthquake Engineering and Engineering Seismology, Skopje, N. Macedonia

²Asst. Prof. Dr., Faculty of Architecture and Civil Engineering, Pristina, Kosovo

³Asst. Prof. Dr., Department of Civil Engineering, Faculty of Engineering, International Balkan University, Skopje

ABSTRACT

Improvement of seismic protection of building structures in Kosovo region is very important task and strategic research activity. Development of advanced seismic isolation method for seismic protection of buildings in Kosovo region is never considered before. The present research actually represents the first attempt and pioneering research effort toward development of new technology for efficient seismic protection of different types of important building structures in the well known seismically prone Kosovo region. In this paper presented is basic concept of the developed new GOSEB-SK seismic isolation system for seismic protection of existing and new multi storey buildings. The proposed system is applicable for economical earthquake protection of building structures of different usability categories and different types under destructive effects of the strongest future earthquakes. Particular emphasis is put on development of seismic isolation and vibration control devices providing high practical efficiency and effective application capability.

Keywords: *seismic isolation, nonlinear response, passive control, shaking table tests*

Topic: *Civil and structural engineering*

Pinus spp. from North Macedonia - Promising Source for Antimicrobial Substances

Natalija Atanasova-Pancevska¹, Dzoko Kungulovski²

¹natalijaap@gmail.com, ²dzokok@yahoo.com

^{1,2} Department of Microbiology and Microbial Biotechnology, Institute of Biology, Faculty of Natural Sciences and Mathematics, "Ss. Cyril and Methodius" University, Skopje, North Macedonia

ABSTRACT

The antimicrobial properties of extracts from *Pinus* spp. grown in North Macedonia were investigated using broth-microdilution assay. For *in vitro* antimicrobial screening the tested concentrations of substances were within 50 - 0.390 %. As a test microorganisms we used *E. coli* ATCC 8739, *Ps. aeruginosa* ATCC 9027, *S. typhimurium*, *B. subtilis* ATCC 6633, *B. pumillus* NCTC 8241, *S. citrus*, *S. aureus* and *L. monocytogenes*. The tested extracts showed antimicrobial activity against tested bacteria. *Ps. aeruginosa* ATCC 9027 was the most sensitive among Gram negative bacteria (MIC=0.39% and MBC=1.562 %), and from Gram positive bacteria *S. citrus* showed biggest sensitivity against tested substances, with MIC=0.39% and MBC= 6.25%. Compared to antibiotics, the tested substances showed promising antimicrobial activity against tested microorganisms.

Key words: Antimicrobial, *Pinus*, Broth-microdilution assay

Topic: Chemistry, chemical and environmental engineering

Densities, Viscosities, and Derived Properties of Binary Liquid Mixtures Water + Methanol, Water + Ethanol, and Methanol + Ethanol at 20°C and Atmospheric Pressure

Fisnik Aliaj¹, Naim Syla², Enis Vatovci³

¹fisnik.aliaj@uni-pr.edu, ²naim.syla@uni-pr.edu, ³enis.vatovci@uni-pr.edu

¹University of Prishtina, Department of Physics, Eqrem Cabej Str. 51, Prishtina, Republic of Kosovo

²University of Prishtina, Department of Physics, Eqrem Cabej Str. 51, Prishtina, Republic of Kosovo

³University of Prishtina, Department of Physics, Eqrem Cabej Str. 51, Prishtina, Republic of Kosovo

ABSTRACT

Experimental densities and viscosities are reported for the binary liquid mixtures water + methanol, water + ethanol, and methanol + ethanol over the entire composition range at 20 °C and 0.1 MPa. From these experimental data, the excess molar volumes V^E and deviations in viscosity $\Delta\eta$ were derived and fitted to Redlich-Kister type polynomial to determine the adjustable fitting parameters and standard deviations. The variation of excess and deviation properties with composition has been interpreted in terms of molecular interactions between the components of the mixtures and structural effects. Additionally, various semi-empirical equations were employed to estimate the viscosities of the mixtures in order to test their validity for the presently studied systems.

Keywords: *alcohols; Redlich-Kister polynomial; binary mixtures*

Topic: *Chemistry, chemical and environmental engineering*

The Nature Needs a Water Framework Law

Ali Telli

ali.telli@dpu.edu.tr

The TEMA Foundation (The Turkish Foundation for Combating Soil Erosion, for
Reforestation and the Protection of Natural Habitats)

ABSTRACT

Preparing and adopting legal regulations, namely "Water Laws" concerning water rights, use and management has to be taken into political agenda with high priority. The law-making process should be fully participatory and completely transparent, aiming to conserve and develop water assets while recognizing access to water as a basic human right. Turkey should quickly prepare the water inventory on ecological basins of Turkey with inclusive methods and through a participatory process. This would give us a clear picture of "what is left" and offer the framework of the measures that can be taken into consideration to conserve and develop water assets in various ecological regions of Turkey. "Integrated basin management" should be realized with uttermost care for all the ecological basins. No hydropower plant (HPP) project or plan should be started, and the existing HPP plans and constructions should be taken on hold until completing the process of holistic basin planning which must be realized with strong and equal participation of civil society and especially local communities. The local communities should have a determining voice in the process, which means that no HPP can be started or built without a clear and proven approval from the local communities and other stakeholders.

Keywords: *Water laws; Water is a natural asset*

Topic: *Chemistry, chemical and environmental engineering*

Dynamics and Their Time Scales in Complex Macromolecular Systems

Blerta Rahmani¹ and Hiqmet Kamberaj²

¹*blerta.rahmani@hotmail.com*, ²*hkamberaj@ibu.edu.mk*

^{1, 2}International Balkan University, Department of Computer Engineering, Skopje, R. of North Macedonia

ABSTRACT

Atomistic molecular dynamics simulations are widely used to study macromolecular systems, such as proteins, DNA, RNA and their complexes. That is because the laws of classical mechanics can in general, drive the experimental methods.

Proteins are characterized by the internal motions with the time scales of their dynamics in the range from nanoseconds to milliseconds. In this presentation, we will discuss the time scales representing different behaviors of those systems in terms of their generalized degrees of freedom subspaces. In particular, we will introduce the normal mode analysis method of the protein dynamics and compare it with the principle components analysis approach. Furthermore, a comparison of the protein internal motion fluctuations with molecular dynamics simulations will be introduced. In this study, we will discuss two macromolecular systems, namely the C2 fragment of protein G and the Fc domain of the IgG protein. Moreover, in this study, we will also present a newly developed method for calculation of the essential subspace of the proteins based on the machine learning approach.

Keywords: *Molecular dynamics; normal modes; Principal component analysis; Machine Learning*

Topic: *Protein engineering*

Some Results on the Analytic Representation of Convolution in L_p Spaces

Egzona Iseni¹, Shpetim Rexhepi², Bilall Shaini³, Samet Kera⁴

¹egzona.iseni@unt.edu.mk, ²shpetim.rexhepi@unt.edu.mk, ³bilall.shaini@unite.edu.mk,
⁴[samet.kera @unt.edu.mk](mailto:samet.kera@unt.edu.mk)

^{1,2,4}Departament of Mathematics, Mother University, Skopje, North Macedonia

³Departament of Mathematics, University of Tetovo, Tetovo, North Macedonia

ABSTRACT

In this paper we consider functions in L_p spaces including convolution of functions and validity of associative law of convolution. Using the generalized Cauchy representation, we obtain some results concerning the analytic representation of convolution of functions and distributions.

Keywords: *convolution; Cauchy representation; distribution*

Topic: *Mathematics, education and application*

Some Relations Involving the Gamma Function

Ilir Demiri¹, Shpetim Rexhepi², Mevludin Dauti³, Dardan Bilalli⁴

¹ilir.demiri@students.unt.edu.mk, ²shpetim.rexhepi@unt.edu.mk,
³mevludin.dauti@gmail.com, ⁴dardan.bilalli@students.unt.edu.mk

^{1,2}Departament of Mathematics, Mother University, Skopje, North Macedonia

³Departament of Mathematics, Cyril and Methodius University, Skopje, North Macedonia

ABSTRACT

In this paper we will present some restrictions- inequalities involving the gamma functions, as well as some integrals, where as an integrating function will be a gamma function, which will be presented in the form of series. A relation between zeta and gamma function is also presented.

Keywords: *gamma function; zeta function*

Topic: *Mathematics, education and application*

Incorporating Geogebra into Teaching Circle Properties at High School Level and its Comparison with Classical Method of Teaching

Vesa Mollakuqe¹, Shpetim Rexhepi², Egzona Iseni ³

¹vesa_mollakuqe@hotmail.com, ²shpetim.rexhepi@unt.edu.mk,

³egzona.iseni@unt.edu.mk

^{1,2,3} Department of Mathematics and Informatics for Teaching, Mother Teresa University, Skopje, Northern Macedonia,

ABSTRACT

In our century, in addition to classical learning, various interactive software are used in teaching geometry. Among them, we can mention Geogebra.

GeoGebra is an interactive math measurement program that consists of teaching and learning from elementary to university level. This program is offered as a pedagogical and mathematical aid tool. GeoGebra helps in teaching math because using this software, students see different mathematical formulas, algebraic and geometric presentations.

In this paper, using GeoGebra software, the pedagogical, methodological, statistical data and impact into teaching circle properties are presented. The study involved 112 students. Of these 40% excellent, 35% average, 25% below average. The research aims to prepare high school students aged 15-18, from grades 1, 2, 3 and 4 in teaching, working, and explaining geometry through Geogebra software, as well as to examine the impact of using this software, making comparisons with the classical form of teaching.

Special emphasis is placed on the circle properties and their presentations. This content includes the district tangent, the potency, the application of the circle in regular polygons with special emphasis on the inscribed, extruded circle in the equilateral triangle and other important properties.

Keywords: *Geogebra, teaching geometry, circle*

Topic: *Mathematics, education and application*

Solving Trigonometric Equations in Primary School?

Delcho Leshkovski¹, Valentina Miovska²

¹*d.leshkovski@ibu.edu.mk*, ²*miovska @pmf.ukim.mk*

¹International Balkan University, Skopje, Republic of North Macedonia

²Faculty of Natural Sciences and Mathematics, Skopje, Republic of North Macedonia

ABSTRACT

Trigonometry is a subject taught at high school and university level. Since the basic trigonometric relations are first introduced in a right triangle, which is sufficiently studied in primary school, with an emphasis on the Pythagorean theorem, certain trigonometric problems can be solved by primary school students if they only know the definitions of the trigonometric functions in a right triangle as well as their values for characteristic acute angles (30° , 45° and 60°). We give a few examples of trigonometric equations that can be solved with basic knowledge of the trigonometric relations in a right triangle and using the geometric tools that the students in the upper grades of primary school already have. Everything is done in order to promote the creative teaching of mathematics, especially in the work with talented students, and to make the classes more interesting and fun. The objectives are to improve the math knowledge of the students, to develop their math skills and to motivate them to do independent research.

Keywords: *trigonometry; trigonometric identities; trigonometric equations*

Topic: *Mathematics education and application*