

**Lucian Blaga University of Sibiu, Romania**  
**Faculty of Sciences**  
**Research Center in Informatics and Information Technology**

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# **ICDD 2020**

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**4<sup>th</sup> International Conference on Applied Informatics**  
**Imagination, Creativity, Design, Development**

**Volume of Abstracts and Program**

**October 8-10, 2020**

**Sibiu, Romania**

**Lucian Blaga University Press**

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**Fourth International Conference on Applied Informatics**  
**Imagination, Creativity, Design, Development**  
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**4<sup>th</sup> International Conference on Applied Informatics**

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**Editor: Assist. Cristina Răulea**

**Motto:**

*“There are no limits, only your imagination”*

**TOPICS**

- Algorithms and data structures
- Graph theory and applications
- Formal languages and compilers
- Cryptography
- Modeling and simulation
- Computer programming
- Computer vision
- Computer graphics
- Game design
- Data mining
- Distributed computing
- Artificial Intelligence
- Service oriented applications
- Networking
- Grid computing
- Mobile operating systems
- Scientific computing

- Software engineering
- Bioinformatics
- Robotics
- Computer Architecture
- Evolutionary Computing
- Multimedia Systems
- Internet Communication and Technologies
- Web Applications

## **OBJECTIVES**

The conference is mainly addressed to bachelor and master level students, PhD students and young researchers from all over the world. The conference gives the participants the opportunity to discuss and present their research on informatics and related fields (like computational algebra, numerical calculus, bioinformatics, etc.). The conference welcomes submissions of original papers on all aspects of informatics and related fields ranging from new concepts and theoretical developments to advanced technologies and innovative applications. The presentation has to include also a practical application. The presentation has to include also a practical application.

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### **Chair of the conference**

- Prof. Dr. Dana Simian

Director of the Research Center in Informatics and Information Technology

Faculty of Sciences

"Lucian Blaga" University of Sibiu, Romania

E-mail: [dana.simian@ulbsibiu.ro](mailto:dana.simian@ulbsibiu.ro), [d\\_simian@yahoo.com](mailto:d_simian@yahoo.com)

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Department of Mathematics and Informatics

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- Teodora Popa - "Lucian Blaga" University of Sibiu, Romania
- Sergiu-Ovidiu Serb - "Lucian Blaga" University of Sibiu, Romania

**OFFICIAL LANGUAGE**

The official language of the conference is English.

## SPONSORS

**In alphabetical order:**



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**P R O G R A M**

**THURSDAY, October 08, 2020**

*International Conference on Applied Informatics – ICDD 2020*

**organized by**

**Faculty of Sciences, *Research Center in Informatics and Information Technology*  
 Lucian Blaga University of Sibiu, Romania**

<b>9<sup>20</sup> – 9<sup>40</sup></b>	<b>Opening ceremony</b>
<b>9<sup>40</sup> – 11<sup>20</sup></b>	<b>Papers presentation - Chair Dana Simian, "Lucian Blaga" University of Sibiu, Romania</b>
9 <sup>40</sup> – 10 <sup>00</sup>	<ul style="list-style-type: none"> <li>• <i>Automatic recognition of acoustic musical chords</i>, <b>Razvan-Cosmin Linca</b>, Babes-Bolyai University, Cluj-Napoca, Romania</li> </ul>
10 <sup>00</sup> – 10 <sup>20</sup>	<ul style="list-style-type: none"> <li>• <i>Collection of software interfaces</i>, <b>Madalina Marinescu</b>, Politehnica University Timisoara, Romania</li> </ul>
10 <sup>20</sup> – 10 <sup>40</sup>	<ul style="list-style-type: none"> <li>• <i>Tampering detection for in-vehicle systems</i>, <b>Roland Bolboaca</b>, "George Emil Palade" University of Medicine, Pharmacy, Sciences and Technology of Targu Mures, Romania</li> </ul>
10 <sup>40</sup> – 11 <sup>00</sup>	<ul style="list-style-type: none"> <li>• <i>Towards a comprehensive attack framework against commercial and private UAV</i>, <b>Leonhard Hosch, Max Arndt, Lars Fichtel, Alexander M. Fruhwald, Vitaliy Schreiber, Andreas Schutz, Christian Bachmeir</b> University of Applied Sciences Wurzburg-Schweinfurt, <b>Helena Schmiedl</b>, Friedrich-Alexander University of Erlangen-Nuremberg, Germany</li> </ul>
11 <sup>00</sup> – 11 <sup>20</sup>	<ul style="list-style-type: none"> <li>• <i>AI and ML in retail industry, Case Study on LiDL (Fresh food market)</i>, <b>Walter Romer</b>, "Lucian Blaga" University of Sibiu, Romania</li> </ul>
<b>11<sup>20</sup> – 11<sup>40</sup></b>	<b>Coffee break</b>
<b>11<sup>40</sup> – 13<sup>20</sup></b>	<b>Papers presentation - Chair Nicolae Constantinescu, University of Craiova, Romania</b>
11 <sup>40</sup> – 12 <sup>00</sup>	<ul style="list-style-type: none"> <li>• <i>Towards an Industrial Recommendation System for Quality Improvement: Comparison of Python and C++ Implementations in an Edge- and Cloud-Computing Environment</i>, <b>Alexander M. Fruhwald, Steffen Kastner, Anna-Maria Schmitt, Simon Haas, Leonhard Hosch, Lars Fichtel and Christian Bachmeir</b>,</li> </ul>

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12 <sup>00</sup> – 12 <sup>20</sup>	University of Applied Sciences Wurzburg-Schweinfurt, Germany <ul style="list-style-type: none"> <li>• <i>Approaches for reducing the number of intersections between the components of software architectures</i>, <b>Ligia - Izabela Craciunescu</b>, Politehnica University Timisoara, Romania</li> </ul>
12 <sup>20</sup> – 12 <sup>40</sup>	<ul style="list-style-type: none"> <li>• <i>Proximity marketing, personalized offers and banking, all on mobile</i>, <b>Arina Ioana Cazacu</b>, Babes-Bolyai University, Cluj-Napoca, Romania</li> </ul>
12 <sup>40</sup> – 13 <sup>00</sup>	<ul style="list-style-type: none"> <li>• <i>Automation of the Examination Timetabling</i>, <b>Janik Hemrich, Stella Konieczek, Justin Seegets</b>, University of Applied Sciences Wurzburg-Schweinfurt, Germany</li> </ul>
13 <sup>00</sup> – 13 <sup>20</sup>	<ul style="list-style-type: none"> <li>• <i>Cashout</i>, <b>Alexandru Dancau, Paul Robert Ceolca</b>, "Lucian Blaga" University of Sibiu, Romania</li> </ul>
13 <sup>20</sup> – 15 <sup>00</sup>	<b>Lunch break</b>
15 <sup>00</sup> – 16 <sup>20</sup>	<b>Papers presentation - Chair Florin Stoica, "Lucian Blaga" University of Sibiu, Romania</b>
15 <sup>00</sup> – 15 <sup>20</sup>	<ul style="list-style-type: none"> <li>• <i>3D Head Reconstruction via Volumetric Regression</i>, <b>Andreea Dogaru</b>, Transilvania University of Brasov, Romania</li> </ul>
15 <sup>20</sup> – 15 <sup>40</sup>	<ul style="list-style-type: none"> <li>• <i>Improving automatic meter reading using data generated from unpaired image-to-image translation</i>, <b>Andreas Filinger</b>, University of Applied Sciences Landshut, Germany</li> </ul>
15 <sup>40</sup> – 16 <sup>00</sup>	<ul style="list-style-type: none"> <li>• <i>Centralized management web app for real estate developers and HOA's</i>, <b>Felix Husac</b>, "Lucian Blaga" University of Sibiu, Romania</li> </ul>
16 <sup>00</sup> – 16 <sup>20</sup>	<ul style="list-style-type: none"> <li>• <i>Solving critical section problems by using a control thread</i>, <b>Milan Savić</b>, Singidunum University, Belgrade, Serbia</li> </ul>
16 <sup>20</sup> – 16 <sup>40</sup>	<b>Coffee break</b>
16 <sup>40</sup> – 18 <sup>00</sup>	<b>Papers presentation - Chair Daniel Hunyadi, "Lucian Blaga" University of Sibiu, Romania</b>
16 <sup>40</sup> – 17 <sup>00</sup>	<ul style="list-style-type: none"> <li>• <i>Garbage Collector</i>, <b>Razvan Gheorghe Filea</b>, "Samuel von Brukenthal" National College of Sibiu, Romania</li> </ul>
17 <sup>00</sup> – 17 <sup>20</sup>	<ul style="list-style-type: none"> <li>• <i>Bayesian networks with applicability in sonoluminescence</i>, <b>Bogdan-George Gros</b>, "Aurel Vlaicu" University of Arad, Romania</li> </ul>
17 <sup>20</sup> – 17 <sup>40</sup>	<ul style="list-style-type: none"> <li>• <i>IoT moisture monitoring system for improving indoor plants growing conditions and optimizing maintenance routines</i>, <b>Minodora Suilea, Teodora Popa, Iuliana Buruiana</b>, "Lucian Blaga" University of Sibiu, Romania</li> </ul>

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**FRIDAY, October 09, 2020**

*International Conference on Applied Informatics – ICDD 2020*

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<b>9<sup>20</sup> – 11<sup>00</sup></b>	<b>Papers presentation - Chair Dana Simian, "Lucian Blaga" University of Sibiu, Romania</b>
9 <sup>20</sup> – 9 <sup>40</sup>	<ul style="list-style-type: none"> <li>• <i>The software application that allow to extract the information from romanian identity cards, <b>Constantin-Marius Stanciu</b>, "Lucian Blaga" University of Sibiu, Romania</i></li> </ul>
9 <sup>40</sup> – 10 <sup>00</sup>	<ul style="list-style-type: none"> <li>• <i>Access control system based on QR Codes, <b>Sebastian Stoica</b>, "Lucian Blaga" University of Sibiu, Romania</i></li> </ul>
10 <sup>00</sup> – 10 <sup>20</sup>	<ul style="list-style-type: none"> <li>• <i>Silent Death, <b>Andrei-Daniel Mihai</b>, "Lucian Blaga" University of Sibiu, Romania</i></li> </ul>
10 <sup>20</sup> – 10 <sup>40</sup>	<ul style="list-style-type: none"> <li>• <i>Study on the influence of the Exhaust Line Ultrasounds over the performance of the Blind Spot Warning System, <b>Catalin Meirosu</b>, NTT Sibiu, Romania</i></li> </ul>
10 <sup>40</sup> – 11 <sup>00</sup>	<ul style="list-style-type: none"> <li>• <i>Vector Embeddings for textual data in Business Intelligence, <b>Eugen Becker, Daniel Wagner</b>, University of Applied Sciences Wurzburg-Schweinfurt, Germany</i></li> </ul>
<b>11<sup>00</sup> – 11<sup>20</sup></b>	<b>Coffee break</b>
<b>11<sup>20</sup> – 12<sup>40</sup></b>	<b>Papers presentation - Chair Milan Tuba, Singidunum University, Belgrade, Serbia</b>
11 <sup>20</sup> – 11 <sup>40</sup>	<ul style="list-style-type: none"> <li>• <i>Analysis of the Operating Costs of a Decentralized App in the Ethereum Blockchain, <b>André Stollberger, Tobias Fertig, Andreas E. Schutz, Karsten Huffstadt, Nicholas H. Muller</b>, University of Applied Sciences Wurzburg-Schweinfurt, Germany</i></li> </ul>
11 <sup>40</sup> – 12 <sup>00</sup>	<ul style="list-style-type: none"> <li>• <i>Data classification and applications, <b>Stela Caramihai, Marina Larisa Indrecan</b>, Ovidius University of Constanta, Romania</i></li> </ul>
12 <sup>00</sup> – 12 <sup>20</sup>	<ul style="list-style-type: none"> <li>• <i>Educational Data Mining using Supervised Learning Techniques, <b>Alexandru-Mihail Craciun</b>, Babes-Bolyai University, Cluj-Napoca, Romania</i></li> </ul>
12 <sup>20</sup> – 12 <sup>40</sup>	<ul style="list-style-type: none"> <li>• <i>Monitoring the player decision in strategy games, <b>Mioara Hanzu</b>, "Lucian Blaga" University of Sibiu, Romania</i></li> </ul>
<b>12<sup>40</sup> – 14<sup>20</sup></b>	<b>Lunch break</b>

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<b>14<sup>20</sup> – 15<sup>40</sup></b>	<b>Papers presentation - Chair Daniel Hunyadi, "Lucian Blaga" University of Sibiu, Romania</b>
14 <sup>20</sup> – 14 <sup>40</sup>	• <i>Map Reduce in Hadoop – Word Count</i> , <b>Andrada Serban, Radu Toderutiu</b> , Transilvania University of Brasov, Romania
14 <sup>40</sup> – 15 <sup>00</sup>	• <i>DICOM image segmentation</i> , <b>Valentin Gabriel Craciun, Matei Florin Graura</b> , "Lucian Blaga" University of Sibiu, Romania
15 <sup>00</sup> – 15 <sup>20</sup>	• <i>Spatial prediction and applications</i> , <b>Marina Larisa Indrecan, Stela Caramihai</b> , Ovidius University of Constanta, Romania
15 <sup>20</sup> – 15 <sup>40</sup>	• <i>MARC (Monitored Automated Remote Car)</i> , <b>Christian Melchior</b> , "Doamna Stanca" High School, Fagaras, Romania
<b>15<sup>40</sup> -16<sup>00</sup></b>	<b>Coffee break</b>
<b>16<sup>00</sup> – 17<sup>20</sup></b>	<b>Papers presentation- Chair Florin Stoica, "Lucian Blaga" University of Sibiu, Romania</b>
16 <sup>00</sup> – 16 <sup>20</sup>	• <i>Stellar Pointer</i> , <b>Eduard Traian Stefanescu</b> , "Lucian Blaga" University of Sibiu, Romania
16 <sup>20</sup> – 16 <sup>40</sup>	• <i>Smart housing plan generator</i> , <b>Luiza-Mihaela Coman</b> , Babes-Bolyai University, Cluj-Napoca, Romania
16 <sup>40</sup> – 17 <sup>00</sup>	• <i>Simulation of rudimentary computer architecture</i> , <b>Marian Marius Aglitoiu, Miruna Teodora Daian</b> , Transilvania University of Brasov, Romania
17 <sup>00</sup> – 17 <sup>20</sup>	• <i>Image Classification by Convolutional Neural Networks</i> , <b>Una Tuba, Milan III Tuba</b> , Singidunum University, Belgrade, Serbia
17 <sup>20</sup> – 17 <sup>40</sup>	• <i>Oracle database</i> , <b>Ivan Savov, Velik Klyontov, Radostina Aleksandrova, Marina Manova, Rositsa Pencheva</b> , National Military School "Vasil Levski" Faculty of Artillery, Air Defence and CIS, Bulgaria
<b>17<sup>40</sup> – 17<sup>50</sup></b>	<b>Closing ceremony</b>



## **ABSTRACTS**

### **Simulation of rudimentary computer architecture**

*Marian Marius AGLIȚOIU, Miruna Teodora DĂIAN*

Nowadays, computers are more and more intelligent, they have a lot of features, but all devices had started from the same point. To understand how all of these systems are working, we have to go back in time to see a simpler model. Our project aims to simulate a rudimentary computer with a CPU, RAM, DISK, a TTY monitor (for text) and a LED matrix (for displaying images). Also, we have written a program which converts assembly in hex, so the computer can work like a real one. Even if the systems are in a continuous evolution, basic instructions are the same, so if we understand the foundation, it will be easier to link new processes and features with old ones.

### **Vector Embeddings for textual data in Business Intelligence**

*Eugen BECKER, Daniel WAGNER*

Vector embeddings for textual data describes numerous methods to convert unstructured text data into a structured form. Especially in the field of Business Intelligence, analysis tools play an important role. Since most machine learning algorithms, like k-Nearest-Neighbor or k-Means, need numerical data as input, text data must be converted into a numerical form. Vector embeddings are a popular approach to achieve this, and over time

many efficient methods have been developed. This paper provides an overview of Word2Vec, Doc2Vec and BERT, which allow a vector representation of words and documents.

## **Tampering detection for in-vehicle systems**

*Roland BOLBOACA*

Tampering denotes the procedure that changes the behavior of a process (e.g., automotive system, process control system) for particular advantages (e.g., financial, operational). Compared to cyber attacks, the purpose of tampering is not to cause specific damages, but to alter the system's behavior in order for the owner to gain particular advantages. This paper documents, to the best of our knowledge, the first approach to detect tampering in automotive systems. The approach embraces a two-step methodology. At first, Principle component analysis (PCA) is applied to reduce the complexity of the data exploration and analysis procedure. Then, the Gaussian mixture clustering technique is applied to classify measurements and to detect tampering attempts. Experimental results based on measurements extracted from the OBD II system of a KIA automobile driven by 10 drivers over a total period of 23 hours in Seoul Korea demonstrate the applicability of the developed approach in real-world scenarios.

## **Data classification and applications**

*Stela CARAMIHAI, Marina Larisa INDRECAN*

Data modeling and classification is of interest in any field, because any activity requires certain calculations. This paper presents a Matlab application that aims to model and classify data, in order to obtain results, which will be used as a starting point in the future activities. Modeling, in the context of this paper, is performed on a set of concentrations of chemicals taken from the soil. The purpose of modeling is to be able to classify data, depending on the results obtained from the transformations made. We want to classify the soil types in different groups / categories. Thus, the optimal combination of soil grouping is calculated, using an genetic algorithm and the K-means algorithm.

## **Proximity marketing, personalized offers and banking, all on mobile**

*Arina Ioana CAZACU*

There certainly aren't many ways in which a senior student might attempt to overcome 2020's mobile applications market, but this is one of them. A quick research about this year's top 10 trending ideas in app development includes the three key concepts in this thesis: Machine Learning, Internet Of Things and Beacon Technology. As Wassily Kandinsky, the theorist whose ideas changed the way of perceiving art, used to say: "Everything

starts from a dot”. The dot that initiates the view of this paper is the well known Revolut app. The banking concept quickly progressed into a self scan software, in which a client enters a store, scans the products on his own, and checks out, all of these using the mobile application. But then the whole painting needs its colors: proximity marketing and personalized offers. That’s how a user passing by a shop that has a beacon placed at the entry gets the privilege of being notified with the offers extracted from his own preferences. The feeling after managing to connect to a beacon and being able to dictate his behaviour is close to what a very well known song suggests: “The World is Mine”. A nice approach here seemed to be getting the user to believe the world is his too. Therefore, let him do the scanning on his own and greet his habits with discounts while he’s taking a walk outside - this is the whole philosophy behind the original manner in which this paper manages to combine beacon detection and proximity with recommendation systems. Overall, this project emphasizes the importance of psychological factors in a software experience. It consolidates user engagement through real time personalized notifications and through granting full control to its clients.

### **Smart housing plan generator**

*Luiza-Mihaela COMAN*

We are looking to simplify and automatize everyday tasks. In the following article, I will present a simple yet scalable solution for furnishing a house. The method itself is a collection of algorithms that can be improved in the

future depending on which part are we interested in. The principle is simple, we are giving as input an image which represents the house plan in two dimensions, containing only walls, doors and windows and we are getting back as output the same house plan but furnished by some rules. The algorithm is comprised of four main parts. The first part is the image processor that is responsible for processing the input image so we have geometrical structures in memory, if the input comes in another form and we are looking to improve the metric precision, this is the part that can be changed. The second part is the genetic algorithm which is the one that decides the type for each room, for example, which room is a bedroom, a living room, a bathroom, a hall or a kitchen. If we already decided on our house structure, we can just forget about this part and set the rooms as we please. The third part is the furnisher, its purpose is to choose compatible furniture and assign the chosen furniture piece a geometrical place that corresponds with the current house structure. If we are looking to transform this project into a house designer, this is the one component that will need improvements. Finally, the exporter is responsible for the output, that is how we take the raw objects from the memory and place them together to get the output. All of the above plus the specific implementation for each of these parts will be presented in the following article.

## **Educational Data Mining using Supervised Learning Techniques**

*Alexandru-Mihail CRĂCIUN*

The main domain of this paper is Educational Data Mining (EDM). In this article we analyze a subdomain of the EDM, called Academic Performance Prediction. A good way to achieve a high level of quality of the educational system is to extract knowledge from the existing data, in order to be able to analyze the behaviors of the students, to see the most popular subjects, to detect the disadvantages of traditional learning methods or to predict the students' academic performance. It is clear that due to large volumes of data this "extractions" have to be made using some machine learning algorithms. This paper aims to make a detailed analysis of how predictions of the academic performances can be made using various machine learning techniques and especially using the Ensemble Learning based methods. This special type of learning has been present in numerous research studies and has proven to be highly effective in solving both classification and regression problems. An original aspect that we introduce consists in the idea of trying to predict students' academic results based on psychological information that we have about them. In order to do this we used a dataset received from the Leibniz Institute for Psychology Information. Moreover, the originality of the machine learning models that we made is ensured by the fact that they can be trained on any new data set, without first knowing its structure.

## **DICOM image segmentation**

*Valentin Gabriel CRĂCIUN, Matei Florin GRAUR*

Organ segmentation is one of the most complex tasks for current image preprocessing techniques, due to some characteristics of DICOM medical images. Therefore, the training of neural networks that can accurately detect tumors or malignant soft tissue, is determined by the quality of the segmentation performed on input images. Due to the differences in CT/MRI machines calibrations and manufacturers, DICOM images have a wide range of Hounsfield units, resulting in machine learning models having difficulties in differentiating between organ tissue from the rest of the pixel map.

This paper presents a semi-automated image segmentation approach, by providing both the original DICOM image and the image on which a doctor performed a manual segmentation using a DICOM viewer. Having an approximation of the organ area and not relying only on the Hounsfield units chart, it reduces the risk of error when choosing an entry point on the translated DICOM image. This approach combines clustering models with a technique of pixel flooding, by adding depth to the pixel map, resulting in an easier and more accurate representation of the real organ. This workflow has been tested against ideal segmentations of a particular organ, achieving on average similarity coefficients of over 90%.

The approach is beneficial both for generating quality training inputs and for augmenting doctors segmentations by refining cut or clipped edges.

## **Approaches for reducing the number of intersections between the components of software architectures**

*Ligia Izabela CRĂCIUNESCU*

Sorting of EA Diagrams is an application which aims to bring a substantial improvement of project SW Architectures, by automatically reducing the number of intersections between architectural component connections and rearranging architectural diagrams so that there can exist a logical and systematic organization in structuring related components and interactions between these. In order to achieve all these goals, the Sorting of EA Diagrams application was developed as an extension of the high performance and complexity tool, Enterprise Architect. This tool offers the possibility of extension through the Add-In feature, which allows the programmer to improve the user interface by adding new menus, submenus and other controls to perform a variety of functions and create new features that are not available in the original product. Using this powerful expansion feature provided, Sorting of EA Diagrams application adds to Enterprise Architect, a menu called "Sorting of diagrams", which makes the transition to the "Sort" button, through which all necessary changes are made to achieve these objectives previous mentioned.



## **Cashout**

*Alexandru DANCAU, Paul CEOLCA*

The purpose of this project is to empower each and every individual to become a better version of themselves. Nowadays, education has become a crucial element on the path to success. What lacks in many educational systems is the Financial Education, so this is where we come in. We want to develop the sense of self-awareness regarding expenses and financial decisions and we do this by challenging the user to manage a certain amount of money per month, proposed by us or set by the customer themselves. We track down expenses, challenge the user to give a rating on every acquisition, and generate useful reports. Moreover, the higher the amount of money is saved, our customer receives recommendations on possible future investments.

## **3D Head Reconstruction via Volumetric Regression**

*Andreea DOGARU*

This paper describes a novel method for automatic 3D head model reconstruction from just a few images featuring the human subject's head. In contrast to alternative techniques, which require numerous images captured under speci\_c controlled conditions for a single head model, our approach can reconstruct accurate representations even from a single image. The proposed method can be used on unconstrained portrait

images, in both single, and multi-view setups. Firstly, a Convolutional Neural Network with an encoder-decoder architecture regresses a coarse volumetric representation for each input image. Afterwards, a facial landmark oriented fusion process combines the raw volumes into a fused 3D volume of the entire head. Finally, the surface of the 3D head model is extracted from the fused volume.

## **Garbage Collector**

*Răzvan Gheorghe FILEA*

This paper describes the implementation of a cross-platform Garbage Collection algorithm for C++ and its improvements regarding the release of the dynamically allocated memory. The algorithm is developed in the form of a code library for C++17, which can be used by any program to identify and release unused memory areas. The library is very easy to use, having an intuitive API.

## **Improving automatic meter reading using data generated from unpaired image-to-image translation**

*Andreas FILINGER*

The automatic reading of water readers or electric readers is a challenging problem that may be solved using deep neural networks (DNNs). Unfortunately, the training of DNNs requires large sets of labeled data that are expensive to obtain. We alleviate this problem by generating artificial

training data using unpaired image-to-image translation based on CycleGANs, ie a special form of Generative Adversarial Networks. We have implemented and evaluated a pipeline for generating artificial meter images using a medium sized dataset (6000 images) of water meter images. Our results confirm that this methodology is indeed effective, especially on small initial datasets.

**Towards an Industrial Recommendation System for Quality Improvement: Comparison of Python and C++ Implementations in an Edge- and Cloud-Computing Environment**

*Alexander FRÜHWALD, Steffen KASTNER,  
Anna-Maria SCHMITT, Simon HAAS, Leonhard HOSCH, Lars  
FICHTEL, Christian BACHMEIR*

This paper discusses the comparison of an exemplary industry 4.0 recommendation system using image recognition algorithms. Foundation of our work is an industry driven use-case: manual assembly of a retaining ring in planetary gears. We apply state-of-the-art machine learning methods, such as principal component analysis for feature extraction and a random decision forest for classification were used to detect incorrect assemblies and generate insights for the recommendation system. We implement the exemplary recommendation system in python and C++, provision and deploy both implementations in a newly developed state-of-the-art automated building and deployment platform. Finally we evaluate both implementations in an Edge-Computing and also in a Cloud-Computing environment.

## **Bayesian networks with applicability in sonoluminescence**

*Bogdan-George GROS*

This project was born out of my curiosity of finding whether Bayesian networks, used in many fields and fulfilling different tasks could be used in explaining undocumented or poorly understood physical phenomenon. One of such phenomenon is sonoluminescence which in essence is the emission of short bursts of light from imploding bubbles in a liquid when excited by sound and can observed in nature being used by Pistol shrimp to hunt prey. Many theories exist that try to explain this phenomenon and although one was accepted the exact definition still remains unclear. As such I decided that instead of a man trying to explain it, training a Bayesian network to best replicate a phenomenon and in turn try to explain it would be much more efficient. Although this seems like a revolutionary idea, a handful of such AI exist to this day studying diseases and their cures, the properties of the universe and many more but these AI require computing power that not many possess, that is why I decided to build a relatively light AI that can be used by many and can be scalable, the more power it gets the faster and more precise the response. I predict this type of AI will help research in many fields as we continue to stretch the limits of what we know about the world around us.

## **Monitoring the player decision in strategy games**

*Mioara HANZU*

The aim of this article is to propose an approach for personalizing the computer response in a strategy game when playing against a human player. The personalization is realized based on a monitoring process of player's decisions. The choice of the next computer movement is made using the player behavior which is stored in a file built within the monitoring process. To test our approach we designed and implemented an application which uses our method and allows a user to play two strategy games against a computer. The games are "Rock paper and scissors" and "Odds and evens".

## **Automation of the Examination Timetabling**

*Janik HEMRICH, Stella KONIECZEK, Justin SEEGETS*

This paper deals with the implementation of an automated examination schedule for the University of Applied Sciences Würzburg-Schweinfurt. Due to a high number of students and a limited number of resources, a large amount of planning was required for each examination phase. In order to reduce the workload and to take advantage of other benefits of an automated plan creation, the general possibility of an automated examination plan creation should be investigated, and a separate solution should be programmed. By researching various sources, approaches and existing solutions for the planning problem were researched and evaluated.

The general and specific requirements for an examination plan of the university were identified and an individual solution was programmed in Java. The result of the work was an overview of possible approaches to the planning problems of scheduling in the context of a university. The implementation of the own solution and the mode of operation of the used algorithms were analysed. A comprehensive list of the university's requirements was created and the implementation of these in the programmed software was evaluated.

### **Towards a comprehensive attack framework against commercial and private UAV**

*Leonhard HOSCH, Max ARNDT, Lars FICHTEL,  
Alexander FRÜHWALD, Vitaliy SCHREIBMANN,  
Helena SCHMIEDL, Andreas SCHÜTZ, Christian BACHMEIR*

Both commercial and private unmanned aerial vehicles (UAV) like drones became popular and widespread over the last years. Seen from an attackers' perspective, this means a continuously growing number of possible targets (UAV) that could be used to generate incidents and damage on purpose. In our work we encounter numerous security-flaws in commercially available UAV-solutions. Consequently, numerous attacks against UAV have been described, making it obvious that commercial and private drones can be hacked. In some cases, no significant effort is required.

In order to improve the security-posture of commercial and private UAV, we propose a comprehensive two-step-approach. First, we

describe a comprehensive framework to develop attacks against commercial and private UAV and validate the framework with a detailed attack-vector towards DJI's DT7 remote control. We propose that taking the view of an attacker using our comprehensive framework and identifying vulnerabilities is the basis to come up with a comprehensive security architecture for commercial and private UAV in a second step.

In this paper, we focus on the first step. We examine the security architecture and formulate a replay attack against the market leader DJI's DT7 remote control with the help of the proposed framework.

## **Centralized management web app for real estate developers and HOA's**

*Felix HUSAC*

Homeowners Associations and even big real estate development agencies have always tried to be better at maintaining a close eye over the inner workings of the communities they manage. There may be disgruntled tenants, sloppy, uninterested landlords, or even problems with access to utilities and the condition of the rooms/spaces offered for rent. Most of these problems have a common root: the lack of proper communication. This application allows its users to interact with each other on the platform, making it easy to send messages between users and landlords or administrators, post public announcements, pay the rent or other utilities and even request access to different facilities offered by the association,

such as parking places, gym memberships etc. The app has different tiers of membership, that can be used by the landlord to restrict or grant access to different privileges within the app. This is a proof of concept that can be expanded to encompass Smart Home and IoT technologies and even augmented and virtual reality.

### **Spatial prediction and applications**

*Marina Larisa INDRECAN, Stela CARAMIHAI*

Data modeling and prediction is of interest in any field, as any activity requires certain estimated results. This paper presents a Matlab application that aims to model and predict data, to obtain results, which will be used as a starting point in future activities. The modeling, in the context of this paper, is performed on a set of data represented by the precipitation recorded in the 10 main stations in Dobrogea: Adamclisi, Cernavodă, Constanța, Corugea, Hârșova, Jurilovca, Mangalia, Medgidia, Sulina and Tulcea. The purpose of modeling is to be able to estimate precipitation using a spatial prediction method, so that the error between predicted and recorded values is minimal. To determine the optimal values used in prediction we worked with the genetic algorithm.



## **Automatic recognition of acoustic musical chords**

*Răzvan-Cosmin LINCA*

The past few years have brought a significant increase in interest for acoustic music, closely related to the parallel evolution of technology globally, with focus on social networks and video streaming. It was found that the evolution determined a distance between performers and the musical sheet, as the process of learning through online tutorials has become much easier. Also, the classical sheet is a musical element with high difficulty, being necessary to know some notions of music theory for a full understanding. Therefore, it proved necessary to use a simple and suggestive notation, specific to acoustic music, namely musical tabulature.

Given the existence of these limitations and the desire of guitarists, one solution would be the existence of a platform through which acoustic parts can be transcribed automatically, directly into a tabular representation, using guitar chords.

The first step of the automatic chord recognition system (ACR) is to apply a sound processing method, in order to extract important musical features, by using a suitable representation in the field, namely chromagram. This first step is a vital one in the analysis of a musical sample, as obtaining a correct representation is closely related to the continuous development of the system.

The second part defines the algorithms that underlie the learning processes and differentiate the features of some chords from a musical sample, specifically, machine learning algorithms. The goal is to gradually arrive at a complex and up-to-date machine learning algorithm, able to automatically and independently analyze the audio signal and to classify with high precision each sequence within an acoustic sample.

In order to highlight the good functioning of the ACR, the system will be connected with a mobile application, intended for acoustic music enthusiasts. The application will be able to display, in real time, the results of the automatic recognition of acoustic musical chords, for any desired musical sheet.

## **Collection of software interfaces**

*Mădălina MARINESCU*

**Reverse engineering**, which means building a software architecture starting from existing software components, is **very complex and time-consuming**, requiring **very high initial efforts**. Experienced engineers allocation is needed, based on the software complexity of the components (number of components within the SW, interconnections, workflow, so on) and **UML** has to be learned by the assigned engineer. Collecting the data from an entire project by **analyzing the C code** from all “.c” and “.h” files for **manually completing** the Excel file needed for the usage of EA Import Plugin can be **close to impossible**, at reverse engineering. Our proposed

solution collects the data from an **entire project** by analyzing the C code files and writes all the information in an **Excel file**, that will further be used by EA Import Plugin to generate the project's architecture, resulting in **reduced effort** due to automation phases, no mandatory prior experience in SW Architecture methods needed, and **direct traceability** of SW changes, between SW Architecture modifications and/or SW changes within “.c” and “.h” files.

### **Study on the influence of the Exhaust Line Ultrasounds over the performance of the Blind Spot Warning System**

*Cătălin MEIROSU*

During the previous years, the vehicle manufacturers have tried to equip their vehicles with as much technology as possible, making the driving experience for people easier than ever. Most of the modern vehicles come today with ADAS (Advanced Driver Assistance Systems) either for driving (E.g. Cruise Control, Blind Spot Warning) or Parking (E.g. Rear Ultrasonic Sensors, Rear View Camera). Since the vehicle come equipped with more technology, a major task in developing vehicle remains the integration of these ADAS system in the vehicle context with the other components. Since most of the components cope with each other, some technologies are more affected by other components – such as the case of an ultrasound vehicle scanning system (Blind Spot Warning) and the Exhaust line that emits ultrasounds from the exhaust muffler. The aim of this paper is to study the influence of the exhaust line ultrasounds

(ultrasounds that are emitted by the engine cycle and filtered in the exhaust line of the vehicle) over the detection of the Blind Spot Warning Ultrasound system.

## **MARC (Monitored Automated Remote Car)**

*Christian MELCHIOR*

As we hear the term robot, we are often thinking of a machine that can work in our service all day long. There are also exceptions, like medical robots which can reach difficult places where no human can. MARC is such a helpful prototype. Imagine that you would borrow your car to your child who recently got his driver license, but you don't have the time required to join his every drive. No worries MARC is getting you out of trouble. You would be able to track multiple parameters of your car in real-time telemetry. You could see if he is over revving the engine, overheating the engine, or if he is exceeding the speed limit. At the moment you could also drive MARC remotely, making itself an enjoyable but a future-proof robot.

## **Silent Death**

*Andrei Daniel MIHAI*

"Silent Death" is a stealth shooter game that illustrates a cyberpunk world where you play as a bounty hunter. Your primary target is to retrieve the items from the keepers and remain undetected. Once the enemies will notice your presence they will as such to stop you.

The main aspects that makes the project different than others are the AI, the character's abilities and the graphics.

The AI will take advantages of everything in his surroundings to achieve his goals, especially analyzing the environment and communicating with other Ais.

To remain undetected the player will be equipped with a silent bow to take down the targets without making any noise and a melee weapon for close combats. Some items will also be implemented to help you (a few ideas are holograms that illustrate your dead body to trick the AI's into thinking that they took you down, invisibility, drone jammers etc.).

The graphic is going to be minimalist using cyberpunk styles with high quality lightning. It's main purpose is to demonstrate that games can achieve stunning graphics even with minimalist environment.

## **AI and ML in retail industry, Case Study on LiDL (Fresh food market)**

*Walter ROMER*

The solution chosen for the topic of the paper is represented by the Prophet Software system produced by the Facebook Data Science team. Using the prediction capabilities of this algorithm with real historical data to which I have access I managed to establish a starting point to build an AI architecture for stock predictions within the company. I chose this solution because the Prophet algorithm is a robust prediction system that works very well with the data that i have available and has a high tolerance for inaccuracies in the data received and can be customized in any direction it wants to make relevant approximations.

From a technical point of view I will apply the solution using Python with the inclusion of the Pandas class to be able to interact with the data I processed in a csv. format, and with the help of fbProphet and the Prophet class I will make predictions for the data set that I extracted from the backend of internal computer systems.

## **Solving critical section problems by using a control thread**

*Milan SAVIĆ*

This paper shall present the implementation of critical section problem solving algorithms. The critical section is a problem that occurs with concurrent systems. Concurrent systems are collections of processors that communicate by writing in shared space or reading from shared space. This way of programming speeds up the work of certain programs and provides greater utilization of resources. Algorithms that solve this problem allow multiple processes to seamlessly access and modify data in a mutual shared space. So far, several algorithms have been implemented to solve this problem. Initially, these were algorithms that enabled the operation of concurrent systems for two processes. Today, there are algorithms that solve this problem for an arbitrary number of processes. Some of the more well-known algorithms that work for an arbitrary number of processes use the help of the operating system or some additional functionalities that are implemented at the processor level. The algorithms that will be presented in this paper represent a software solution to this problem without the additional help of the operating system or some other functions that are outside the program. The algorithms will be displayed in pseudo-code, but they can be implemented in any programming language that supports multithreaded programming. The mutual shared space access simulation will be represented by using a

thread on a simple example of the increment of a shared variable in the Java programming language.

## **Oracle database**

*Ivan SAVOV, Velik KLYONTOV, Radostina ALEKSANDROVA,  
Marina MANOVA, Rositsa PENCHEVA*

This project was born while we were in Erasmus+ mobility in Romania, Sibiu and our coordinator told us for this conference and we decided to make a project which is on our specialization and for this we decided to make a project about "Oracle" Database, what is database some words about where we can use it and how is helpful, why we chose "Oracle", the pros and cons about Oracle.

## **The software application that allow to extract the information from romanian identity cards**

*Constantin-Marius STANCIU*

Through Machine Learning technics I succeeded to build a software capable to detect and extract the informations from the romanian identity card such as: last name, first name, personal identification number and picture portrait. The final shape of the informations are saved in the text format (last name, first name and personal identification number) and image format (picture portrait). The outcome of the recognition is over 98%. Unlike of the another system that allow to scan the identity card



through a scanner device, this system have capacity to detect and extract the information from a distance of up to one meter with the help webcam integration of 1 MegaPixel. This system plays an important role in social distancing and the protection of personal data used often in companys.

## **Access control system based on QR Codes**

*Sebastian STOICA*

Access control systems are security systems that allow a company to control the access of people in different buildings, offices. It is a fundamental concept to increase security and minimize risks for businesses or various organizations. In many of the company's headquarters, employees use cards to gain access inside the building or to exit the building. In large businesses, access control software is often interfaced with a turnstile system to make unauthorized access impossible. For office spaces, access may be restricted by an access door locking system. These cards can be replaced through an application, which creates a unique QR code for each employee. In the absence of a hardware infrastructure, in this paper we will address the software component of the access control system, based on QR codes, as a cheaper alternative to the card-based solution. Each employee will scan their own QR code, generated through an application installed on the mobile phone, at certain control points installed at the entrance or exit of the company headquarters. This eliminates the cost of physical cards, and scanning the QR code can be done with a simple webcam.

## **Analysis of the Operating Costs of a Decentralized App in the Ethereum Blockchain**

*André STOLLBERGER, Tobias FERTIG, Andreas E. SCHÜTZ,  
Karsten HUFFSTADT, Nicholas H. MÜLLER*

The Ethereum blockchain is one of the largest and most used public blockchains. Unlike Bitcoin, Ethereum supports the development and execution of decentralized applications (DApp) as well as smart contracts. However, there is a lack of information about the operating costs of such a DApp on a public blockchain like Ethereum. In case of Ethereum, the costs of a DApp is based on the amount of transactions and their so-called gas price. The gas price depends strongly on the calculation effort of the respective transaction. In order to get an overview of these costs, we analyzed 350 DApps which are deployed on the Ethereum blockchain. Moreover, we classified their costs in different categories, such as games or finance. Furthermore, we also propose different approaches how to obtain the required data from the Ethereum blockchain and we discuss the advantages and disadvantages of every approach.

## **IoT moisture monitoring system for improving indoor plants growing conditions and optimizing maintenance routines**

*Minodora SUILEA, Teodora POPA, Iuliana BURUIANA*

Plants play a major role in human well-being. Recent studies suggest that human health is greatly impacted by the presence of plants and green spaces. Plant production and maintenance can be improved by adjusting the growing conditions in an effective way and by optimizing the resource consumption. As water supplies represent a rising concern in the current age, the paper addresses sustainability by providing a IoT solution with low cost sensors and an Arduino microcontroller. Soil moisture level is being collected into time series data to be further analyzed and interpreted. Relations to room temperature and humidity are discussed in order to support the improvement of plant growing conditions and maintenance routine.

## **Map Reduce in Hadoop – Word Count**

*Andrada ȘERBAN, Radu TODERUȚIU*

In this article we will focus on the topic "Map Reduce in Hadoop with Word Count". Map Reduce is a software framework and programming model used for processing large amounts of data. The MapReduce programming work consists of two phases, Map and Reduce. Map tasks deal with split-ting and mapping data, while Reduce tasks mix and reduce data.

Hadoop can run MapReduce programs written in different languages: Java, Ru-by, Python, and C++. MapReduce programs are inherently parallel and are therefore very useful for performing extensive data analysis with multiple ma-chines in a cluster.

The “Map Reduce Word Count” application is written in Java. From the java application we created a ".jar" file and used it as input for the job in Hadoop. Hadoop was installed with Docker. At the end, one compares the parameters like the time spend in order to have the job finished, the file number of bytes read.

## **Stellar Pointer**

*Eduard Traian STEFANESCU*

In this era, to study what's in our solar system it's becoming easier than ever. The Stellar Pointer project can help the kids to understand how and where the planets are positioned or the adults to position their telescopes to a specific planet.

## **Image Classification by Convolutional Neural Networks**

*Una TUBA, Milan III TUBA*

Digital images improved many areas of everyday life as well as numerous science fields. Fast and more accurate image analysis found a purpose in various applications from security to self-driving cars. Many applications need to perform image classification and the true revolution happened with

the introduction of the convolutional neural networks. Convolutional neural networks are used for classification of spatial correlated inputs such as digital images but also other signals such as voice or sound. In this paper we tested, compared and analyzed different convolutional neural network architectures for classifying standard digital image datasets.

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