



# ICETA

## 2019

International Conference

**17<sup>th</sup> International Conference  
on Emerging eLearning  
Technologies and Applications**



# PROCEEDINGS

**Information and Communication Technologies in Learning**

November 21-22, 2019  
Stary Smokovec, The High Tatras  
Slovak Republic

Website: <http://www.iceta.sk>

ISBN: 978-1-7281-4967-7

IEEE Catalog number: CFP1938M-ART

Proceedings editor: František Jakab

Copyright and Reprint Permission: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For reprint or republication permission, email to IEEE Copyrights Manager at [pubs-permissions@ieee.org](mailto:pubs-permissions@ieee.org). All rights reserved. Copyright ©2019 by IEEE.

# TABLE OF CONTENTS

<b>Committees</b> .....	4
<b>Table of Contents</b> .....	7
<b>Fuzzy Rule Interpolation Toolbox for the GNU Open-Source OCTAVE</b> .....	16
M. Alzubi, M. Almseidin, M.A. Lone, S. Kovacs	
<b>Case Studies in Data Science and Internet of Things</b> .....	23
L. Antoni, F. Galčík, J. Guniš, Š. Horvát, S. Krajči, O. Krídlo, M. Opiela, A. Szabari, L. Šnajder, G. Andrejková, D. Šveda	
<b>Genetic Constructivism in Mathematical Preparation of Computer Science Students</b> .....	29
K. Bachratá, H. Bachratý, M. Smiešková	
<b>Accelerating SDN control plane with GPGPU-based packet classification</b> .....	36
M. Baláž, P. Helebrandt	
<b>Modeling Students' Academic Performance Using Bayesian Networks</b> .....	42
M. Baranyi, K. Gál, R. Molontay, M. Szabó	
<b>Practical Application of the SAP ERP Information System in the Innovative Teaching Process of the Controlling of a Manufacturing Company</b> .....	50
A. Behunova, L. Knapcikova, M. Behun, M. Albert	
<b>Customization of the educational process in the study programme of technology and management in the building industry through the BIM application</b> .....	58
A. Behúnová, P. Mésároš, J. Smetanková, K. Krajníková, T. Mandičák, M. Behún	
<b>The impact of virtual learning tools on the student's remembering knowledge</b> .....	64
M. Beňo, M. Ölvecký	
<b>Teaching L1 and L2 communication skills with a robotic head</b> .....	69
Š. Beňuš, R. Sabo, M. Trnka	
<b>The objective comparison of recent video compression formats for visual weather prediction</b> .....	76
J. Bienik, M. Uhrina, T. Mizdos, A. Holesova, L. Sevcik	
<b>Web - Based Laboratory for Modeling and Simulation of Power System</b> .....	83
E.C. Bobric, D. Irimia, C. Ungureanu, E.D. Lupu	
<b>Cloud Computing Security</b> .....	87
L. Bordak	
<b>Analysis of educational content of the subject Informatics in selected countries of the European Union in the context of curricular changes in the Czech Republic</b> .....	93
H. Bučková, J. Dostál	

<b>Microphone array speech enhancement using LSTM neural network .....</b>	<b>100</b>
A. Buday, J. Juhár, A. Čižmár	
<b>Comparison of Distributed Data Transformation and Comparing Query performance In Relational and Non-relational Database .....</b>	<b>108</b>
R. Čerešňák, M. Kvet	
<b>Spoken Dialogue-based Remote Control of Educational Mobile Robot with Mecanum Wheels .....</b>	<b>115</b>
N. Chivarov, D. Chikurtev, M. Pleva, S. Ondas, J. Juhar, Y. Liao	
<b>Wearable Internet of Things to Trigger the Actions of a Tele-Controlled Service Robot for Increasing the Quality of Life of Elderly and Disabled – ROBCO 19 .....</b>	<b>122</b>
N. Chivarov, M. Marinov, V. Lazarov, D. Chikurtev, G. Goranov	
<b>Interactive Data Visualization of Fuzzy Membership Functions and Fuzzy Clustering .....</b>	<b>126</b>
O. Chovancova, J. Laukova, A. Dudas, J. Kostolny	
<b>Extending Telepresence Technology as a Middle Stage between Humans to AI Robots Transition in the Workplace of the Future. ....</b>	<b>133</b>
D. Cymbalak, F. Jakab, Z. Szalay, J. Turňa, Ľ. Bilský	
<b>Interactive system programming course tailoring based on student feedback .....</b>	<b>139</b>
A. Deák, D. Gecášek, M. Vrábek, J. Genčí, F. Jakab	
<b>Energy disaggregation based intelligent data processing tool .....</b>	<b>145</b>
A. Deák, F. Jakab	
<b>Efficient Sensitive Data Gathering with Forensic Analysis of Android Operating System .....</b>	<b>149</b>
F. Dian, J. Hudec	
<b>An overview of DNS security in V2X networks.....</b>	<b>156</b>
I. Dolnák, A. Jantošová, J. Litvik	
<b>T-Kids: Innovative ways of educating elementary school children in the STEM skills .....</b>	<b>160</b>
M. Džbor, M. Stefanovicova, M. Varga, K. Priesterova, M. Burak, N. Mitrova, K. Kocisova	
<b>Framework for Promoting the Education of Network Traffic Engineering .....</b>	<b>166</b>
D. Farkas, M. Husovský, P. Beňko, J. Juhár, A. Pekár	
<b>Collecting unification and presentation of multimedia content and product configurations in multilingual product catalogs .....</b>	<b>173</b>
R. Fasuga, J. Čech, M. Dedek, K. Mašlík, J. Rýdel, M. Kuchařík	
<b>On a Mobile Application for Learning Positive and Negative Integers .....</b>	<b>179</b>
J. Fialová	
<b>Change Management Towards Digitalization and Innovation .....</b>	<b>185</b>
A. Fichter	

<b>The vehicle classification based on neural networks in intelligent transport systems.....</b>	<b>191</b>
M. Frniak, P. Kamencay, M. Markovic, J. Dubovan, M. Dado	
<b>Network controller extension for unsplittable data flows in the SDN environment.....</b>	<b>197</b>
M. Galinski, T. Vrtal, I. Kotuliak	
<b>Semi-automatic processing and annotation of meeting audio recordings .....</b>	<b>204</b>
S. Gereg, P. Viszlay, J. Staš, M. Lojka	
<b>Developing Computational Thinking in Pre-School Children .....</b>	<b>210</b>
T. Havlásková, Z. Homanová, D. Tran	
<b>Five years on K-MOOC: Challenges on Higher Education .....</b>	<b>216</b>
F. Hegyesi, J. Velencei	
<b>Development of Application for Simulation of Video Quality Degradation Artifacts .....</b>	<b>222</b>
A. Holesova, P. Sykora, M. Uhrina, D. Ticha	
<b>Empirical Study of Minkowski–Bouligand and Hausdorff–Besicovitch Dimensions of Fractal Curves .....</b>	<b>231</b>
R. Horváth	
<b>Virtual Reality in Mathematics: Design of the Serious Game Improves Spatial Imagination Performance.....</b>	<b>239</b>
M. Host'ovecký, L. Huraj, K. Pribilová	
<b>A Study of Risk Internet Addiction among University Students .....</b>	<b>245</b>
M. Host'ovecký, M. Pietriková, D. Tóthová	
<b>Robotic Systems and Present.....</b>	<b>250</b>
J. Hrbacek, L. Stuchlikova	
<b>Possibilities of methods for IDS testing .....</b>	<b>257</b>
M. Hulič, A. Baláž, M. Štancel	
<b>Design proposal of multi sensor connected device for monitoring environment and newborn metrics.....</b>	<b>263</b>
J. Hurtuk, J. Matuš, M. Hulič	
<b>Nonsense to Sense: A Way to Critical Thinking Development .....</b>	<b>268</b>
J. Hvorecky	
<b>Using Digital Technologies for Electrical Engineering Students Training .....</b>	<b>274</b>
D. Irimia, E.C. Bobric, E.D. Lupu	
<b>Introductory Programming Exams and Their Benchmarking in Slovakia .....</b>	<b>279</b>
J. Jacková, A. Kanáliková	

<b>Signing the documents using National Telepresence Infrastructure .....</b>	<b>285</b>
F. Jakab, S. Kosárová, R. Vápeník, J. Kováčová, P. Hrčka	
<b>Innovation Universities Ecosystem: Acceleration of Innovative Entrepreneurship in the University Environment .....</b>	<b>291</b>
F. Jakab, P. Čižmár, O. Kainz, A. Lavrin, M. Michalko	
<b>Contribution of MIDIH project to solution of selected aspects supporting efficient application of Digital Transformation in industrial processes .....</b>	<b>296</b>
F. Jakab, O. Kainz, A. Lavrin, M. Michalko, G. Alexandrová	
<b>An overview of vehicular ad hoc networks.....</b>	<b>305</b>
A. Jantošová, I. Dolnák, M. Dado	
<b>Comparing the Effectiveness of Microlearning and eLearning Courses in the Education of Future Teachers .....</b>	<b>309</b>
T. Javorcik, R. Polasek	
<b>In-service science teacher's education in the framework of IC Academy project.....</b>	<b>315</b>
Z. Ješková, S. Lukáč, K. Kimáková, S. Csachová, M. Ganajová, M. Kireš	
<b>IT Induced Innovations: Digital Transformation and Process Automation .....</b>	<b>322</b>
A. Juhásová, G. Juhás, L. Molnár, M. Ondrišová, J. Mažári, M. Mladoniczky	
<b>Education improving thorough information technology and their impact on the students career pathways within the "IT Academy" Project. ....</b>	<b>330</b>
V. Jurková, R. Kollár, M. Janková, R. Hajduk, A. Trnovec, D. Šveda, J. Turňa, G. Gavurníková	
<b>Innovation in Educational Process of Computer Networks .....</b>	<b>336</b>
O. Kainz, M. Michalko, F. Jakab, R. Petija, J. Uramova, M. Moravcik	
<b>Students' Attendance Monitoring through the Face Recognition .....</b>	<b>342</b>
O. Kainz, M. Nguyen, F. Jakab, R. Petija, M. Michalko, G. Alexandrova	
<b>Critical Infrastructure Protection Against Chemical Attack - Project CIPAC .....</b>	<b>348</b>
K. Kampova, K. Makka, L. Hadáček	
<b>Generalized Metropolis-Hastings Algorithm for Distributed Averaging with Uniform Quantization Scheme .....</b>	<b>354</b>
M. Kenyeres, J. Kenyeres	
<b>Air carrier training process specifications .....</b>	<b>361</b>
M. Keselova, D. Liptakova, P. Koscak, J. Kolesar	
<b>The experience of organizing blended learning at a university (using pedagogical disciplines as an example) .....</b>	<b>366</b>
S.S. Khapaeva, L.N. Anisimova	

<b>Multidisciplinary Development Process of a Story-based Mobile Augmented Reality Game for Learning Math .....</b>	<b>372</b>
J.C. Kim, R.S.N. Lindberg, T.H. Laine, E.-C. Faarinen, O.De Troyer, E. Nygren	
<b>Key innovation concepts of STEM education driven by IT Academy project .....</b>	<b>378</b>
M. Kireš, D. Šveda, Z. Ješková, S. Lukáč, M. Ganajová, A. Lešková, S. Csachová	
<b>Predicting Dropout Using High School and First-semester Academic Achievement Measures .....</b>	<b>383</b>
B. Kiss, M. Nagy, R. Molontay, B. Csabay	
<b>Phonetic measures of speech rate and fluency assessments in read speech .....</b>	<b>390</b>
P. Kleman	
<b>Development of Critical Thinking in Education: A Case Study on Hoax Messages .....</b>	<b>396</b>
N. Klimová, G. Lovászová	
<b>Simulation of Selected Product as a Bridge between Knowledge and Practice in the Educational Process .....</b>	<b>403</b>
L. Knapčíková, A. Behúnová, M. Behún	
<b>Improving student reading comprehension of learning materials using the analysis of Eye-Tracking data .....</b>	<b>411</b>
M. Kohútek, M. Turčáni, M. Magdin	
<b>Approaches and tools for network protocol modeling .....</b>	<b>419</b>
M. Kontšek, P. Segeč, M. Moravčík, J. Papán	
<b>A Qualitative Methodology Framework of Investigation of Learning and Teaching Based on the Use of Augmented Reality .....</b>	<b>425</b>
D. Kostrub, P. Ostradický	
<b>Design of educational and testing software for firefighters training on aircraft accident.....</b>	<b>441</b>
M. Košuda, A. Tobisová, S. Szabo, jr., D. Blaško	
<b>Comparing tool for detection of plagiaries in Excel based homework files.....</b>	<b>447</b>
K. Kovalčíková, M. Ďuračík, P. Hrkút	
<b>ICT Infrastructure Development as Political Entrepreneurship: The Case of the Estonian Education and Research Network (EENet) .....</b>	<b>453</b>
M. Kraav, T. Mets	
<b>Hierarchical Text Classification using CNNs with Local Classification Per Parent Node Approach .....</b>	<b>460</b>
M. Krendzelak, F. Jakab	
<b>Conceptual Modeling in e-Learning and its Relation to the Educational Content Quality .....</b>	<b>465</b>
J. Lang, P. Kysel'	

<b>Implementation of NLMS algorithm for chromatic dispersion compensation .....</b>	<b>471</b>
J. Litvik, I. Dolnák, M. Dado	
<b>Web tutorial to increase students' scientific creativity.....</b>	<b>475</b>
E.D. Lupu, D. Irimia, E.C. Bobric	
<b>Selecting the Most Probable Author of Asocial Posting in Online Media .....</b>	<b>480</b>
K. Machová, P. Staroňová	
<b>Continuous Analysis of Assignment Evaluation Results from Automated Testing Platform in Iterative-Style Programming Courses .....</b>	<b>486</b>
M. Madeja, M. Biñas, L. Prokein	
<b>Field Programmable Gate Array Hardware Accelerator of Prime Implicants Generation for Single-Output Boolean Functions Minimization.....</b>	<b>493</b>
B. Madoš, Z. Bilanová, E. Chovancová, N. Ádám	
<b>Using the SDK Affdex for a Complex Recognition System Based on a Webcam.....</b>	<b>499</b>
M. Magdin, L. Benko, M. Kohútek, Š. Koprda	
<b>Virtual Laboratories: Engineers' Training for Automotive Industry.....</b>	<b>505</b>
I. Makarova, A. Boyko, K. Shubenkova, A. Pashkevich, I. Giniyatullin	
<b>Internet of Things Platform for Rapid Development and Learning .....</b>	<b>512</b>
S. Matuska, R. Hudec, P. Kamencay	
<b>Biometric Systems Utilizing Neural Networks in the Authentication for E-learning Platforms.....</b>	<b>518</b>
M. Messerschmidt, M. Pleva	
<b>Students fearing public speaking as an attribute of our time? .....</b>	<b>524</b>
M. Miklosikova, M. Malcik, D. Vykydal	
<b>Failure Mode and Effects Analysis of the Consequences of the Life Cycle of the University Educational Services .....</b>	<b>531</b>
Z. Mingaleva, I. Klackova, A. Selezneva, N. Shaidurova.	
<b>Virtual Mine – successful story of education in raw materials.....</b>	<b>536</b>
M. Molokáč, D. Tometzová, G. Alexandrová, M. Kobylanska, Z. Babicová	
<b>Proposal of VoIP infrastructure and services for academia - case study .....</b>	<b>540</b>
M. Moravcik, M. Kontsek	
<b>EKV Transistor Model For Ultra Low-Voltage Bulk-Driven Circuits.....</b>	<b>546</b>
L. Nagy, D. Arbet, M. Kovac, M. Potocny, M. Sovcik, V. Stopjakova	
<b>Proposing a decision-support system to maximize the robustness of computer network topologies.....</b>	<b>552</b>
T. Nemes, A. David, Z. Sule	

<b>The Education and Training Methodology of the Air Traffic Controllers in Training.....</b>	<b>556</b>
H. Némethová, J. Bálint, J. Vagner	
<b>Educational Game with Web-Based Evaluation .....</b>	<b>564</b>
P. Novotný, K. Bachratá, H. Bachratý	
<b>Metadata associations and relationship with real data .....</b>	<b>570</b>
M. Ölvecký, D. Gabriška	
<b>How chatbots can be involved in the education process.....</b>	<b>575</b>
S. Ondáš, M. Pleva, D. Hládek	
<b>Story of Artificial Intelligence: research and publications behind.....</b>	<b>581</b>
M. Ondrišová, L. Molnár, G. Juhás, A. Juhásová, J. Mažári, M. Mladoniczky	
<b>Smart Cities and the Importance of Smart Traffic Lights .....</b>	<b>587</b>
J. Palša, L. Vokorokos, E. Chovancová, M. Chovanec	
<b>Fast ReRoute error detection – Implementation of BFD mechanism .....</b>	<b>593</b>
J. Papán, P. Segeč, J. Dobrota, L. Koncz, F. Kubala, M. Kontšek, O. Yeremenko	
<b>Support of General Public Education about Prevention of Antisocial Behaviour on the Web.....</b>	<b>600</b>
J. Paralič, J. Kapcala	
<b>A Short-Time Prediction of Sun Radiation Intensity .....</b>	<b>606</b>
M. Paralič	
<b>Critical analysis of Communication Protocols to Support the Quality of Services in IoT-based Infrastructures.....</b>	<b>612</b>
R. Petija, P. Fecifak, F. Jakab, M. Michalko	
<b>Digital Games in Primary and Lower Secondary Education Classes .....</b>	<b>618</b>
K. Picka, L. Stuchlikova	
<b>User Experience in the Development of the Education System.....</b>	<b>626</b>
K. Pilarcikova, P. Rusnak, J. Rabcan, J. Kostolny	
<b>Integrating online education in Innovation and Entrepreneurship (I&amp;E) Doctoral training program.....</b>	<b>633</b>
G. Pisoni	
<b>Investigating effective dynamics of virtual student teams through analysis of Trello boards .....</b>	<b>639</b>
G. Pisoni, M. Hoogeboom	
<b>Innovation of Elearning at Comenius University .....</b>	<b>644</b>
K. Pisutova	
<b>Exposing students to AI and industry related skills via OpenLab.....</b>	<b>649</b>
L. Pomsar, M. Zorkovsky, B. Rusinakova, I. Zolotova	

<b>Measurement of a wireless power transfer system with a fully integrated receiver .....</b>	<b>655</b>
M. Potočný, V. Stopjaková, M. Kováč	
<b>The Interactive Web Applications in Financial Literacy Teaching .....</b>	<b>661</b>
P. Pšenák, I. Pšenáková, T. Szabó, U. Kováč	
<b>Use of 3D graphics in education .....</b>	<b>667</b>
M. Pytlík	
<b>Intercultural Education - New Challenges for Higher Education .....</b>	<b>676</b>
M. Račková, Z. Vranayová, Š. Fejedelem	
<b>An evaluation of student performance at e-learning platform .....</b>	<b>681</b>
S. Rakic, M. Pavlovic, S. Softic, B. Lalic, U. Marjanovic	
<b>Optimization Methods in Bike-Sharing Systems.....</b>	<b>687</b>
V. Šalgová, M. Kvet	
<b>Challenges of Big Data technologies in education process in Business information systems.....</b>	<b>693</b>
M. Sarnovsky, P. Bednar	
<b>Network virtualization tools – analysis and application in higher education.....</b>	<b>699</b>
P. Segeč, M. Moravčík, M. Kontšek, J. Papán, J. Uramová, O. Yeremenko	
<b>Architecture design in private Cloud Computing.....</b>	<b>709</b>
P. Segeč, J. Uramová, M. Moravčík, M. Kontšek, M. Drozdová	
<b>Cloud-type classification of ground-based images using Deep learning .....</b>	<b>715</b>
M. Šinko, P. Kamencay, P. Sýkora, M. Benčo, R. Hudec	
<b>Survey on security threats and algorithms in Internet of Things environment.....</b>	<b>721</b>
S. Širka, J. Erdelyi, P. Čičák, K. Jelemenská	
<b>Virtualized Collaborative Learning Environment In The Process of Teaching People with Disabilities .....</b>	<b>727</b>
M. Sivý, B. Sobota, Š. Korečko, M. Hudák	
<b>On-chip Digital Calibration of Low-Voltage Analog ICs in Nanotechnologies .....</b>	<b>733</b>
M. Šovčík, V. Stopjaková, D. Arbet, M. Kováč	
<b>Value Orientations of Generation Z and Their Performance in Education Process .....</b>	<b>739</b>
A. Starecek, K. Koltnerova, Z.G. Babelova, D. Cagenova, S. Lovasikova, M. Ivic	
<b>Dynamic Temporal Alignment of Slovak Audiovisual Content .....</b>	<b>745</b>
J. Staš, M. Lojka, P. Vízlay, D. Hládek, J. Juhár	
<b>Artificial Neural Networks in Educational Process .....</b>	<b>751</b>
P. Sykora, M. Sinko, R. Vrskova, P. Kamencay, R. Hudec	

<b>Does ICT Education in the Region Need a Strategy? Background and Proposal of the Integrated Approach .....</b>	<b>757</b>
J. Ťapák, M. Džbor, M. Šechný, V. Fedák	
<b>Taking Off: Towards Real Competence-Based Flight Pilot Training .....</b>	<b>764</b>
C. Thomay, B. Gollan, A. Ferscha, M. Spiess	
<b>Encouraging students to take action in developing problem-solving competency.....</b>	<b>770</b>
D. Tran, T. Havlásková, Z. Homanová	
<b>End-to-end Packet Loss Differentiation Algorithms and Their Performance in Heterogeneous Networks .....</b>	<b>777</b>
P. Truchly, M. Sith, R. Repka	
<b>Best practise for creating Packet Tracer activities for distance learning and assessment of practical skills .....</b>	<b>784</b>
J. Uramová, P. Segeč, M. Kontšek	
<b>Mobile application ESKO as a tool for developing communicative competence in Slovak as a hereditary language .....</b>	<b>791</b>
L. Urbancová, P. Voštinár	
<b>Unit Testing in Data Structures Graphical Learning Environment .....</b>	<b>797</b>
M. Varga, M. Kvassay	
<b>Comparison of in-house HPC calculation with public cloud computing for parallel algorithm containing recursive functions .....</b>	<b>805</b>
E. Vesel, J. Škrinárová, A. Dudáš	
<b>Interactive course for JavaScript in LMS Moodle .....</b>	<b>810</b>
P. Voštinár	
<b>Perception of Employees Educational Activities Effectiveness from Different Generation Groups in Industrial Enterprises .....</b>	<b>816</b>
N. Vranakova, Z.G. Babelova, A. Starecek, D. Caganova, A. Chlpekova, M. Fero	
<b>Pressure mapping tool for the correct footprint learning in the home environment.....</b>	<b>823</b>
R. Vršková, R. Hudec	
<b>Applying Additive Technologies to Teaching Graphic Disciplines in a Technical University .....</b>	<b>829</b>
O. Zhuykova, P. Božek, E. Sosnovich, E. Akhmedzianov	
<b>Moodle vs Sakai: evaluating user experience for online entrepreneurship education .....</b>	<b>836</b>
G. Pisoni	
<b>Author Index .....</b>	<b>841</b>