



# Program of The 29th Conference of Open Innovations Association FRUCT

Tampere, Finland  
12-14 May 2021



**GAUDEAMUS IGITUR,  
JUVENES DUM SUMUS!  
POST JUCUNDAM JUVENTUTEM,  
POST MOLESTAM SENECTUTEM  
NOS HABEBIT HUMUS.**

**UBI SUNT, QUI ANTE NOS  
IN MUNDO FUERE?  
VADITE AD SUPEROS,  
TRANSITE AD INFEROS,  
UBI JAM FUERE.**

**VITA NOSTRA BREVIS EST,  
BREVI FINIETUR,  
VENIT MORS VELOCITER,  
RAPIT NOS ATROCITER,  
NEMINI PARCETUR.**

**VIVAT ACADEMIA,  
VIVANT PROFESSORES!  
VIVAT MEMBRUM QUODLIBET,  
VIVANT MEMBRA QUÆLIBET!  
SEMPER SINT IN FLORE!**

**VIVANT OMNES VIRGINES  
FACILES, FORMOSÆ!  
VIVANT ET MULIERES,  
TENERÆ, AMABILES,  
BONÆ, LABORIOSÆ!**

**VIVAT ET RESPUBLICA,  
ET QUI ILLAM REGIT!  
VIVAT NOSTRA CIVITAS,  
MÆCENATUM CARITAS,  
QUÆ NOS HIC PROTEGIT**

**PEREAT TRISTITIA,  
PEREANT DOLORES,  
PEREAT DIABOLUS,  
QUIVIS ANTIBURSCHIUS,  
ATQUE IRRISORES!**

## Practical Information

Due to COVID-19, the absolute majority of the FRUCT29 conference participants prefer online participation. Correspondingly the conference processes are adapted to best fit for online participation. All conference presentations are pre-recorded by the authors and uploaded to Youtube. The conference program contains links to individual presentations and playlists of all talks for each session. All conference sessions consist of two modules:

- 1) **Self-watching of the presentations on Youtube.** You are welcome to use the advantages of online participation and freely manage your time. You can ask questions in the comments of the videos. Please subscribe to the FRUCT youtube channel as it will help us to organize video streaming in the future.
- 2) **Questions and Answers (Q&A) in Zoom.** Zoom links are in the conference program. We recommend joining a Zoom session in audio mode (without video). Please prepare your questions/comments to the authors and use this time to discuss the presented works.

**The conference time is EEST (GMT+3)**, which corresponding to Finnish and Moscow time zones. The conference program consists of two parallel tracks. Each track uses its Zoom ID (the corresponding Zoom credentials are published in the conference program). The Q&A sessions are scheduled with minimal overlapping. So you can take part in most of the Q&A sessions of the parallel tracks. For that, please watch video presentations beforehand, and don't forget to change Zoom telcos for changing the sessions. Please note that all conference presentations (except for keynote talks and demos) will be available online starting from Monday, May 10, 2021. If you have any further questions don't hesitate to email us at [info@fruct.org](mailto:info@fruct.org).

Authors of the selected conference papers get an invitation to publish an extended version of the paper in our partner journals. If you are interested in this opportunity, please express it clearly to the chair of your session. The list of partner journals is as follows:

An official publication of the Information Resources Management Association



IGI PUBLISHING  
WWW.IGI-GLOBAL.COM

**INTERNATIONAL JOURNAL OF  
Embedded and Real-Time  
Communication Systems**

Authors of the best papers of FRUCT conference can get invitation to **FREE of charge** publish extended version of the paper in the International Journal of Embedded and Real-Time Communication Systems (IJERTCS) (ISSN 1947-3176, **Scopus** indexing, etc.).



*future internet*  
an Open Access Journal by MDPI

Authors of the best papers of FRUCT conference can get invitation to publish extended version of the paper in the Future Internet journal (ISSN 1999-5903, Q2, Scopus indexing, etc.) with **15% discount**.

Moreover the conference participants are welcome to submit papers to a [Special Issue "Ambient Intelligence for Emerging Tactile Internet"](#) with **20% discount**



*applied sciences*  
an Open Access Journal by MDPI

Authors of the best papers of FRUCT conference can get invitation to publish extended version of the paper in the Applied Sciences Journal (impact factor 2.474) with **10% discount**.

The proceedings of 29<sup>th</sup> FRUCT conference are available online:

Issue 1: <https://fruct.org/publications/fruct29/>

Issue 2: <https://fruct.org/publications/acm29/>

### General Facts and Statistics for the 29<sup>th</sup> FRUCT Conference:

Total submissions: **128**  
Total authors: **289**

Accepted Full Papers: **49**  
representing **27** countries

Acceptance rate: **38%**  
from **all continents**

# Organization Committee of the 29th IEEE FRUCT

**Local Chair:** Yevgeni Koucheryavy      **Conference secretary:** Alexey Kashevnik

**FRUCT President:** Sergey Balandin      **Publishing team leader:** Tatiana Tyutina

## Program Committee

**Chair:** Yevgeni Koucheryavy (Tampere University, Finland)

**Members:** Albert Abilov (Izhevsk State Technical University, Russia)  
Ilya Afanasyev (Innopolis University, Russia)  
Nazim Agoulmine (University of Evry Val d'Essonne, France)  
Mikhail Alexandrov (Autonomous University of Barcelona, Spain)  
Omar Almousa (Jordan University of Science and Technology, Jordan)  
Ahmed Ammari (Research unit of Materials Measurements and Applications, Tunisia)  
Fazel Ansari (TU Wien, Institute of Management Science, Fraunhofer, Austria)  
Francesco Antoniazzi (Ecole des Mines de Saint-Etienne, France)  
Leena Arhippainen (University of Oulu, Finland)  
Guntis Arnicans (University of Latvia, Latvia)  
Ivaylo Atanasov (Technical University of Sofia, Bulgaria)  
Konstantin Avrachenkov (INRIA, France)  
Serena Baiocco (University of Bologna, Italy)  
Sergey Balandin (FRUCT Oy, Finland)  
Ekaterina Balandina (Tampere University, Finland)  
Taoufik Ben Rejeb (Moscow Technical University of Communications and Informatics, Russia)  
Emmanouil Benetos (Queen Mary University of London, UK)  
Sergey Bezzateev (State University of Aerospace Instrumentation, Russia)  
Ankur Bist (Govind Ballabh Pant University of Agri. and Tech., India)  
Iurii Bogoiavlenskii (Petrozavodsk State University, Russia)  
Juris Borzovs (University of Latvia, Latvia)  
Aleš Bourek (Center for Healthcare Quality, Masaryk University, Czech Republic)  
Alessio Brutti (FBK, Italy)  
Doina Bucur (University of Twente, Netherlands)  
Lev Buziukov (Saint Petersburg State University of Telecommunications, Russia)  
Fabio Caraffini (De Montfort University, UK)  
John Cardiff (ITT Dublin, Ireland)  
Paolo Casari (University of Trento, Italy)  
Paolo Castaldi (University of Bologna, Italy)  
Marco Centenaro (FBK, Italy)  
Gianmarco Cerutti (Fondazione Bruno Kessler, Italy)  
Tien-Fu Chen (National Chiao Tung University, Taiwan)  
Elhadi Cherkaoui (University of Evry, France)  
Luca Chiaraviglio (University of Rome Tor Vergata, Italy)  
Saw Chin Tan (Multimedia University, Malaysia)  
Chrysostomos Chrysostomou (Frederick University, Cyprus)  
Kirill Chuvilin (Moscow Institute of Physics and Technology, Russia)  
Luca Comanducci (Politecnico di Milano, Italy)  
Vera Danilova (RPANEP, Russia)  
Jose De Souza (Federal University of Ceará, Brazil)  
Vladimir Deart (Moscow Technical University of Communications and Informatics, Russia)  
Leticia Decker de Sousa (INFN Bologna and University of Bologna, Italy)  
Alfredo D'Elia (University of Bologna, Italy)

Balandino Di Donato (University of Leicester, UK)  
Salvatore Distefano (University of Messina, Italy)  
Carlo Drioli (Università degli Studi di Udine, Italy)  
Adam Dudáš (Matej Bel University, Slovakia)  
Alexey Dudkov (NRPL Group, Finland)  
Roman Dunaytsev (Saint-Petersburg State University of Telecommunications, Russia)  
Jan-Erik Ekberg (Huawei, Finland)  
Stefano Fasciani (University of Oslo, Norway)  
Gyorgy Fazekas (Queen Mary University of London, UK)  
Pumudu Fernando (Informatics Institute of Technology, Italy)  
Dieter Fiems (Ghent University, Belgium)  
Andrey Fionov (Siberian State University of Telecommunications and Information Sciences, Russia)  
Carlo Fischione (KTH Royal Institute of Technology, Italy)  
Frederic Font (Music Technology Group, Universitat Pompeu Fabra, Spain)  
Angelo Fraietta (UNSW Art and Design, Australia)  
Leonardo Gabrielli (Università Politecnica delle Marche, Italy)  
Ivan Ganchev (University of Limerick, Ireland / University of Plovdiv "Paisii Hilendarski", Bulgaria)  
Alexander Geida (St. Petersburg Federal Research Center of the Russian Academy of Science, Russia)  
Boris Goldstein (Saint-Petersburg State University of Telecommunications, Russia)  
Oleg Golovnin (Samara University, Russia)  
Fabrizio Granelli (University of Trento, Italy)  
Andrei Gurtov (Linköping University, Sweden)  
Timo Hämäläinen (University of Jyväskylä, Finland)  
Robert Hupke (Leibniz Universität Hannover, Institut für Kommunikationstechnik, Germany)  
Giovanni Iacca (University of Trento, Italy)  
Alessandro Ilic Mezza (Politecnico di Milano, Italy)  
Joel J.P.C. Rodrigues (Instituto de Telecomunicações, University of Beira Interior, Portugal)  
Carlos Kamienski (Federal University of the ABC, Brazil)  
Alexey Kashevnik (St. Petersburg Federal Research Center of the Russian Academy of Science, Russia)  
Lazhar Khriji (Sultan Qaboos University, Oman)  
Vladimir Khryashchev (Piclab LLC, Russia)  
Geun-Hyung Kim (Dong-Eui University, South Korea)  
Mikhail Komarov (NRU Higher School of Economics, Russia)  
Georgy Kopanitsa (Tomsk Polytechnic University, Russia)  
Alexey Koren (ING Nederland, Netherlands)  
Dmitry Korzun (Petrozavodsk State University, Russia)  
Ivan Kotuliak (Slovak University of Technology, Slovakia)  
Vadim Kramar (Oulu University of Applied Sciences, Finland)  
Dmitry Kravchenko (Accenture Israel Cyber R&D Lab & Ben-Gurion University of the Negev, Israel)  
Kirill Krinkin (Saint-Petersburg Electrotechnical University "LETI", Russia)  
Kirill Kulakov (Petrozavodsk State University, Russia)  
Roman Kupriyanov (Moscow City University, Russia)  
Andrey Kuzmin (Penza State University, Russia)  
Marek Kvet (University of Zilina, Slovakia)  
Michal Kvet (University of Zilina, Slovakia)  
Mathieu Lagrange (IRCCYN, France)  
Ksenia Lagutina (P. G. Demidov Yaroslavl State University, Russia)  
Ilya Lebedev (ITMO University, Russia)  
Antonio Liotta (Edinburgh Napier University, UK)  
Sergey Listopad (Kaliningrad branch of the Institute of Informatics Problems of the RAS, Russia)  
Andrei Lobov (Norwegian University of Science and Technology, Norway)  
Simona Lohan (Tampere University, Finland)  
Hsi-Pin Ma (National Tsing Hua University, Taiwan)

Joaquim Macedo (University of Minho, Portugal)  
Jose Mairton Barros da Silva Junior (KTH Royal Institute of Technology, Sweden)  
Anton Makarov (St. Petersburg State University, Russia)  
Anna Maltseva (St. Petersburg State University, Russia)  
Vladimir Mankov (Alcatel-Lucent Training Center, Russia)  
Ninoslav Marina (Princeton University, USA)  
Charles Martin (Research School of Computer Science, The Australian National University, Australia)  
Karol Matiasco (University of Zilina, Slovakia)  
Benjamin Matuszewski (IRCAM, France)  
Oleg Medvedev (Moscow State University, Russia)  
Alexander Meigal (Petrozavodsk State University, Russia)  
Eduardo Meneses (McGill University, UK)  
Tommi Meskanen (University of Helsinki, Finland)  
Nataliia Miroshnikova (MTUCI, Russia)  
Thomas Mitchell (University of the West of England, UK)  
Segundo Moises Toapanta Toapanta (Universidad Politécnica Salesiana del Ecuador, Ecuador)  
Giulio Moro (Queen Mary University of London, UK)  
Dmitry Mouromtsev (ITMO University, Russia)  
Vladimir Muliukha (Peter the Great St.Petersburg Polytechnic University, Russia)  
Dmitry Namiot (Moscow State University, Russia)  
Victor Netes (MTUCI, Russia)  
Valtteri Niemi (University of Helsinki, Finland)  
Valerie Novitzka (Technical University of Kosice, Slovakia)  
Stavros Ntalampiras (University of Milan, Italy)  
Thomas Ohlson Timoudas (KTH Royal Institute of Technology, Sweden)  
Valentin Olenev (State University of Aerospace Instrumentation, Russia)  
Martin Omana (University Bologna, Italy)  
Maurizio Omologo (Fondazione Bruno Kessler, Italy)  
Valentin Onossovski (Saint-Petersburg State University, Russia)  
Jarkko Paavola (Turku University of Applied Science, Finland)  
Michele Pagano (University of Pisa, Italy)  
Ilya Paramonov (Yaroslavl State University, Russia)  
Pramod Pathak (National College of Ireland, Ireland)  
Johan Pauwels (Queen Mary University of London, UK)  
Evelina Pencheva (Technical University of Sofia, Bulgaria)  
Elisabeth Pereira (University of Aveiro, Portugal)  
Dmitry Petrov (Nokia, Finland)  
Vitaly Petrov (Nokia Bell Labs, Finland)  
Simon Pietro Romano (University of Napoli Federico II, Italy)  
Lidia Pivovarova (University of Helsinki, Finland)  
Konstantin Platonov (Saint Petersburg State University, Russia)  
Svetlana Popova (Saint-Petersburg State University, Russia)  
Jari Porras (LUT, Finland)  
S.P.Shiva Prakash (JSS Research Foundation/ Sri Jayachamarajendra College of Engineering, India)  
Alexey Rabin (State University of Aerospace Instrumentation, Russia)  
Luca Roffia (University of Bologna, Italy)  
Juha Röning (University of Oulu, Finland)  
Simone Rossi Tisbeni (INFN-CNAF, Italy)  
Cristina Rottondi (Politecnico di Torino, Italy)  
Pavel Rybin (Skolkovo Institute of Science and Technology, Russia)  
Tullio Salmon Cinotti (University of Bologna, Italy)  
Kurt Sandkuhl (The University of Rostock, Germany)  
Roberto Saracco (Telecom Italia, Italy)  
Vladimir Sayenko (Kharkov National University of Radio Electronics, Ukraine)

Alexander Semenov (University of Jyväskylä, Finland)  
Anton Shabaev (Petrozavodsk State University, Russia)  
Nikolay Shilov (St. Petersburg Federal Research Center of the Russian Academy of Sciences, Russia)  
Hossein Shokri (Ghadikolaei, Switzerland)  
Simone Sindaco (University of Bologna, Italy)  
Charalabos Skianis (University of the Aegean, Greece)  
Jarmila Skrinarova (Matej Bel University, Slovakia)  
Maria Skvortsova (Bauman Moscow State Technical University, Russia)  
Alexander Smirnov (St. Petersburg Federal Research Center of the Russian Academy of Science, Russia)  
Gennady Smorodin (Dell EMC, Russia)  
Manfred Sneps-Sneppe (Ventspils University College VIRAC, Russia)  
Juha-Pekka Soininen (VTT, Finland)  
Valery Solovyev (Kazan University, Russia)  
Sergey Staroletov (Polzunov Altai State Technical University, Russia)  
William Steingartner (Technical University of Kosice, Slovakia)  
Ravidu Suien Rammuni Silva (University of Westminster, UK)  
Elena Suvorova (State University of Aerospace Instrumentation, Russia)  
Takeshi Takahashi (National Institute of Information and Communications Technology, Japan)  
Ernesto Tarantino (ICAR-CNR, Italy)  
Yahya Tashtoush (Jordan University of Science and Technology, Jordan)  
Hannu Tenhunen (EIT ICT Labs KTH, Sweden)  
Nikolay Teslya (St. Petersburg Federal Research Center of the Russian Academy of Sciences, Russia)  
Alberto Tonda (INRA, France)  
Peter Trifonov (ITMO University, Russia)  
Lauri Tuovinen (University of Oulu, Finland)  
Luca Turchet (University of Trento, Italy)  
Timofey Turenko (MariaDB Corporation Ab, Finland)  
Tatiana Tyutina (SUAI, Russia)  
Willy Ugarte (University of Applied Sciences, Peru)  
Frane Urem (Polytechnic of Sibenik, Croatia)  
Dmitry Ustalov (University of Mannheim, Germany)  
Lev Utkin (Peter the Great Saint-Petersburg Polytechnic University, Russia)  
Andrey Vasilyev (Yaroslavl State University, Russia)  
Fabio Viola (ARCES - Advanced Research Center on Electronic Systems, Italy)  
Valery Vyatkin (Aalto University, Finland)  
Katarzyna Wac (University of Geneva, Switzerland)  
Adeesha Wijayasiri (University of Moratuwa, Sri Lanka)  
Anna Xambo (De Montfort University, UK)  
Maxim Yatskovskiy (FRUCT MD Ltd, Russia)  
Weider Yu (San Jose State University, USA)  
John Z. Zhang (University of Lethbridge, Canada)  
Anatoliy Zabrovskiy (Petrozavodsk State University, Russia)  
Anna Zakrzewska (Nokia Bell Labs, Ireland)  
Victor Zappi (Northeastern University, USA)  
Mark Zaslavskiy (Saint-Petersburg Electrotechnical University "LETI", Russia)  
Yunpeng Zhang (University of Houston, USA)  
Ivan Zyrianoff (Federal University of ABC, Brazil)

# Program of the 29th IEEE FRUCT conference

## May 12-14, 2021, Tampere, Finland

Tampere University, Tampere, Finland / Online participation by Youtube + Zoom

**NOTE: Conference time is in Finnish time (EEST, GMT+3) as conference is held in Tampere, Finland**

DATE	TIME	PROGRAM		
12.05.21	13:20-14:30	<b>Opening of the 29th FRUCT conference</b> <b>Keynote talk:</b> Past and Present Grand Challenges of Computer Vision, by Joni-Kristian Kämäräinen, Tampere University, Finland		
	14:30-15:45	Artificial Intelligence, Robotics and Automation Systems I	Security and Privacy	
	15:45-16:15		Software Design and Innovative Applications I	
	16:15-17:15	Artificial Intelligence in Text Analysis and Generation	e-Health and Wellbeing	
	17:15-18:15			
13.05.21	10:00-10:45	<b>MMDM2021 keynote talk:</b> Mobile Artificial Intelligence for Driver Monitoring: Methods, Evaluation, and Business Perspectives, by Alexey Kashevnik, SPC RAS, and Yuri Visnevsky, SKAUT Group, Russia		
	10:45-12:00	The MMDM 2021 Workshop	Internet of Things and Enabling Technologies	
	12:00-12:45		<b>Lunch break</b>	
	12:45-13:00	<b>Lunch break</b>		
	13:00-13:30	<b>Lunch break</b>		
	13:30-14:30	Natural Language Processing and Speech Technologies	Next Generation Networks and Wireless Technologies	
	14:30-15:30		Location Based Services: Navigation and Logistics	
	15:30-16:00	Artificial Intelligence, Robotics and Automation Systems II	Software Design and Innovative Applications II	
	16:00-17:00			
	17:00-18:10	<b>Demos &amp; Posters Session</b>		
14.05.21	10:00-10:45	<b>The 2<sup>nd</sup> DataWorld keynote talk:</b> Data-Driven Prediction Systems in Transportation, by Michal Zabovsky, University of Žilina, Slovakia		
	10:45-12:45	The 2nd DataWorld Workshop		
	12:45-14:00	Knowledge Management Systems		
	14:00-14:15	<b>Official closing of the 29th FRUCT conference</b>		

***Thank you and looking forward to see you at the 30th FRUCT in Oulu, Finland on October 27-29, 2021!  
(Note that the 30th FRUCT conference allows online participation)***

# Program of the 29th IEEE FRUCT conference

May 12 (Wednesday)

Tampere University, Tampere, Finland / Online participation by Youtube + Zoom

**NOTE: Conference time is in Finnish time (EEST, GMT+3) as conference is held in Tampere, Finland**

<b>Session:</b> Opening and Plenary session of the 29th FRUCT conference		Chairman: Sergey Balandin
13:20	10m	<a href="#">Welcome words and practical information</a> , Sergey Balandin
13:30	50m	<a href="#">Keynote talk: Past and Present Grand Challenges of Computer Vision</a> , by Joni-Kristian Kämäräinen, Tampere University, Finland
14:20	10m	<a href="#">Q&amp;A session for the keynote talk</a> , Zoom 280-192-1973, passcode 535851
14:30		<p><b>Session:</b> Artificial Intelligence, Robotics and Automation Systems I Chairman: Karol Matiaško Playlist:<a href="https://www.youtube.com/watch?v=SoDjdYfP9l4&amp;list=PLKIZJpg1JqdNft0fvXpPj5RAb_Od80u-E">https://www.youtube.com/watch?v=SoDjdYfP9l4&amp;list=PLKIZJpg1JqdNft0fvXpPj5RAb_Od80u-E</a></p> <p><b>Session:</b> Security and Privacy Chairman: Valtteri Niemi Playlist:<a href="https://www.youtube.com/watch?v=w4Q7hnVXx6s&amp;list=PLKIZJpg1JqdOHuwPJVbUAeKGwqsPvHm8q">https://www.youtube.com/watch?v=w4Q7hnVXx6s&amp;list=PLKIZJpg1JqdOHuwPJVbUAeKGwqsPvHm8q</a></p>
14:30	50m	<p><a href="#">The Best Model of Convolutional Neural Networks Combined With LSTM for the Detection of Interpersonal Physical Violence in Videos</a>, by Hugo David Calderon Vilca, Kent Jhuniar Cuadros Ramos, Elmer Y. Diaz Quiroz, Jorge Alexander Angeles Rojas, Rene Alfredo Calderon Vilca, Alejandro Apaza Tarqui</p> <p><a href="#">Multi-Stream Sensed Data Processing Model for Industrial Internet</a>, by Nikita Besednyi, Nikita Harziya, Kirill Kulakov, Dmitry Korzun</p> <p><a href="#">Deviation Detection Using Feature Extraction in Industrial Rotary Machinery Diagnostics</a>, by Vladislav Ermakov, Kirill Rudkovskiy</p> <p><a href="#">Toward Practical Cybersecurity Mapping of STRIDE and CWE a Multi-Perspective Approach</a>, by Anne Honkaranta, Tiina Leppanen, Andrei Costin</p> <p><a href="#">Reducing the Time to Detect Cyber Attacks - Combining Attack Simulation With Detection Logic</a>, by Juuso Myllyla, Andrei Costin</p> <p><a href="#">Authentication of Diffie-Hellman Protocol for Mobile Units Executing a Secure Device Pairing Procedure in Advance</a>, by Viktor Yakovlev, Valery Korzhik, Sergei Adadurov</p> <p><a href="#">Preventing Hidden Information Leaks Using Author Attribution Methods and Neural Networks</a>, by Alisa Vorobeva, Alexander Khazararov, Viktoriia Korzhuk</p>
15:20	25m	<p><a href="#">Development of the Detecting System of the Landmark Tags to Increase the Navigation Accuracy of an Unmanned Vehicle in a Known Location</a>, by Pavel Belyaev, Anton Spivak, Evgenii Neverov</p> <p><a href="#">On Applying Convolutional Neural Network to Bearing Fault Detection</a>, by Valentin Perminov</p> <p><a href="#">Intelligent Data Selection Method in Autonomous Robot Movement</a>, by Olga Bogoiavlenskaia, Dmitry Korzun</p> <p><a href="#">Q&amp;A in Zoom with authors of Security and Privacy session</a>, Zoom 280-192-1973, passcode 535851</p>
15:45	30m	<p><a href="#">Q&amp;A in Zoom with authors of Artificial Intelligence, Robotics and Automation Systems I session</a>, Zoom 974-238-2704, passcode 490571</p> <p><b>Session:</b> Software Design and Innovative Applications I Chairman: Nikolay Teslya Playlist:<a href="https://www.youtube.com/watch?v=pZkq3bTGsvE&amp;list=PLKIZJpg1JqdPw--MsZyNu3GcNvHoAxLxm">https://www.youtube.com/watch?v=pZkq3bTGsvE&amp;list=PLKIZJpg1JqdPw--MsZyNu3GcNvHoAxLxm</a></p> <p><a href="#">Design of an Economic System for Improving the Performance of Three Types of PV Panels Using Solar Reflectors</a>, by Ramy Ahmed, Ghada Amer</p>
16:15		<p><b>Session:</b> Artificial Intelligence in Text Analysis and Generation Chairman: Dmitry Korzun Playlist:<a href="https://www.youtube.com/watch?v=juF1S3eQ">https://www.youtube.com/watch?v=juF1S3eQ</a></p> <p><a href="#">Review of Crimes in Peru and Proposal of a Neural Network Architecture to Predict if a Person Could Commit a Crime</a>, by Hugo David Calderon Vilca, Luciano E. Carhuaricra Rivera, Oscar F. Abad Nauto,</p>

		<a href="#">gZ0&amp;list=PLKIZJpq1JqdMsxeMwzVIK5JTTFOfpucOe</a>	Jose A. Carrillo Estrada, Edwin F. Calderron-Vilca, Flor C. Cardenas-Marino
16:15	30m	<a href="#">Incoherent Sentence Detection in Scientific Articles in Russian and English</a> , by Mark Zaslavskiy, Quang Huy Nguyen <a href="#">Multilingual Sentiment Analysis and Toxicity Detection for Text Messages in Russian</a> , by Darya Bogoradnikova, Olesia Makhnytkina, Anton Matveev, Anastasia Zakharova, Artem Akulov	<a href="#">Deep Image Captioning Survey: A Resource Availability Perspective</a> , by Mousa Alsulaimi, Imtiaz Ahmad, Mohammad Jeragh <a href="#">Content-Based Music Recommendation System</a> , by Aldiyar Niyazov, Elena Mikhailova, Olga Egorova <a href="#">Analysis of the Malicious Bots Market</a> , by Maksim Kalameyets, Andrey Chechulin
16:45	30m	<a href="#">Towards a Toolbox for Mining QA-pairs and QAT-triplets From Conversational Data of Public Chats</a> , by Nikolay Butakov, Alexander Egorov, Dmitriy Alexandrov <a href="#">Part-of-Speech Taggers Features in French Learner Texts</a> , by Nadezhda Barymova, Nadezhda Oulianova, Anna Zhestkova, Olga Nikiforova <a href="#">Chatbot for Applicants on University Admission Issues</a> , by Liudmila Shchegoleva, Grigorii Burdin <a href="#">Comparative Analysis of Automatic POS Taggers Applied to German Learner Texts</a> , by Irina Kotiurova, Andrey Solnyshkov, Maximov Evgeny, Polina Trenina <a href="#">Authority Changes Constitution and Regions Answer: What Search Queries Show</a> , by Anna Boldyreva	<a href="#">Q&amp;A in Zoom with authors of <b>Software Design and Innovative Applications I</b> session</a> , Zoom 280-192-1973, passcode 535851
17:15	25m		<b>Session:</b> e-Health and Wellbeing Chairman: Oleg Medvedev Playlist: <a href="https://www.youtube.com/watch?v=xOuh_aOghriU&amp;list=PLKIZJpq1JqdP5mHcrIPYXvdDX5KJttdsa">https://www.youtube.com/watch?v=xOuh_aOghriU&amp;list=PLKIZJpq1JqdP5mHcrIPYXvdDX5KJttdsa</a>
17:40	15m		<a href="#">Color-Optimized One-Pixel Attack Against Digital Pathology Images</a> , by Joni Korpiahkola, Tuomo Sipola, Tero Kokkonen <a href="#">A Weather-Based Simulation Model for the Development of Wheat Stem Rust Epidemics</a> , by Serena Baiocco, Federico Cavina, Gianfranco Pradolesi <a href="#">COVID-19 Recognition Based on Patients Coughing and Breathing Patterns Analysis: Deep Learning Approach</a> , by Lazhar Khriji, Seifeddine Messaoud, Soulef Bouaafia, Amna Maraoui, Ahmed Ammari, Mohsen Machhout
17:55	20m	<a href="#">Q&amp;A in Zoom with authors of <b>Artificial Intelligence in Text Analysis and Generation</b> session</a> , Zoom 974-238-2704, passcode 490571	<a href="#">Q&amp;A in Zoom with authors of <b>e-Health and Wellbeing</b> session</a> , Zoom 280-192-1973, passcode 535851
18:15	<b>Closing of Day</b>		

May 13 (Thursday)

Tampere University, Tampere, Finland / Online participation by Youtube + Zoom

**NOTE: Conference time is in Finnish time (EEST, GMT+3) as conference is held in Tampere, Finland**

10:00	35m	<b>MMDM2021 keynote talk: Mobile Artificial Intelligence for Driver Monitoring: Methods, Evaluation, and Business Perspectives</b> , by Alexey Kashevnik, SPC RAS, and Yuri Visnevsky, SKAUT Group, Russia	
10:35	10m	<a href="#">Q&amp;A in Zoom of MMDM2021 keynote talk</a> , Zoom 974-238-2704, passcode 490571	
10:45		<b>Session:</b> The MMDM 2021 Workshop Chairman: Christian Kaiser Playlist: <a href="https://www.youtube.com/watch?v=g4yBpOCiBog&amp;list=PLKIZJpq1JqdN6BWuuPqucfHptGqRRHiMw">https://www.youtube.com/watch?v=g4yBpOCiBog&amp;list=PLKIZJpq1JqdN6BWuuPqucfHptGqRRHiMw</a>	<b>Session:</b> Internet of Things and Enabling Technologies Chairman: Dmitry Namiot Playlist: <a href="https://www.youtube.com/watch?v=EVY_XYXDeKA&amp;list=PLKIZJpq1JqdMF-U2R5GyGmitD04YWZep9">https://www.youtube.com/watch?v=EVY_XYXDeKA&amp;list=PLKIZJpq1JqdMF-U2R5GyGmitD04YWZep9</a>

10:45	50m	<p><a href="#">An Effort to Detect Vehicle Drivers Drowsy State Based on the Speed Analysis</a>, by Nikolay Shilov, Alexey Kashevnik</p> <p><a href="#">State-Of-The-Art Analysis of Modern Drowsiness Detection Algorithms Based on Computer Vision</a>, by Fudail Hasan, Alexey Kashevnik</p> <p><a href="#">Gradual Labeling of the Training Set to Improve the Efficiency of Image Detection by a Neural Network on the Example of License Plate Recognition</a>, by Yaroslav Schegolihin, Maksim Mitrohin, Maksim Semenkin, Valeriya Sazykina</p> <p><a href="#">Distracted Driver Monitoring With Smartphones: A Preliminary Literature Review</a>, by Christian Kaiser, Efi Papatheocharous, Alexander Stocker</p>	<p><a href="#">Presence and Availability Service at the Network Edge</a>, by Evelina Pencheva, Ivaylo Atanasov, Vladislav Vladislavov, Ventsislav Trifonov</p> <p><a href="#">Resource Taxonomy for a Fog System</a>, by Lisbeth Olinda Lopez Verdecie, Kirill Krinkin</p> <p><a href="#">RISC v Based Reconfigurable Manager for Event Transmission in SpaceFibre Networks</a>, by Elena Suvorova</p> <p><a href="#">Research and Development of a Service-Oriented Architecture for a Smart Factory Production System</a>, by Oman Abyshev, Eugeny Yablochnikov</p>
11:35	25m	<p><a href="#">State-Of-The-Art on Neural Network Based Tourist Vehicle Behavior Analysis</a>, by Sergei Mikhailov</p>	<p><a href="#">Q&amp;A in Zoom with authors of <b>Internet of Things and Enabling Technologies</b> session</a>, Zoom 280-192-1973, passcode 535851</p>
12:00	10m	<p><a href="#">Smartphone Movement Detection Based on IMU Data as Basis for Driver Distraction Detection</a>, by Matthias Maurer, Christian Kaiser</p> <p><a href="#">Adaptive Driving Event Detection Algorithm Using Smartphone Sensor Data</a>, by Patrick Lackner</p>	<p><b>Lunch break</b></p>
12:10	35m	<p><a href="#">Q&amp;A in Zoom with authors of the <b>MMDM 2021 Workshop</b></a>, Zoom 974-238-2704, passcode 490571</p>	
12:45	15m	<p><b>Lunch break</b></p>	
13:00	30m	<p><b>Lunch break</b></p>	<p><b>Session:</b> Next Generation Networks and Wireless Technologies Chairman: Jan-Erik Ekberg Playlist:<a href="https://www.youtube.com/watch?v=N0IldbVRJk8&amp;list=PLKIZJpq1JqdPxb0Av78SRxGFPrxIpMOiV">https://www.youtube.com/watch?v=N0IldbVRJk8&amp;list=PLKIZJpq1JqdPxb0Av78SRxGFPrxIpMOiV</a></p> <p><a href="#">Parental Control With Edge Computing and 5G Networks</a>, by Sara Ramezani, Tommi Meskanen, Valtteri Niemi</p>
13:30		<p><b>Session:</b> Natural Language Processing and Speech Technologies Chairman: Nikolay Shilov Playlist:<a href="https://www.youtube.com/watch?v=mD9xjqjAq5w&amp;list=PLKIZJpq1JqdMBQ8c9h6zZaG1M3I0RLAOZ">https://www.youtube.com/watch?v=mD9xjqjAq5w&amp;list=PLKIZJpq1JqdMBQ8c9h6zZaG1M3I0RLAOZ</a></p>	<p><a href="#">Detecting and Controlling the Occurrence of Data Congestion in a High-Density VANETs Environment</a>, by Tarandeep Kaur Bhatia, Ramkumar Ketti Ramachandran, Robin Doss, Lei Pan</p>
13:30	30m	<p><a href="#">Concept of Implementing Computer Voice Control for CNC Machines Using Natural Language Processing</a>, by Aleksei Katridi, Yury Fedosov</p> <p><a href="#">Topic Modeling of Russian-Language Texts Using the Parts-Of-Speech Composition of Topics (Case of Volunteer Movement Semantics in Social Media)</a>, by Anna Maltseva, Natalia Shilkina, Olesia Makhnytkina, Evgenii Evseev,</p>	<p><a href="#">The Interval Reliability, Its Usage and Calculation for Information and Communication Systems and Networks</a>, by Victor Netes</p> <p><a href="#">Measurements to Study the Coexistence of Private 4G LTE TDD Networks in 2,3 GHz Band</a>, by Reijo Ekman, Pekka Talmola, Juha Kalliovaara, Tero Jokela, Jarkko Paavola, Heidi Himmanen, Juhani Hallio, Petri Hyvärinen, Tibor Lakner</p> <p><a href="#">Quasi-Orthogonal Space-Time Block Coding with</a></p>

		Mikhail Matveev <a href="#">Speaker Diarization Through Waveform and Neural Net</a> , by Rustam Latypov, Evgeni Stolov	<a href="#">Closed-Loop Control in MIMO Communication Systems</a> , by Mikhail Bakulin, Vitaly Kreyndelin, Dmitry Petrov, Sergei Melnik
14:00	30m	<a href="#">Public Speaking Web Trainer</a> , by Mark Zaslavskiy, Daniil Pliushchenko <a href="#">A Survey of Models for Constructing Text Features to Classify Texts In Natural Language</a> , by Ksenia Lagutina, Nadezhda Lagutina	<a href="#">Q&amp;A in Zoom with authors of Next Generation Networks and Wireless Technologies session</a> , Zoom 280-192-1973, passcode 535851
14:30	25m	<a href="#">Towards Automatic Modelling of Thematic Domains of a National Literature: Technical Issues in the Case of Russian</a> , by Tatiana Sherstinova, Anna Moskvina, Margarita Kirina <a href="#">Speech Recognition for Mobile Linux Distributions in the Case of Aurora OS</a> , by Alexey Andreev, Kirill Chuvilin	<b>Session:</b> Location Based Services: Navigation and Logistics Chairman: Kirill Chuvilin Playlist: <a href="https://www.youtube.com/watch?v=xDcLOaVVH5g&amp;list=PLKIZJpq1JqdPnDYRmKzxVIApPRjXce0J5">https://www.youtube.com/watch?v=xDcLOaVVH5g&amp;list=PLKIZJpq1JqdPnDYRmKzxVIApPRjXce0J5</a>
14:55	35m	<a href="#">Q&amp;A in Zoom with authors of Natural Language Processing and Speech Technologies session</a> , Zoom 974-238-2704, passcode 490571	<a href="#">On the New Architecture of Location-Based Services</a> , by Dmitry Namiot, Manfred Sneys-Snepe <a href="#">Partial Decoding of the GPS Extended Prediction Orbit File</a> , by Vladimir Vinnikov, Ekaterina Pshhotskaya, Maria Gritsevich <a href="#">Design of a Smart Vacuum Cleaner With Indoor Localization</a> , by Julide Toprak, Aysenur Kamiloglu, Pinar Kirci <a href="#">Air Navigation: The Method of Airborne Vehicles Classification Based on Fuzzy Colored Petri Nets</a> , by Igor Grishin, Rena Timirgaleeva, Ivan Linnik, Elena Linnik, Aleksander Tamargazin <a href="#">Using Open Street Map for Content Creation in Location-Based Games</a> , by Nancy Fazal, Radu Marinescu-Istodor, Pasi Fränti
15:30		<b>Session:</b> Artificial Intelligence, Robotics and Automation Systems II Chairman: Dmitry Korzun Playlist: <a href="https://www.youtube.com/watch?v=WUNB_J1iQFI&amp;list=PLKIZJpq1JqdPM1X-uelsUO6R2xorPv7So">https://www.youtube.com/watch?v=WUNB_J1iQFI&amp;list=PLKIZJpq1JqdPM1X-uelsUO6R2xorPv7So</a>	<a href="#">Q&amp;A in Zoom with authors of Location Based Services: Navigation and Logistics session</a> , Zoom 280-192-1973, passcode 535851
15:30	30m	<a href="#">Computer Vision System for Landing Platform State Assessment Onboard of Unmanned Aerial Vehicle in Case of Input Visual Information Distortion</a> , by Iuliia Kim, Ilya Viksnin, Irina Kaisina, Vadim Kuznetsov	<b>Session:</b> Software Design and Innovative Applications II Chairman: Andrey Vasiliev Playlist: <a href="https://www.youtube.com/watch?v=InficqDiS0&amp;list=PLKIZJpq1JqdML4un6L1OQSwYrq8qKdLfx">https://www.youtube.com/watch?v=InficqDiS0&amp;list=PLKIZJpq1JqdML4un6L1OQSwYrq8qKdLfx</a>
16:00	30m	<a href="#">Analysis of Robotic Platforms: Data Transfer Performance Evaluation</a> , by Andrei Gavrilov, Marlen Bergaliyev, Sergey Tinyakov, Kirill Krinkin <a href="#">Multi-Criteria Evaluation of Publication Impacts: Deep Learning in Autonomous Vehicles</a> , by Goshgar Ismayilov, Cansu Damla Yilmaz <a href="#">Features of Building a Forestry Intelligent Robotic System</a> , by Oleg Galaktionov, Sergei Zavyalov, Liudmila Shchegoleva, Dmitry Korzun <a href="#">Information-Driven Monitoring of Production Process: A Semantic Data Model</a> , by Oksana Petrina, Sergei Marchenkov	<a href="#">Agent-Based Modeling of Blockchain Decentralized Financial Protocols</a> , by Igor Struchkov, Alexey Lukashin, Bogdan Kuznetsov, Igor Mikhalev, Zoia Mandrusova <a href="#">Smart Greenhouse and Smart Agriculture</a> , by Pinar Kirci, Erdinc Ozturk, Yavuz Celik <a href="#">PDF Document Rendering on Mobile Devices in the Case of Aurora OS</a> , by Alexey Fedchenko, Kirill Chuvilin

16:30	10m	<a href="#">Q&amp;A in Zoom with authors of <b>Artificial Intelligence, Robotics and Automation Systems II</b> session</a> , Zoom 974-238-2704, passcode 490571	<a href="#">Q&amp;A in Zoom with authors of <b>Software Design and Innovative Applications II</b> session</a> , Zoom 280-192-1973, passcode 535851
16:40	20m		
17:00	25m	<b>Pecha Kucha pitches for posters and demos followed by show of demos and posters</b> ; Playlist: <a href="https://www.youtube.com/watch?v=oXFpAgU-ks8&amp;list=PLKIZJpq1JqdMqwqs1spbqf_wkXTZ_Z3dr">https://www.youtube.com/watch?v=oXFpAgU-ks8&amp;list=PLKIZJpq1JqdMqwqs1spbqf_wkXTZ_Z3dr</a>	
17:25	45m	<a href="#">The conference meetup in Zoom: discussion on demos and any other topics</a> , Zoom 280-192-1973, passcode 535851	

### May 14 (Friday)

Tampere University, Tampere, Finland / Online participation by Youtube + Zoom

**NOTE: Conference time is in Finnish time (EEST, GMT+3) as conference is held in Tampere, Finland**

10:00	35m	<a href="#">The 2<sup>nd</sup> DataWorld keynote talk: Data-Driven Prediction Systems in Transportation</a> , by Michal Zabovsky, University of Žilina, Slovakia	
10:35	10m	<a href="#">Q&amp;A session for the 2nd DataWorld keynote talk</a> , Zoom 280-192-1973, passcode 535851	
10:45		<b>Session:</b> The 2nd DataWorld Workshop <b>Chairman:</b> Michal Kvet <b>Playlist:</b> <a href="https://www.youtube.com/watch?v=M5Eq_BQa_lk&amp;list=PLKIZJpq1JqdMpnPvYZmPmKtGsQvLyspG8">https://www.youtube.com/watch?v=M5Eq_BQa_lk&amp;list=PLKIZJpq1JqdMpnPvYZmPmKtGsQvLyspG8</a>	
10:45	1.5h	<a href="#">Database Index Balancing Strategy</a> , by Michal Kvet <a href="#">Tree Localization and Monitoring on Autonomous Drones Employing Deep Learning</a> , by Lars Fichtel, Alexander M. Fruhwald, Leonhard Hoesch, Vitaliy Schreibmann, Christian Bachmeir, Frank Bohlander <a href="#">Implementing Machine Learning Methods in Searching Processes</a> , by Roman Ceresnak, Karol Matiasako, Adam Dudas <a href="#">A New Approach to Clustering Districts and Connections Between Them Based on Cellular Operator Data</a> , by Mark Bulygin, Dmitry Namiot <a href="#">The Effect of Partitioning and Indexing on Data Access Time</a> , by Veronika Salgova, Karol Matiasako <a href="#">Data Import and Export Methods</a> , by Martina Durnekova, Michal Kvet <a href="#">The Minutovka a Word Typing Web Game for Obtaining Typos to Create an Error Corpus</a> , by Stefan Toth, Michal Duracik, Patrik Hrkut, Matej Mesko	
12:15	30m	<a href="#">Q&amp;A session for the 2nd DataWorld workshop</a> , Zoom 280-192-1973, passcode 535851	
12:45		<b>Session:</b> Knowledge Management Systems <b>Chairman:</b> Alexey Kashevnik <b>Playlist:</b> <a href="https://www.youtube.com/watch?v=H_ghRLbr_aw&amp;list=PLKIZJpq1JqdPWasR7Yi-tf1r8aRH18Spx">https://www.youtube.com/watch?v=H_ghRLbr_aw&amp;list=PLKIZJpq1JqdPWasR7Yi-tf1r8aRH18Spx</a>	
12:45	50m	<a href="#">Recommendation of Collaboration Patterns for Human-Machine Collective Intelligence</a> , by Alexander Smirnov, Andrew Ponomarev <a href="#">Desbordante: A Framework for Exploring Limits of Dependency Discovery Algorithms</a> , by Maxim Strutovskiy, Nikita Bobrov, Kirill Smirnov, George Chernishev <a href="#">System Capability Estimation Example</a> , by Alexander Geida <a href="#">Proficiency Level Adjustment Approach for Human Resources in Professional Networks</a> , by Mikhail Petrov	
13:35	25m	<a href="#">Q&amp;A session for the Knowledge Management Systems session</a> , Zoom 280-192-1973, passcode 535851	
14:00	15m	<b>Official closing of the 29th FRUCT conference</b> , Zoom 280-192-1973, passcode 535851	

## Demos/Posters Session of the 29th FRUCT Conference

The first part of the Demos/Posters section is a promotional section to present/introduce demo projects to the public. Presentations will be done as 2 minutes videos on Youtube in the Pecha Kucha style. The second part of the session will be held in form of open discussion held by Zoom teleconference.

All conference participants are warmly welcome to take part in voting for the best demo/poster of the 29<sup>th</sup> IEEE FRUCT conference by giving your “Like” for the demos you like the most. One person can vote for as many demos as he/she liked. If you have some special requirements please contact organizing committee by email [info@fruct.org](mailto:info@fruct.org).

### **Pecha Kucha Presentation Format**

Pecha Kucha is a presentation technique where a speaker shows a definite number of slides (usually 20 or 15), each for 20 seconds. The slides are changed automatically. The main intention for Pecha Kucha presentation style is to prevent participants from being too verbose and to make their talks more dynamic and impressive.

Pecha Kucha Night is an event where each speaker uses Pecha Kucha presentation, and speakers change each other in non-stop fashion. Initially invented by architects, this kind of event is often used to present creative projects or work; nowadays it is also used for R&D talks too. Pecha Kucha Night format allows all participants to make announcements about their demos in attractive and time-efficient way. That is why we have chosen this format for demo promotion section at FRUCT conference. More information can be found at <http://www.fruct.org/demo29>.

### **How to prepare Pecha Kucha presentation**

Here is an instruction on how to prepare your Pecha Kucha style presentation for Demo promotion section. Your presentation must contain exactly 6 slides, and each of them will be displayed for 20 seconds. The slides will be changed automatically. The presentation will take exactly 2 minutes (it should be noted that classical Pecha Kucha has 20 slides, but we have to reduce the number due to a large amount of submitted presentations). Provide the information about yourself and your presentation on the first slide (name, institution, title of your presentation).

The main purpose of your talk would be to interest people, so your presentation should make absolutely clear the main ideas of your project and explain what you plan to show at the demo stand. Make your presentation fascinating to attract attendees and avoid technical details in your talk. Reveal one main idea on each slide. Do not overload your slides with information. Remember, that each slide is displayed only for 20 seconds. Place no more than 2 lines of text per slide, or one big picture. Avoid using slide titles. Do not duplicate the same slides in your presentation — it is cheating! If you see that 20 seconds for a particular slide is not enough for you, try to decouple it into the two or more, or omit the details. Do not place “Thank you” or “Q&A” slides in the presentation. Pecha Kucha session does not imply any questions from the auditory. All the questions will be asked afterwards in a poster room. Prepare your speech thoroughly and beforehand. As you have only 20 seconds per slide, it is quite impossible to improvise during the talk. Rehearse your speech several times to be sure in the absence of pauses when you wait for the slide change, or accelerations when you fails to follow your slides. Try to speak in the same pace during all the presentation. It definitely depends on your text, so try to prepare near the same amount of text in speech for each slide.

### **Check list**

- Use exactly 6 slides.
- Place information about yourself and your presentation (name, institution) on the first slide.
- Reveal one main idea on each slide.
- Place no more than 2 lines of text or 1 large image per slide.
- Do not duplicate the same slides, do not place “Thank you” or “Q&A” slides in the presentation.
- Do not use any slide change animation.
- Prepare your speech thoroughly and do not forget to rehearse it.

## List of Demos/Posters (preliminary list based on submissions by May 10, 2021)

1. **Demo:** [Video Analysis-Based Estimation of Movement and Breathing Characteristics During the Meditation Practice](#), by Walaa Othman and Alexey Kashevnik, ITMO University  
We present an approach to detect human activity during the meditation process based on image analysis. We first analyze the breathing characteristics like respiratory rate, breathing rhythmicity, and stability. Then, we propose to detect the movement of each body part (head, thorax, shoulders, elbows, wrists, stomach, and knees) and find the direction of the movement. Based on the detected activity, we implement an evaluation procedure to estimate the performance during the practice. Our approach consists of three stages: (1) body part detection, (2) optical flow based method to find the difference in coordination of the body parts between two successive frames, (3), and analysis of the estimated movements to calculate human activities. The approach has been evaluated for meditation practice videos of 17 different people and showed that human activity during the meditation practice could be correctly estimated by the presented approach that is based on video analysis.
2. **Demo:** [Development of a Method for Meditation Quality Assessment Based on Wearable Electronics](#), by Vladislav Maliutin, ITMO University, and Alexey Kashevnik, SPC RAS  
The demo considers an approach related to human state detection during the meditation process. We describe the developed mobile application for collecting and analysis of the data on a person's state using connected wearable electronics as well as the developed method for the statistics analysis.
3. **Poster:** [Image Generation of Night-Vision Goggles for Training in Flight Simulator](#), by Alexander Chori, ITMO University  
This paper proposes a framework for rendering scenes as they would be visible through a night-vision device. This framework takes into account the spectral characteristics of materials or lights and reproduces image artifacts such as bloom and eye adaptation.
4. **Poster:** [Integration of Kotlin Multiplatform Projects with Swift Package Manager Dependencies](#), by Pavel Gromov, ITMO University, and Yaroslav Chernyshev, JetBrains  
This paper will discuss cross-platform programming using the Kotlin language as an example. About what are the native ways of connecting dependencies to platforms of the Apple family and which of them are available in Kotlin Multiplatform. Looking at the Kotlin integration with the Cocoapods dependency manager and its drawbacks. Also I will offer my implementation for integrating Swift package dependencies in Kotlin.
5. **Demo:** [Driver's Yawning Detection Using Deep Neural Network](#), by Fudail Hasan, ITMO University, and Alexey Kashevnik, SPC RAS  
The proposed method is to detect driver yawning using some facial features of the driver. These features are extracted automatically using a Deep Neural Network (DNN) model. The method consists of three steps. The first step is to capture the frame from the camera, and the second step is to use the 'FaceBoxes' face detector to detect and extract the driver's face in the frame. The third step is to use a DNN classification model to classify the image of the face and detect whether it contains yawning or not.
6. **Poster:** [Ambient Intelligence for Emerging Tactile Internet](#), by Dmitry Korzun, Petrozavodsk State University, Sergey Balandin, FRUCT, and Anatoly Voronin, Petrozavodsk State University  
The Tactile Internet paradigm is the next big wave of Internet innovation and the Internet of Things (IoT). The Tactile Internet aims to enhance the collaboration and interaction between humans and machines (or systems) in real, virtual, and remote IoT environments. Ambient Intelligence (Aml) refers to electronic environments that are sensitive and responsive to people present. In this poster presentation, we introduce the open special issue "Ambient Intelligence for Emerging Tactile Internet" ([https://www.mdpi.com/journal/futureinternet/special\\_issues/AI\\_ETI](https://www.mdpi.com/journal/futureinternet/special_issues/AI_ETI)) in Future Internet-a scholarly, peer-reviewed, open access journal on Internet technologies and the information society, published monthly online by MDPI. The authors act as Guest Editors in this special issue.
7. **Demo:** [Implementation of Multi-Stream Sensed Data Processing](#), by Nikita Besednyi, Nikita Harziya, Kirill Kulakov, and Dmitry Korzun, Petrozavodsk State University  
The performance of multi-stream sensed data processing is a challenging problem for Industrial Internet of Things (IIoT) monitoring applications. This demo is a part of the developed system for multi-parameter monitoring of production equipment. It shows an edge computing model for receiving and processing the sensed data. The key element of our model is specialized computing modules for reading raw sensed data from multiple sensors in the physical environment. The equipment unit is mounted with several sensors for measuring physical parameters (temperature, rotation frequency, current strength, vibration). These parameters are processed by the model, and the results are saved to databases, with a notification to the message broker when the results are available. The demo shows how the experimental web interface displays the results of processing multiple sensors when notifications appear in the message broker.

8. **Demo:** [Making a Tracking Object Smarter in the Monitoring System](#), by Darya Madrahimova, and Dmitry Korzun, Petrozavodsk State University  
We consider development of intelligent services for multi-sensor monitoring systems in Internet of Things (IoT) environments. Software modules are developed based on Zabbix. The modules track objects under monitoring and deduce on their operation. The research problem of evaluating the operation status of an object is solved using sensed data analysis algorithms. This demo shows several software mechanisms that implement the algorithms and make smarter any tracking object as if the object deduces about its own operation.
9. **Demo:** [Personalized Video Services Using One Camera for Human Motion Tracking](#), by Nikita Bazhenov, Arthur Harkovchuk, Egor Rybin and Dmitry Korzun, Petrozavodsk State University  
We consider development of video analytics services for real-time industrial monitoring in Internet of Things (IoT) environments. A service of the studied class implements the basic function of human motion tracking using observations from a single camera. In this demo, we show the following three services.
  - 1) Recognition of a human silhouette with local coordinates evaluation (within the local physical area).
  - 2) Recognition of a human pose (or motion state) (e.g., hands up, hands down, sitting).
  - 3) Person identification using face recognition and a database of registered people.
10. **Poster:** [Concept of a Smart Assistant in Technical Writing](#), by, Nikita Remshu, George Safonov and Dmitry Korzun, Petrozavodsk State University  
We consider development of smart assistance system for technical writing. When a user makes a document, the provided assistance reduces time expenses. This poster presentation shows the following assistance services.
  - 1) Technical editing when the service finds typos, misprints, typing errors, misspellings, etc.
  - 2) Co-authoring when the service recommends text fragments to modify or insert, based on typical examples, standard templates, or similar texts in Internet or text corpus.
  - 3) Text quality evaluation when the service quantitatively highlights bad and good text fragments (e.g., consistency analysis).
  - 4) Chat-bot when the service interacts with the writer to proofread the document.
11. **Poster:** [Training artificial neuronal networks on social media imagery for autonomous driving](#), by Thomas Chen, The Academy for Mathematics, Science, and Engineering  
The rise of autonomous vehicles yields many opportunities in terms of transportation safety and efficiency. Many autonomous vehicles are now driven by computer vision-based technology. Computer vision, the study of how computers gain high-level insights from imagery and video, has largely been conducted using deep learning (multi-layered machine learning) techniques in the last decade. In this introductory work, we discuss the use of social media data for the training of convolutional neural networks for scene and object identification, with the goal of implementing them in self-driving cars such that navigation mechanisms will allow for the avoidance of obstacles and the saving of lives in difficult situations. Social media platforms have become increasingly popular in recent years, as they are utilized by people around the world to post images and text during times of relaxation as well as times of crisis. Social media data (the user-created content itself) is analyzed using machine learning in two primary ways: natural language processing (NLP) and computer vision. Computer vision-enhanced approaches can be useful in a variety of fields, from humanitarian assistance and natural disaster response, to wildlife conservation. In regards to autonomous driving, we first acknowledge that social media networks such as Twitter and Instagram contain various sets of imagery depicting situations on the road from the perspectives of individuals in vehicles. Collecting this data through web scraping and subsequently crowdsourcing labels for object segmentation is conducted through platforms such as Amazon Mechanical Turk. Further, we train a convolutional neural network of the AlexNet architecture on this data. Finally, we compare the results to other works in the literature utilizing other sources of data for deep neural network training in this scope. We seek to determine whether transfer learning from social media-based vehicle-level scene data is effective when deployed.
12. **Poster:** [The Importance of Interpretability in Artificial Intelligence: A Case Study in Machine Learning for Post-disaster Building Damage Assessment](#), by Thomas Chen, The Academy for Mathematics, Science, and Engineering  
For many, artificial intelligence (AI) can be an unfamiliar and even terrifying concept. However, as machine learning and deep learning techniques become more popular techniques to analyze very large quantities of data in various fields, we see that these approaches have tremendous potential for social and humanitarian good. One prominent instance in relation to climate change adaptation is the fact that natural disasters ravage the world on a daily basis. Having precise and efficient mechanisms for assessing infrastructure damage is essential to channel resources and minimize the loss of life. Using a dataset that includes labeled pre- and post- disaster satellite imagery, the xBD dataset, we train multiple convolutional neural networks to assess building damage on a per-building basis. In order to investigate how to best classify building damage,

we present a highly interpretable deep-learning methodology that seeks to explicitly convey the most useful information required to train an accurate classification model. Our findings include that ordinal-cross entropy loss is the most optimal loss function to use and that including the type of disaster that caused the damage in combination with a pre- and post-disaster image best predicts the level of damage caused. We also make progress in the realm of qualitative representations of which parts of the images that the model is using to predict damage levels, through gradient class-activation maps. Our research advances more interpretable machine learning models for humanitarian good, which were lacking in previous literature. The reason why developing models of which inner decision making processes are transparent is important is that previous literature has shown that it leads to a higher level of societal comfort with AI. Because AI is so important in climate mitigation and adaptation, interpretable ML at the nexus of climate is a crucial area of future research.

FOR NOTES

# The 29th IEEE Conference of Open Innovations Association FRUCT

## Program

Tampere, Finland  
12-14 May 2021

A special word of thanks goes to the  
*Tampere University, IEEE Finland, Applied Sciences MDPI journal,  
and Future Internet MDPI journal for sponsoring the conference;  
and to certifyme.online as an e-Badge partner of the conference.*

Printed in National Research University ITMO (Russia)

---

Approved for publishing on 10.05.2021  
Page format 60x84 1/8  
Number of copies 300

---

ITMO university publisher house  
197101, Saint Petersburg, Kronverkskiy pr., 49



# CALL FOR PARTICIPATION

## 30<sup>th</sup> Conference of Open Innovations Association FRUCT

### Oulu, Finland, 27-29 October 2021



#### Overview

FRUCT is a large Pan-European cooperation network that promotes open innovations of academia and industry. FRUCT conference is a high-quality scientific event for meeting academia and business people and setting projects. The average conference is attended by 150+ participants representing over 30 member organizations and guests from whole world, e.g., Finland, Italy, Russia, UK, Denmark, India, Brazil, etc. The average **acceptance rate is 40%**. A lot of industrial players traditionally take part in the conference, including, Dell EMC, Nokia, MariaDB, Intel, Jolla, Open Mobile Platform, etc. The conference attracts most active and talented students to present their R&D projects, meet people alike, create new teams, and find employers and investors. The conference invites the world-class academic and industrial experts to lecture on the hottest topics. We welcome everybody to submit papers and take part in the conference, present your research results and join activities of the FRUCT Association. Due to COVID-19 situation the 30th FRUCT conference **allows both onsite and online participation**.

Traditionally the conference offers low registration fee. FRUCT doesn't offer deadline extension, but **we offer Early-bird submission** option. For further details please refer to <http://www.fruct.org/cfp30>.

#### List of conference topics

- ✓ Artificial Intelligence, Robotics and Automation Systems
- ✓ Location Based Services: Navigation, Logistics, e-Tourism
- ✓ Big Data and Data Mining, Data Storage and Management
- ✓ Open Source Mobile OS: Architectures and Applications
- ✓ Cloud Computing Systems, Networks and Applications
- ✓ Wearable-Computing Novel Architectures and Solutions
- ✓ Security and Privacy: Applications and Coding Theory
- ✓ Relational databases, Spatial databases, SQL tuning
- ✓ Natural Language Processing, Speech Technologies
- ✓ Internet of Things and Enabling Technologies
- ✓ Network Technologies, Next Generation Networks, Emerging Wireless Technologies, 5G
- ✓ Bioinformatics, e-Health and Wellbeing
- ✓ Smart Spaces, Linked Data and Semantic Web
- ✓ Knowledge and Data Managements Systems
- ✓ Context Awareness and Proactive Services
- ✓ Sensor Design, Ad-hoc and Sensor Networking
- ✓ Software Design, Innovative Applications
- ✓ Smart Systems and Embedded Networks
- ✓ Computer Vision, Image and Video Processing
- ✓ Crowdsourcing and Collective Intelligence
- ✓ Intelligence, Social Mining and Web
- ✓ Simulation platforms for Drone Applications
- ✓ Drones and IoT convergence

#### Call for papers

Depending on the type and maturity level please submit your work into one of the following 3 categories:

1. **Full paper** (min 6 full pages, max 12 pages) **OR** 2. **Short paper** (min 2 pages, max 6 pages)

**Submission deadline: 30 August 2021**

**Early-bird deadline: 30 July 2021**

Notification of acceptance: **24 September 2021**

Camera-ready deadline: **1 October 2021**

3. **Poster / Demo proposal:** submission deadline: **22 October 2021**

#### Publication

All submitted Full Papers will be peer reviewed by the technical committee. Accepted Full papers and extended abstracts are published in the proceeding of FRUCT conference (ISSN 2305-7254). The accepted Full Papers will be included to **IEEE Xplore (application is pending)** and **DOAJ**, indexed by **Scopus**, **ACM**, **Web of Science**, **RSCI/РИИЦ** (as journal publication), **DBLP**, etc. The selected papers get invitations to publish extended papers in partner journals, e.g., **IJERTCS**. The Full Papers are in **Scimago Journal Rank (SJR)** <http://scimagojr.com/journalsearch.php?q=21100305223&tip=sid>. FRUCT is **rated by many systems**, e.g., **Finnish (JUFO=1, ID: 72707)**, **Norwegian (NSD=1)**, **Danish (BFI=1, ID: 8782540)**.

#### Contacts

Paper templates, conference news and other relevant details are available at <http://www.fruct.org/conference30>. If you get some questions that are not covered at the conference web page, feel free to send email to [info@fruct.org](mailto:info@fruct.org).