



The 7th International Conference on Fuzzy Systems and Data Mining (FSDM 2021)

October 26-29, 2021 (GMT+9, Seoul Time)
Online Conference (Microsoft Teams)

Conference Guide



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FSDM 2021

CONFERENCE PROGRAM

October 26th-29th, 2021 (GMT+9, Seoul Time)
ONLINE-Microsoft Teams Meeting

For FSDM2021 Academic Exchange Only



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Part I Conference Schedule Summary

Tuesday, October 26, 2021

MS Teams: <http://www.academicconf.com/teamslink?confname=fsdm2021>

10:00-12:00 MS Teams Online Conference Testing and Ice Breaking

15:00-17:00 MS Teams Online Conference Testing and Ice Breaking Continued

Wednesday, October 27, 2021

MS Teams: <http://www.academicconf.com/teamslink?confname=fsdm2021>

Chaired by Prof. Qun Wei, Keimyung University, South Korea

09:00-09:10 **Opening & Welcoming Remarks**
Prof. Jong-Ha Lee, Keimyung University, South Korea

09:10-10:00 **Keynote Speech 1: Optimized Machine Learning for Critical Industrial Applications**
Assoc. Prof. Simon James Fong, University of Macau, China

10:05-10:55 **Keynote Speech 2: Linking Cognitive Behavior to Neural Circuits via DEVS Models and Their Minimal Realizations**
Prof. Bernard P. Zeigler, University of Arizona, USA

11:00-11:15 **BREAK**

11:15-12:05 **Keynote Speech 3: High Performance and Unconventional Computing for Fuzzy Systems and Data Mining**
Prof. Dmitry Zaitsev, Odessa State Environmental University, Ukraine

12:10-14:30 **BREAK**

14:30-15:20 **Keynote Speech 4: Multi-Objective Fault Detection Filter Synthesis for a Class of Nonlinear Systems: Some Results and Perspectives**
Prof. Mohammed Chadli, University of Paris-Saclay, France

15:25-16:15 **Keynote Speech 5: Artificial Intelligence in Health Care**
Prof. Huiyu Zhou, University of Leicester, UK

16:20-16:35 **BREAK**

16:35-17:25 **Keynote Speech 6: Non-statistical Methods for Analysis, Forecasting and Mining Time Series**
Prof. Vilem Novak, University of Ostrava, Czech Republic

17:30-18:00 **Poster Session**

Thursday, October 28, 2021

MS Teams: <http://www.academicconf.com/teamslink?confname=fsdm2021>

9:00-12:40 **Oral Session 1: Fuzzy Theory, Algorithm and System**

12:45-14:30 **BREAK**

14:30-17:55 **Oral Session 2: Data Mining, Machine Learning related to AI**

Friday, October 29, 2021

MS Teams: <http://www.academicconf.com/teamslink?confname=fsdm2021>

9:00-12:50 **Oral Session 3: Fuzzy Application**

12:55-14:30 **BREAK**

14:30-18:25 **Oral Session 4: Interdisciplinary Field of Fuzzy Logic and Data Mining**

Part II Opening & Welcoming Remarks

Opening & Welcoming Remarks from Conference General Chair



FSDM2021 General Chair

*Prof. Jong-Ha Lee,
Keimyung University, South Korea*

Part III Keynote Speeches

Keynote Speech 1: Optimized Machine Learning for Critical Industrial Applications



**Assoc. Prof. Simon James Fong,
University of Macau, China**

Biography: Simon Fong graduated from La Trobe University, Australia, with a 1st Class Honours BEng. Computer Systems degree and a PhD. Computer Science degree in 1993 and 1998 respectively. Simon is now working as an Associate Professor at the Computer and Information Science Department of the University of Macau. He is a co-founder of the Data Analytics and Collaborative Computing Research Group in the Faculty of Science and Technology. Prior to his academic career, Simon took up various managerial and technical posts, such as systems engineer, IT consultant and e-commerce director in Australia and Asia. Dr. Fong has published over 500 international conference and peer-reviewed journal papers, mostly in the areas of data mining, data stream mining, big data analytics, meta-heuristics optimization algorithms, and their applications. He serves as editors at various special issues of SCIE-indexed journals. Simon is also an active researcher with leading positions such as Vice-chair of IEEE Computational Intelligence Society (CIS) Task Force on "Business Intelligence & Knowledge Management", and Vice-director of International Consortium

for Optimization and Modelling in Science and Industry (iCOMSI).

Research Interests: data mining, data stream mining, big data analytics, meta-heuristics optimization algorithms, and their applications

Abstract: With the rapid development of industrial technology and intelligent information technology, the processing of big data by artificial intelligence (AI) enables industrial production to reach a higher level of automation. This is because AI has the ability of learning and identifying manufacturing defects using machine learning. It can control, monitor, and predict the state of the manufacturing equipment through the production data it has obtained, and it can achieve self-learning by establishing a neural network. On this basis, industrial production can rely on AI to achieve advanced intelligent requirements. As a branch of computer science and technology, the buzzword AI is actually rebranded from traditional machine learning techniques. But in industrial applications, especially for critical applications, the demand for precision and performance of AI is extremely high. Any mistake made by the AI means life and death.

Machine Learning (ML) has been around for decades, empowering many AI applications from computer vision to bioinformatics. Recently Deep Learning gained a remarkable popularity as a branch of ML, by its power to progressively extract higher-level features from the raw input through multiple "deep" layers. Convolutional Neural Network (CNN) is such a flagship model of DL that has unprecedented influential innovations in the field of computer vision and object recognition. While CNN has shown its power in many real-life case studies and successful deployment, recently much attentions of computer scientists are focused on how to build a best CNN for a given task with the best performance [1]. In this talk, I will describe holistic methodology called Optimized Learning (OL) which is designed to uplift the performance of DL, from augmenting the input data, to the CNN optimization and corrective output learning. The context of optimization in OL here is different from traditional optimization algorithms. ML usually acts indirectly in terms of enhancing the prediction performance. It is supposed that optimization in OL needs to be done at several levels and at different places of a ML model. This endeavor aims at leveraging a better ML/DL model for better outcomes, especially in critical applications where the best possible accuracy matters. Some prior works have already been done and applied in industries [2]. Some demos in real commercial AI projects will be shown, with a highlight of the importance of researching for enhanced ML/DL algorithms to better solve industrial problems.

References:

[1] Latest Journal Papers about artificial intelligence in industrial applications:

<https://www.sciencedirect.com/journal/computers-and-electrical-engineering/special-issue/10H6P2R11TZ>

[2] Examples of AI in actions as industrial solutions

<https://www.opencv.ai/#solutions>

Keynote Speech 2: Linking Cognitive Behavior to Neural Circuits via DEVS Models and Their Minimal Realizations



Prof. Bernard P. Zeigler,
University of Arizona, USA

Biography: Dr. Bernard P. Zeigler is Professor Emeritus of Electrical and Computer Engineering at the University of Arizona and the Chief Scientist at RTSync Corp (rtsync.com). He received a B.Eng. Physics from McGill, M.S. from MIT, and Ph.D. from the University of Michigan (1968). Prof. Zeigler is best known for his theoretical work concerning modeling and simulation based on systems theory and the DEVS formalism which he invented in 1976. His book “Theory of Modeling and Simulation” has become a classic in the field. Recently, he published the third edition of the book updated with the help of two young researchers. His R&D work in academia and industry has received recognition from numerous funding and professional agencies. Zeigler is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and The Society for Modeling and Simulation International (SCS). He is a member of the SCS Hall of Fame and received the Institute for Operations Research and Management Sciences (INFORMS) Simulation Society Lifetime Professional Achievement Award. His interests include Intelligent Systems, Knowledge Based System Design and Engineering, Cognitive behavior modeling and simulation, and cyber-physical systems Internet-of-Things realizations. His Wikipedia page is https://en.wikipedia.org/wiki/Bernard_P._Zeigler.

Abstract: Perception and generation of temporal event patterns, such as order of arrival of distinct events, coincidence of such events, and equality of event patterns are interesting cognitive behaviors that are simple enough to connect to potential biological realizations. Here we discuss Discrete Event System Specification (DEVS) models that exhibit such behaviors and can be developed, observed and tested in computational form. In this talk, we review the basics of the systems theory underlying DEVS as a modeling and simulation abstraction. Then we show how DEVS represents individual neural elements and their compositions to realize temporal event patterns by having the necessary states, processing signals, and memory features while coordinating themselves in space and time. Mathematical system-theory proofs of such models’ canonical minimal nature support the claim that their structures must be embedded in any plausible biological model of cognitive behavior. Thus, we argue that discrete event models of this nature constitute waypoints in the search for implementations involving elements such as neurons, neural micro-circuits, glial-astrocyte-neuron conglomerates, or as yet-unknown components. Implications of this methodology for intelligent cyber-physical system implementations will be discussed.

Keynote Speech 3: High Performance and Unconventional Computing for Fuzzy Systems and Data Mining



Prof. Dmitry Zaitsev,

Odessa State Environmental University, Ukraine

Biography: Dmitry A. Zaitsev received the Eng. degree in Applied Mathematics from Donetsk Polytechnic Institute, Donetsk, Ukraine, in 1986, the Ph.D. degree in Automated Control from the Kiev Institute of Cybernetics, Kiev, Ukraine, in 1991, and the Dr.Sc. degree in Telecommunications from the Odessa National Academy of Telecommunications, Odessa, Ukraine, in 2006. He has been a Professor of

Information Technology at Odessa State Environmental University, Ukraine, since 2019. He developed the analysis of infinite Petri nets with regular structure, the decomposition of Petri nets in clans, generalized neighborhood for cellular automata, and the method of synthesis of fuzzy logic function given by tables. He developed Opera-Topaz software for manufacture operative planning and control; a new stack of networking protocols E6 and its implementation within Linux kernel; Petri net analysis software Deborah, Adriana, and ParAd; models of TCP, BGP, IOTP protocols, Ethernet, IP, MPLS, PBB, and Bluetooth networks. His current research interests include Petri net theory and its application in networking, computing and automated manufacture. Recently he started working in the area of exascale computing applying his theory of clans to speed-up solving sparse linear systems on parallel and distributed architectures. He was a co-director of joint projects with China and Austria. Recently he has been a visiting professor to Technical University of Dortmund, Germany on DAAD scholarship, to University of Tennessee Knoxville, USA on Fulbright scholarship and to Eindhoven University of Technology, Netherlands. He published a monograph, 3 book chapters and more than a hundred of papers including issues listed in JCR. He is a senior member of ACM and IEEE. Additional information including papers, software, models, video-lectures in put on personal website via <http://daze.ho.ua>.

Abstract: Fuzzy systems and big data mining require considerable computational resources. Traditionally high performance computing is involved represented by supercomputers and clusters. A classification of fuzzy systems and data mining tasks is provided with regard to required computing capacity, solution time limitations, concurrent algorithms and others. An overview of conventional high performance computing systems is presented, including recent most powerful computers, their architecture and programming technology for multicore distributed nodes supplied with graphical processing units. Since traditional architecture suffers from memory-processor bottlenecks, unconventional computing models are in demand such as Sleptsov nets, cellular automata, spiking neuron systems, neuron networks and others. Their implementation, especially in the form of dedicated hardware, promises hyper-performance at the expense of mass parallelism and fine granulation provided by computing memory.

Keynote Speech 4: Multi-Objective Fault Detection Filter Synthesis for a Class of Nonlinear Systems: Some Results and Perspectives



Prof. Mohammed Chadli,
University of Paris-Saclay, France

Biography: Mohammed Chadli (Senior Member'99, IEEE) received the MScEng (DEA) from the Engineering School INSA-Lyon (1999), the PhD thesis in Automatic Control from the University of Lorraine (UL), CRAN-Nancy France in 2002 and his habilitation in 2011 at the University of Picardie Jules Verne (UPJV) Amiens, France. He was Lecturer and Assistant Professor at the UL “Institut National Polytechnique de Lorraine” (2000-2004). Since 2004, he was Associate Professor at the UPJV and currently Full Professor at the University Paris-Saclay, Univ Evry, IBISC Lab., France. He was a visiting professorship at the TUO-Ostrava (Czech Rep.), UiA (Norway), SMU-Shanghai (2014-2017), NUAA-Nanjing (2018, 2019) and the University of Naples Federico II (Italy).

Dr Chadli's research interests include fuzzy/LPV and switched systems, singular systems, robust control, fault detection and isolation (FDI), fault tolerant control (FTC) via LMI, SOS and Lyapunov methods. On the application side he is mainly interested in automotive control and renewable energy. He is co-author of books and book chapters (Wiley, Springer, Hermes), and numerous articles published in international journals and conferences.

Dr. Chadli is a senior member of IEEE, an Editor/Associate Editor/Editorial Board Member of several international journals, including the IEEE Transactions on Fuzzy Systems, Automatica, the IET Control Theory and Applications, the Franklin Institute Journal, Asian Journal of Control. He is also Moderator for IEEE TechRxiv and was a Guest Editor for Special Issues in international journals.

Abstract: This presentation proposes some methods of fault detection filter synthesis for a class of nonlinear systems. Observer-based LMI synthesis methods for T-S systems subjected to unknown inputs are presented. Subsequently, multi-objective synthesis problem is discussed in FDI framework. When we are interested in these problems in finite frequency domains (FFD), i.e. in frequency ranges of the fault and unknown perturbations known in advance and belonging to finite frequency bands, these classic techniques (in infinite frequency domains) become quite restrictive. Indeed, the problem of multiobjective synthesis in the finite frequency domain is addressed. In a fault diagnosis context, the generated residue must be as sensitive as possible to faults and as robust as possible against unknown perturbations by means of two finite frequency performance indices such as the H_- and H_∞ indexes. Based on the Kalman-Yakubovich-Popov generalized lemma (GKYP) and the Lyapunov method, sufficient design conditions have been proposed in recent years. Despite these recent developments, and the use of polyquadratic Lyapunov functions, the multiobjective LMI synthesis conditions are only sufficient. Still open perspectives will be discussed.

Keynote Speech 5: Artificial Intelligence in Health Care



Prof. Huiyu Zhou,
University of Leicester, UK

Biography: Dr. Huiyu Zhou received a Bachelor of Engineering degree in Radio Technology from Huazhong University of Science and Technology of China, and a Master of Science degree in Biomedical Engineering from University of Dundee of United Kingdom, respectively. He was awarded a Doctor of Philosophy degree in Computer Vision from Heriot-Watt University, Edinburgh, United Kingdom. Dr. Zhou currently is a full Professor at School of Informatics, University of Leicester, United Kingdom. He has published over 300 peer-reviewed papers in the field. He was the recipient of "CVIU 2012 Most Cited Paper Award", "MIUA 2020 Best Paper Award", "ICPRAM 2016 Best Paper Award" and was nominated for "ICPRAM 2017 Best Student Paper Award" and "MBEC 2006 Nightingale Prize". Dr. Zhou serves as the Editor-in-Chief of Recent Advances in Electrical & Electronic Engineering and Associate Editor of "IEEE Transaction on Human-Machine Systems", "IEEE Journal of Biomedical and Health Informatics", "Pattern Recognition", "PeerJ Computer Science" and "IEEE Access", and Area Chair of IJCAI and BMVC. He is one of the Technical Committee of "IEEE Cognitive and Development Systems", "Information Assurance & Intelligent Multimedia-Mobile Communication in IEEE SMC Society", "Robotics Task Force" and "Biometrics Task Force" of the Intelligent Systems Applications Technical Committee, IEEE Computational Intelligence Society. He has given over 100 invited talks at international conferences, industry and universities, and has served as a chair for 70 international conferences and workshops. His research work has been or is being supported by UK EPSRC, MRC, EU, Royal Society, Leverhulme Trust, Puffin Trust, Alzheimer's Research UK, Invest NI and industry. His research fields include machine learning, computer vision and signal processing and his research interest has focused on the development of AI/machine learning algorithms that enable a system to better understand and interpret images/signals. More details about Dr. Zhou, please refer to <https://www2.le.ac.uk/departments/informatics/people/huiyu-zhou>.

Abstract: Artificial intelligence has significantly influenced the health sector for years by delivering novel assistive technologies from robotic surgery and hospital management systems to versatile biosensors that enable remote diagnosis and efficient treatment. While the COVID-19 pandemic is devastating, the uses of AI in the healthcare sector are dramatically increasing and it is a critical time to look at its impact and possible limitations in different aspects. In this talk, I will introduce the concept of artificial intelligence (AI) and its uses. Then, I discuss the current public opinion on AI and its hype. I also present the regulation of AI in the community, followed by the discussion on challenges in the field. Finally, I predict the future work in AI using a few examples.

Keywords: Artificial intelligence; health care; hype; regulation; challenges

Keynote Speech 6: Non-statistical Methods for Analysis, Forecasting and Mining Time Series



Prof. Vilem Novak,
University of Ostrava, Czech Republic

Biography: Prof. Vilem Novak, Ph.D., DSc. is founder and former director of the Institute for Research and Applications of Fuzzy Modeling of the University of Ostrava, Czech Republic. The institute (established in 1996) is one of the world-renowned scientific workplaces that significantly contributed to the theory and applications of fuzzy modeling.

V. Novak obtained a PhD in mathematical logic at Charles University, Prague in 1988; DSc. (Doctor of Sciences) in computer science in the Polish Academy of Sciences, Warsaw in 1995; full professor at Masaryk University, Brno in 2001. His research activities include mathematical fuzzy logic, approximate reasoning, mathematical modeling of linguistic semantics, fuzzy control, analysis and forecasting of time series, and various kinds of fuzzy modeling applications. He belongs among pioneers of the fuzzy set theory. He was general chair of the VIIth IFSA' 97 World Congress, Prague and of the international conferences EUSFLAT 2007, Ostrava and EUSFLAT 2019, Prague. He is a member of editorial boards of several scientific journals. He is often invited to give plenary talks at international conferences and to give university lectures all over the world. He is the author or co-author of 5 scientific monographs, two edited monographs, and over 300 scientific papers with over 7000 citations. He was awarded in the International Conference FLINS 2010 in China and obtained the title “IFSA fellow” in 2017 for his scientific achievements. He is currently the vice-president of IFSA.

Abstract: In this lecture, we will overview results obtained in our institute over several years in the analysis, forecasting, and mining of information from time series using methods that predominantly have non-statistical character. We argue that our methods can be pretty successful in time series processing. In addition to that, they can also provide information that can hardly be obtained using statistical methods. Let us emphasize, however, that our goal is not to beat statistical methods but rather to extend the power of time series processing methods and benefit from the mutual synergy.

We will present special techniques of fuzzy modeling suitable for applications in time series processing, namely the Fuzzy Transform (F-transform) and selected methods of Fuzzy Natural Logic (FNL). The F-transform is applied especially to estimation of the trend or trend-cycle of time series, and also to estimation of the slope of time series over an imprecisely specified area. These results are then applied in the methods of FNL using which we are able to forecast the time series, provide explanation of the forecast in natural language and also provide comments to the slope of time series and detect possible structural breaks in it. Other applications of our methods include: reduction of the dimensionality, detection of “bull and bear” phases of financial time series, measures of similarity between time series, automatic summarization of knowledge about time series, detection of perceptual important points, and a few other ones.

Part IV Poster Presentation

Poster Presentation Preparation

- ✚ There is no size constraint for the e-poster, if you have difficult to decide one, then A1 size (594mm×841mm) is recommended.
- ✚ Please send the poster at **.PDF** format. The Poster would be updated on the conference website after pre-review and confirmation.
- ✚ The Poster could design as you like with requirements as below:
 - ✧ The conference logo should be clearly shown in the header
 - ✧ Title, presenter, and affiliation information should be well indicated;
- ✚ Signed and stamped electronic presentation certificate would be issued via e-mail after the conference.

List of Posters

Please Click <http://www.academicconf.com/poster?confname=fsdm2021> to Access the Poster Presentations.

If you have any questions to ask the presenters, you can leave your questions at the webpage of related poster listed via the same link mentioned above. The presenters will answer your questions as soon as possible via the same webpages.

17:30-18:00, Wednesday, Oct. 27, 2021 (GMT+9, Seoul Time)

FSDM3641	R-Calculus For Post Three-Valued Description Logic <i>Ms.Lanxi Hu, Chinese Academy of Sciences, China</i>
FSDM3637	Feature Back-tracking with Sparse Deep Belief Networks <i>Dr. Wenfeng Jing, Xi'an Jiaotong University, China</i>
FSDM3691	A Novel Method for Mining Fuzzy Co-location Patterns <i>Mr. Jinyu Guo, Yunnan University, China</i>
FSDM3711	Bioengineering for L-Asparaginase Production by Halotolerant Bacillus licheniformisPPD37 strain using Statistical Approaches - Response Surface Methodology (RSM)and Artificial Neural Network (ANN) <i>Ms. Payal Patel, Indrashil University, India</i>
FSDM3724	Tracking Control Design for Positive T-S Fuzzy Systems under H_∞Performance <i>Dr. Aiwen Meng, Yanshan University, China</i>
FSDM3751	Short note on “Nonlinear optimization problem subjected to fuzzy relational equations defined by Dubois-Prade family of t-norms” <i>Prof. Xiaopeng Yang, Hanshan Normal University, China</i>
FSDM3697	The Prime Ideals of QMV*-algebras <i>Dr. Wenjuan Chen, University of Jinan, China</i>
FSDM3817	Differentiating Service Quality Strategies of Mobile Trading System Services to Incentivize Investors' Loyalty Behaviors through the Kano Model <i>Prof. Shu-Ping Lin, Department of Banking and Finance, CTBC Business School</i>
FSDM3621	Modified Harmony Search Combing Artificial Bee Colony Operator with Levy

	Flight for Function Optimization Problem <i>Prof. Kai-Qing Zhou, Jishou University, China</i>
FSDM3668	Adaptive Harmony Search Algorithm Utilizing Differential Evolution and Opposition-Based Learning <i>Mr. Di-Wen Kang, Jishou University, China</i>
FSDM3676	Research on the Concerns of Tourists During the Epidemic Based on Topic Model <i>Mr. Honglei Hua, Beijing Institute of Technology, China</i>

Abstracts of Posters

FSDM3641 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3637 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3691 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3711 Bioengineering for L-Asparaginase Production by Halotolerant *Bacillus licheniformis* PPD37 strain using Statistical Approaches - Response Surface Methodology (RSM) and Artificial Neural Network (ANN)

Payal Patel¹, Haren Gosai¹, Haresh Panseriya^{1,2}, Bharti Dave¹

¹*Indrashil University, India*

²*Gujarat Ecology Society, Synergy house, India*

Abstract. The study aims at sequential bioengineering of antineoplastic L-Asparaginase production by halotolerant *Bacillus licheniformis* PPD37 strain. To achieve this, significant media components were screened followed by optimisation of a combination of media components and culture conditions – L-Asparagine, MgSO₄, NaCl, pH and temperature, using statistical models given by both response surface methodology (RSM) and artificial neural network (ANN). The production improved from 2.86 U/mL to 17.089 U/mL, an increase of approximately 6-times the original value. On comparing RSM and ANN models for optimised L-Asparaginase production based on R² value, mean absolute percentage error (MAPE), root mean square error (RMSE), and mean absolute deviation (MAD) values, the ANN model emerged as the superior one. As this is the first report to the authors best knowledge on detailed analysis of RSM and ANN models for L-Asparaginase production using a halotolerant bacteria, this study could lead to more in-depth and large-scale production studies for halotolerant or halophilic L-Asparaginase.

Keywords: artificial neural network, central composite design, halotolerant, L-Asparaginase, response surface methodology

FSDM3724 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3751 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3697 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3817 Differentiating Service Quality Strategies of Mobile Trading System Services to Incentivize Investors' Loyalty Behaviors through the Kano Model

Shu-Ping Lin, Ya-Hui Chan, Toh-Sing Huang

Department of Banking and Finance, CTBC Business School

Abstract. Mobile trading is a major business focus in promoting the mobile banking market. The primary purpose of this study is to understand what establishes investors' satisfaction in a mobile trading system service and whether this satisfaction leads to a change in their loyalty behaviors. A service quality strategy identification framework integrating the Kano model is proposed and adopted. Investors who had used the top three mobile trading systems in Taiwan are surveyed, and 287 valid questionnaires are obtained. Service quality strategies for enhancing various investors' loyalty behaviors are suggested on the basis of the results.

Keywords: mobile banking, mobile trading system service, service quality, customer loyalty behaviors, kano model

FSDM3621 To avoid repeatability issue, this abstract will be available after the full paper is published in the related journal.

FSDM3668 To avoid repeatability issue, this abstract will be available after the full paper is published in the related journal.

FSDM3676 To avoid repeatability issue, this abstract will be available after the full paper is published in the related journal.

Part V Oral Presentation

Oral Presentation Guidelines

- ✚ The oral presentations include the forms of pre-recorded video presentation and oral presentation on live via **Microsoft Teams (MS Teams) meeting**.
- ✚ For oral presentation on live, please refer to the official instructions on [how to share content via MS Teams](#) before the conference.
- ✚ The pre-recorded video should be uploaded to FSDM2021 online submission system **before October 10, 2021** in the format of **.mp4** and time duration should be 15-20 mins.
- ✚ Visit [Here](#) to know How to record a video with PowerPoint
- ✚ The PPT either for pre-recorded video presentation or oral presentation on live could design as you like with requirements as below:
 - ✓ The conference logo should be added to each PPT slide
 - ✓ Title, presenter and affiliation information should be indicated in the first slide
 - ✓ Each slide should be concise, uncluttered and readable from a distance
 - ✓ Include only key words and phrases for visual reinforcement
- ✚ Signed and stamped electronic oral presentation certificate would be issued via e-mail after the conference

Best Oral Presentations Selection

Four best oral presentations will be selected based both on the “**Votes**” received on the website and the performances on live.

Selection Criteria

A best presentation will be selected based on the following items:

- ✓ Research Quality
- ✓ Presentation Performance
- ✓ Presentation Language
- ✓ PowerPoint Design

Selection Procedure

- Each session will select one Best Oral Presentation, please ensure your Paper ID (FSDM*****) is shown correctly on the first or last page at your presentation data.
- The best presenter of each session will be awarded with free registration for the next FSDM conference.

Best Oral Presentations Award

This award consists of a certificate and the privilege of free registration fee to attend FSDM2022.

Oral Session 1: Fuzzy Theory, Algorithm and System

Thursday, Oct. 28, 2021 (GMT+9, Seoul Time)

Session Chair:

Prof. Feng Feng, Xi'an University of Posts and Telecommunications, China

Prof. Xuanhua Xu, Central South University, China

Please Click <http://www.academicconf.com/teamslink?confname=fsdm2021> to enter the conference meeting room.

Please Click <http://www.academicconf.com/video?confname=fsdm2021> to Access the Video Presentations.

9:00-9:20	FSDM3651 (Invited) (live)	An Order-theoretic Framework for Multiple Attribute Decision Making Based on Weighted Intuitionistic Fuzzy Soft Sets <i>Prof. Feng Feng, Xi'an University of Posts and Telecommunications, China</i>
9:25-9:40	FSDM3776 (video)	Hierarchical Structure in Fuzzy Multi-information Granular Computing Model <i>Ms. Weijie Liu, Qinghai Normal University, Xining, China</i>
9:45-10:00	FSDM3689 (video)	An Optimization of Several Distance Function on Fuzzy Subtractive Clustering <i>Assoc. Prof. Sugiyarto Surono, Universitas Ahmad Dahlan, Indonesia</i>
10:05-10:20	FSDM3611 (video)	A Theorem about the Existence of Minimax Rules for Statistical Decision Problems with Trapezoidal Fuzzy Losses <i>Prof. Alexey S. Shvedov, National Research University, Russia</i>
10:25-10:40	FSDM3823 (video)	Ranking of Trapezoidal Bipolar Fuzzy Numbers Based on A New Improved Score Function <i>Dr. Jeevaraj S, Atal Bihari Vajpayee Indian Institute of Information Technology and Management Gwalior, India</i>
10:45-11:00		BREAK
11:00-11:15	FSDM3732 (video)	Control Design for One Class of Uncertain Metzler-Takagi-Sugeno Time-delay Systems <i>Prof. Dusan Krokavec, Technical University of Kosice, Slovakia</i>
11:20-11:40	FSDM3825 (video)	On Some Extended Rectangular Fuzzy b-Metric Spaces <i>Assoc. Prof. Naeem Saleem, University of Management and Technology, Pakistan</i>
11:40-12:00	FSDM3664 (Invited) (live)	A Large-Scale Group Risk Emergency Decision Method Based on the Entropy of Fuzzy and Conflict <i>Prof. Xuanhua Xu, Central South University, China</i>
12:05-12:20	FSDM3764 (video)	Uncertainty Measure of Pythagorean Fuzzy Sets <i>Ms. Xiaozhuan Gao, University of Electronic Science and Technology of China, China</i>
12:25-12:40	FSDM3749 (live)	Matrix Games Involving Linguistic Pythagorean Fuzzy Sets <i>Dr. Deebea Naqvi, Indira Gandhi Delhi Technical University for Women, and Maharaja Surajmal Institute of Technology, India</i>

Abstracts of Oral Session 1

FSDM3651 An Order-theoretic Framework for Multiple Attribute Decision Making Based on Weighted Intuitionistic Fuzzy Soft Sets

Feng Feng

Xi'an University of Posts and Telecommunications, China

Abstract. Decision making is a ubiquitous activity in the real world, which can be seen as a process of ranking a collection of alternatives or selecting the optimal one(s) from them based on the available information. Multiple attribute decision making (MADM) refers to the decision making process in which alternatives are evaluated by virtue of several attributes, reflecting the performance of alternatives from independent perspectives. The notion of intuitionistic fuzzy soft sets provides an elegant framework for addressing MADM problems in an intuitionistic fuzzy setting. In this talk, we first introduce the history and recent progress of intuitionistic fuzzy multiple attribute decision making. Then some rudiments regarding intuitionistic fuzzy soft sets, order relations and preference structures are recalled. Moreover, we establish an order-theoretic framework for MADM based on weighted intuitionistic fuzzy soft sets. In the proposed scheme, the essence of intuitionistic fuzzy multiple attribute decision making is described as the process of aggregating the initial information expressed as a weighted intuitionistic fuzzy soft set and deriving a preference structure on the universe of alternatives. Illustrative examples are presented to demonstrate the validity and generality of the proposed framework.

Keywords: multiple attribute decision making, weighted intuitionistic fuzzy soft sets

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FSDM3689 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3611 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3823 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3732 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3825 On Some Extended Rectangular Fuzzy b-Metric Spaces

Naeem Saleem

University of Management and Technology, Pakistan

Abstract. In this talk, we will introduce an extended rectangular fuzzy b-metric space which is a generalization of rectangular fuzzy b-metric space and rectangular fuzzy metric space. We will show that an extended rectangular fuzzy b-metric space is not Hausdorff. A Banach fixed point theorem is stated and proved as a special case of our main result where a Ćirić type contractive mappings are

involved. Our main results generalize some comparable results in rectangular fuzzy b-metric space and rectangular fuzzy metric space. We provide some examples to support the concepts and results presented herein. As an application of our result, we obtain the existence of the solution of the integral equation.

Keywords: fuzzy metric space, rectangular fuzzy b-metric space, Ćirić type contractions, fixed points, integral equations

FSDM3664 A Large-Scale Group Risk Emergency Decision Method Based on the Entropy of Fuzzy and Conflict

Xuanhua Xu, Hanhan Sun

Central South University, China

Abstract. Based on the decision risk caused by both the ambiguity of emergency decision information and the large group preference conflict, a large group risk emergency decision method based on the Entropy of Fuzzy and Conflict is proposed. The first, the decision group is clustered by preferences to form aggregation preference matrix. Second, the interval-valued intuitionistic fuzzy (IVIF) distance is proposed in the form of intuitionistic fuzzy (IF) number in order to reduce the loss of preference information. And generalized IVIF number is also defined. Combining with prospect theory, the IF prospect matrix of different cluster is obtained by conversion. Then, large group emergency decision model of fuzzy conflict entropy is constructed, the goal is to minimize the risk in the process of emergency decision. According to the optimization model, the weight of every attribute can be got, and then prospect matrix and attribute's weight are aggregated to figure out the comprehensive prospect values which decide the ranking of alternatives. Finally, a case analysis and comparison are used to illustrate the rationality and effectiveness of above method.

Keywords: large-scale group; emergency decision; entropy of fuzzy and conflict entropy; risk decision

FSDM3749 Matrix Games Involving Linguistic Pythagorean Fuzzy Sets

Deeba Naqvi¹ and Geeta Sachdev²

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Maharaja Surajmal Institute of Technology, C-4 Janakpuri, New Delhi-110058, India

² *Indira Gandhi Delhi Technical University for Women, Delhi-110006, India*

Abstract. This paper presents a thorough examination of matrix games in which the payoffs are defined by qualitative variables. To define the payoffs of the matrix game, we attempted to use linguistic Pythagorean fuzzy variables (LPFVs). The mathematical formulation and the solution concept for matrix games involving LPFVs is developed. The solution to matrix games with payoffs defined by LPFVs is found by transforming the bi-objective models into linear or non-linear programming problems and thereafter solving them. The concept of Pareto optimum solutions is used to define the solution of matrix games involving LPFVs. Furthermore, special cases for the aforementioned matrix games have been extensively discussed. The proposed method has been shown effective via numerical illustration.

Keywords: linguistic pythagorean fuzzy set, average aggregation operator, matrix games, linear programming problem, non-linear programming problems

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Oral Session 2: Data Mining, Machine Learning related to AI

Thursday, Oct. 28, 2021 (GMT+9, Seoul Time)

Session Chair: *Adjunct Prof. Dmitry Korzun, Petrozavodsk State University, Russia*

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14:30-14:45	FSDM3827 (live)	A Deep Neural Network Model for the Prediction of Major Adverse Cardiovascular Event Occurrences in Patients with non-ST-Elevation Myocardial Infarction <i>Dr. Huilin Zheng, Chungbuk National University, South Korea</i>
14:50-15:05	FSDM3816 (live)	Facial Expression Recognition and Image Description Generation in Vietnamese <i>Dr. Khang Lam, Can Tho University, Vietnam</i>
15:10-15:25	FSDM3777 (video)	Mass Ratio Variance Majority Undersampling and Minority Oversampling Technique for Class Imbalance <i>Mr. Piboon Polvimoltham, Chulalongkorn University, Thailand</i>
15:30-15:45	FSDM3612 (live)	Formulation of Average from Pythagorean Means: Improved Measure of Central Tendency of Data <i>Dr. Dhritikesh Chakrabarty, Handique Girls' College, India</i>
15:50-16:10	FSDM3810 (Invited)	Edge Analytics for Bearing Fault Detection based on Convolution Neural Network <i>Adjunct Prof. Dmitry Korzun, Petrozavodsk State University, Russia</i>
16:15-16:30		BREAK
16:30-16:40	FSDM3775 (video)	Support Vector Machine Technique as Classifier of Impaired Body Fat Percentage <i>Prof. Erika Severeyn, Universidad Sim'on Bol'ivar, Venezuela</i>
16:40-16:55	FSDM3625 (live)	Semantic Supervised Training for General Artificial Cognitive Agents <i>Mr. Roman Dushkin, Artificial Intelligence Agency, Russia</i>
17:00-17:15	FSDM3725 (live)	A Deep Learning Approach to Recognize Human Activity using Inertial Sensors and Motion Capture Systems <i>Ms. Milagros Jaén-Vargas, Universidad Politécnica de Madrid, Spain</i>
17:20-17:35	FSDM3833 (live)	Automated Contextual Anomaly Detection for Network Interface Bandwidth Utilisation: A Case Study in Network Capacity Management <i>Dr. Savas Konur, University of Bradford, UK</i>
17:40-17:55	FSDM3822 (live)	HMM-based Performance Patterns Recognition for Web Services <i>Assoc. Prof. Hamdi Yahyaoui, Kuwait University, Kuwait</i>

Abstracts of Oral Session 2

FSDM3827 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3816 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3777 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3612 Formulation of Average from Pythagorean Means: Improved Measure of Central Tendency of Data

Dhritikesh Chakrabarty

Handique Girls' College, India

Abstract. Average is a concept which describes any characteristic of an aggregate / population / class of individuals overall but not of an individual in the aggregate / population / class in particular. It is used in most of the measures of associated to data (or list of numerical values). It is Pythagoras, the pioneer of defining average, who defined the three most common averages namely the arithmetic mean, the geometric mean and the harmonic mean. Later on, a number of definitions / formulations of average had been derived due to necessity of handling different situations (different types of data). Recently, some generalized definitions / formulations of average have been derived along with one general method of defining average. In statistics, the three Pythagorean means are used in measuring the central tendency of data. However, the accuracy of the value of central tendency yielded by each of the three Pythagorean means is not known. Attempt has therefore here been made on finding out more accurate measure of central tendency of data. In this connection, four definitions / formulations of average have been developed from the three Pythagorean means. These four definitions / formulations have been termed as Arithmetic-Geometric Mean (abbreviated as AGM), Arithmetic-Harmonic Mean (abbreviated as AHM), Geometric-Harmonic Mean (abbreviated as GHM) and Arithmetic-Geometric-Harmonic (abbreviated as Mean AGHM) respectively. These four have been found to be improved measures of central tendency of data.

Keywords: average, AGM, AHM, GHM, AGHM, central tendency, measure

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FSDM3775 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

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FSDM3833 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3822 HMM-based performance patterns recognition for Web services

Hamdi Yahyaoui and Reem AlDaihani

Computer Science Department, Kuwait University, Kuwait

Abstract. We propose in this work a Hidden Markov Model (HMM) based approach for the recognition of Web services' performance patterns. The service performance data is modelled as a multivariate time series, which is transformed into a univariate time series using the quality attributes' correlations. The transformed data is then discretized and translated into symbolic sequences. These sequences are clustered in order to derive typical sequences called performance patterns. The symbolic data is used in training HMMs to derive models that recognize a number of performance patterns. We use the elbow method to establish a trade-off between elaborated model parameters and accuracy. Experiments are then conducted to assess the applicability of the proposed approach.

Keywords: services, performance, patterns, hidden markov model, recognition

Oral Session 3: Fuzzy Application

Friday, Oct. 29, 2021 (GMT+9, Seoul Time)

Session Chair:

Assis. Prof. Anand Nayyar, Duy Tan University, Vietnam

Assoc. Prof. Sayan Kaennakham, Suranaree University of Technology, Thailand

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Please Click <http://www.academicconf.com/video?confname=fsdm2021> to Access the Video Presentations.

9:00-9:20	FSDM3712 (video)	Inconsistency-Tolerant Hierarchical Probabilistic Computation Tree Logic Model Checking and its Application to Clinical Reasoning Verification <i>Assoc. Prof. Norihiro Kamide, Teikyo University, Japan</i>
9:25-9:45	FSDM3634 (video)	Multi-step Low-rank Decomposition of large Page Rank Matrices <i>Dr. Bruno Carpentieri, Free University of Bolzano, Italy</i>
9:50-10:05	FSDM3710 (video)	A Secure Image Authentication Scheme with Tamper Localization and Recovery <i>Dr. Shreelekshmi R, Government Engineering College, India</i>
10:10-10:30	FSDM3820 (Invited) (live)	A Consistency- and Consensus-Based Method for Group Decision-Making with Incomplete Probabilistic Linguistic Preference Relations <i>Prof. Peide Liu, Shandong University of Finance and Economics, China</i>
10:35-10:50	FSDM3658 (video)	Social Media User Profiling based on Genre Extraction <i>Mr. Ivan Labutin, Perm State University, Russia</i>
10:55-11:10		BREAK
11:10-11:25	FSDM3705 (live)	Securing Mobile Adhoc Networks from Black-Hole Attacks <i>Dr. Fahmina Taranum, Muffakham Jah College of Engineering and Technology, India</i>
11:30-11:45	FSDM3717 (live)	An Aspect of Bilevel Indefinite Quadratic Transportation Problem under Intuitionistic Fuzzy Environment <i>Assoc. Prof. Ritu Arora, University of Delhi, India</i>
11:50-12:05	FSDM3654 (video)	Ontology-Driven Data Mining Platform for Fuzzy Classification of Mental Maps <i>Assoc. Prof. Konstantin Ryabinin, Perm State University, Russia</i>
12:10-12:30	FSDM3812 (invited) (live)	Generalized-Multiquadric Radial Basis Function Neural Networks (RBFNs) with Variable Shape Parameters for Function Recovery <i>Assoc. Prof. Sayan Kaennakham, Suranaree University of Technology, Thailand</i>
12:35-12:50	FSDM3815 (live)	Hierarchical Digital Control System Performance <i>Mr. Konstantin Grishin, Tula State University, Russia</i>

Abstracts of Oral Session 3

FSDM3712 Inconsistency-Tolerant Hierarchical Probabilistic Computation Tree Logic Model Checking and its Application to Clinical Reasoning Verification

Norihiro Kamide, Seidai Kanbe, Hiroto Ishino, Yiwei Yang, and Khoo Nee Kwan

Teikyo University, Japan

Abstract. Model checking is a computer-assisted method of verifying concurrent systems that can be modelled using state-transition systems. In this study, we introduce an inconsistency-tolerant hierarchical probabilistic computation tree logic (IHpCTL) to establish a new extended model-checking paradigm named IHpCTL model checking. This proposed IHpCTL model checking is aimed at verifying randomized, open, large, and complex concurrent systems; it is constructed on the basis of several previously established extensions of the standard probabilistic temporal logic known as probabilistic computation tree logic (pCTL), which is widely used for probabilistic model checking. We show that the IHpCTL can be embedded in pCTL and is relatively decidable with respect to pCTL. The results of the proposed method indicate that the existing pCTL model checking algorithms can be effectively reused for IHpCTL model checking. We also propose a new application of IHpCTL model checking to clinical reasoning verification. The concurrent system for clinical reasoning is considered as randomized, open, large, and complex. On the one hand, model checking is typically used for software verification; on the other hand, an application of model checking is newly proposed in this study for verifying clinical reasoning systems. As a future direction of this study, we intend to realize an automated method for developing and verifying a practical clinical reasoning model. This model could be automatically developed using machine-learning technologies based on data evaluated by medical doctors and automatically verified thereafter by IHpCTL model checking. The results presented herein include those in a recently published paper.

Keywords: probabilistic model checking, inconsistency-tolerant model checking, hierarchical model checking, clinical reasoning verification

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FSDM3710 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings or related journals.

FSDM3820 A Consistency- and Consensus-Based Method for Group Decision-Making with Incomplete Probabilistic Linguistic Preference Relations

Peide Liu

Shandong University of Finance and Economics, China

Abstract. The use of incomplete probabilistic linguistic term sets (InPLTSs) can enrich the flexibility of qualitative decision-making information expression, especially in decision-making situations with high time pressure and insufficient knowledge. In this study, a method for group decision-making (GDM) with incomplete probabilistic linguistic preference relations (InPLPRs), considering consistency and consensus simultaneously, is developed. First, to fully explore the ability of InPLTSs to express uncertain information, InPLTSs are specifically classified. Then, an expected multiplicative consistency of InPLPRs is introduced, which is conducive to estimating the

missing information more accurately and effectively. Subsequently, considering the consensus of GDM problems, a consensus index, which considers the principle of majority and minority, is developed to measure the agreement degree among multiple individuals. Because individual InPLPRs may not all meet acceptable consistency after reaching consensus, a consistency- and consensus-improving mathematical programming model considering information distortion is presented. Then, to aggregate all individual preference relationships into a collective one, a reliability induced ordered weighted geometric operator is introduced, whose induced variable reliability is determined by the confidence degree and consistency index of individual preference relationships. Furthermore, a multi-phase algorithm with InPLPRs is developed to solve GDM problems. Finally, a numerical example is presented to illustrate the applicability of the proposed method, and some detailed validity test and comparative analysis are conducted to highlight the advantages of the proposed method.

Keywords: incomplete probabilistic linguistic preference relation, expected multiplicative consistency, consensus, mathematical programming, group decision-making

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Oral Session 4: Interdisciplinary Field of Fuzzy Logic and Data Mining

Friday, Oct. 29, 2021 (GMT+9, Seoul Time)

Session Chair: Assoc. Prof. Lanyong Zhang, Harbin Engineering University (HEU), China

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14:30-14:50	FSDM3800 (Invited) (live)	Edge Intelligent Epidemic Control System Based on Visual Internet of Things <i>Assoc. Prof. Lanyong Zhang, Harbin Engineering University (HEU), China</i>
14:55-15:10	FSDM3839 (live)	Evaluation, Analysis, and Treatment of Educational Risks in Migration of Presential Teaching for Remote <i>Mr. Renan Silveira Holtermann, University of Brasilia, Brazil</i>
15:15-15:30	FSDM3831 (video)	How Artificial Intelligence May Impact Your Job <i>Dr. Gianluca P. M. Virgilio, Universidad Católica Sedes Sapientiae, Peru</i>
15:35-15:50	FSDM3760 (live)	Open Access Digital Thesaurus on Ethnic Groups in the Mekong River Basin <i>Dr. Wirapong Chansanam, Khon Kaen University, Thailand</i>
15:55-16:20	FSDM3765 (Invited) (video)	Block Chain Technologies and Quantum Computing <i>Prof. V Padmavathi Reddy, Anurag University, India</i>
16:20-16:35		BREAK
16:35-16:45	FSDM3638 (video)	Creation of a Digital Passport for An Electronic Product and Formation of Design Solutions Based on It <i>Assoc. Prof. Julia V., ITMO University, Russia</i>
16:45-17:00	FSDM3736 (live)	Recent Advances in Protein Spatial Structure Prediction <i>Dr. Borys Biletskyy, Glushkov Institute of Cybernetics of NAS, Ukraine</i>
17:05-17:20	FSDM3791 (live)	Is the TikTok hype real? A Contextual Quality Analysis of the #FordWatchMe Challenge <i>Dr. Markus Rach, Institute of Competitiveness and Communication, Switzerland</i>
17:25-17:40	FSDM3824 (live)	Do Reviews Influence Real Estate Marketing: the Experience Combing with Natural Language Processing <i>Ms. Ting Wu, Harbin Institute of Technology, China</i>
17:45-18:00	FSDM3670 (live)	Using Hyperparameter Bayes Optimized LightGBM for Frequency Prediction of Auto Insurance <i>Prof. Yuantao Xie, University of International Business and Economics, China</i>
18:05-18:25	FSDM3844 (video)	Image Segmentation by Pairwise Nearest Neighbor Using Mumford-Shah Model <i>Prof. Pasi Fränti, University of Eastern Finland, Finland</i>

Abstracts of Oral Session 4

FSDM3800 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings or related journal.

FSDM3839 Evaluation, Analysis, and Treatment of Educational Risks in Migration of

Presential Teaching for Remote

Renan Silveira Holtermann, Ricardo Matos Chaim

University of Brasília, Brazil

Abstract. This paper presents a study on the risk management process in an educational environment during 2020, when the pandemic of the new coronavirus began. The analysed institution had to migrate its teaching model from the presential format to the remote mode. Thus, aiming to comprehend the context in which it was inserted, the risk management process proposed by ISO 31,000 was applied. Its process was also relevant to evaluate, analyse, treat, and monitor the educational environment throughout this migration. The analysed environment is a private Higher Education Institution (HEI) and at this time, many uncertainties and questions had arisen about the maintenance of its educational services. In addition, ensuring student's satisfaction is crucial for the company success and its financial health which includes maintain students registered and active in the institution. Thus, to understand this complex system, elements of the dynamics of systems were used to identify the risks related in this environment. Additionally, the Mosler's Method was used to measure these risks, providing input data for the analysis and treatment steps, which allowed the organization to work directly on crucial topics and organize feasible solutions. Finally, a structured questionnaire was applied to students enrolled in *stricto sensu* postgraduate courses, aiming to understand their levels of satisfaction in the adaptations made.

Keywords: risk management, Covid-19, educational management, ISO 31,000, system dynamics

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FSDM3760 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3765 Block Chain Technologies and Quantum Computing

Padmavathi Vurubindi

Anurag University, India

Abstract. Blockchain technology secures data from modification as it is a distributed ledger which is secured cryptographically. Most of the recent applications are implemented through blockchain and distributed ledger. Among the prevailing technology, cryptocurrency has taken over the finance sector. Though blockchain is ruling the present generation of technology, it is vulnerable to the attacks by quantum computer. The base to implement these technologies is hashing and digital signatures which are susceptible to threats and attacks. The principles of quantum mechanics are applied to build the blocks to enhance security. These principles are the concepts of quantum computing which uses qubits for communication. These encrypted data blocks rely on the laws of physics. As a result, this leads to quantum challenge i.e. superposition of quantum states. The computations are performed through photons or qubits which are produced by means of photon's polarization. These photons are the quantized features used to for encoding the information. Cryptography in quantum computing can be carried out by the principle of uncertainty which is the one of the principle of quantum mechanics. This quantum cryptography through quantum mechanics can be enhanced as quantum key distribution (QKD) in which distantly apart communicators share a common secret key. The QKD implements sharing of common secret key which is then used to implement blocks.

Keywords: blockchain, ledger, quantum mechanics, quantum cryptography, qubits, QKD

FSDM3638 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3736 Recent Advances in Protein Spatial Structure Prediction

Borys Biletskyy

Glushkov Institute of Cybernetics of NAS, Ukraine

Abstract. The problem of predicting the spatial structure of proteins is one of the most important unsolved problems of contemporary Bioinformatics. Proteins make up about 80% of the dry mass of the cell and coordinate the processes of metabolism. The functions of proteins are defined by its spatial structure. The results of recent competitions in methods for determining protein structures (CASP 2018, CASP2020) have shown significant progress in this direction. The accuracy of one of the methods called AlphaFold reached the accuracy of experimental methods. In this paper we consider and analyze the main components and stages in the process of recognizing the structure of a protein by the AlphaFold method. The component stages and corresponding methods include: search for homologous proteins based on multiple alignment methods, construction of protein-specific differentiated potential using artificial neural networks and energy optimization using gradient descent and limited sampling. The combination of a number of methods and the use of information from protein and genetic data banks allows AlphaFold authors to make significant progress in solving the extremely important task of determining the structure of a protein.

Keywords: protein spatial structure, machine learning, AlphaFold

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FSDM3824 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3670 To avoid repeatability issue, this abstract will be available after the full paper is published in related journal.

FSDM3844 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

Part VI Acknowledgements

On behalf of the FSDM2021 Organizing Committee, we would like to take this opportunity to express our sincere gratitude to our participants. Without their support and contributions, we would not be able to hold the conference successfully in this special year. We would also like to express our acknowledgements to the Technical Program Committee members who have given their professional guidance and valuable advice as reviewers.

Special Thanks go to the supports from Keimyung University, South Korea and Petrozavodsk State University (PetrSU), Russia. In these uncertain times, their continuous support and valuable opinions help us to meet the challenges of organizing the conference in this moment and those yet to come.

Below are the lists of the Technical Program Committee members. For those who contribute to the success of the conference organization without listing the name here, we would love to say thanks as well.

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