



The 6th International Conference on Fuzzy Systems and Data Mining (FSDM 2020)

November 13-16, 2020 (GMT+8 Time, Beijing)
Online Conference (Microsoft Teams)

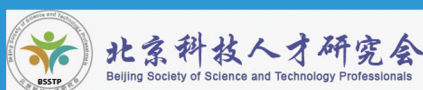
Conference Guide

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FSDM 2020

CONFERENCE PROGRAM

November 13th-16th, 2020 (GMT+8 Time, Beijing)
ONLINE-Microsoft Teams Meeting



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Part I Conference Schedule Summary

Friday, November 13, 2020

MS Teams: <http://www.academicconf.com/teamslink?confname=fsdm2020>

09:00-11:00 MS Teams Online Conference Testing and Ice Breaking

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

Saturday, November 14, 2020

MS Teams: <http://www.academicconf.com/teamslink?confname=fsdm2020>

09:10-09:20 **Opening & Welcoming Remarks**
Prof. Jin Gou, Dean, College of Computer Science and Technology, Huaqiao University, China

09:20-10:10 **Keynote Speech 1: Compact Visual Representation – Effectiveness, Interpretability and Robustness**
Prof. Rongrong Ji, School of Information, Xiamen University, China

10:15-11:05 **Keynote Speech 2: Blockchain, Edge Computing and Artificial Intelligence**
Prof. Juan Manuel Corchado, Director - European IoT Digital Innovation Hub; Director - BISITE Research Group, University of Salamanca, Spain

11:10-12:00 **Keynote Speech 3: Recent Advances in Digital Image Classification**
Prof. Milan Tuba, Vice Rector for International Relations, Singidunum University, Serbia

12:05-14:00 **BREAK**

14:00-18:10 **Oral Session 1: Fuzzy Theory, Algorithm and System**

Sunday, November 15, 2020

MS Teams: <http://www.academicconf.com/teamslink?confname=fsdm2020>

08:30-12:40 **Oral Session 2: Data Mining**

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

14:30-18:35 **Oral Session 3: Fuzzy Application**

Monday, November 16, 2020

MS Teams: <http://www.academicconf.com/teamslink?confname=fsdm2020>

08:30-12:15 **Oral Session 4: Interdisciplinary Field of Fuzzy Logic and Data Mining**

12:20-14:30 **BREAK**

14:30-16:40 **Oral Session 4: Interdisciplinary Field of Fuzzy Logic and Data Mining Continued**

16:45-17:30 **Poster Session & Online Conference Closing**

Part II Opening & Welcoming Remarks

Opening & Welcoming Remarks from Conference General Chair Prof. Jin Gou



FSDM2020 General Chair

Jin Gou, Ph.D.

*Professor, Dean, College of Computer Science
and Technology, Huaqiao University, China*

Part III Keynote Speeches

Keynote Speech 1: Compact Visual Representation – Effectiveness,
Interpretability and Robustness



Prof. Rongrong Ji

Professor, School of Information, Xiamen University, China

Biography: In 2011, Rongrong Ji obtained his doctorate from professor Yao Hongxun in Harbin Institute of Technology. In 2010, he worked as a research assistant in academician Gao Wen laboratory of Peking University. From the end of 2010 to 2013, he worked as a postdoctoral researcher in Shih-Fu Chang laboratory of Columbia University. In 2013, he joined the department of intelligent science and technology, school of information science and technology, Xiamen University. He was appointed as a full professor at Xiamen University in 2014 and he has been Minjiang Scholar distinguished professor since 2015 at the same university.

His research falls in the field of computer vision, multimedia, and machine learning. His scholarly work mainly focuses on leveraging big data to build computer systems to understand visual scenes and human behaviors, inferring the semantics and retrieving instances for various emerging applications. His recent interests include compact visual descriptor, social media sentiment analysis, and holistic scene understanding. He has published over 70 papers in top journals and reputed conferences like PAMI, IJCV, TIP, CVPR, ICCV, IJCAI, AAAI and ACM Multimedia.

In the past decade, Prof. Ji and his collaborators have developed some of the state-of-the-art mobile

visual search systems and social multimedia analytics tools, with top performances in the MPEG Compact Descriptor for Visual Search (CDVS) standard evaluations. His work has also been recognized by ACM Multimedia 2011 Best Paper Award, Microsoft Fellowship 2007, and Best Thesis Award of Harbin Institute of Technology. His research has been supported by government agencies like National Science Foundation of China. He has been awarded the National Science Foundation for Excellent Young Scholars (2014). In 2017, he was awarded the National Top Talent of Ten Thousand People Program.

He is associate editors in Neurocomputing, Multimedia Tools and Applications, The Visual Computer, PLOS ONE, Frontiers of Computer Science etc., guest editors in ACM Transactions on Intelligent Systems and Technology, IEEE Multimedia Magazine, Signal Processing, Neurocomputing etc., General Chair of VALSE (Vision And Learning SEminar) 2017, Local/Session/Area Chairs in IEEE MMSP 2015, ACM ICMR 2014, IEEE VCIP 2014, ACM MMM 2015, IEEE ISM 2015 etc. TPC Members in AAAI 2015, CVPR 2013, ICCV 2013, ACM Multimedia 2010-2015 etc. He has been a Senior Member of IEEE (2014-now), Senior Member of ACM (2015-now), Chair of VAIG Group for IEEE Multimedia Communication Technical Committee (MMTC) (2014-2016), Member of ACM, Chair of CCF YOCSEF Xiamen (2016-2017), and Executive Member of Fujian Association of Artificial Intelligence.

Abstract: This talk mainly introduces a few representative compact computer vision models for visual recognition and retrieval on massive datasets. It covers the main progress of Prof. Rongrong Ji's research group on compact visual representation, feature interpretability, and robust visual analytics. For the issue of representation compactness, a ranking-sensitive hashing model will be introduced, which can effectively preserve the ranking information of data in the Hamming space by learning from large-scale unsupervised data pairs. For the interpretability issue, this talk will report recent developments of diverse feature learning, feature coupling & decoupling analysis, as well as the structural decomposition of neural networks. For the robustness issue, an in-depth investigation on the sensitivity of adversarial samples in visual retrieval tasks will be presented and discussed. Finally, this talk will highlight some typical industrial applications of the above research achievements in recent vision-related products of leading AI companies such as Huawei and Tencent.

Key Words: Compact Visual Representation; Robustness; Interpretability

Keynote Speech 2: Blockchain, Edge Computing and Artificial Intelligence



Prof. Juan Manuel Corchado

**Director - European IoT Digital Innovation Hub;
Director - BISITE Research Group, University of Salamanca,
Spain**

Biography: Juan Manuel Corchado is Full Professor with Chair at the University of

Salamanca. He was Vice President for Research and Technology Transfer from December 2013 to December 2017 and the Director of the Science Park of the University of Salamanca, Director of the Doctoral School of the University until December 2017 and also, he has been elected twice as the Dean of the Faculty of Science at the University of Salamanca. In addition to a PhD in Computer Sciences from the University of Salamanca, he holds a PhD in Artificial Intelligence from the University of the West of Scotland. Juan Manuel Corchado is Visiting Professor at Osaka Institute of Technology since January 2015, Visiting Professor at the Universiti Malaysia Kelantan and a Member of the Advisory group on Online Terrorist Propaganda of the European Counter Terrorism Centre (EUROPOL).

Corchado is the Director of the European IoT Digital Innovation Hub and of the BISITE (Bioinformatics, Intelligent Systems and Educational Technology) Research Group, which he created in the year 2000, President of the AIR Institute, Academic Director of the Institute of Digital Art and Animation of the University of Salamanca and has been President of the IEEE Systems, Man and Cybernetics Spanish Chapter. He also oversees the Master's programs in Digital Animation, Security, Blockchain, IoT, Mobile Technology, Information Systems Management and Agile Project Management at the University of Salamanca.

Corchado has supervised more than 25 PhD theses, is author of over 800 research peer review papers and books, has chaired the scientific committee of more than 30 international conferences, and is also Editor-in-Chief of Specialized Journals like ADCAIJ (Advances in Distributed Computing and Artificial Intelligence Journal) and OJCST (Oriental Journal of Computer Science and Technology).

Abstract: Artificial Intelligence (AI) is the driving force of growth in the world and therefore it is an extremely topical subject nowadays. The ever-greater developments in the field of artificial intelligence have sparked conversations of its potential in different sectors (society, business, government, etc). AI has been here for ages but now we have all we need to make it a reality; computing power, storage capacities, communications technology and man power. With all these resources we can become more efficient by incorporating AI into our daily activities.

Blockchain is the technology behind bitcoin, ether and most of the other cryptocurrencies. Blockchain is essentially a form of record keeping and can be used in almost any product that uses some form of record keeping or database management. Blockchain is ideal for protecting any data that must be unalterable and indestructible.

Edge Computing streamlines the flow of traffic from IoT devices and provides real-time local data analysis. Instead of a centralized data-processing warehouse, this paradigm processes the data near the edge of the network, where the data is being generated. Edge computing accelerates data-streaming, including real-time data processing without latency. It allows smart applications and devices to respond to data as they are being created, this almost instantaneous response eliminates lag time. This is critical for technologies such as self-driving cars and has equally important benefits for business.

Keynote Speech 3: Recent Advances in Digital Image Classification



Prof. Milan Tuba

Vice Rector for International Relations, Singidunum University, Serbia

Biography: Milan Tuba is the Vice Rector for International Relations, Singidunum University, Belgrade, Serbia and was the Head of the Department for Mathematical Sciences at State University of Novi Pazar and the Dean of the Graduate School of Computer Science at John Naisbitt University. He received B. S. in Mathematics, M. S. in Mathematics, M. S. in Computer Science, M. Ph. in Computer Science, Ph. D. in Computer Science from University of Belgrade and New York University. From 1983 to 1994 he was in the U.S.A. first at Vanderbilt University in Nashville and Courant Institute of Mathematical Sciences, New York University and later as Assistant Professor of Electrical Engineering at Cooper Union School of Engineering, New York. During that time he was the founder and director of Microprocessor Lab and VLSI Lab, leader of scientific projects and theses supervisor. From 1994 he was Assistant Professor of Computer Science and Director of Computer Center at University of Belgrade, from 2001 Associate Professor, Faculty of Mathematics, University of Belgrade, from 2004 also a Professor of Computer Science and Dean of the College of Computer Science, Megatrend University Belgrade. He was teaching more than 20 graduate and undergraduate courses, from VLSI Design and Computer Architecture to Computer Networks, Operating Systems, Image Processing, Calculus and Queuing Theory. His research interest includes nature-inspired optimizations applied to computer networks, image processing and combinatorial problems. Prof. Tuba is the author or coauthor of more than 200 scientific papers and coeditor or member of the editorial board or scientific committee of number of scientific journals and conferences. He was invited and delivered around 60 keynote and plenary lectures at international conferences. He has been member of the ACM, IEEE, AMS, SIAM, IFNA.

Abstract: Digital images introduced big changes in the world. Besides using digital images in everyday life, they became an irreplaceable part of numerous scientific areas such as medicine, security, agriculture, etc. One of the usual tasks in applications with digital images is digital image classification. Great progress in solving this task was made in recent years by convolutional neural networks. Convolutional neural networks represent a special class of deep neural networks that take a spatial correlation of input data into consideration. The results achieved by CNN are significantly better in comparison with the other classification methods. To use a CNN for a specific classification problem it is necessary to find the optimal network architecture and set various hyperparameters such as the number of different layers, number of neurons in each layer, optimization algorithm, activation functions, kernel size, optimization algorithm, etc. Frequently, CNN's configuration is based on some previous experience or knowledge or set by guessing and estimating (guestimating) better values for the hyperparameters. Recent studies achieved promising results when using swarm intelligence algorithms for CNN's hyperparameters tuning. A few examples of using swarm intelligence algorithms for convolutional neural network hyperparameter tuning will be presented.

Part IV 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 FSDM2020 online submission system **before November 10, 2020** 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

- All video presentations will be updated on the conference website;
- Audience could select best video presentations by clicking “**Vote for the Best Presentation**” and vote from the same IP would be counted only one time for each video presentation;
- Six video presentations will be selected based on the number of “**Votes**” till **November 27, 2020**.
- The conference general chair, session chairs and TPC members of FSDM 2020 (Who will not deliver presentations) will choose four best oral presentations among the six selected video presentations and one best presentation on live in each oral session, and results will be demonstrated on the website on **December 4, 2020**.

Best Oral Presentations Award

This award consists of a certificate and the privilege of free registration fee to attend FSDM2021.

Oral Session 1: Fuzzy Theory, Algorithm and System

Please Click <http://www.academicconf.com/video?confname=fsdm2020> to Access the Video Presentations.

Please Click <http://www.academicconf.com/teamslink?confname=fsdm2020> to enter the conference meeting room. (Saturday, Nov. 14, 2020, GMT+8 Time, Beijing)

Session Chair: Assoc. Prof. Jialin Peng, College of Computer Science and Technology, Huaqiao University, China

14:00-14:20	FSDM3559 (Invited)	A Fuzzy Graph Approach to Interconnection Networks <i>Assist. Prof. Sunil Mathew, I National Institute of Technology Calicut, India</i>
14:25-14:40	FSDM3263	A Stable Attribute Reduction Approach for Fuzzy Rough Sets <i>Ms. Zehua Jiang, Jiangsu University of Science and Technology, China</i>
14:45-15:05	FSDM3302 (Invited)	Inconsistency-tolerant Fuzzy Description Logics <i>Assoc. Prof. Norihiro Kamide, Teikyo University, Japan</i>
15:05-15:15	FSDM3223	Study on Generalized Directional Differentiability Problems of Fuzzy Mappings <i>Ms. Tingting Li, Inner Mongolia University for Nationalities, China</i>
15:20-15:45	FSDM3474	Synthesis of Fuzzy Logic Functions Defined in Tabular Form <i>Prof. Dmitry Zaitsev, Odessa State Environmental University, Ukraine</i>
15:50-16:05	BREAK	
16:05-16:25	FSDM3556 (Invited)	On Least-Squares Fuzzy Transforms and Autoencoders <i>Assoc. Prof. Stefania Tomasiello, University of Tartu, Estonia</i>
16:30-16:50	FSDM3516 (Invited)	Gradient Estimates for Weak Solutions of Elliptic PDE's <i>Prof. Giuseppe Di Fazio, University of Catania, Italy</i>
16:55-17:10	FSDM3490	Interval Observer Design for Metzlerian Takagi-Sugeno Systems <i>Prof. Dusan Krokavec, Technical University of Kosice, Slovakia</i>
17:15-17:25	FSDM3501	Data-driven Modeling of Mechanical Properties of Cast Iron Using Fuzzy Logic <i>Dr. He Tan, Jönköping University, Sweden</i>
17:30-17:45	FSDM3390	Fuzzy Expert Pricing Systems and Optimization Techniques in Marketing Science <i>Mr. Adeolu Dairo, University of Pecs, Hungary</i>
17:50-18:10	FSDM3382 (Invited)	On fuzzy Differential Equations in Normed Spaces <i>Prof. Ali Farajzadeh, Razi University, Iran</i>

Abstracts of Oral Session 1

FSDM3223 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3263 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3302 Inconsistency-tolerant Fuzzy Description Logics

Norihiro Kamide

Department of Information and Electronic Engineering, Teikyo University, Japan

Abstract. Description logics are well-known to be a family of logic-based knowledge representation formalisms, and fuzzy description logics are expressive description logics for representing and handling fuzzy (vague or imprecise) knowledge bases. Even though handling fuzzy concepts is known to be a significant issue in knowledge representation (KR) in AI, inconsistency handling is of growing importance in KR because inconsistencies can frequently occur in the real world. Thus, combining these issues is also regarded as a significant issue in KR, especially for realizing smart knowledge-based systems. Knowledge-based systems would be smarter, more robust, and more fine-grained if they were capable of handling inconsistent fuzzy knowledge bases. In this study, to effectively handle inconsistent fuzzy knowledge bases, an inconsistency-tolerant fuzzy description logic is introduced, and a translation from this logic to a standard fuzzy description logic is defined. A theorem for embedding the proposed inconsistency-tolerant fuzzy description logic into the standard fuzzy description logic is proved using this translation. A theorem for relative decidability of the inconsistency-tolerant fuzzy description logic with respect to the standard fuzzy description logic is also proved using this embedding theorem. The proposed logic and translation are intended to effectively handle inconsistent fuzzy knowledge bases. By using the translation, the previously developed methods and algorithms for the standard fuzzy description logic can be reused for appropriately handling inconsistent fuzzy knowledge bases that are described by the proposed logic. Furthermore, in this study, inconsistency-tolerant fuzzy temporal next-time description logic is obtained from the inconsistency-tolerant fuzzy description logic by adding a temporal next-time operator. Similar results as those for the inconsistency-tolerant fuzzy description logic are also obtained for this temporal extension.

Keywords: description logic, fuzzy description logic, inconsistency-tolerant fuzzy description logic, temporal inconsistency-tolerant fuzzy description logic, embedding theorem, relative decidability

FSDM3559 A Fuzzy Graph Approach to Interconnection Networks

Sunil Mathew

National Institute of Technology Calicut, India

Abstract. In most of the modern interconnection networks like internet, the reduction of flow between different nodes is more frequent than the disruption of the entire network. Majority of the

classical graph theoretical parameters were dealing with disconnections alone. The introduction of fuzzy logic by Zadeh, paved the way for fuzzy graph theory, which mainly concerned with strength reducing sets rather than disconnecting sets. Partial cutnodes and partial bridges respectively represent cutvertices and bridges in fuzzy graphs, whose removal reduce the strength of connectedness between different pairs of nodes of a network. Determination of partial cutnodes and partial bridges in a fuzzy graph is still a difficult task. There was a gradual development in the field of interconnection networks, using fuzzy graph theory in the last 20 years. Different theoretical and algorithmic aspects of networks will be studied in a fuzzy graph framework in the presentation.

Keywords: fuzzy graph, interconnection networks

FSDM3474 Synthesis of Fuzzy Logic Functions Defined in Tabular Form

Dmitry Zaitsev

Odessa State Environmental University, Ukraine

Abstract. The early published method of a continuous (fuzzy) logic function synthesis on a choice table has been adjusted for fast partitioning the source choice table with a set of fuzzy logic functions. Constituents of minimum and maximum have been introduced, their properties studied. A toolbox for fuzzy logic functions synthesis on a choice table, available for free download on GitHub, has been implemented in C language. The toolbox implements a command line style of programming using data located in textual files of simple intuitive formats. The toolbox can process big data rapidly and can be easily integrated into fuzzy logic frameworks as a synthesis engine for developing graphical environment of fuzzy (control) systems design. It has been proven that obtained decomposition into a set of fuzzy logic function contains the minimal number of fuzzy logic functions.

Keywords: fuzzy logic, tabular form

FSDM3556 On Least-Squares Fuzzy Transforms and Autoencoders

Stefania Tomasiello

University of Tartu, Estonia

Abstract. In this talk analogies and differences between a type of fuzzy transform and a type of autoencoder, both based on a least-squares optimization, will be presented. Such schemes have been recently introduced in the literature in different contexts. As it will be shown, the least-squares fuzzy transform can be regarded as a kind of autoencoder with a lower computational cost.

Keywords: least-squares fuzzy transforms, autoencoders

FSDM3516 Gradient Estimates for Weak Solutions of Elliptic PDE's

Giuseppe Di Fazio

University of Catania, Italy

Abstract. Let us consider an elliptic equation of second order in variational form in a bounded domain of the Euclidean n dimensional space. The right hand side is a function satisfying suitable assumptions. The problem of gradient estimates for elliptic equations is very important both from theoretical and applied point of view. In this talk we exploit what is the heart of the technique to show gradient estimates allowing the function f to belong to very general function spaces. Our technique is very flexible and it is allowed to show existence, uniqueness and well posedness of the Dirichlet problem in several classes.

FSDM3490 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3501 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3390 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3382 On Fuzzy Differential Equations in Normed Spaces

Ali Farajzadeh

Razi University, Iran

Abstract. In this talk, we present fuzzy differential equations (FDE) in the setting of normed spaces by introducing new definitions and extending the H -differentiability to normed spaces. This concept stands on the expansion of the class of differentiable fuzzy mappings and, for this, the lateral Hukuhara derivatives should be propounded. We will see that both derivatives are different and they lead us to different solutions from a FDE. Some illustrative examples are also given and some comparisons with other methods for solving FDE are made.

Oral Session 2: Data Mining

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Session Chair: Prof. Xin Liu, College of Computer Science and Technology, Huaqiao University, China

08:30-08:50	FSDM3328 (Invited)	Drilling Time Series Analysis with Deep Kalman Filter <i>Dr. Yingwei Yu, Schlumberger, USA</i>
08:55-09:10	FSDM3445	Community Detection, Pattern Recognition, and Hypergraph-Based Learning: Approaches Using Metric Geometry and Persistent Homology <i>Dr. Lizhen Lin, University of Notre Dame, USA</i>
09:15-09:35	FSDM3570 (Invited)	Revving up the Power of Your Machine Learning Model: An Adaptive Approach <i>Assoc. Prof. Simon James Fong, University of Macau, China</i>
09:40-10:00	FSDM3392 (Invited)	Challenges on IoT in Big Data <i>Dr. Connie YUEN, Hong Kong Shue Yan University, Hong Kong, China</i>
10:05-10:20	FSDM3506	Visualization of the Artist Relations Using Twitter User Profiles <i>Dr. Minoru Yoshida, University of Tokushima, Japan</i>
10:25-10:40	FSDM3492	ASCII Art Classification Model by Transfer Learning and Data Augmentation <i>Dr. Akira Fujisawa, Aomori University, Japan</i>
10:45-11:00		BREAK
11:00-11:15	FSDM3377	Machine Learning and Statistical Analysis Techniques on Terrorism <i>Dr. Babitha D, Koneru Lakshmaiah Education Foundation (KLEF), formerly K L University, India</i>
11:20-11:35	FSDM3274	Facial Expression Analysis Based on Fusion Multi-layer Convolutional Layer Feature Neural Network <i>Dr. Fei Yuan, Harbin Engineering University, China</i>
11:40-11:55	FSDM3397	The Coupling Co-Location Pattern: A New Spatial Pattern for Spatial Data Sets <i>Mr. Shiran Zhou, Yunnan University, China</i>
12:00-12:10	FSDM3458	3D Single Person Pose Estimation Method Based on Deep Learning <i>Ms. Xinrui Yuan, North Minzu University, China</i>
12:15-12:25	FSDM3460	A Review of Inference Methods Based on Knowledge Graph <i>Mr. Dexiang Zhang, North Minzu University, China</i>
12:30-12:40	FSDM3461	Recommendation Based on Java Code Analysis and Search <i>Dr. Junxia Guo, Beijing University of Chemical Technology, China</i>

Abstracts of Oral Session 2

FSDM3328 Drilling Time Series Analysis with Deep Kalman Filter

Yingwei Yu

Schlumberger, USA

Abstract. Kalman filter (Kalman, 1960) has been widely used to model dynamic system as defined below. However, for complex system, the transfer functions F , B , and H are usually hard to obtain due to their high non-linearity. This paper is a summary of our recent research on how we employed deep neural network as the implementation of Kalman filter, i.e., Deep Kalman Filter (DKF) (Yu et al., 2018, 2019) and its applications. We model these transfer functions with neural networks components, and solve these transfer functions by training with real data. The implemented deep neural network model contains components of convolutional neural network (CNN) layers, long short-term memory layers (LSTM), and deconvolutional layers. The DKF has been applied in a number time series analysis in drilling application. First, the dynamics of a rig drilling system is modelled as $Y = PEU$, where P is the plant of the rig mechanical system, E the environment (i.e., the earth, formations, etc.), U the rig controls (e.g., the top drive RPM, the flow rate, etc.), and Z the measurement (e.g., the hookload). The dynamics of the rig is then framed into the DKF, and we can predict the time series (Yu, et. al., 2018), and estimate the rig states (Yu, et. al., 2019). In addition, DKF is applied in the downhole to estimate the whirling state (Chen et al., 2019), which can reduce risks in drilling. By combining with a physical model, DKF can also detect the water pipe leakage during drilling (Jeong, 2020).

Keywords: kalman filter, deep neural network, time series, application in energy

FSDM3445 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3570 Revving up the Power of Your Machine Learning Model: An Adaptive Approach

Simon James Fong

University of Macau, China

Abstract. We all want to have a perfect machine learning model for a perfect prediction. There exists unfortunately no universal ML model that suits all. Different applications would have their own performance requirements and unique characteristic of data. By a popular belief of no-free-lunch-theorem, no algorithm in fact is the best under all situations; likewise an algorithm works well outperforming others for one particular dataset may not generalize well in other cases. In this talk, from my two decades of experiences in data mining (well, not always successful), I will be sharing some tips and possibilities in crafting up a humbly-speaking a near-best ML model without reinventing the wheels, for solving supervised learning problems upon adaptive, multi-view, varying resolutions, real-time, big and perhaps super big data of different kinds. Techniques that fix the ins and outs of a ML model ranging from data pre-processing, smart data sampling to hyperparameter optimization are reviewed and shown to you, via a simple methodology called GROOMS for

configuring your best bet for machine learning. Case studies of radiology-oriented cancer detection over medical images, IoT data stream mining for human activity recognition and even Lidar point cloud (spatial resolution 1 meter in radius per cycle gives you 800Mb of data!) for a self-flying UAV are presented and discussed. It is hoped that by using an adaptive approach, a ML model would be positioned at its best shape, when it is being applied in different situations.

FSDM3392 Challenges on IoT in Big Data

Connie YUEN

Hong Kong Shue Yan University, Hong Kong, China

Abstract. In the 21st century, IoT has many applications in our daily lives which can help people to improve the quality of life. IoT supports the automation of repetitive tasks which can increase task efficiency and accuracy, and can collect vast data within a second. With the evolution of networking technologies, people can collect and share data in smart devices easily. The 5G mobile network is much faster and much reliable than the previous generation of mobile network. It provides a strong backbone for IoT applications. With big data analysis, more AI applications are launched. The combination of AI and IoT brings us AIoT, which has many potential applications. IoT brings us a lot of convenience. On the other hand, IoT also brings us numerous challenges especially for the rapid growth of IoT devices in public spaces. In this presentation, we discuss the challenges that IoT applications faced and the impacts of these challenges on our daily lives.

FSDM3506 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3492 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3377 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3274 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3397 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3458 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3460 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3461 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

Oral Session 3: Fuzzy Application

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Session Chair: Dr. Ziyi Chen, College of Computer Science and Technology, Huaqiao University, China

14:30-14:50	FSDM3569 (Invited)	Research on Multi-UAV Cooperative Control Based on Consistency Theory and Fuzzy Control <i>Assoc. Prof. Lanyong Zhang, Harbin Engineering University (HEU), China</i>
14:55-15:10	FSDM3465	An Improved Similarity Measure for Generalized Trapezoidal Fuzzy Numbers and Its Application on Brain Wave Classification <i>Dr. Zhenya Qi, Tianjin University, China</i>
15:10-15:30	FSDM3565 (Invited)	The Study of Determining the Tax Burden Depending on Production Capacity under Uncertainty <i>Prof. Musayev Akif Farhad, The Institute of Economics of Azerbaijan National Academy of Science (ANAS), Azerbaijan</i>
15:35-15:55	FSDM3561 (Invited)	Intelligent Control of the Autonomous Dump Trucks Movement in the Quarry based on Digital Twins and Soft Computing Models <i>Prof. Igor O. Temkin, National University of Science and Technology, Russia</i>
16:00-16:20	FSDM3563 (Invited)	Advances in Fuzzy Order Statistics in Data Mining Applications <i>Assoc. Prof. Dimitrios A. Karras, National and Kapodistrian University of Athens (NKUA), Greece</i>
16:25-16:40		BREAK
16:40-17:00	FSDM3310 (Invited)	Price Promotion Strategies in CPGs: A Multidimensional Fuzzy Framework to Evaluate Business Results <i>Dr. Luigi Palumbo, University of Tuscia, Italy</i>
17:05-17:25	FSDM3425 (Invited)	Prediction of Heart Disease and Classifiers' Sensitivity Analysis <i>Assoc. Prof. Khaled Mohamad Almustafa, Prince Sultan University, Saudi Arabia</i>
17:30-17:50	FSDM3564 (Invited)	AI in Healthcare: State of the Art, Current Trends and Future Possibilities <i>Prof. Tanzila Saba, Prince Sultan University, Saudi Arabia</i>
17:55-18:15	FSDM3562 (Invited)	Artificial Intelligence: Its Potential Risks upon Jobs From a Knowledge Based Perspective <i>Dr. Salem Humaidan, King Abdulaziz University, Saudi Arabia</i>
18:20-18:35	FSDM3340	Distance Metrics of D Numbers <i>Dr. Liguao Fei, Harbin Institute of Technology, China</i>

Abstracts of Oral Session 3

FSDM3569 Research on Multi-UAV Cooperative Control Based on Consistency Theory and Fuzzy Control

Lanyong Zhang

Harbin Engineering University (HEU), China

Abstract. Multi-UAV (Unmanned Aerial Vehicle) systems have been the focus of research in the military field at home and abroad in recent years. UAV combat systems have also evolved from “single-platform remote control operations” to “multi-UAV autonomous cluster operations”, supporting combat systems with the characteristics of coordination, autonomy, flexibility under uncertain tasks and environments. The report briefly introduces the development of UAVs, UAV system models, UAV autonomy levels, and UAV cooperation issues. The cooperative control principle based on consistency theory and fuzzy control is given, the cooperative control of formation and obstacle avoidance is introduced, and the cooperative control algorithm based on virtual force is constructed. A brief description of the next research plan is given.

Keywords: multi-UAV, cooperative control, consistency, fuzzy control, formation and obstacle avoidance

FSDM3465 An Improved Similarity Measure for Generalized Trapezoidal Fuzzy Numbers and Its Application on Brain Wave Classification

Zhenya Qi

Tianjin University, China

Abstract. Fuzzy methods are widely applied in decision-making problems because they are effective tools for handling imprecise and vague data. The similarity measure between generalized trapezoidal fuzzy numbers is a hot spot in fuzzy set theory. Although many methods have been put forward to measure the similarity of fuzzy numbers, there are still drawbacks and limitations in existing measures. This paper criticized previous approaches via presenting some examples. Then, a modified algorithm is proposed to calculate the center of gravity of generalized trapezoidal fuzzy numbers. Accordingly, a new similarity measure for generalized trapezoidal fuzzy numbers is introduced. This measure combines the height, the center of gravity, the perimeter, the area, and the gyradius of generalized trapezoidal fuzzy numbers. Afterwards, 16 sets of generalized trapezoidal fuzzy numbers are used to compare the proposed similarity measure with existing ones. The comparison results indicate that the proposed similarity measure can overcome the drawbacks of existing similarity measures. Finally, a hand movement imagination task is accomplished by five participants, and the proposed measure is examined in the classification of electroencephalogram (EEG) signals. The experimental results demonstrate that the proposed similarity measure has gained higher accuracy than other methods in terms of classification of EEG signals.

Keywords: generalized trapezoidal fuzzy number, center of gravity, similarity measure, EEG signals

FSDM3565 The Study of Determining the Tax Burden Depending on Production Capacity under Uncertainty

Musayev Akif Farhad

The Institute of Economics of Azerbaijan National Academy of Science (ANAS), Azerbaijan

Abstract. The country's production potential is the possibility of paying for the needs of the population and society as a whole socio-economic activity of the economic system, production of qualitative and competitive products, ensuring the development of production and demand, improving the structure of the economy. The production capacity of society - is the capacity of production of the maximum possible benefit through the full and efficient use of available resources. It is known that economic processes are naturally characterized by imprecise and uncertain relevant information. One of the main reasons is existence of an underground economy. However, in existing works, real-world imprecision and uncertainty of economic conditions are not taken into account. This paper focuses on defining the tax burden evaluation methodology that depends on production capacity, for a proportionally growing economy under uncertainty. A fuzzy integral equation is used to identify an integral tax burden taking into account the contribution of the underground economy for a certain financial (tax) year. It is also assumed that dynamics of gross domestic products are modeled by a fuzzy linear differential equation. An optimal value of tax burden is determined as a solution to the considered fuzzy integral equation.

FSDM3561 Intelligent Control of the Autonomous Dump Trucks Movement in the Quarry based on Digital Twins and Soft Computing Models

Igor O. Temkin, Sergey A. Deryabin

National University of Science and Technology, Russia

Abstract. This article discusses modern modeling technologies that open up new opportunities in solving the problem of autonomous robotized heavy dump trucks control in the open pit mine. Specific approaches to the intelligent management of transport and technological operations are mentioned while the extraction of mineral raw materials is discussed. A brief overview of methods and tools for modeling technological processes in open pit mining is given. It is proposed to use the instrumental environments of the gaming industry platforms and virtual reality systems as a toolkit for solving problems related to modeling the dynamics of autonomous mobile objects in 3D. The classes of agents introduced by us for the convenience of structuring the tasks to be solved are briefly described. The main developed functional elements and algorithms, which using fuzzy models of the intelligent control are given, as well as the generalized structure of the control system for technological processes in the quarry. The principles of operation are described, and the advantages of a particular tool for creating digital 3D models are discussed. Some results obtained in the course of the modeling of the transport cycle with the use of digital 3D model of the quarry and digital shadows of mobile objects are presented.

Keywords: intelligent control, autonomous robotized heavy dump truck, digital modeling, digital twin, soft computing, algorithms of prediction, optimization and fuzzy control

FSDM3563 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings or related journals.

FSDM3310 Price Promotion Strategies in CPGs: A Multidimensional Fuzzy Framework to Evaluate Business Results

Gianni Betti¹ and Luigi Palumbo²

¹ *University of Siena, Italy*

² *University of Tuscia, Italy*

Abstract. This research aims to provide a fuzzy and multidimensional framework for evaluating the economic outcome of price promotion strategies in the CPG market. Price promotions in the form of temporary price reductions are a relevant driver for sales in CPGs. However, the literature debates their efficacy in building long term market share. We provide a framework for testing the results of different price promotion strategies, classified according to a multidimensional fuzzy index. We tested our model on a database of reported weekly prices and promotions for pasta Brands across different retailers and NUTS1 Areas in Italy. The database has been elaborated to impute missing data and correct for reporting inconsistencies. Pricing and price promotions strategies are classified for every year across the different retailers and NUTS1 areas according to three dimensions: regular price level, temporary price reduction frequency, and temporary price reduction depth. For each dimension we designed membership functions to accommodate the membership in up to 2 adjacent categories. Different membership function approaches have been compared, using linear and non-linear methodologies to fuzzify the transition of items between membership in adjacent categories. The resulting multidimensional indexes have been used to classify the Brand strategy, using the retailers market share as a weight for aggregation on each brand. Market shares for pasta Brands have been derived empirically according to limited data available. We finally associated each Brand strategy to the change in its market share, searching for relations between strategies and their outcomes.

Keywords: fuzzy logic, consumer packaged goods, pricing, price promotion strategies, market share

FSDM3425 Prediction of Heart Disease and Classifiers' Sensitivity Analysis

Khaled Mohamad Almustafa

Prince Sultan University, Saudi Arabia

Abstract. *Background:* Heart disease (HD) is one of the most common diseases nowadays, and an early diagnosis of such a disease is a crucial task for many health care providers to prevent their patients for such a disease and to save lives. In this paper, a comparative analysis of different classifiers was performed for the classification of the Heart Disease dataset in order to correctly classify and or predict HD cases with minimal attributes. The set contains 76 attributes including the class attribute, for 1025 patients collected from Cleveland, Hungary, Switzerland, and Long Beach, but in this paper, only a subset of 14 attributes are used, and each attribute has a given set value. The algorithms used K- Nearest Neighbor (K-NN), Naive Bayes, Decision tree J48, JRip, SVM, Adaboost, Stochastic Gradient Decent (SGD) and Decision Table (DT) classifiers to show the performance of the selected classifications algorithms to best classify, and or predict, the HD cases.

Results: It was shown that using different classification algorithms for the classification of the HD dataset gives very promising results in term of the classification accuracy for the K-NN (K=1), Decision tree J48 and JRip classifiers with accuracy of classification of 99.7073%, 98.0488% and 97.2683% respectively. A feature extraction method was performed using Classifier Subset Evaluator on the HD dataset, and results show enhanced performance in term of the classification accuracy for K-NN (N=1) and Decision Table classifiers to 100% and 93.8537% respectively after using the selected features by only applying a combination of up to 4 attributes instead of 13 attributes for the predication of the HD cases. **Conclusion:** Different classifiers were used and compared to classify the HD dataset, and we concluded the benefit of having a reliable feature selection method for HD disease prediction with using minimal number of attributes instead of having to consider all available ones.

Keywords: Heart Disease (HD), prediction, classification, k-nearest neighbor, Support Vector Machine (SVM), decision tree J48, feature selection, sensitivity analysis

FSDM3564 AI in Healthcare: State of the Art, Current Trends and Future Possibilities

Tanzila Saba

Prince Sultan University, Saudi Arabia

Abstract. Artificial intelligence in healthcare has been a particularly hot research topic in recent years. Artificial intelligence has come a long way since it was first established as a field in 1956. It has been playing a critical role in industries for decades. AI has only recently begun to take a leading role in healthcare. A recent McKinsey review predicted healthcare as one of the top five industries with more than 50 use cases that would involve AI. This transformative technology is revolutionizing the health sectors in many ways, from drug development to clinical research; AI has helped improve patient outcomes at reduced costs. Numerous applications of AI such as virtual assistants, robotic assisted surgery, are well positioned to improve patient care and potentially save lives. While there is a sense of great potential in the application of AI in healthcare, there are also concerns of privacy, accuracy, data ownership, integrity, data usability about it. This talk will highlight the current applications, future innovations and possible issues of AI applications in healthcare.

FSDM3562 Artificial Intelligence: Its Potential Risks upon Jobs From a Knowledge Based Perspective

Salem Humaidan

King Abdulaziz University, Saudi Arabia

Abstract. Although Artificial Intelligence (AI) has significantly reshaped the present and the future of our lives in many ways, there are worthwhile risks regarding the potential impact of AI on different aspects. This study focused on the risks facing current jobs in different sectors. The analysis of potential risks relied on the nature of job activities in terms of repetition, routine, non-routine, complexity and creativity, in light of the dimensions of tacit knowledge, according to the tripartite model of tacit knowledge notion: intellectual abilities, physical skills, and the emotional aspect of attitudes and morals. Structured interviews were the main method for gathering primary data. Data on 20 selected jobs were reviewed and summarized and presented to a group of academic experts and

practitioners in multiple disciplines (Delphi method) to figure out the magnitude of the impact of potential risks from the inclusion of artificial intelligence upon jobs. The study resulted in four types of effected jobs, ranging from jobs with a complete displacement of workforces to save jobs in the near and long term.

Keywords: artificial intelligence, knowledge management

FSDM3340 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

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

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Session Chair: Prof. Wentao Fan, College of Computer Science and Technology, Huaqiao University, China

08:30-08:50	FSDM3406 (Invited)	The Overview of Genetic Algorithm with Tree Chromosome Structure to Identify Functions <i>Prof. Mitsukuni Matayoshi, Okinawa International University, Japan</i>
08:55-09:15	FSDM3560 (Invited)	Intelligent Acoustic Systems: Classifying Environments from the Sounds <i>Assoc.Prof. Cheng Siong Chin, Newcastle University, Singapore; Chongqing University, China</i>
09:20-09:35	FSDM3483	Mapping Property of Bilateralization and Its Application to Human-Following Robot <i>Dr. Heungju Ahn, Convergence Research Institute, DGIST, South Korea</i>
09:40-09:50	FSDM3491	A Cognitive Robotic System for a Human-Following Robot <i>Dr. Chien Van Dang, Convergence Research Institute, DGIST, South Korea</i>
09:55-10:15	FSDM2893 (Invited)	Data-driven Train Condition Recognition <i>Prof. Yan Yang, Southwest Jiaotong University, China</i>
10:20-10:35		BREAK
10:35-10:55	FSDM3309 (Invited)	Investigation on Machine Learning Method for Large Scale Building Information Modeling <i>Assoc. Prof. Manyu Xiao, Northwestern Polytechnical University, China</i>
11:00-11:15	FSDM3293	Sentiment Classification through Collaborative Multi-input and Multi-task Learning <i>Prof. Zheng Xiao, Hunan University, China</i>
11:20-11:35	FSDM3380	A Hybrid Model Combining Variational Mode Decomposition and an Attention-GRU Network for Stock Price Index Forecasting <i>Dr. Hongli Niu, University of Science and Technology Beijing, China</i>
11:40-11:55	FSDM3453	A Classification for Electronic Nose Based on Broad Learning System <i>Dr. Pengfei Jia, Southwest University, China</i>
12:00-12:15	FSDM3527	Characterizing Eating Disorder Issues on Sina Weibo <i>Ms. Jingyun Tang, Harbin Institute of Technology, China</i>
12:20-14:30		BREAK

14:30-14:45	FSDM3371	A Brief Review of Relation Extraction based on Pre-trained Language Models <i>Dr. Fu Zhang, Northeastern University, China</i>
14:50-15:10	FSDM3572 (Invited)	Smart Assistance Services based on Multisource Sensing and Data Mining in Tactile Internet <i>Prof. Dmitry Korzun, Petrozavodsk State University (PetrSU), Russia</i>
15:15-15:30	FSDM3366	A Virtual Reality Check: Covid-19 & the Challenges Facing Virtual Reality as an off-the-shelf Mainstream EdTech Solution <i>Mr. Markus Rach, Institute of Competitiveness and Communication, Switzerland</i>
15:35-15:50	FSDM3415 (Invited)	Exploring the Potential of GPT-2 for Generating Fake Reviews of Research Papers <i>Assoc. Prof. Alberto Bartoli, University of Trieste, Italy</i>
15:55-16:20	FSDM3523 (Invited)	Industry 4.0 for Food Manufacturing: A Case Study <i>Dr. Savas Konur, University of Bradford, UK</i>
16:25-16:40	FSDM3477	Stochastic Comparison of Parallel Systems with Log-Lindley Distributed Components under Random Shocks <i>Assoc. Prof. Shovan Chowdhury, Indian Institute of Management, India</i>

Abstracts of Oral Session 4

FSDM3406 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3560 Intelligent Acoustic Systems: Classifying Environments from the Sounds

Cheng Siong Chin

Newcastle University, Singapore; Chongqing University, China

Abstract. The neural networks using a combination of multiple Gated Recurrent Units (GRUs) layers in the Neural Network enhance ASC's accuracy. Due to the advantage of time sequence modelling, the GRUs can perform better class-based discrimination and mapping features. The results on the TUT Acoustic Scenes evaluation dataset demonstrates that the proposed model performs better in ASC than Long short-term memory layer. The average class-wise accuracy has shown improvement with the proposed method.

FSDM3483 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3491 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM2893 Data-driven Train Condition Recognition

Yan Yang

Southwest Jiaotong University, China

Abstract. Real time monitoring of the running status of train and detecting their hidden failures accurately have great significance. Train bogie is an important part to guarantee the safe operation of High Speed Train (HST) and the comfort of passengers. The main techniques for recognizing conditions of HST are to collect the vibration signals by mounting sensors, analyze data features and build fault diagnosis model. Deep learning, ensemble learning and multi-view learning have attracted considerable attention in recent years. In this talk, I will discuss train condition recognition with Deep Belief Networks (DBNs), Multi-view Clustering Ensemble, Multi-view Classification Ensemble, and etc.

FSDM3309 Investigation on Machine Learning Method for Large Scale Building Information Modeling

Manyu Xiao¹, Rajan Filomeno Coelho², Shaobo Tian¹ and Yu Yan¹

¹ *School of Mathematics and Statistics, Northwestern Polytechnical University, China*

² *Kabandy, 4 rue des Pères Blancs, 1040 Brussels, Belgium*

Abstract. In the global trend of digitization of all engineering fields, Building Information Modeling (BIM) has recently revolutionized the construction sector. From the initial design of a building to its

construction, operations and maintenance phases, all the data related to a construction project can now be collected and synchronized into a unified numerical model consisting in a 3D representation enriched with all useful properties (structural, thermal, budget, planning, etc.). However, a construction project being in evolution, the Level Of geometric Detail (LOD) related to all the objects of the building must constantly be checked to ensure that sufficient data are available at a given moment and for a given task. For example, to perform a structural analysis, the exact geometry of the structure including all connections and material properties, must be described in the model with sufficient accuracy. Unfortunately, this verification of LOD's for all objects cannot be easily automated with explicit rules, because of the huge number of possible geometries, the variety of objects, etc.

Therefore, in this contribution, An investigation based on machine learning is firstly proposed to classify the element, then to detect anomalies in the LOD based on geometric inputs (e.g. length, perimeter, gross area and gross volume) and additional metadata properties (e.g. is the element load-bearing or not? what is the type of the element?) extracted from the building model in the future work.

Machine learning has already been used in a few papers in both unsupervised and supervised learning, for classification or prediction tasks [1-3]. However, the main scientific challenge here lies in the mixed character of the data, i.e. continuous (geometric dimensions) but also categorical (like the type of object: beam, column, slab, roof, window, door, etc.). Mixed variables have been considered by the authors in seminal papers in mechanical and structural design [4-5]. In the current contribution, a Python program is used to decipher the BIM models (available through IFC files) for a series of complex buildings, and Three types of machine learning methods are then tested to classify and detector objects of a big BIM data. The numerical results are obtained and discussed on one practical example.

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FSDM3293 Sentiment Classification through Collaborative Multi-input and Multi-task Learning

Zheng Xiao¹, Chao Song¹, Le Wang¹, Jiayi Du²

¹ Hunan University, China

² Central South University of Forestry and Technology, China

Abstract. Through sentiment analysis, the advantages and drawbacks of things are presented to potential people to help them make better decisions. Unlike English, Chinese words are not separated by space and generally need to be segmented artificially, which has a significant impact on sentence semantics. Word segmentation is affected by many factors, such as typos, network terms and abbreviations. Texts posted on the Internet often have the aforementioned characteristics, posing great challenges to word segmentation. In addition, the existing sentiment classification data sets have multiple tags. Based on these data sets, researchers generally perform coarse-grained classification with two or three classes. Multiple tags can imply intensity information of sentimental words, which, however, is ignored by coarse-grained classification. To alleviate negative impact on word segmentation, multiple inputs are designed by simultaneously introducing character vectors and word vectors. To exploit multiple tags, multi-tasking is incorporated by combining classification tasks with regression tasks. Then a collaborative learning model is proposed to enhance binary sentiment classification. Experiment results demonstrate that our approach's macro-average f1 value of the binary classification in the data set MinChnCorp is 96.17%, which is 5 and 3.7 percentage points higher than that of the multi-model fusion LR all and the deep convolution model CCB, respectively.

Keywords: sentiment classification, multi-input, multi-task, collaborative learning

FSDM3380 A Hybrid Model Combining Variational Mode Decomposition and an Attention-GRU Network for Stock Price Index Forecasting

Hongli Niu and Kunliang Xu

School of Economics and Management, University of Science and Technology Beijing, China

Abstract. In this paper we introduce a new hybrid model based on variational mode decomposition (VMD) and Gated Recurrent Units (GRU) network improved by attention mechanism to enhance the accuracy of stock price indices forecasting. In the process of establishing the model, VMD is made a use to decompose the primary series into some almost orthogonal subsequences. The attention mechanism is introduced into GRU to assign different weights to the input elements in advance so that better predictive results can be achieved for each component. In empirical experiment, London FTSE Index (FTSE) and Nasdaq Index (IXIC) are adopted to examine the performance of VMD-AttGRU model. Empirical results report that the developed hybrid model outperforms the single models and indeed raises the accuracy of stock price indices forecasting. In addition, the introduction of attention mechanism can increase the level predictive accuracy but decrease the correctness of direction forecasting.

Keywords: variational mode decomposition, gated recurrent units, attention mechanism, forecasting, stock price

FSDM3453 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3527 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3371 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3572 Smart Assistance Services based on Multisource Sensing and Data Mining in Tactile Internet

Dmitry Korzun

Petrozavodsk State University (PetrSU), Russia

Abstract. Many digital devices (mobile or embedded) appear near people due to the Internet of Things (IoT). Such devices are sensors that enable cooperative service construction on the sensed data. A service acts as a smart assistant in the given IoT environment. Information on participants and processes become “tactual” online (close to real-time), leading to the Tactile Internet Paradigm. Tactile Internet is the next evolution of the IoT, encompassing human-to-machine and machine-to-machine interaction in services. A smart service is characterized by such intelligence properties as context-awareness, ubiquitous access, adaptation, personalization, pro-active delivery, information ranking, and others. Service intelligence can be created based on the Ambient Intelligence (AmI), where data mining methods play the key role in information fusing and knowledge extraction from the sensed multisource data. IoT environment provides multisource data and sensing possibilities. Data sources are people, information systems, Internet services, smart IoT objects, and embedded and mobile sensors. The data are fused and analyzed to derive the proper information to assist the user. The analysis is in the form of smart information services that make analytics over the sensed data primarily at the Internet edges. In this talk, we review the following open problems of construction smart assistance services based on multisource sensing and data mining in Tactile Internet.

- Services provide analytics in real-time using edge IoT devices.
- Applying AI methods to robotic movement analysis with very fast response.
- Assistance services based on event recognition in video data.
- Programming smart services for IoT environments as an information system of agents.

FSDM3366 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3415 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3523 Industry 4.0 for Food Manufacturing: A Case Study

Savas Konur

University of Bradford, UK

Abstract. Industry 4.0 is a transformation of industrial processes by utilising digital and smart technologies. When implemented, it has a huge impact on efficiency, productivity and profitability of businesses. This however requires overcoming a list of challenges. In this talk, we will present the

case of a traditional food manufacturer (a typical plant for such type of business), still using the machinery more than one hundred years old, and their move towards the Industry 4.0 technologies. We will report the challenges we have encountered during the transformation process. We will present a novel smart platform that we have developed by utilising a number of emerging technologies, e.g. Internet of Things, Machine Learning, Big Data Analytics, Cyber Physical Systems and Cloud Computing. Our platform, integrated into the company's existing production facilities, provides a novel data collection, information extraction and intelligent monitoring process, which has led to improving efficiency and consistency and reduction in operational costs. One of the significances of our approach is that the company was not required to replace old machinery outright, but rather adapted the existing machinery to an entirely new way of operating. The proposed approach can benefit similar food manufacturing industries and other industries.

Keywords: industry 4.0, smart manufacturing, food manufacturing, internet of things, artificial intelligence, machine learning, big data

FSDM3477 Stochastic Comparison of Parallel Systems with Log-Lindley Distributed Components under Random Shocks

Shovan Chowdhury

Quantitative Methods & Operations Management Area, Indian Institute of Management, Kozhikode, Kerala, India

Abstract. Here two parallel systems of heterogeneous-independent log-Lindley distributed components are compared using the concept of matrix majorization. The comparisons are carried out with respect to usual stochastic ordering when each component receives a random shock. It is proved that for two parallel systems with common shape parameter vector, the majorized matrix of the scale and shock parameters leads to better system reliability. It is also shown through counter examples that no such results exist when the matrix of shape and shock parameters of one system majorizes the same of the other.

Keywords: parallel system, stochastic order, log-lindley distribution, random shock, matrix majorization

Part V Poster Presentation

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- ✓ Research Quality
- ✓ Poster Design

Selection Procedure

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List of Posters

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FSDM3269	Classification of Unbalanced Data Based on RSM and Binomial Distribution <i>Dr. Wei-bai Zhou, Guangzhou College of Commerce, China</i>
FSDM3296	The Origin and Evolution of the Conceptual Differences between the Two Measurement Theories <i>Prof. Xiaoming Ye, Wuhan University, China</i>
FSDM3304	The Diagnosis of the Alzheimer's Disease: An Ensemble Approach <i>Prof. Yubei Lin, South China University of Technology, China</i>
FSDM3330	Output Feedback Control Synthesis and Stabilization for Positive Polynomial Fuzzy Systems Under L1 Performance <i>Dr. Aiwen Meng, Yanshan University, China</i>
FSDM3405	The Improved Algorithm of Sample Adaptive Offset Based on Visual Saliency <i>Dr. Nana Shan, Taishan University, China</i>
FSDM3407	A Pipeline Abnormal Signal Detection Method Based on 1D-Faster R-CNN <i>Mr. Zhen Zhang, Beijing University of Chemical Technology, China</i>
FSDM3408	Research on Characteristics of Chinese Herbal Medicine Compounds Based on Bisecting K-means Algorithm <i>Ms. Fenfen Xie, Qinghai University, China</i>
FSDM3409	Keyword Extraction from TV Program Viewers' Tweet based on Neural Embedding Model <i>Dr. Taiga Kiriara, Tokushima University, Japan</i>
FSDM3412	Water Quality Data Outlier Detection Method based on Spatial Series Features <i>Ms. Ya Gao, Beijing University of Technology, China</i>
FSDM3414	A Novel Regret Theory-Based Decision-Making Method Combined with the Intuitionistic Fuzzy Canberra Distance <i>Dr. Haiping Ren, Jiangxi University of Science and Technology, China</i>
FSDM3432	The Design of ERP Intelligent Sales Management System <i>Dr. Weibo Huang, Guangdong University of Foreign Studies, China</i>
FSDM3439	Estimating Observation Error Statistics Using A Robust Filter Method for Data Assimilation <i>Dr. Yue Wang, Northwest Normal University, China</i>

FSDM3452	A Consensus Optimization Model for Group Decision Making Based on Intuitionistic Fuzzy Linguistic Information <i>Ms. Xiang Li, Southwest Petroleum University, China</i>
FSDM3479	Conditional Generative Adversarial Nets for AI Music Composition <i>Assoc. Prof. Chih-Fang (Jeff) Huang, Kainan University, Taiwan, China</i>
FSDM3482	Focused Crawler Strategy Based on Improved Energy Landscape Paving Algorithm <i>Dr. Wei Zhang, University of Foreign Studies, China</i>
FSDM3487	Construction of Cloud ERP Security Evaluation Index System Based on Text Mining <i>Ms. Ying Gao, Xi'an Jiaotong University, China</i>
FSDM3488	Personalized Mobile Information Recommendation Based on Fine-grained User Behaviors <i>Mr. Xueqin Chen, Fuzhou University, China</i>
FSDM3489	Research on the Construction of Cloud ERP Ecosystem Security Evaluation Index System <i>Ms. Zhujun Wang, Xi'an Jiaotong University, China</i>
FSDM3495	An Intelligent Marshalling Model for Enterprise Station Freight Railway <i>Dr. Junxia Guo, Beijing University of Chemical Technology, China</i>
FSDM3503	Reward-free Reinforcement Learning Algorithm Using Prediction Network <i>Ms. Yimin Feng, Xiamen University, China</i>
FSDM3505	Differential Privacy Trajectory Data Protection Algorithm Based on Polar Coordinate Transformation <i>Ms. Zhenzhen Zhang, Fuzhou University, China</i>
FSDM3511	A New Approach for the Detection of Concrete Cracks Based on Adaptive Morphological Filtering <i>Mr. Huan Hou, Beijing University of Chemical Technology, China</i>
FSDM3514	The Relation of Career Adaptability to Values Realization Degree and Organizational Citizenship Behavior <i>Ms. Ruiting Tan, Sichuan University, China</i>
FSDM3526	Research on the Internal Relationship Characteristics and Their Influences of Knowledge Sharing Multilevel Network in Q&A Community <i>Dr. Xiaohui Chen, Xi'an Jiaotong University, China</i>
FSDM3549	Robust Penalized M-estimation for Function-on-Function Linear Regression <i>Mr. Xiong Cai, Beijing University of Technology, China</i>
FSDM3554	On the Construction of College Students' Automatic Job Hunting System <i>Assoc. Prof. Minchuan Huang, Guangdong Institute of Petroleum and Chemical Engineering, China</i>

Abstracts of Posters

FSDM3269 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3296 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3304 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

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FSDM3412 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3432 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3414 A Novel Regret Theory-Based Decision-Making Method Combined with the Intuitionistic Fuzzy Canberra Distance

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Abstract. In practical decision-making, the behavior factors of decision makers often affect the final decision-making results. Regret theory is an important behavioral decision theory. Based on the regret theory, a novel decision-making method is proposed for the multiattribute decision-making problem with incomplete attribute weight information, and the attribute values are expressed by Atanassov intuitionistic fuzzy numbers. At first, a new distance of intuitionistic fuzzy sets is put forward based on the traditional Canberra distance. Then, we utilize it for the definition of the regret value (rejoice) for

the attribute value of each alternative with the corresponding values of the positive point (negative point). The objective of this method is to maximize the comprehensive perceived utility of the alternative set by the decision maker. The optimal attribute weight vector is solved, and the optimal comprehensive perceived utility value of each alternative is obtained. Finally, according to the optimal comprehensive perceived utility value, the rank order of all alternatives is concluded.

FSDM3439 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3452 A Consensus Optimization Model for Group Decision Making Based on Intuitionistic Fuzzy Linguistic Information

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Southwest Petroleum University, China

Abstract. Group consensus degree is an important numerical feature to measure the acceptability of results in intuitionistic fuzzy multi-attribute group decision making. Because of the intuitiveness of fuzzy language, we often use it to describe the preference information. Intuitionistic fuzzy information can comprehensively and flexibly describe the fuzziness and uncertainty among alternatives. Therefore, it's significant to transform fuzzy language into intuitionistic fuzzy numbers and use group consensus degree to check the rationality of decision making. The first task of group decision making in intuitionistic fuzzy language is to transform fuzzy language into intuitionistic fuzzy numbers, a reasonable transformation table plays an important role in improving the effectiveness of group decision making. However, the intuitionistic fuzzy language transformation table given by experts is often used at present, which has strong subjectivity. At the same time, it is also necessary to improve the group consensus, but there is no relevant research on improving the group consensus degree through optimization methods. In this paper, we study the consensus degree based on intuitionistic fuzzy linguistic information in multiple attribute group decision making. Based on the existing intuitionistic fuzzy transformation table, we improve the degree of consensus to obtain a new intuitionistic fuzzy transformation table and make group decision-making based on the new intuitionistic fuzzy transformation table. Firstly, we define distance measures of intuitionistic fuzzy matrix and intuitionistic fuzzy consensus degree. Then, we establish the consensus optimization model, and further propose the sorting algorithms of optimization decision-making on the basis of intuitionistic fuzzy linguistic information. Finally, the algorithm is applied to the risk assessment of failure mode. The results show that :(1) the decision-making bias between two experts is reduced;(2) all experts reach consensus on the decision results;(3) the consensus degree of group decision making is improved..

Keywords: fuzzy linguistic sets, Intuitionistic fuzzy number, group consensus, multiple attribute decision making

FSDM3479 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

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FSDM3526 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

FSDM3549 To avoid repeatability issue, this abstract will be available after the full paper is published in related journals.

FSDM3554 On the Construction of College Students' Automatic Job Hunting System

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Abstract. As the tutor or class director of the e-generation college students, he always hopes to know that when the students leave school, everyone can learn and apply, and at the same time, they have found their ideal job. Fortunately, today's international community has been in the Internet era, in the network and app system, you can easily find your own employment information. Therefore, we want to make a learning and practical graduation project, which is to complete the automatic job search system for college students, to actively assist students in their urgent needs and provide the latest employment market information. The key to the feasibility and success of this automatic job search system is to actively provide the latest daily development of employment related industries and professional titles, find the job categories and salary orientation of new recruitment work from the professional recruitment website and the company's personnel recruitment and job search line, actively

broadcast to the students in school or just leaving school, and actively assist students at all levels to measure their employment intention and plan My own undergraduate course map. Because the division of job market and occupation category is more and more refined, and the demand is more and more huge, there are more and more recruitment websites. The system consists of demand analysis, overall model design, coding, system development tools selection, design pattern integration, testing and completion. The purpose of this paper is to store the position information of the recruitment website into MySQL through the crawler technology in the database; the system selects the job information that meets their own needs according to the application conditions filled in by students. The system quickly pushes the latest job information to teachers and students by email, app and SMS through the contact method selected by students, so as to help teachers, students or parents discuss and screen their ideal employment field together. The design ideas and achievements of this system are shared for all teachers and students for reference.

Keywords: job recommendation, crawler technology, MySQL, software engineering

Part VI Call for Papers for Peer Review Journals

Welcome to submit papers to the related SCI/EI indexed journals listed below:

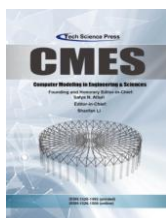


International Journal of Fuzzy Systems (IF=4.406)

Special Issue: Fuzzy Decision-Making Methods for Sustainable Developments of Industrial Engineering

ISSN: 1088-467X (Print) 1571-4128 (Online)

Indexed by: SCIE, EI Compindex, EBSCO database, Scopus, etc.



CMES-Computer Modeling in Engineering & Sciences (IF=0.805)

Special Issue: Intelligent Computing for Engineering Applications

ISSN: 1526-1492 (Print); ISSN: 1526-1506 (Online)

Indexed by: SCIE, Scopus, Engineering Index (Compindex), etc.



International Journal of Information Technology and Web Engineering (IJITWE)

Special issue: Big Data Analysis in Intelligent Decision Support Systems

ISSN: 1554-1045 EISSN: 1554-1053

Indexed by: ESCI, Compindex (Elsevier Engineering Index), SCOPUS, and others.



electronics

Electronics (IF=2.412); ISSN: 2079-9292

Special issue: Internet of Things (IoT)-Based Smart Power Grid and Systems for Future Vessels and Platforms

Indexed by the SCIE, Ei Compindex, Inspec (IET) and Scopus, etc.



mathematics

Mathematics (IF=1.747); ISSN: 2227-7390

Special issue: Computational Mathematics and Neural Systems

Special issue: Dynamics under Uncertainty: Modeling Simulation and Complexity

Indexed by the SCIE, Ei Compindex, Inspec (IET) and Scopus, etc.



symmetry

Symmetry (IF=2.645); ISSN 2073-8994; CODEN: SYMMAM

Special issue: Recent Advances in Social Data and Artificial Intelligence 2019

Special issue: Uncertain Multi-criteria Optimization Problems

Indexed by the SCIE, Ei Compindex, Inspec (IET) and Scopus, etc.

Besides, the SSCI/SCI indexed journals featuring Data Engineering, Machine Learning, and Algorithms by SAGE are calling for papers as listed below:



Scan the QR Code or click the URL to read popular articles
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Call for Papers

Journals Featuring Data Engineering, Machine Learning, and Algorithms



Big Data & Society

Impact Factor:4.577

Indexed In: SSCI, SCOPUS, DOAJ

Big Data & Society (BDS) is an open access peer-reviewed scholarly journal that publishes interdisciplinary work principally in the social sciences, humanities and computing and their intersections with the arts and natural sciences about the implications of Big Data for societies.



SAGE Open

Impact Factor:0.715

Indexed In: SSCI, SCOPUS, DOAJ,ERIC,ProQuest

SAGE Open (SGO) is a peer-reviewed, "Gold" open access journal from SAGE that publishes original research and review articles in an interactive, open access format. Articles may span the full spectrum of the social and behavioral sciences and the humanities.



International Journal of Advanced Robotic Systems

Impact Factor:1.482

Indexed In: SCIE,SCOPUS, DOAJ,EBSCO,Ei Compendex, ProQuest



Science Progress

Impact Factor:1.906

Indexed In: SCIE, SCOPUS, EBSCO,ProQuest



Advances in Mechanical Engineering

Impact Factor:1.161

Indexed In:SCIE, SCOPUS, Chemical Abstracts Service (CAS), DOAJ,EBSCO,ProQuest, TEMA Technology & Management



Measurement and Control

Impact Factor:1.492

Indexed In: SCIE,SCOPUS, DOAJ,Compendex,EBSCO, ProQuest,TEMA Technology & Management,CSA Technology Research Database



Part VII Acknowledgements

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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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