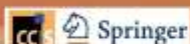


'Science in Analytics: Harnessing Data and Simplifying Solutions'
**5th INTERNATIONAL CONFERENCE
ON SOFT COMPUTING IN
DATA SCIENCE 2019**



SCDS2019
28-29 AUGUST 2019
Kyushu Institute of Technology, Japan



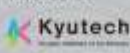
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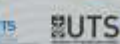
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The Fifth International Conference on Soft Computing in Data Science (SCDS 2019)

Science in Analytics: Harnessing Data and Simplifying Solutions

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YBhg. Emeritus Prof Ir Dr Mohd Azraai Kassim

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 Institute of Neo Education (iNED)
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 UiTM-PDRM Academy of Police
 Arshad Ayub Graduate Business School (AAGBS)

University Profile

Universiti Teknologi MARA (UiTM) is Malaysia's largest institution of higher learning in terms of size and population. It has experienced phenomenal growth since its inception in 1956 and it is still growing. Besides the main campus in Shah Alam, the university has expanded nationwide with 12 state campuses, 6 satellite campuses in Shah Alam, 11 state satellite campuses and 21 affiliated colleges. With this vast network and a workforce of 17,770, the university offers more than 500 academic programmes in a conducive and vibrant environment. It is also home to some 175,200 students.

To accommodate the increasing number of students, six new branch campuses were completed in 2014, namely Phase 2 of Puncak Alam Campus, Samarahan 2 Campus in Sarawak, Jasin Campus in Melaka, Pasir Gudang Campus in Johor, Seremban 3

Faculty of Computer & Mathematical Sciences



Prof. Ts. Dr. Haryani Haron
 Dean

Postgraduate (Research)

Doctor of Philosophy (Computer Science)
 Doctor of Philosophy (Information Technology)
 Doctor of Philosophy (Mathematics)
 Doctor of Philosophy (Statistics)
 Doctor of Philosophy (Decision Science)
 Doctor of Philosophy (Actuarial Science)
 Master of Science (Computer Science)
 Master of Science (Information Technology)
 Master of Science (Mathematics)
 Master of Science (Statistics)
 Master of Science (Decision Science)
 Master of Science (Actuarial Science)

Postgraduate (Coursework)

Master of Science in Applied Statistics
 Master of Computer Science
 Master of Science in Computer Networking
 Master of Computer Science in Language Computing Technology
 Master of Computer Science (Web Technology)
 Master of Information Systems (Intelligent Systems)
 Master of Science in Strategic Information System with Business Management
 Master of Science in Information Technology
 Master of Quantitative Sciences
 Master of Science in Applied Mathematics
 Master of Data Science

Undergraduate

Bachelor of Computer Science (Hons)
 Bachelor of Information Technology (Hons)
 Bachelor of Science (Hons) Statistics
 Bachelor of Science (Hons) Actuarial Science
 Bachelor of Information Technology (Hons) Intelligent System Engineering
 Bachelor of Information Technology (Hons) Business Computing
 Bachelor of Computer Science (Hons) Data Communication & Networking
 Bachelor of Information Technology (Hons) Information System Engineering
 Bachelor of Science (Hons) Computational Mathematics
 Bachelor of Science (Hons) Management Mathematics
 Bachelor of Science (Hons) Mathematics
 Bachelor of Computer Science (Hons) Netcentric Computing
 Bachelor of Computer Science (Hons) Multimedia Computing
 Diploma in Computer Science
 Diploma in Statistics
 Diploma in Actuarial Science
 Diploma in Mathematical Sciences

Faculty Background

Founded in 1966, the Faculty of Computer and Mathematical Sciences (FSKM), UiTM, currently offers BSc, MSc. and Ph.D. degrees through its seven academic centres; Computer Science, Computer Technology and Networking, Information System, Information Technology, Mathematics, Statistics, Decision Science, and Actuarial Science. The purpose of these programs is to prepare students with a general background in their respective areas of specialization and to equip them with the relevant knowledge and skills by using the state-of-the-art technology to meet the rapidly changing demands of a modern society. With the emergence of current technologies, FSKM has introduced courses related to Big Data Analytics (BDA) in Bachelor and Master programs. In keeping with the university's mission, this faculty is committed in providing high quality programs of study with inputs from industry experts.

After more than 40 years of existence, FSKM has grown beyond expectations. Since its inception, we have improved tremendously in terms of our number of faculty staffs who are well qualified, experienced and caring. Our strength lies in our passion for teaching as the success of students remains strong in our vision. We are mission focused although our student body is remarkably diverse. This is one of our unique challenges in providing an education par excellence.

Message from the Vice Chancellor



To all respected guests, esteemed keynote speakers, paper presenters and participants, welcome to The 5th International Conference on Soft Computing in Data Science 2019 (SCDS 2019). This year's annual conference is proudly organised by the Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA (UiTM). I am pleased to say that the success of this year's event is due to the collaboration with several reputable universities in the region, and this year's SCDS2019 is hosted by Kyushu Institute of Technology, Iizuka, Japan.

Events such as the SCDS 2019 are crucial in promoting impactful partnerships between the academic and industry world. They are also vital to encourage a more inclusive dialogue on a global scale. In this 21st century, it is undeniable that the roles of universities go beyond teaching and the emphasis is now on researching which influence the global society and economy. Hence, it is critical for universities to work hand in hand with the industry in order to provide technological advancements especially in the area of Big Data Analytics (BDA). These advancements have expanded opportunities in various ways such as niche marketing strategies, emergence of new career paths and highly efficient process-flow on an industrial scale. By harnessing data through the use of sophisticated technologies, universities can create, enhance and mobilise the transformative power of higher education through inventive teaching and learning experience, and producing graduates who can innovate and design solutions for real world problems.

With the availability of infinite data, invaluable knowledge and hidden gems are accessible. Thus, it is essential that researches representing different disciplines explore the opportunities and the future of BDA. Hence, we proudly present to you this esteemed conference, themed **Science in Analytics: Harnessing Data and Simplifying Solutions**. Keynote speakers, paper presenters and participants will share their insightful thoughts on the headed path of Data Science with both

scholars and industry experts. I am optimistic that this two-day event will provide opportunities for more multi-disciplinary collaborations which will intensify impactful research.

On that note, I would like to congratulate the Faculty of Computer and Mathematical Sciences, UiTM, as well as Kyushu Institute of Technology, Japan specifically its Department of Computer Science and Electronics, for co-hosting this conference and for all the assistance rendered in making this event a success. I would also like to express my appreciation to all our sponsors for being on board with UiTM in this scholastic journey. To everyone, I wish you a rewarding and fulfilling experience at SCDS 2019. May you move forward with strategic collaborations and bring forth innovative ideas for the benefit of the global community.

Emeritus Professor Ir Dr Mohd Azraai Kassim
Universiti Teknologi MARA

Message from the Dean



Assalamu'alaikum Warahmatullahi Wabarakatuh and warm greetings to everyone.

First and foremost, I wish a warm welcome to all keynote speakers, and delegates to The 5th International Conference on Soft Computing in Data Science (SCDS 2019) themed **"Science in Analytics: Harnessing Data and Simplifying Solutions"**. SCDS 2019 focuses on the importance of Big Data Analytics in this data driven economy era. This year we are grateful to have Kyushu Institute of Technology, Iizuka, Japan for co-hosting this conference. This conference has attracted speakers and participants from various countries, including Japan, Korea, France, Thailand, Indonesia, China, South Africa and Malaysia.

The intention of today's conference is to provide a far-reaching platform for knowledge sharing and technical skills building on Big Data Analytics. These knowledge and skillsets are very much needed in disciplines such as bio-informatics, medical and health informatics, social sciences, manufacturing, economics, business and finance.

I would like to express my utmost appreciation to Professor Mario Köppen who has shown great commitment in organizing SCDS 2019, We are extremely grateful for your great efforts in preparing the venue for the conference and ensuring the success of SCDS 2019. I hope that this joint-effort in co-hosting an international conference will strengthen the good relations between the two universities.

I am also very happy with the continuous support from Professor Dr Michael W. Berry, University of Tennessee, USA. I also would like to thank our Keynote Speakers: Professor Dr Hideyuki Takagi, Professor Dr Daud Mohamad, Professor Dr Sri Hartati and Professor Dr Layth Sliman for taking time off their busy schedules to come and share with us their knowledge and experience which I am sure will benefit the conference participants.

Through this conference we have increased our international strategic partners. I would like to thank Kyushu Institute of Technology, Iizuka, Japan; Fuzzy Logic Systems Institute; University of Tennessee, USA; Universitas Gadjah Mada, Indonesia; Chulalongkorn University, Thailand; Liverpool John Moores University, UK; Institut Teknologi Sepuluh Nopember, Indonesia; Data Analytics and Collaborative Computing Group, University of Macau, China; and University of Technology Sydney, Australia for their support and being great academic partners in the diverse forms of scholastic endeavours. I also thank the Advanced Analytics Engineering Centre (AAEC) of FSKM for organizing this conference annually and establishing international collaborations.

My heartfelt gratitude goes to MDEC (Malaysia Digital Economy Corporation) for their support and sponsorship since the first SCDS conference in 2015. My sincere appreciation also goes to MGV Energy Sdn Bhd, Quandatics (M) Sdn Bhd and Department of Statistics Malaysia for the conference sponsorship and materials. Last but not least, I would like to thank the conference joint-organizing committees from Universiti Teknologi MARA, Malaysia and Kyushu Institute of Technology, Iizuka, Japan who have shown great commitment and fantastic team efforts in ensuring that SCDS 2019 will be an unforgettable event for all participants.

I wish all of you a delightful and fruitful time in SCDS 2019 and I look forward to your participation in SCDS 2020.

**Professor Ts Dr Haryani Haron
Faculty of Computer and Mathematical Sciences
Universiti Teknologi MARA**

Message from the Conference Chairs



On behalf of Universiti Teknologi MARA (UiTM) and Kyushu Institute of Technology (KYUTECH), we would like to extend a warm welcome to all our honourable guests, keynote speakers and participants of The 5th International Conference on Soft Computing in Data Science 2019 (SCDS 2019) with the theme “Science in Analytics: Harnessing Data and Simplifying Solutions”. The success of the SCDS 2015, SCDS 2016, SCDS 2017, and SCDS2018 motivated the organizing of SCDS 2019 in Ilzuka, Japan.

SCDS 2019 continues to provide a platform for knowledge sharing on leading edge analytical methods and also addressing challenges, problems and issues in Big Data Analytics. We highly appreciate the great support from MDEC (Malaysia Digital Economy Corporation), Quandatics (M) Sdn Bhd, MGV Energy Sdn Bhd, Department of Statistics Malaysia, and FLSI (Fuzzy Logic Systems Institute). We also thank all Honorary Chairs and International Scientific Committee for your support and commitment in working with UiTM and KYUTECH to be in the frontiers of advancing knowledge in Data Science and Big Data Analytics. We hope to have strategic partnership with universities and industries to strengthen our BDA initiatives and actualize academic and research collaborations for the good of the university, industries and community.

We are proud and happy to have four distinguished experts as our keynote speakers: Professor Dr Hideyuki Takagi (Kyushu University, Japan), Professor Dr Layth Sliman (EFREI, France), Professor Dr Sri Hartati (Universitas Gadjah Mada, Indonesia), and Professor Dr Daud Mohamad (Universiti Teknologi MARA, Malaysia). We hope that the keynote sessions will add value to your knowledge and career and may you establish further collaborations with our Keynote Speakers.

We are delighted that this year, UiTM-KYUTECH joint collaboration has increased the paper submissions from a diverse group of researchers. We received 75 paper submissions, among which 30 were accepted. We would like to thank Professor Dr Michael W. Berry and Professor Dr Azlinah Hj. Mohamed for their contributions as editors of SCDS 2019 proceedings which will be published by Springer in the Communications in Computer and Information Science series. We gratefully

acknowledge the wonderful support provided by all the technical reviewers who generously sacrifice their time for reviewing the papers.

We greatly appreciate the dedicated support of our SCDS 2019 committees from both universities who have worked tirelessly to ensure a successful conference. We highly appreciate all those who have contributed directly or indirectly to the success of SCDS 2019.

Last but not least, we wish everyone an enjoyable and memorable experience at SCDS 2019 and in Iizuka, Japan.

Thank you.

**Professor Dr Yap Bee Wah & Professor Dr Mario Köppen
Conference Chairs**

Introduction to SCDS 2019

In conjunction with the 25th Anniversary of IIZUKA'94, the first Soft Computing we welcome you to participate in The Fifth International Conference on Soft Computing in Data Science (SCDS) 2019 at Centre of Iizuka Research and Development, Iizuka, Japan from 28-29 August 2019. SCDS 2019 is jointly organized with Kyushu Institute of Technology, Iizuka, Japan. The theme of the conference is 'Science in Analytics: Harnessing Data and Simplifying Solutions'.

Big Data and digital technology empowers an enterprise to leverage on data and technology for innovative solutions, better data-driven decision and strategic planning for their business growth. Data analysis and automation help companies not only to survive but thrive in the future. Thus, demand is growing for data professionals and universities play an important role in ensuring that students have the knowledge and skills for the jobs in industries which are facing the fourth industrial revolution. The world is moving towards automation, cloud computing, cognitive computing, quantum computing and artificial intelligence.

SCDS 2019 has invited renowned keynote speakers to share their knowledge and experience in the area of soft computing in data science. The conference topics include but are not limited to big data capture and storage; information and customer analytics; sentiment and text analytics, data visualization; image processing; data mining tools and techniques; big data technologies; computational intelligence; machine learning and deep learning algorithms for big data.

Keynote Speakers

Keynote Speaker 1: Professor Dr. Daud Mohamad

Universiti Teknologi MARA, Malaysia



Z-Number in the Evolution of Fuzzy Logic

Abstract

The concept of fuzzy logic introduced by Zadeh in 1965 has changed the views of many in looking at the computing theory. The term “Computing with Words” (CWW) has become a new jargon for the next generation of artificial intelligence where now uncertainties are now possibly represented in the form of a natural language using fuzzy logic. It extends the manipulation of measurement which normally in numbers and symbols to the manipulation of perception. In 2012, Zadeh coined another new concept known as the Z-number to facilitate the theoretical advancement of the CWW that incorporate the reliability factor. By definition a Z-number is an ordered pair of fuzzy numbers (A,B) associated with variable X where A representing the restriction on the value of X can take and B measures the reliability or certainty of A. The Z-number is considered to have the highest level of generality of uncertain computation and it opens a new horizon to the construction of better models of reality. The Z-number is envisaged to play a dominant role in shaping the future of computing. In this presentation, we will discuss on the historical development of fuzzy logic until the birth of the Z-number concept and the existing applications of Z-number. We will also present some possible directions of its theoretical development and applications.

Biography

Daud Mohamad is a Professor in Mathematics at the Universiti Teknolgi MARA, Malaysia where he has joined the institution since 1986. He obtained his secondary education at the MARA Junior Science College, Kuantan before pursuing his Bachelor Degree in Mathematics at the University of Tasmania, Australia in 1990. He received his Master degree in Mathematics from the Universiti Kebangsaan Malaysia in 1993 and further his study to PhD level at the University of Swansea, Wales, United Kingdom in 1995 and completed it in 1999 specializing in the area of geometric function theory. He is the Vice President of the Malaysian Mathematical Sciences Society since 2015 and a member of the American Mathematical Society since 2008. His current interest in research is in the area of fuzzy mathematics and fuzzy logic, in particular in the area of fuzzy decision making. He has published and presented more than 100 papers related to fuzzy mathematics and geometric function theory.

Keynote Speaker 2: Professor Hideyuki Takagi

Kyushu University, Japan



Soft Computing Approaches to Knowledge Handling

Abstract

We introduce (1) knowledge acquisition and knowledge compilation using fuzzy systems (FS), neural networks (NN), and evolutionary computation (EC), (2) interactive evolutionary computation (IEC) to optimize target systems based on IEC user's knowledge, experiences, and preferences together with a computer and (3) knowledge acquisition in human science by analysing the target system optimized by an IEC user.

FS, NN, and EC are three major techniques of Soft Computing, and they have used to extracted explicit knowledge from data using FS+NN and FS+EC framework since late 1980's using explicit knowledge expressions of IF-THEN fuzzy logic rule structures and NN learning capability or EC optimization algorithms. Especially, this approach is effective when we have partial knowledge of the target data or systems; we express our partial a priori knowledge in IF-THEN fuzzy logic rules as a skeletal structure, and detail parts of the rules are adjusted using NN.

IEC is a cooperation framework of a human and a computer, and EC in a computer optimizes a target system based on human subjective evaluations which are further based on his/her knowledge, experiences, and preferences. When we can measure system performance, we can use classical optimization techniques without a human. However, there are many tasks that computer cannot measure how the target systems are good or bad, such as hearing-aid fitting, design of robot's cute or funny motions, and others. In such cases, IEC provides a framework that we can embed our evaluations based on our knowledge, experiences, and preferences.

By analysing the system optimized by an IEC user, we may be able to obtain his/her information that are a key of his/her IEC evaluations for the system. This is a new approach for human science. We show examples of this approaches including

measuring psychological dynamics of mental patients and obtaining new knowledge of hearing.

Biography

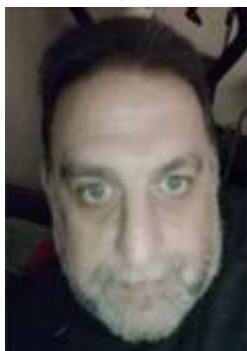
Hideyuki TAKAGI received the degrees of Bachelor and Master from Kyushu Institute of Design in 1979 and 1981, and the degree of Doctor of Engineering from Toyohashi University of Technology in 1991. He was a researcher at Panasonic Central Research labs in 1981 - 1995, was an Associate Professor of Kyushu Institute of Design in 1995 - 2003, and is a Professor of Kyushu University now. He was a visiting researcher at UC Berkeley in 1991-1993 hosted by Prof. L. A. Zadeh.

He had worked on neuro-fuzzy systems in 1987 - early 1990's and extended his interests to fusing neuro-fuzzy-genetic algorithms and human factors. Now, he aims Humanized Computational Intelligence and is focusing on interactive evolutionary computation (IEC) as a tool for this research direction and developing methods for enhancing evolutionary computation. The number of citations of the most cited his IEC paper is around 1,500 times, and his well cited papers can be found at Google Scholar Citations.

He has been a volunteer for IEEE Systems, Man, and Cybernetics (SMC) Society. Some of his contributions are: Vice President in 2006 - 2009: a member of Administrative Committee/Board of Governors in 2001 - 2010, and 2016 - 2018: Chair of SMC Japan Chapter in 2014 - 2017 and a Vice-Chair in 2018 - 2019: Technical Committee (TC) Coordinator in 2004 - 2005: Chair of TC on Soft Computing in 1998 - 2004 and since 2008: Distinguished Lecturer in 2006 - 2011: Associate Editor of IEEE Transactions on SMC, Part B / Cybernetics since 2001.

Keynote Speaker 3: Professor Layth Sliman

**French Engineering School of Information Science and Technology EFREI,
Paris, France**



Towards Blockchain-Based Collaborative Enterprise

Abstract

Nowadays, we witness the emergence of new collaborative business models such as virtual market places, sharing economy, Remote Fabrication and distributed supply chain. This has been geared by the rise of new IT technologies, namely Internet of Things technologies and cloud computing.

Despite the advantages of these scenarios, managing security and trust are major obstacles that should be studied to spread the collaboration intensive business.

One of the most promising technologies that can overcome these obstacles is distributed ledger technology. Distributed ledger technology e.g. Blockchain is a technology that provides a decentralized “database” on a network that is scalable, secure, tamper-proof, and accessible by each peer on the network. However, distributed ledger technologies are basically designed for financial application. Consequently, these technologies are, so far, not adapted to the development and the execution of collaborative business process necessary to meet business needs. In this talk, I will try to answer the questions: how to enable distributed ledger based infrastructures so that they can meet collaborative business needs? What are the fundamental obstacles in the current distributed ledger technologies state that hinder the support of the business collaboration? At what levels in distributed ledger architecture the changes are needed?

Biography

Completed his Diploma in Computer Engineering. Then he obtained his masters in Computer Science (Information systems) in INSA Lyon-France and then his Phd from INSA Lyon, in collaboration with the University of the Ryukyus, Japan. In 2003, he underwent training in Development and Implementation program in Computer Software Applications in CMC-TATA, New Delhi, India. In the same year, he also underwent another training in Information and Communication Technologies in MEIO University and Okinawa International Center, Japan.

In 2008, 2009 2010, 2012, 2013 and 2014 he did many research stays on Digital Rights Management and image processing in the University of the Ryukyus and Ritsumeikan University - Japan. During the period 2000-2010, he worked as lecturer and assistant professor, did his research and taught Computer Engineering and Information Systems in many universities including INSA, Lyon, the University of the Ryukyus in Japan, Beijing University of Technology, South China University of Technology China, and the Institute of Visual Informatics in Malaysia.

Since September 2010 he is associate professor in EFREI, a French engineering school located in Paris. He is a research fellow in many international institutes. His main topic is Collaborative Information Systems. This involves many topics including Web 2.0, IS Architecture, IoT Security, Cloud Computing, SaaS, Semantic Web and semantic SOA.

He delivered many talks and seminars on the subject of Blockchain in France, Italy, Japan, and Spain. He has chaired and or organized more than 10 international conferences. This include 27th IEEE WETICE, 25th IEEE WETICE, SOCPAR2017 (LNCS), IAS2017 (LNCS), 13th IAS (LNCS), IBICA2017(LNCS), 10th IFIP NTMS2019, 9th NTMS18, 6th NTMS15, 14th ISDA(IEEE), and 10th IAS(IEEE).

Keynote Speaker 4: Professor Dr. Sri Hartati

Universitas Gadjah Mada, Indonesia



Soft Computing in Healthcare System

Abstract

Medical science and engineering have been using various medical systems such as medical imaging devices, medical testing devices, and medical information systems. With those systems, patients' information has been collected every day and accumulated in various medical institutions. Also, the medical systems generate high-dimensional, multimodal, and huge data. In order to analyze such big data efficiently, image processing, signal processing and data mining play important roles for computer-aided diagnosis (CAD) and monitoring. Soft computing approaches especially plays a fundamental role in the analysis of such medical data because of the ambiguity of human data. In this talk, some opportunities and challenges in soft computing approaches for healthcare analytics and delivery are highlighted. An example of how some of these methods that can contribute to clinical decision-making will be presented, such as its application to the development of a referral system.

Biography

Dr. Sri Hartati is Professor in the Department of Computer Science and Electronics at Universitas Gadjah Mada, Indonesia. Her current research interests are soft computing approaches for medical informatics, medical informatics analysis methods and soft computing for education and social sciences. Her research group combines experimental and medical informatics analysis methods and soft computing to understand how abnormalities / diseases can be screened or detected.

Conference Schedule

Day 1: 28 August 2019 (Wednesday)

Venue: Center of Iizuka Research and Development, Iizuka

Time	Activities
8:00 - 8:30 am	Registration
9:00 - 9:15 am	Welcome Speech Professor Dr Mario Köppen & Professor Dr Yap Bee Wah Conference Chair
9:15 - 9:30 am	Opening Remarks Professor Ts Dr Haryani Haron Dean Faculty of Computer and Mathematical Sciences, UiTM
9:30 – 9:45 am	Welcoming Remarks Professor Dr Seiji Kajihara Dean Department of Computer Science and Electronics Kyushu Institute of Technology, Iizuka, Japan
9:45 – 9:55 am	Exchange of Souvenirs between UiTM and Kyutech
9:55 – 10:00 am	Photography Session
10:00 - 10:30 am	Tea Break
10:30 - 11:15 am	Keynote Speech 1 Z-number in the Evolution of Fuzzy Logic Professor Dr Daud Mohamad Universiti Teknologi MARA, Malaysia
11:15 - 11:30 am	Q & A
11:30 - 12:15 pm	Keynote Speech 2 Soft Computing Approaches to Knowledge Handling Professor Dr Hideyuki Takagi Kyushu University, Japan
12:15 - 12:30 pm	Q & A
12:30 - 2:00 pm	Lunch Break

2:00 – 3:00 pm	<i>Paper presentations (Session 1)</i> Track: Information and Customer Analytics SCDS2019 Conference Hall
	<i>Paper presentations (Session 2)</i> Track: Visual Data Science Seminar Room
3:00 - 3:30 pm	Tea Break
3:30 – 5:00 pm	<i>Paper presentations (Session 3)</i> Track: Machine and Deep Learning SCDS2019 Conference Hall
	<i>Paper presentations (Session 4)</i> Track: Big Data Analytics Seminar Room
6.30 – 8.30 pm	Conference Dinner

Day 2: 29 August 2019 (Thursday)

Venue: Center of Iizuka Research and Development, Iizuka

Time	Activities
8:00-8:30am	Registration
9:00 - 9:45 am	<p>Keynote Speech 3 Towards Blockchain-Based Collaborative Enterprise</p> <p>Professor Dr Layth Sliman French Engineering School of Information Science and Technology EFREI, Paris, France</p>
9:45-10:00 am	Q & A
10:00 -10:45 am	<p>Keynote Speech 4 Soft Computing in Healthcare System</p> <p>Professor Dr Sri Hartati Universitas Gadjah Mada, Indonesia</p>
10:45- 11:00 am	Q & A
11:00 - 11:30 am	Tea Break
11:30 - 1:00 pm	<p><i>Paper presentations (Session 5)</i> Track: Computational Intelligence & Artificial Intelligence SCDS2019 Conference Hall</p>
1:00 - 2:00 pm	Lunch Break
2:00-3:30 pm	<p><i>Parallel Paper presentations (Session 6)</i> Track: Social Network and Media Analytics SCDS2019 Conference Hall</p>
4:00 - 5:00 pm	<p>Best Paper Awards Closing</p>

Paper Presentations Schedule

Track: Information and Customer Analytics				
Venue : SCDS2019 Conference Hall Date : 28 August 2019 (Wednesday) Session 1 : 2:00 pm –3:00 pm Session Chair : Assoc. Prof. Dr Shuzlina Abd Rahman				
NO	TIME	ID	TITLE	AUTHORS
1.	2.00 pm – 2.15 pm	1570564259	Entropy Analysis of Questionable Text Sources by Example of the Voynich Manuscript	Natsuki Kouyama; Mario Köppen
2.	2.15 pm – 2.30 pm	1570564285	Decision Tree: Customer Churn Analysis for a Loyalty Program using Data Mining Algorithms	Angela Siew-Hoong Lee; , Ng Claudia; Zuraini Zainol; Khin-Whai Chan
3.	2.30 pm – 2.45 pm	1570559284	Improving e-Commerce Severity Rating Measurement using Consistent Fuzzy Preference Relation	Tenia Wahyuningrum; Azhari Azhari; Suprpto
4.	2.45 pm – 3.00 pm	1570569746	A Case Study of Customers' Payment Behaviour Analytics On Paying Electricity With RFM Analysis And K-Means	Fakhrul Hazman Yusoff; Nur Liyana Asyiqin Rosman

Track: Visual Data Science

Venue : Seminar Room

Date : 28 August 2019 (Wednesday)

Session 2 : 2.00 pm – 3:00 pm

Session Chair : Dr Suhartono

NO	TIME	ID	TITLE	AUTHORS
1.	2.00 pm – 2.15 pm	1570560543	Amniotic Fluid Segmentation by Pixel Classification in B-Mode Ultrasound Image for Computer Assisted Diagnosis	Desiana Wulaning Ayu; Sri Hartati; Aina Musdholifah
2.	2.15 pm – 2.30 pm	1570560688	Machine Learning Assisted Medical Diagnosis for Segmentation of Follicle in Ovary Ultrasound	Eliyani Eliyani; Sri Hartati; Aina Musdholifah
3.	2.30 pm – 2.45 pm	1570563792	Malaysian Budget Visualization using Circle Packing	Nur Atiqah Sia Abdullah; Nursyahira Zulkeply; Zainura Idrus
4.	2.45 pm – 3.00 pm	1570564223	An Overview of Visualization Techniques: A survey of Food-Related Research	Nurfarah Mazarina Mazalan; Zainura Idrus; Nur Atiqah Sia Abdullah; Zaidah Ibrahim

Track: Machine and Deep Learning

Venue : SCDS2019 Conference Hall

Date : 28 August 2019 (Wednesday)

Session 3 : 3:30 pm – 4:30 pm

Session Chair : Dr Supphachai Thaicharoen

NO	TIME	ID	TITLE	AUTHORS
1.	3:30 pm – 3:45 pm	1570561610	A Hybrid TSR and LSTM for Forecasting NO2 and SO2 in Surabaya	Suhartono; Hendri Prabowo; Soo-Fen Fam
2.	3:45 pm – 4:00 pm	1570574389	Evaluation of Pooling Layers in Convolutional Neural Network for Script Recognition	Zaidah Ibrahim; Dino Isa; Zainura Idrus; Zolidah Kasiran; Rosniza Roslan
3.	4:00 pm – 4:15 pm	1570568304	Predictive Model of Graduate-On-Time using Machine Learning Algorithms	Nurafifah Mohammad Suhaimi; Shuzlina Abdul-Rahman; Sofianita Mutalib; Nurzeatul Hamimah Abdul Hamid; Ariff Md Ab Malik
4.	4:15 pm – 4:30 pm	1570561617	New Hybrid Statistical Method and Machine Learning for PM10 Prediction	Suhartono; Hendri Prabowo; Dedy Dwi Prastyo; Muhammad Hisyam Lee

Track: Big Data Analytics

Venue : Seminar Room

Date : 28 August 2019 (Wednesday)

Session 4 : 3:30 pm – 5:00 pm

Session Chair : : Dr Retantyo Wardoyo

NO	TIME	ID	TITLE	AUTHORS
1.	3:30 pm – 3:45 pm	1570561054	B-Spline in the Cox Regression with Application to Cervical Cancer	Jerry Dwi Trijoyo Purnomo; Santi Wulan Purnami; Sri Mulyani
2.	3:45 pm – 4:00 pm	1570560985	Multilevel Logistic Regression and Neural Network- Genetic Algorithm for Modeling Internet Access	Wahyu Wibowo; Shuzlina Abdul-Rahman; Nita Cahyani
3.	4:00 pm – 4:15 pm	1570571998	A Case Study on Student Attrition Prediction in Higher Education using Data Mining Techniques	Syaidatus Syahira Ahmad Tarmizi ¹ Sofianita Mutalib ¹ Nurzeatul Hamimah Abdul Hamid ¹ Shuzlina Abdul Rahman ¹ Ariff Md Ab Malik
4.	4:15 pm – 4:30 pm	1570561381	The Use of Hybrid Information Retrieve Technique and Bayesian Relevance Feedback Classification on Clinical Dataset	Fatihah Mohd; Masita Abdul Jalil; Noor Maizura Muhamad Noor; Suryani Ismail; Zainab Abu Bakar

5	4:30 pm – 4:45 pm	1570569457	An Experience Report on Building a Big Data Analytics Framework Using Cloudera CDH and RapidMiner Radoop with a Cluster of Commodity Computers	Sittiporn Kunnakorntammano p; Netiphong Thepwuttisathaphon; Supphachai Thaicharoen
6	4:45 pm – 5:00 pm	1570560891	Multi-stage Clustering Algorithm for Energy Optimization in Wireless Sensor Networks	Israel Edem Agbehadji; Richard C. Millham; Simon James Fong; Jason J. Jung; Khac-Hoai Nam Bui; Abdultaofeek Abayomi

Track: Computational Intelligence & Artificial intelligence

Venue : SCDS2019 Conference Hall

Date : 29 August 2019 (Thursday)

Session 5 : 11.30 am – 1:00 pm

Session Chair: Professor Dr Layth Sliman

NO	TIME	ID	TITLE	AUTHORS
1.	11.30 pm – 11.45 pm	1570565105	Case Based Reasoning for Diagnosing Types of Mental Disorders and Their Treatments	Sri Mulyana; Sri Hartati; Retantyo Wardoyo
2.	11.45 pm – 12.00 pm	1570561074	Study of Score Fusion and Quality Weighting in the Bio-Secure DS2 Database	Saliha Artabaz; Layth Sliman
3.	12.00 pm – 12.15 pm	1570560190	Arabic Phonemes Recognition Using Convolutional Neural Network	Irwan Mazlin; Zan Azma Nasruddin; Wan Adilah Wan Adnan; Fariza Hanis Abdul Razak
4.	12.15 pm – 12.30 pm	1570561115	Forecasting the Search Trend of Muslim Clothing in Indonesia on Google Trends Data using ARIMAX and Neural Network	Novri Suhermi; Suhartono; Regita Putri Permata; Santi Puteri Rahayu
5.	12.30 pm – 12.45 pm	1570563387	Convolutional Neural Network Application in Smart Farming	Yudhi Adhitya; Setya Widyawan Prakosa; Mario Köppen; Jenq-Shiou Leu
6	12:45 pm – 1:00 pm	1570572917	Comparison of Artificial Neural Network (ANN) and Other Imputation Methods in Estimating Missing Rainfall Data at Kuantan Station	Nur Afiqah Ahmad Norazizi; Sayang Mohd Deni

Track: Social Network and Media Analytics

Venue : SCDS2019 Conference Hall

Date : 29 August 2019 (Thursday)

Session 6 : 2.00 pm – 3.30 pm

Session Chair : Assoc. Prof. Dr Norhaslinda Kamaruddin

NO	TIME	ID	TITLE	AUTHORS
1.	2.00 pm – 2.15 pm	1570553947	Anonymized User Linkage Under Differential Privacy	Chao Kong; Hao Li; Haibei Zhu; Yu Xiu; Jianye Liu; Tao Liu
2.	2.15 pm – 2.30 pm	1570560009	Context Enrichment Model Based Framework for Sentiment Analysis	Nor Nadiah Yusof; Azlinah Mohamed; Shuzlina Abdul- Rahman
3.	2.30 pm – 2.45 pm	1570560080	2019 Thai General Election: A Twitter Analysis	Chamemee Prasertdum; Duangdao Wichadakul
4.	2.45 pm – 3.00 pm	1570560091	Science Lab Repository Requirements Elicitation based on Text Analytics	Norhaslinda Kamaruddin; Abdul Wahab Abdul Rahman; Mohammad Bakri; Muhammad Hamiz
5.	3.00 pm – 3.15 pm	1570572933	A Gillespie Algorithm and Upper Bound of Infection Mean on Finite Network	Sapto Wahyu Indratno; Yeftanus Antonio
6.	3.15 pm – 3.30 pm	1570561021	Sentiment Analysis in Social Media Based on English Language Multilingual Processing Using Three Different Analysis Techniques	Nor Saradatul Akmar Zulkifli; Allen Lee Wei Kiat

Proceeding Abstracts

Track: Information and Customer Analytics

NO	ID	TITLE	AUTHORS
1.	1570564259	Entropy Analysis of Questionable Text Sources by Example of the Voynich Manuscript	Natsuki Kouyama; Mario Köppen
2.	1570564285	Decision Tree: Customer Churn Analysis for a Loyalty Program using Data Mining Algorithms	Angela Siew-Hoong Lee; Ng Claudia; Zuraini Zainol; Khin-Whai Chan
3.	1570559284	Improving e-Commerce Severity Rating Measurement using Consistent Fuzzy Preference Relation	Tenia Wahyuningrum; Azhari Azhari; Suprpto
4.	1570569746	A Case Study of Customers' Payment Behaviour Analytics On Paying Electricity With RFM Analysis And K-Means	Fakhrul Hazman Yusoff; Nur Liyana Asyiqin Rosman

Entropy Analysis of Questionable Text Sources by Example of the Voynich Manuscript

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Abstract. The Voynich Manuscript(referred to as 'VMS') can be considered as one of the oldest puzzles which remained unsolved until now. While some say VMS is genuine, others say that it is just a hoax. In this research, we propose three methods to analyze VMS and verify the effectiveness of them. The reason for using this manuscript is that no one on this planet knows the meaning of the text of VMS, so we can tackle research without being biased. We analyze from the viewpoint of character frequency and entropy of VMS. Statistical analysis of word frequency already exists, in contrast, we adopt analysis based on a character unit. In that respect, there is diversity from other research. We stated the following three hypotheses as H1 through H3. H1: VMS is a Ciphertext. H2: VMS is close to a programming language. H3: VMS is close to a natural language. The experimental results demonstrate that our methods are valid and efficient. The methods can be applied to all text sources and different classes of them can be distinguished. The possibility that VMS is likely a Ciphertext can be rejected. This mysterious manuscript can be concluded as a meaningful human art, not a hoax. Moreover, the VMS is not encrypted. (However, we are not able to exclude being encoded.)

Keywords: Voynich Manuscript, character frequency analysis, entropy analysis, ciphertext analysis, encrypted text analysis, Shannon entropy, Rényi entropy

Decision Tree: Customer Churn Analysis for a Loyalty Program using Data Mining Algorithm

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Abstract. In the world of retailer, customers typically patronize multiple shops thus making loyalty programs a favorite among retailer to retain their customers. Loyalty programs are utilized across many different businesses as a marketing strategy to encourage customers to continuously shop or patronize the services provided by a certain organization. However, one of the biggest problem faced by these businesses is customer churn. The purpose of this research was to build a predictive model, which could predict customer churn, where visualization of data was generated to better understand the existing members and see the patterns and behavior demonstrated by members of the loyalty program. Through these, meaningful insights about the businesses' analysis on customers could be gathered and utilized for better actions which could be taken to address the issues which the company faces. At the end, based on the issues found, strategies were proposed to address the issues found. For this research, SAS Enterprise Miner was used to perform predictive analysis while Tableau was used to perform descriptive analysis.

Keywords: Decision Tree, Customer Analytics, Churn Analysis, Loyalty Program.

Improving e-Commerce Severity Rating Measurement using Consistent Fuzzy Preference Relation

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Abstract. Usability is a critical success factor in business. However, many usability issues on e-commerce websites cannot be adequately handled because there is no priority scale. The severity rating helps focus on the significant problem. The severity triggered by the data is considered better than the severity triggered by the evaluator. Data obtained quantitatively used to determine essential values and usability scores. Previous research has applied the Fuzzy Analytical Hierarchy Process (FAHP) method with Extent Analysis (EA), and Fuzzy Preference Programming (FPP) approaches. We were assessing the weight of criteria to evaluate usability and determine severity rating. However, EA and FPP approaches have disadvantages. Among them, when determining the number of paired comparisons at the level of importance between criteria. The number of comparisons that must be assessed by Decision-Maker (DM) causes the fuzzy pairing matrix to be inconsistent. This inconsistency causes the weight between rules to be invalid. The Consistent Fuzzy Preference Relation (CFPR) method is present to overcome the problem of the number of paired comparisons. The CFPR method summarizes the comparison steps to facilitate DM in assessing the level of importance between criteria. The results show the results of rank similarity testing; the EA and CFPR methods have close relationships. The FPP and CFPR methods have a weak correlation in generating usability ranking and severity ratings.

Keywords: Consistent Fuzzy Preference Relation, e-Commerce, Usability, Severity Rating.

A Case Study of Customers' Payment Behaviour Analytics on Paying Electricity with RFM Analysis and K-Means

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Abstract. The lack of management control and not aware about their potential customer is becoming a growing concern of the service provider. The problem of the late payment cannot be solved simply by providing more penalty and spending more money on management. There is an urgent need for upgrading, for better understanding of the current and potential electricity customers to meet the needs in modern urban life. Hence, this study proposed an integrated data mining and customer behaviour scoring model to manage existing tenants at Empire Damansara. This segmentation model was developed to identify groups of customers based on their electricity payment transaction background of history. Thus, the developer or provider can develop its intensive actions that can maintain its incomes and keep high customers' satisfaction.

Keywords: Data mining; paying behaviour; customer segmentation, RFM analysis, K-Means

Track: Visual Data Science

NO	ID	TITLE	AUTHORS
1.	1570560543	Amniotic Fluid Segmentation by Pixel Classification in B-Mode Ultrasound Image for Computer Assisted Diagnosis	Desiana Wulaning Ayu; Sri Hartati; Aina Musdholifah
2.	1570560688	Machine Learning Assisted Medical Diagnosis for Segmentation of Follicle in Ovary Ultrasound	Eliyani ; Sri Hartati; Aina Musdholifah
3.	1570563792	Malaysian Budget Visualization using Circle Packing	Nur Atiqah Sia Abdullah; Nursyahira Zulkeply; Zainura Idrus
4.	1570564223	An Overview of Visualization Techniques: A survey of Food-Related Research	Nurfarah Mazarina Mazalan; Zainura Idrus; Nur Atiqah Sia Abdullah; Zaidah Ibrahim

Amniotic Fluid Segmentation by Pixel Classification in B-Mode Ultrasound Image for Computer Assisted Diagnosis

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Abstract. B-mode ultrasound imaging segmentation is facing a challenge in the artifacts such as speckle noise, blurry edges, low contrast, and unexpected shadow. This study proposed a model segmentation considering the local information from each pixel based upon its neighborhood information. The features used are a statistical texture (mean intensity, deviation standard, skewness, entropy, and property) taken based upon the 3x3 and 5x5 window. Random forest was used to classify each pixel into three regions: the amniotic fluid, uterus, and fetal body. An evaluation was carried out by calculating the comparison between the ground truth area and the segmentation results of the proposed model. The experimental results showed that the proposed model has an average accuracy of 81.45% in the 3x3 window and 85.86% in the 5x5 window on 50 tested images.

Keywords: Statistical Texture, Pixel Classification, Random Forest.

Machine Learning Assisted Medical Diagnosis for Segmentation of Follicle in Ovary Ultrasound

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Abstract. Machine learning can be applied to the diagnosis of polycystic ovarian syndrome (PCOS), one of criteria for PCOS patients is presence polycystic ovary (PCO). PCO is the presence of the least 12 follicles in the ovary or follicular diameter between 2 and 9 mm and/or increased ovarian volume 10 cm³. In this research, a computational model for the detection of follicles of various sizes and extracting relevant features of the follicle and calculate the diameter and the number of follicles is proposed. The proposed model consists of pre-processing, speckle noise reduction, follicular segmentation, feature extraction, feature selection, and calculate the diameter of number follicles. The segmentation method uses active contour to divide objects base on the similarity of follicle shape feature so that it is more accurate in calculating the number and diameter of follicles. The performance of this method is tested on a dataset of ovarian ultrasound images of patients at Sardjito Hospital, Yogyakarta using Probabilistic Rand Index (PRI) and Global Consistency Error (GCE).

Keywords: Segmentation, Active Contour, Feature Extraction.

Malaysian Budget Visualization using Circle Packing

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Abstract. Data visualization is used to analyze the patterns and trends of data, including budget distributions, business analytics and so forth in a form of diagrams, charts, graphs and so on. In Malaysia, the budget is still in the form of a speech text and infographics. In the previous study, a treemap visualization technique is used to visualize the Malaysia budget, but it has resulted in data congestion as there are too many ministries and its programs in Malaysia. Besides, the visualization failed to compare previous and current budgets. Therefore, this study uses the circle packing technique to visualize Malaysia's budget where it provides a more presentable and interactive way to explore the budget that can compare the current and previous budget on a single website. In order to construct this data visualization, it starts with the preparation of a JSON file to reorganize the budgets data and imported as an input file. Then, circle packing algorithm is used, which includes creating a new pack layout, followed by packing the root node by assigning coordinate x, y, and radius. Besides, it needs to pack the radius, and then set the size using two elements of an array. It follows by setting the padding and packing the array of siblings circles. Lastly, it encloses the circles to the packing. This algorithm is then integrated with JSON file and HTML to visualize it interactively on the web. This dynamic budget visualization webpage is a better option of exploration and it is beneficial to Malaysians as it helps the citizen in seeing a clearer picture of the distributions of their money. Furthermore, it is handy to understand the government future financial planning for Malaysia in an interactive way. This algorithm can be reusable to visualize any other financial data in a hierarchy structure.

Keywords: Data Visualization, Budget Distribution, Hierarchical Data Visualization, Circle Packing, Malaysia Budget.

An Overview of Visualization Techniques: A survey of Food-Related Research

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Abstract. The varieties of food including food choice and preference, food production, dietary intake and other have been done by previous researchers. Other than that, the implementation of visualization techniques has been used in visualizing the result and its findings regarding on food-related research. However, there is lack of understanding towards food-related research in Malaysia. Furthermore, the graphical view that had been illustrated is very limited which lead into the difficulty of understanding the pattern of food-related studies. Therefore, this paper purposely is to do an overview regarding on the visualization techniques that have been used in displaying the results and its finding. The methods that have been used in this study is by constructing the comparison table of visualization techniques such as tree map, heat map, canonical map, word cloud and semantic tree. The classification of visualization techniques also has been differentiated into four types of structures of visualization which are hierarchical, relational, textual and spatial. The aim of this study is to analyze the variety of visualization techniques. This study also is to identify the criteria of each visualization techniques such as size, color, latitude and longitude, vertices, edges and others. Lastly, this paper produces the conceptual framework of visualization techniques as expected outcome due to assist people in making decision in order to get the suitable of visualization technique based on the criteria that matches with its requirement.

Keywords: Visualization Techniques, Information Visualization, Food-Related, Social Media, Criteria of Visualization First Section.

Track: Machine and Deep Learning

NO	ID	TITLE	AUTHORS
1.	1570561610	A Hybrid TSR and LSTM for Forecasting NO ₂ and SO ₂ in Surabaya	Suhartono; Hendri Prabowo; Soo-Fen Fam
2.	1570574389	Evaluation of Pooling Layers in Convolutional Neural Network for Script Recognition	Zaidah Ibrahim; Dino Isa; Zainura Idrus; Zolidah Kasiran; Rosniza Roslan
3.	1570568304	Predictive Model of Graduate-On-Time using Machine Learning Algorithms	Nurafifah Mohammad Suhaimi; Shuzlina Abdul-Rahman; Sofianita Mutalib; Nurzeatul Hamimah Abdul Hamid; Ariff Md Ab Malik
4.	1570561617	New Hybrid Statistical Method and Machine Learning for PM ₁₀ Prediction	Suhartono; Hendri Prabowo; Dedy Dwi Prastyo; Muhammad Hisyam Lee

A Hybrid TSR and LSTM for Forecasting NO₂ and SO₂ in Surabaya

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Abstract. This study proposes a hybrid model that combining time series regression (TSR) and long short-term memory (LSTM) to forecast NO₂ and SO₂ in Surabaya City, Indonesia. TSR is one of the linear statistical methods to capture deterministic patterns, both are trend and seasonal, whereas LSTM is a neural network method that has a memory block in its hidden layer to handle the nonlinear pattern. Data about half-hourly NO₂ and SO₂ at three SUF stations in Surabaya City are used as cased study. These data have double seasonal pattern, i.e. daily and weekly seasonality. The performance of this hybrid model was compared to several individual models both linear and non-linear methods, i.e. TSR and ARIMA as linear model and FFNN and LSTM as nonlinear model. Based on the smallest RMSEP and sMAPEP, the results showed that hybrid TSR-LSTM yielded more accurate forecast at two datasets, whereas LSTM as an individual method produced more accurate forecast at three datasets. Hence, it is in line with the results of M3 and M4 forecasting competition, i.e. more complex methods do not necessary yield better forecast than simpler ones.

Keywords: Hybrid, TSR, LSTM, NO₂, SO₂, forecasting.

Evaluation of Pooling Layers in Convolutional Neural Network for Script Recognition

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Abstract. This paper investigates the suitable position and number of pooling layers in Convolutional Neural Network (CNN) for script recognition from scene images. A common practice of CNN for object recognition is to position a convolve layer alternately with a pooling layer followed by a few layers of fully connected layers. We re-evaluate this basic principle by examining the position of pooling layer after every convolve layer, reducing and increasing its numbers. Experimental results on MLe2e dataset for script recognition show that a CNN with less number of pooling layers and non-overlapping pooling stride can reach excellent percentage of accuracy compared to alternating convolve layer with pooling layer.

Keywords: Convolutional Neural Network, Script Recognition, MLe2e Dataset.

Predictive Model of Graduate-On-Time using Machine Learning Algorithms

Nurafifah Mohammad Suhaimi¹, Shuzlina Abdul-Rahman², Sofianita Mutalib³,
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Abstract. In most universities, the number of students who graduated on time reflect tremendously on their operation costs. In such cases, the high number of graduate-on-time or GOT students achievement will indirectly reduce the university's annual operation cost per student. Not as trivial as it seems, to ensure most of the students able to GOT is challenging. It may vary in the perspective of university practises, academic programmes, and students' background. At the university's level, students' data can be used to identify the achievement and ability of students, interests, and weaknesses. To build an accurate predictive model, it requires an extensive study on significant factors that may contribute to students' ability to graduate on time. Consequently, this study aims to construct a predictive model that can predict students' graduation status. We applied five different machine learning algorithms (classifiers) namely Decision Tree, Random Forest, Naïve Bayes, Support Vector Machine (PolyKernel), and Support Vector Machine (RBFKernel). These classifiers were evaluated with four different k folds of 5, 10, 15, and 20. The performance of these classifiers was compared based on different measurement subject to accuracy, precision, recall, and F-Score. The results indicated that Support Vector Machine (PolyKernel) outperformed other classifiers and the best numbers of k folds for this experiment are 5 and 20. This predictive model of GOT is hopefully will beneficial to university management and academicians to devise their strategies in helping and improving the weakness of students' academic performance and to ensure they can graduate on time.

Keywords: Data Mining, Graduate-On-Time, Machine Learning, Predictive Model, Supervised Algorithm.

New Hybrid Statistical Method and Machine Learning for PM₁₀ Prediction

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Abstract. The objective of this research is to propose new hybrid model by combining Time Series Regression (TSR) as statistical method and Feedforward Neural Network (FFNN) or Long Short-Term Memory (LSTM) as machine learning for PM₁₀ prediction at three SUF stations in Surabaya City, Indonesia. TSR as an individual linear model is used to capture trend and seasonal pattern. Whereas, FFNN or LSTM is employed to handle nonlinear pattern. Thus, this research proposes two hybrid models, i.e. hybrid TSR-FFNN and hybrid TSR-LSTM. Data about PM₁₀ level that be observed half hourly at three SUF stations in Surabaya are used as case study. The performance of these two hybrid models will be compared with several individual models such as ARIMA, FFNN, and LSTM by using sMAPEP. The results at identification step showed that the data has double seasonal patterns, i.e. daily and weekly seasonality. Moreover, the forecast accuracy comparison showed that hybrid TSR-FFNN produced more accurate PM₁₀ forecast than other methods at SUF 7, whereas FFNN yielded more accurate forecast at SUF 1 and SUF 7. These results show that FFNN as an individual nonlinear model produce better forecast than TSR and ARIMA as an individual linear model. It indicates that the PM₁₀ in Surabaya tend to have nonlinear pattern. Moreover, these results are also in line with the results of M3 competition, i.e. more complex method do not necessary produce better forecast than a simpler one.

Keywords: TSR, FFNN, LSTM, Hybrid, PM₁₀, Surabaya.

Track: Big Data Analytics

NO	ID	TITLE	AUTHORS
1.	1570561054	B-Spline in the Cox Regression with Application to Cervical Cancer	Jerry Dwi Trijoyo Purnomo; Santi Wulan Purnami; Sri Mulyani
2.	1570560985	Multilevel Logistic Regression and Neural Network- Genetic Algorithm for Modeling Internet Access	Wahyu Wibowo; Shuzlina Abdul-Rahman; Nita Cahyani
3.	1570571998	A Case Study on Student Attrition Prediction in Higher Education using Data Mining Techniques	Syaidatus Syahira Ahmad Tarmizi ¹ Sofianita Mutalib ² Nurzeatul Hamimah Abdul Hamid ³ Shuzlina Abdul Rahman ⁴ Ariff Md Ab Malik
4.	1570561381	The Use of Hybrid Information Retrieve Technique and Bayesian Relevance Feedback Classification on Clinical Dataset	Fatihah Mohd; Masita Abdul Jalil; Noor Maizura Muhamad Noor; Suryani Ismail; Zainab Abu Bakar
5	1570569457	An Experience Report on Building a Big Data Analytics Framework Using Cloudera CDH and RapidMiner Radoop with a Cluster of Commodity Computers	Sittiporn Kunnakorntammanop; Netiphong Thepwuttisathaphon; Supphachai Thaicharoen
6	1570560891	Multi-stage Clustering Algorithm for Energy Optimization in Wireless Sensor Networks	Israel Edem Agbehadji; Richard C. Millham; Simon James Fong; Jason J. Jung; Khac-Hoai Nam Bui; Abdultaofeek Abayomi

B-Spline in the Cox Regression with Application to Cervical Cancer

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Abstract. Recently, Cox proportional hazard (PH) models have played an important role and become increasingly famous in survival analysis. A crucial assumption of the Cox model is the proportional hazards assumption, that is the covariates do not vary over time. One way to check this assumption is to utilize martingale residuals. Martingale residual is an estimate of the overage of events seen in the data but not covered by the model. These residuals are used to examine the best functional form for a given covariate using an assumed Cox model for the remaining covariates. However, one problem that could be occurred when applying martingale residuals is that they tend to be asymmetric and the line does not fall around zero. Hence, in this paper, the main discussion will focus on the use of smoothing martingale residuals, another type of martingale residuals that give a higher rate of flexibility, by using B-spline and the relation to another smoothing technique, locally weighted scatterplot smoothing (LOWESS). An analysis of variables that probably affect the survival rate of patients with cervical cancer is used for illustration.

Keywords: Martingale Residual, B-Spline, locally weighted scatterplot smoothing.

Multilevel Logistic Regression and Neural Network- Genetic Algorithm for Modeling Internet Access

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Abstract. Logistic regression is one of the classical methods for classification. Meanwhile, neural network is the recent method for classification. Both methods are widely used in the supervised learning and competing to be the best methods in many classifications research. This paper aims to study the performance of both methods using data of youth internet access of East Java Province of Indonesia. The first method used is Multilevel Logistic Regression, a hierarchical model which is part of Generalized Linear Mixed Model (GLMM) where the response variable is influenced by fixed and random factors. The second one is Neural Network-Genetic Algorithm in which the weight optimization is performed by selecting the relevant input variables, the optimal number of hidden nodes, and the optimal connection weights. The result shows that Multilevel Logistic Regression produced a slightly better accuracy rate of 0.873 compared to Genetic Neural Network Algorithm with an accuracy rate of 0.871.

Keywords: Multilevel Logistic Regression, Neural Network Genetic Algorithm, Accuracy

A Case Study on Student Attrition Prediction in Higher Education using Data Mining Techniques

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Abstract. Student attrition in higher educational institutions (HEI) concern with the failure of undergraduate students who unable to complete their studies within the stipulated period. Student attrition problem relates to the resource's usage in which dropout students still use the same resources as graduated students though they do not yield any outcomes. Hence, HEI efforts to curb the percentage of student attrition numbers would have positive impact on the productivity. In a similar vein, findings from previous studies highlight numerous factors that contributed to student attrition. These factors vary from one case to another depending on the case profile. In such cases, the historical or past data can provide useful insights in understanding the factors of student attrition in an institution. In this paper, we discuss data mining techniques primarily on the supervised classification algorithms for predicting student attrition. We use the Cross-Industry Standard Process for Data Mining (CRISP-DM) that comprises of five phases for the case study. Both evaluation methods, the cross-validation and percentage split have been used to evaluate the classification methods. The study has identified the significant attributes for the student attrition prediction which are Cumulative Grade Point Average (CGPA), sponsor, family income, disability and the number of dependent. Support Vector Machine with Polynomial Kernel appeared to be the best method from the five tested algorithms.

Keywords: Classification, Data Mining, Higher Education and Student Attrition.

The Use of Hybrid Information Retrieve Technique and Bayesian Relevance Feedback Classification on Clinical Dataset

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Abstract. Retrieval of information related to a subset variable or feature has become the attention of many researchers in data mining fields. The objective of feature selection (FS) is to improve the performance of the prediction. This contributes to providing a better definition of the features, feature structure, feature ranking, feature selection functions, efficient search techniques, and feature validation methods. In this study, a retrieval method that integrates correlation and linear forward selection algorithms to evaluate and generate the subset of clinical features are present. The objective of the research is to find the optimal features of a cancer dataset and to classify the disease into multiple cancer stages: one, two, three, and four. The research methodology is developed based on data mining, knowledge data discovery with four phases: pre-processing, resampling, feature selection, and classification. The proposed Bayesian Relevance Feedback (BRF) for classification is also described to resolve the zero value of posterior probabilities, concentrating on increasing the accuracy in the diagnosis of cancer stages. The experimental works are done on oral cancer dataset by applying WEKA. The analysis on accuracy performance was done on several classification algorithms using 15 optimal features that were chosen by a hybrid features selection method. The result shows that, BRF has outperformed others achieving 97.25% classification accuracy compared to the six classifiers, which are K-Nearest Neighbors Classifier, Multi Class Classifier, Tree-Random, Multilayer Perceptron, Naïve Bayes, and Support Vector Machine.

Keywords: Bayesian Relevance Feedback (BRF), Classification, Correlation, Data Mining, Features Selection, Oral Cancer Diagnosis.

An Experience Report on Building a Big Data Analytics Framework Using Cloudera CDH and RapidMiner Radoop with a Cluster of Commodity Computers

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Abstract. Many real-world data are not only large in volume but also heterogeneous and fast generated. This type of data, known as big data, typically cannot be analyzed by using traditional software tools and techniques. Although an open-source software project, Apache Hadoop, has been successfully developed and used for handling big data, its setup and configuration complexity including its requirement to learn other additional related tools have hindered non-technical researchers and educators from actually entering the area of big data analytics. To support big-data community, this paper describes procedures and experiences gained from building a big data analytics framework, and demonstrates its usage on a popular case study, Twitter sentiment analysis. The framework comprises a cluster of four commodity computers run by Cloudera CDH 6.0.1 and RapidMiner Studio 9.3 with Text Processing, Hive Connector, and Radoop extensions. According to the study results, setting up a big data analytics framework on a cluster of computers does not require advanced computer knowledge but needs meticulous system configurations to satisfy system in-stallation and software integration requirements. Once all setup and configurations are correctly done, data analysis can be readily performed using visual workflow designers provided by RapidMiner. Finally, the framework is further evaluated on a large data set of 185 million records, “TalkingData AdTracking Fraud Detection” data set. The outcome is very satisfied and proves that the framework is easy to use and can practically be deployed for big data analytics.

Keywords: Apache Hadoop, Big Data Analytics, Cloudera CDH, Computer Cluster, Rapidminer Radoop, Sentiment Analysis.

Multi-stage Clustering Algorithm for Energy Optimization in Wireless Sensor Networks

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Abstract Clustering technique is one of the approach to optimize energy consumption, balance load and increase lifetime of networks in wireless sensor network (WSN). In this paper, a novel multi-stage clustering algorithm is proposed for heterogeneous energy environment. The proposed multi-stage approach combines the behaviour of a bird and the distributed energy efficient model. The behaviour of the bird is expressed in the form of mathematical expression and then translated into an algorithm. The algorithm is then combined with the distributed energy efficient model to ensure efficient energy optimization. The proposed multi-stage clustering algorithm (referred to as DEEC-KSA) is evaluated through simulation and compared with benchmarked clustering algorithms. The result of simulation showed that the performance of DEEC-KSA is efficient among the comparative clustering algorithms for energy optimization in terms of stability period, network lifetime and network throughput. Additionally, the proposed DEEC-KSA has the optimal network running time (in seconds) to send higher number of packets to base station successfully.

Keywords: Edge computing, load balancing, wireless sensor network, clustering algorithm, kestrel-based search algorithm, heterogeneous environment, internet of things (IoT) analytics

Track: Computational Intelligence & Artificial Intelligence

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2.	1570561074	Study of Score Fusion and Quality Weighting in the Bio-Secure DS2 Database	Saliha Artabaz; Layth Sliman
3.	1570560190	Arabic Phonemes Recognition Using Convolutional Neural Network	Irwan Mazlin; Zan Azma Nasruddin; Wan Adilah Wan Adnan; Fariza Hanis Abdul Razak
4.	1570561115	Forecasting the Search Trend of Muslim Clothing in Indonesia on Google Trends Data using ARIMAX and Neural Network	Novri Suhermi; Suhartono; Regita Putri Permata; Santi Puteri Rahayu
5	1570563387	Convolutional Neural Network Application in Smart Farming	Yudhi Adhitya; Setya Widyawan Prakosa; Mario Köppen; Jenq-Shiou Leu
6	1570572917	Comparison of Artificial Neural Network (ANN) and Other Imputation Methods in Estimating Missing Rainfall Data at Kuantan Station	Nur Afiqah Ahmad Norazizi; Sayang Mohd Deni

Case Based Reasoning for Diagnosing Types of Mental Disorders and Their Treatments

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Abstract. Mental health is still a serious problem in Indonesia. Basic health research data in 2013 recorded the prevalence of severe mental disorders in Indonesia reaching 1.7 permil. On the other hand, the availability of mental health services and experts in the field is not yet adequate and not evenly distributed. Therefore, developing a system to help diagnosing the types of mental disorders and their treatment can be an alternative to overcome these inequalities. Case-Based Reasoning is one of the reasoning methods in expert systems. On Case-Based Reasoning, a base case is required containing cases with sotions that have been achieved. To find a solution to a given new problem, the system will look for cases on the case base that have the highest level of similarity. In this research, a case-based reasoning system has been developed for diagnosing the types of schizophrenic disorders and mood disorders along with their treatment. The case base was constructed based on medical records of mental disorder patients, which were obtained from the collaboration with a Mental Hospital in Yogyakarta. In addition, it also considers Guidelines for Classification and Diagnosis of Mental Disorders in Indonesia III, which contains 10 categories of mental disorders.

Keywords: Case-Based Reasoning, Case Base, Mental Disorders, Medical Records.

Study of Score Fusion and Quality Weighting in the Bio-Secure DS2 Database

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Abstract. A uni-biometric system suffers from unbalanced accuracy because of image quality, features extraction weakness, matching algorithm and limited degrees of freedom. This can be overcome by using multiple evidences of the same identity (Multi-biometrics fusion). In a previous work, we proposed new fusion functions based on arithmetic operators and search the best ones using Genetic Programming on the XM2VTS score database. The objective function is based on the Half Total Error Rate (HTER) (a threshold dependent metrics), from the Expected Performance Curve (EPC), of fused matching scores. In this paper, we select ten functions from the generated ones and apply them on matching scores of different biometric systems, which are provided by the bio-secure database. This database provide 24 streams that we use to generate 1000 multi-biometric combinations that we, then, use to conduct our comparative study. Since the result of fusion can be biased and requires a good quality assessment to evaluate the degree of reliability of a processed scheme, we use quality weights on the proposed functions and we compare the results with existing approaches. The proposed quality weights help to reduce the Equal Error Rate (EER a threshold-independent metric) since the obtained matching scores are results of different fusions of instances, sensors and evidences. The EER range is optimized along the tested functions. To confirm that our proposed functions give better score results than the existing functions based on arithmetic rules, we perform multiple statistical significance tests to check the reliability of our experimentation.

Keywords: Multi-biometrics, Fusion, Quality Weights, Genetic Programming, Optimized Search.

Arabic Phonemes Recognition Using Convolutional Neural Network

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Abstract. This paper focuses on a machine learning that learn the correct pronunciation Arabic phonemes. In this study, the researchers develop using convolutional neural network as feature extraction in order to enhance the performance of the model and Multi layer perceptron as the classifier to classify classes. Different parameters of CNN model are used in order to investigate the best parameter for the recognition purpose. The dataset have been recorded from experts using smartphone which consist of 880 recorded audios to train the model (210 for each class). The researchers have experimented the models to measure the accuracy and the cross entropy in the training process.

Keywords: Convolutional Neural Network, Arabic phonemes Recognition, Signal Processing, Speech Recognition.

Forecasting the Search Trend of Muslim Clothing in Indonesia on Google Trends Data using ARIMAX and Neural Network

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Abstract. The trend of muslim fashion has significantly raised the search trend for the brands of hijab and sarong in Indonesia. The aim of this study is to forecast the search trend for hijab and sarong based on google trends data. The Hijab brands include Rabbani, Zoya, Dian Pelangi, Elzatta, and Shafira, while the sarong brands include Gajah Duduk, Wadimor, Atlas, Mango, and Sapphire. We apply several forecasting methods such as Holt-Winters' Exponential Smoothing, ARIMA, ARIMAX, FFNN and ERNN. The data contains calendar variation effect due to the Eid al-Fitr days use different calendar system. The results show that FFNN yields the most accurate forecast on 6 out of 10 brands. The forecast results for year 2019 period show that the search trend for Atlas brand is predicted to be the highest of all sarong brands. On the contrary, all the hijab brands' trend search will decrease in this period.

Keywords: ARIMA, ARIMAX, ERNN, FFNN, Forecasting, Google Trends.

Convolutional Neural Network Application in Smart Farming

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Abstract. The agricultural sector has a very pivotal role, furthermore very important in the global economy country in the world. The uses of machine learning become trending, and massive improvement technology has widely used in modern agricultural technology. Artificial Intelligent techniques are being used extensively in the agricultural sector as one purpose to increase the accuracy and to find solutions to the problems. As implementation of Artificial Intelligent (AI) based on Convolutional Neural Networks (CNN) application in several fields, indicates that CNN based machine learning scheme is adaptable and implemented on an agricultural area. In this contribution, we apply CNN based feature extraction on cocoa beans images. Cocoa beans images used in this study were cocoa beans (*Theobroma Cacao L.*) in various quality classes originating from districts in South Sulawesi, Indonesia, and we separate those images 30% for training and the remaining 70% for testing. From our assessment, the result shows that we can achieve 82.14% accuracy to classify seven classes of cocoa beans images using 5 CNN layers.

Keywords: Convolutional Neural Network, Artificial Intelligent, Classification, Feature Extraction, Cocoa Beans, Smart Farming.

Comparison of Artificial Neural Network (ANN) and Other Imputation Methods in Estimating Missing Rainfall Data at Kuantan Station

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Abstract. Daily rainfall data are one of the basic inputs in hydrological (e.g. streamflow, rainfall-runoff, recharge) and environmental (e.g. crop yield, drought risk) models as well as in assessing the water quality. In Malaysia, the number of rain gauge stations with complete records for a long duration is very scarce. Rainfall records often contain missing data values due to malfunctioning of equipment and severe environmental conditions. Thus, the estimation of rainfall is needed, whenever the missing data happened at the principal rainfall station. In this study, daily rainfall data from eight meteorological stations located in Pahang state are considered and Kuantan is selected as the target station. The main purposes of this study is to compare the performance of the imputation methods by using Artificial Neural Network method (ANN), Bootstrapping and Expectation Maximization Algorithm method and Multivariate Imputation by Chained Equations method (MICE). Random missing data has been generated for Kuantan station with 5%, 10% and 15% of missingness. The three methods are compared based on Mean Absolute Error (MAE), Root Mean Square Error (RMSE) and Coefficient of Determination (R²). The findings concluded that Artificial Neural Network (ANN) is found to be the best imputation method for this study, followed by Multiple Imputation by Chained Equation (MICE) and Bootstrapping and Expectation Maximization Algorithm method.

Keywords: Daily Rainfall Data, Artificial Neural Network, Bootstrapping and Expectation Maximization Algorithm, Multivariate Imputation by Chained Equations, Imputation Method, Missing Data.

Track: Social Network and Media Analytics

NO	ID	TITLE	AUTHORS
1.	1570553947	Anonymized User Linkage Under Differential Privacy	Chao Kong; Hao Li; Haibei Zhu; Yu Xiu; Jianye Liu; Tao Liu
2.	1570560009	Context Enrichment Model Based Framework for Sentiment Analysis	Nor Nadiah Yusof; Azlinah Mohamed; Shuzlina Abdul-Rahman
3.	1570560080	2019 Thai General Election: A Twitter Analysis	Chamemee Prasertdum; Duangdao Wichadakul
4.	1570560091	Science Lab Repository Requirements Elicitation based on Text Analytics	Norhaslinda Kamaruddin; Abdul Wahab Abdul Rahman; Mohammad Bakri; Muhammad Hamiz
5.	1570572933	A Gillespie Algorithm and Upper Bound of Infection Mean on Finite Network	Sapto Wahyu Indratno; Yeftanus Antonio
6.	1570561021	Sentiment Analysis in Social Media Based on English Language Multilingual Processing Using Three Different Analysis Techniques	Nor Saradatul Akmar Zulkifli; Allen Lee Wei Kiat

Anonymized User Linkage Under Differential Privacy

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Abstract. This work develops a user linkage method for anonymized social networks under differential privacy. The existing works have primarily focused on multi-dimensional features of user profile (e.g. user name, gender, ID, etc.) in general, but overlooked the special issue of privacy security. As such, the existing methods can be suboptimal for identifying users across anonymized social networks under differential privacy. In this paper, we try to study the problem of combining differential privacy with anonymized user linkage problem simultaneously. To the best of our knowledge, none of the existing works has paid special attention to connect these two separate research problems. To tackle the challenges, we first propose a Hierarchy Differential Privacy-based Generator (HDP) to generate a social publishing graph that can well preserve differential privacy protection in the original social graph by performing anonymized user linkage purposely. We then apply the proposed AUL, short for Anonymized User Linkage, to identify users across anonymized social networks via probabilistic generative models in a semi-supervised manner. We conduct extensive experiments on several real datasets covering the tasks of social publishing graph generation and anonymized user linkage. Both quantitative results and qualitative analysis verify the effectiveness and rationality of our HDP+AUL framework.

Keywords: Anonymized User Linkage, Differential Privacy, Probabilistic Generative Models.

Context Enrichment Model Based Framework for Sentiment Analysis

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Abstract. Online medium has become popular among knowledgeable society as a new emerging platform of information gathering and sharing where their thoughts and opinions are considered important in many aspects of nation building. The overwhelmed of online opinionated data has created a great challenge for researchers to mine sentiments accurately. Sentiment analysis or also known as opinion mining helps to understand and analyse those opinions due to the explosively growths of online opinionated data. This refers to the process of identifying and classifying the sentiments into several orientations, whether positive or negative opinions. Classifying sentiments based on the correct context remains a challenge, as the orientation of sentiments could change when the context changes. Existing sentiment analyser tend to classify sentiments based on keywords rather than the meaning of words. The real meaning of sentiment texts is often interpreted differently and consequently lead to poor classification results. Context plays an important role in analysing and classifying sentiment texts. This paper proposes a context enrichment model based framework for sentiment analysis in predicting the orientation of sentiments. The framework aims to provide a workflow for sentiments classification by considering the context and semantic information. There are four components in this framework: pre-processing, context enrichment model, classification and performance evaluation. This study is expected to create a new technique of classifying sentiments with more enriched semantic information.

Keywords: Context-based, Context Enrichment, Sentiment Classification.

2019 Thai General Election: A Twitter Analysis

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Abstract. Elections are the most important part in the democracy. The general election in Thailand was held on 24 March 2019. It was the first vote in the last five years since the seizure of power by the military coup led by General Prayut Chan-o-cha. A social media has become a part of daily life with a real time message distribution including sharing an opinion in politics. Twitter becomes the most widely used tool for creating trends by political parties and politicians. In this paper, we propose an analysis of election result according to data analysis from Twitter and Election Commission of Thailand (ECT). We used Twitter Advanced Search to collect data within three months from January 1 to March 31, 2019. We found the top keywords and hashtags trended on Twitter as the Future Forward Party (FFP). Meanwhile, the winner of the popular vote was the Palang Pracharat Party. We found no correlation between the number of retweets and votes as only one party got the outstanding number of retweets. From the analysis of retweeters' accounts, the characteristics of retweeters of the Future Forward Party differed from the retweeters of other parties. We then refined the analysis based on the sentiment of messages mentioning the political parties tweeted by the retweeters. The correlation coefficient between the number of positive mentions and votes became 0.615 with the removal of the FFP from the analysis. In addition, we found that the number of messages with a specific political party mentioned might reflect the election results. Finally, the TF-IDF analysis of words from the tweet messages during the campaign showed that words delivered by each party had different contextual meanings such as paying attention to people, party's policy, complaint, and blame.

Keywords: Twitter, Social media mining, Election.

Science Lab Repository Requirements Elicitation based on Text Analytics

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Abstract. Requirements elicitation is an important task before any development of system repository can be conducted. Typically, traditional methods such as interview, questionnaire and observation are made to gauge the users' needs. However, the users may not be able to spell out specifically of their need especially if there is no available system to compare resulting to outrageous demands and unrealistic expectations to the repository developer. An alternative approach to gauge the user needs from users' reviews of the on-the-shelf software may be a good starting point. In this paper we attempt to extract requirements from the users' independent reviews gathered from the internet using text analytics approach. The keywords are visualized based on its relevance and importance to the user. Then, it is used as a benchmark for the user to alter to their specific repository needs. From the experimental results, it is observed that there are functions that are very much needed by the user and yet there are also functions that are not used at all. Hence, this proposed approach may give insight to the user and developer about the actual needs of the respective system. It is envisaged that such approach can be a guide to the novice user and the developer in order to shorten the time to agree on the development of the repository system.

Keywords: Requirements Elicitation, User Review, Business Rules, Text Analytics, Word Cloud.

A Gillespie Algorithm and Upper Bound of Infection Mean on Finite Network

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Abstract. Predictions of increasing cyber attacks in the next few years encourage researchers to estimate cyber risk. Viruses, trojans, and worms transmitted from one computer to another on a network. Mathematical epidemiology model used to understand the process of spreading viruses on computer network inspired by the process of spreading disease in a biological population. A simple stochastic epidemic model, namely the susceptible-infectious-susceptible (SIS) model with modification of contact parameters, will be assessed to estimate the upper bound of infection mean in the different computer network topology. The Gillespie Algorithm also called the Stochastic Simulation Algorithm (SSA), used to compare the upper bound and mean of sample-paths in the stochastic model. The computational result confirms the mean of sample paths always less than the upper bound of infection mean.

Keywords: Gillespie algorithm · Stochastic SIS model · Upper bound · Infection Mean.

Sentiment Analysis in Social Media based on English Language Multilingual Processing Using Three Different Analysis Techniques

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Abstract. Numerous numbers of companies have utilized the web to offer their services and products. Web customers dependably look through the reviews of other customers towards a product or service before they chose to buy the things or viewed the films. The company needs to analyse their customers' sentiment and feeling based on their comments. The outcome of the sentiment analysis makes the companies easily discover either the expression of their users is more to positive or negative. There are numerous numbers of sentiment analysis techniques available in the market today. However, only three (3) techniques will be used in this research which are the Python NLTK Text Classification, Miopia and MeaningCloud. These techniques used to analyse the sentiment analysis of the reviews and comments from English language in social media. 2400 datasets from Amazon, Kaggle, IMDb, and Yelp were used to analyse the accuracy of these techniques. From this analyses, average accuracy for sentiment analysis using Python NLTK Text Classification is 74.5%, meanwhile only 73% accuracy achieved using Miopia technique. The accuracy achieved when using MeaningCloud technique is 82.1% which is the highest compared to other techniques. This shows that hybrid technique offers a greatest accuracy for sentiment analysis on social reviews.

Keywords: Multilingual Sentiment Analysis, English Language, Text Classification.

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