BINUS Joint International Conference

BJIC
2018

INAPR
Indonesian Association
for Pattern Recognition

IEEE Conference number 44351

The 1st 2018 Indonesian Association
for Pattern Recognition (INAPR)
International Conference

Proceeding

September 7, 2018

Bina Nusantara University, Alam Sutera Campus, Tangerang, Banten, Indonesia.

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GRADUATE
PROGRAM
Doctoral Program | Doctor of Computer Science

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THE 1ST **INAPR**
Indonesian Association
for Pattern Recognition

INTERNATIONAL
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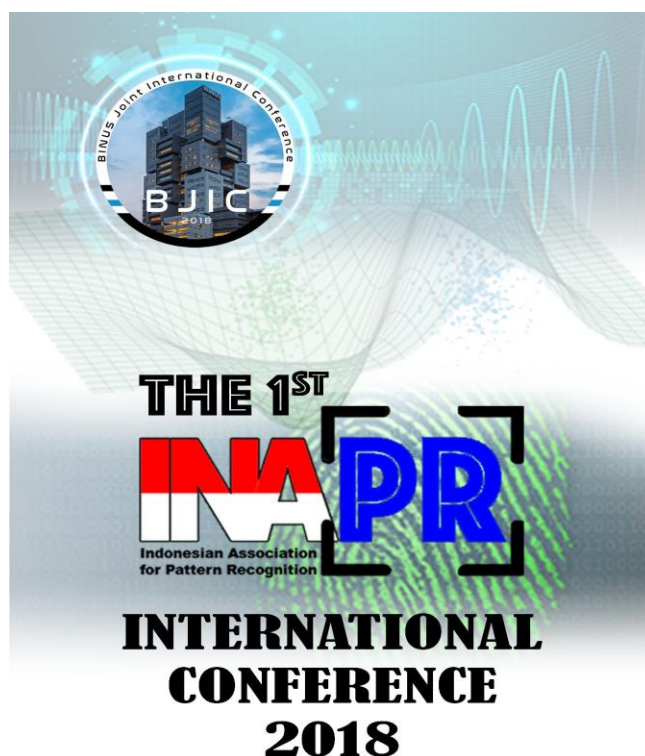
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The 1ˢᵗ 2018 INAPR International Conference, 7 Sept 2018, Jakarta, Indonesia

The 1st 2018 INAPR International Conference Preface
(IEEE International Conference #44351)

Message from the Conference Chairs

First of all and the most important thing as human, we would like thank to God almighty for His blessing and inclusion, where we can gather here in this lovely day and believe or not there is nothing coincidental in our lives join in this Academic sharing knowledge. Moreover, I would thank as well to CEO Binus Ir. Bernard Gunawa, Rector Binus University Prof. Dr. Ir. Harjanto Prabowo, MM, Vice rectors, Directors, Deans, and Professors. We also do not forget to thank you as much as possible to Research and Techonology Transfer Office (RTTO) BINUS university under Prof. Prof. Tirta Nugraha Mursitama, S.Sos., M.M., Ph.D. and Prof. Ir. Bahtiar Saleh Abbas, M.Sc., Ph.D for their fully support.

We also address thank to Prof. Dr. Ir. Nicolas Gascoin as Science and Technology Cooperation Attache of Institut Français d'Indonésie (IFI) France Embassy, who initiate to setup INAPR as part of International Association of Pattern Recognition (IAPR) including the running of this international conference. Thanks as well to IEEE Indonesia section under leading of Profile Dr. Fitri Yuli Zulkifli, S.T., M.Sc., IPM and to DR. Suryadiputra Liawatimena as chapter chair of The Indonesia Section Computer Society Chapter (TISCSC) for their acknowledgment and support for running such as this international academic event. Moreover, thanks to the keynote speakers Prof. Dr. Pitoyo Hartono, Dr.Setiawan Hadi, M.Sc, CS, Prof. Antonie Doucet for their lowliness to share research frontier knowledge.

Ladies and Gentlemen, the Conference have accepted total 64 papers as 23 papers accepted and 41 papers accepted with Major Correction which are comes from 108 papers submitted. The papers divided into 3 type of papers such as Pattern Recognition (PR), Miscellaneous in Computer Science (CS) and Miscellaneous in Information Systems (IS) with number of papers 26, 20 and 18 respectively. The detail of papers accepted in this 1st 2018 INAPR international conference are:

- For papers Pattern Recognition (PR), there are 4 papers Sign language recognition, 2 papers for traffic and vehicle, 4 papers for face recognition, 2 papers pattern in Bahasa Indonesia, 3 papers Document and manuscript, 3 papers using images for recognition, 3 papers current pattern recognition algorithm, 1 paper for cooking recipes video, 1 paper about Dangdut Music and 3 papers pattern recognition in bioinformatics.

- Moreover, for papers Miscellaneous in Computer Science (CS) has 5 papers Business Intelligence and Data Warehouse, 4 papers Smart Transportation, Smart Home and Smart monitoring and evaluation, 2 papers Game and gamification, 2 papers unstructured data in Social Media, 2 papers in Android and smartphone, 2 papers in Big Data and High Performance Computing (HPC) and 2 papers in Software metrics.

- Finally, for paper Miscellaneous in Information Systems (IS), there are 5 papers Information Systems (IS) Framework such as COBIT 5, Big Data Framework, Zachman, EA3 ubes, 2 papers IS development with Service Oriented Architecture (SOA), 5 papers Strategic IS such as Executive IS (EIS), Knowledge Management (KM), 2 papers development IS web based such as E-filling and e-Health and 4 papers for startup, implementation Technology Acceptance Model (TAM) and Unified

Theory of Acceptance and Use of Technology (UTAUT), IS design and financial data statistics program.

However, after the conference 7 Sept 2018 only 60 papers who qualified to be accepted in book Proceeding and 4 papers do not continue with presentation and payment for the conference.

The paper was organized with EDAS system and had been checked with similarity tool iThenticate and from the 64 accepted papers we split into 4 similarity score such as under score 10.1, between score 11 and 20, between 21 and 30 and more than score 31 with number of percentage pages such as 20.3%, 50%,28.1% and 3.1% respectively. So, Mostly the accepted papers are having similarity score between 11 and 20. Moreover, in quality paper checking we applied non subjected to the level 3 IEEE checking plagiarism where the paragraph in the paper did not copy and paste from other paragraphs including self plagiarism. In terms of reviewer, we invited 224 reviewers from all over the world, and only 99 reviewers which accepted as reviewer for this conference.

Honourable audience, from that 64 accepted paper, shows as research collaboration where 15 papers are national institutional collaboration and 10 papers are international institutional collaboration. The authors are come from 33 national institutions, 10 international institutional from 7 different countries. The national institutions are BINUS- Jakarta, BINUS Bandung, Institute Technology Sepuluh Nopember,Surabaya UIN Syarif Hidayatullah-Jakarta, State University of Malang, Narotama University- Surabaya, Universitas Atma Jaya, Jakarta, Syiah Kuala University, Banda Aceh, Politeknik Pos Indonesia, Bandung, Universitas Negeri Jakarta, Adhi Tama Institute of Technology, Surabaya, Padjajaran University, Bandung, Tarumanagara University, UIN Sunan Ampel Surabaya, Riau University, Universitas putra Indonesia, Padang, Sanatha Dharma University, Yogyakarta, Universitas Gadjah Mada, Yogyakarta, AMIK BSI Bekasi, Universitas Indonesia, Depok, Buana Perjuangan University, Karawang, University of Technology, Yogyakarta, STT PLN, Jakarta, Universitas Sumatera Utara, STMIK Antar Bangsa, Tangerang, STMIK Raharja, Tangerang, University of Muhammadiyah, Tangerang, STMIK Insan Pembangunan, Tangerang. Including non national educational institutions such as BPPT, Serpong, PT.Gadjah Tunggal Tbk, Tangerang, Yayasan Al-Hikmah, Jakarta, PT.Bank Mandiri (Persero) Tbk., PT.GMF AeroAsia Tbk.,Tangerang. The international institutional from 7 different countries are Kumamoto Univ JAPAN, Advanced Institute technology, Japan, The National University of Malaysia, Universiti Utara Malaysia, Muria University, Spain, The Hartree Centre,Warrington, United Kingdom, Kwangwoon University, South Korea, Ecole Central de Nantes, France, Prince Songkla University, Thailand.

Last but not least, we thank all to who attend in this conference, and we do apologize for any inconvenience either before or after this conference, particularly for authors when they submitted and waiting for the result review's papers and we are waiting for the correction of your accepted papers.

Having a happy conference day !

Jakarta, Indonesia, Friday-7 September 2018

Harco Leslie Hendric Spits Warnars,Ph.D and DR. Anto Satriyo Nugroho

General Chairs of 1st 2018 INAPR International Conference

WELCOMING REMARKS
General Chair
BINUS Joint International Conference (BJIC) 2018

H.E. Ir. Bernard Gunawan, CEO BINA NUSANTARA
H.E. Prof. Dr. Ir. Harjanto Prabowo, MM, Rector, BINUS University
Vice rectors, Directors, Deans, and Professors,

Distinguished keynote speakers,
Prof. Dr. Dato. Ishak Ismail, Assistant Vice Chancellor,
Universiti Malaysia Pahang
Dr. Andreas Raharso, Founder and CEO at Organizational Analytics Private-Limited
Dr. Rinaldi Firmansyah, Commissioner, Blue Bird Group

All chairpersons and committee members,
Distinguished guests, Ladies and gentlemen,

First of all, let us praise to God the Almighty for His merciful and blessings as we are here to witness a historical moment, a very first initiative of BINUS University to host The First BINUS Joint International Conference (BJIC) 2018.

I would like to welcome CEO BINA NUSANTARA, Rector BINUS University, all keynotes speakers, presenters, and participants of the First BINUS Joint International Conference (BJIC) 2018. Dissemination of research, sharing knowledge, and developing new ideas through academic conferences is one of the key elements of the advancement of science, technology and innovation. In this vein, we proudly present the BINUS Joint International Conference (BJIC) to be held from the 3rd to the 14th of September 2018 in Kemanggisan and Alam Sutera campuses.

The BJIC consists of 8 unique and integrated conferences that reflect the state of the art in engineering, computer science, game application, business, management, the social sciences and the arts and humanities. These conferences will provide you opportunities to present your current research, share knowledge and experiences, discuss new ideas, meet like-minded scholars and broaden your international networks.

Distinguished guests, ladies and gentlemen,

Total accepted and presented papers in this conference is 872 that comprises of 159 from universities across Indonesia, 46 from international, and 667 from Binus University. This achievement is possible because of the hard work of the committee under the leadership of the chairperson of each conference. As part of our appreciation, I would like to introduce them to all of you.

1. International Conference on Computer Science and Computational Intelligence (ICCSCI): Dr. Alexander Agung Santoso Gunawan, S.Si., M.T., M.Sc. Total papers: 87 papers; 10 (national); 23 (international); 54 (Binus);
2. International Conference on Information Management and Technology (ICMTech): Dr. Sulistyo Heripracoyo, S.I.P., M.M. Total papers: 104 papers: 6 (national); 1 (international); 97 (Binus);
3. International Conference on Management, Hospitality & Tourism, and Accounting (IMHA): Bachtiar H. Simamora, Ph.D. Total papers: 189 papers: 42 (national); 9 (international); 138 (Binus);
4. International Conference on Eco Engineering Development (ICEED): Ir. Tota Pirdo Kasih S.T. M. Eng., Ph.D, IPM. Total papers: 100 papers: 16 (national); 2 (international); 82 (Binus);

5. International Conference on Game, Game Art and Gamification (ICGGAG): Dr. Ir. Yaya Heryadi. Total papers: 34 papers: 7 (national); 3 (international); 24 (Binus);
6. International Conference on Social Science, Law, Art and Humanities (ICSSLAH): Lili Yulyadi, Ph.D. Total papers: 240 papers: 46 (national); 4 (international); 190 (Binus);
7. International Conference on Advanced Management and Information Technology Services (@MITS): Dr. Wibowo Kosasih. Total papers: 56 papers; 10 (national); 46 (Binus);
8. Indonesian Association Pattern Recognition (INAPR): Harco Leslie Hendric Spits Warnars, Ph.D. Total papers: 64 papers; 22 (national); 6 (international); 36 (Binus).

Ladies and gentlemen,

With the theme: "Fostering Innovative Science, Technology and Humanities in a Disruptive World", BJIC underlines the growing importance and significance roles of science that interacts closely with technology. All respected conferences bring its uniqueness in discussing and deliberating these important issues.

This conference is also very special because of our keynote speakers are prominent scholars and professionals from Indonesia, Malaysia, Singapore, Australia, Canada, People Republic of China, Taiwan (Republic of China), Japan, France and Germany. They are professors from world class university as well as executives from leading multinational corporations. I do appreciate for their time, commitment and professionalism to attend this conference.

With the features of the BJIC, such as more than 800 total presented papers, more than 50 papers from international authors and keynote speakers from 10 countries, we are very proud to say that international flavor of this conference is very strong and real. Therefore, I would like to ask continuous supports from CEO BINA NUSANTARA and Rector BINUS University for the similar event for the next year.

Distinguished guests,

In this occasion, I would like to appreciate all chairpersons of the 8 conferences and committee members who have been working very hard to make this conference happen. I would like to thank presenters, participants, our reviewers and publishers of the paper presented in the conferences as well as sponsor of this event. Last but not least, my deepest gratitude goes to CEO, rector, vice rectors, directors and all Binusian leaders for their tremendous supports. I hope you enjoy the conference!

Thank you very much.

Jakarta, 3 September 2018

Prof. Dr. Tirta N. Mursitama, PhD
General Chair BJIC 2018

Welcome speech by Prof. Dr. Ir. Nicolas Gascoin

In August 2017, a delegation from France went to visit some Indonesian colleagues for offering to share a network. With a tremendous enthusiasm from Indonesian stakeholders, an association was set in few months and nearly 400 indonesian scientific members were identified and joined. Tribute shall be paid to BPPT, Binus and La Rochelle universities. They were among the first to tackle the challenge to come for strengthening their link and the cooperation in informatics and computer engineering.

A year later, this first international conference of the Indonesian Association for Pattern Recognition (INAPR) is a key event in the life of the Indonesian and international scientific community of pattern recognition and informatics. In this day of the 7th September 2018, all the participants will witness a great momentum of Science and Networking which shall set the basis of future actions and cooperation structures.

The French PR community and the French Embassy in Indonesia do support the INAPR setting up and development because networking is the key in our fast-moving society for forefront research activities and discoveries; able to support innovation and competitiveness for our companies. Progress, which is surely the main specificity of the human life, is possible and positive when shared among all. This is the duty of Science.

The networking set in Indonesia by INAPR is a gateway to the rest of the world because the International Association for Pattern Recognition (IAPR) has accepted in August 2018 to welcome INAPR as one of its member states. The 400 INAPR researchers are now part of an international network of some 45.000 scientists all over the world. The leverage effect is tremendous for the Indonesian universities and research centers.

Through the positive support of France, INAPR is welcome to extend any cooperation further to develop its network, its activities and those of its member. "Sharing is caring"; for this reason France is so pleased to share contacts and to share its experience in order to take care of all its friends of Indonesia.

Prof. Dr. Ir. Nicolas Gascoin

Science and Technology Cooperation Attache of Institut Français d'Indonésie (IFI) France Embassy.

Message from The Indonesia Section Computer Society Chapter Chair

On behalf of The Indonesia Section Computer Society Chapter Chair, we are pleased to welcome you all to The 1st 2018 INAPR International Conference (INAPR 2018), September 7, 2018, at Bina Nusantara University, Alam Sutera Campus, Indonesia. INAPR 2018 gives us the opportunity to know recent advances and ongoing research in the latest research Pattern Recognition in Indonesia. INAPR 2018 intends to be a major forum for scientists, engineers and practitioners interested in the study, analysis, design, modeling and implementation of Pattern Recognition, both theoretically and in a broad range of application fields.

We strongly believe that this conference will provide an excellent platform to exchange research ideas and findings. We hope that INAPR 2018 will definitely give its participants, both young and experienced researchers, the opportunity to explore new areas of research, enhance their current knowledge and understanding of the scope of Pattern Recognition sciences.

INAPR 2018 invited full papers from academia, industries and research centers around the world. A total of 108 submissions were received and reviewed through our expert reviewers' panel. The technical program committee comprised which as external reviewers are 99. Each paper was reviewed by at least two or more reviewers. We would like to thank all the reviewers for their great efforts and valuable time. After a rigorous review based on novelty and technical merit, only 64 full papers (out of 108 with the acceptance rate of about 59%). We would like to thank all the authors for submitting their articles in INAPR 2018.

The conference features keynote speeches from three esteemed researchers: Keynote speaker from Prof. Dr. Pitoyo Hartono (Department of Electrical and Electronics Engineering, Chukyo University, Japan), Dr. Setiawan Hadi, M.Sc.CS. (Computer Vision Research Laboratory University of Padjadjaran, Indonesia) and Prof. Antoine Doucet (L3i laboratory, University of La Rochelle, France). We would like to thank all the keynote and invited speakers for attending this conference and giving excellent talks.

INAPR 2018 could not be successful without sincere efforts of its organizing members. We thank the members of the organizing committee. We also thank its program committee members and advisory members for their continuous supports. We would specially like to thank IEEE Indonesia Section. We also would like to thank The Institut Français d'Indonésie (IFI) as representative of collaboration science and technology between Indonesia and France. We hope that INAPR 2018 would bring opportunities to share your knowledge. We wish all the success of this conference.

Dr. Suryadiputra Liawatimena

The Indonesia Section Computer Society Chapter Chair &

Liaison Chair 1st 2018 INAPR

Message from the President of INAPR

Welcome to INAPR 1st International Conference. This conference is the first academic event, since the formation of Indonesian Association for Pattern Recognition (INAPR) last year, October 5, 2017. The objective of INAPR is to support the activity of pattern recognition research in Indonesia, and also providing a forum for individual researcher in pattern recognition, machine learning, data mining, image and video processing, computer vision, natural language processing, speech recognition and big data.

Last month, Indonesia is finally accepted as formal member of the International Association of Pattern Recognition (IAPR), by the Governing Board meeting in the 24th International Conference on Pattern Recognition (ICPR), Beijing. This is a great news, and has motivated us to work more effectively to support the research, development, and collaboration among academician, industry and government in the area of pattern recognition.

This conference is the first step to achieve the goals. We have received a lot of paper submissions, and after careful evaluation by the reviewers, 64 papers are accepted for being published. We hope, this conference serves as the best place to discuss the advances of pattern recognition, and to build collaboration among all of us.

I would like to thank the Bina Nusantara University as the host of this conference, also the French Embassy for their support, and to keynote speakers, reviewers, all speakers and participants. Last but not least, I would like to thank the committee members of this conference. Without their hard works, this event is impossible. All these great efforts are the fuel of this conference, and the future of Indonesian Association for Pattern Recognition.

DR. Anto Satriyo Nugroho

INAPR President

Prof. Dr. Pitoyo Hartono (Department of Electrical and Electronics Engineering, Chukyo University)

with Speech title : Transparent Hierarchical Classifier

1993	B. Eng., Dept. of Applied Physics, Waseda University, Tokyo, Japan
1995	M. Eng., Dept of Pure and Applied Physics, Waseda University, Tokyo, Japan
1995-1998	Software Engineer with Hitachi Ltd, Yokohama, Japan
2002	D. Eng, Dept of Pure and Applied Physics, Waseda University, Tokyo, Japan
2001-2003	Research Associate, Advanced Research Institute for Science and Engineering, Waseda University, Tokyo, Japan
2003-2005	Visiting Lecturer, WABOT-House Laboratory, Waseda University, Tokyo, Japan
2005-2010	Associate Professor, Dept. of Complex and Intelligent Systems, Future University Hakodate, Hakodate City, Japan
2010-present	Professor, School of Engineering, Chukyo University, Nagoya, Japan
2014-present	Visiting Researcher, Humanoid Research Institute, Waseda University, Tokyo, Japan

Keynote Speech 2
Dr. Setiawan Hadi, M.Sc.CS. (*Computer Vision Research Laboratory University of Padjadjaran, Indonesia.)*
With Speech title: Amadi: learning patterns from the past for better future

He is a researcher and lecturer at Department of Computer Science, Universitas Padjadjaran. His research interests are Ancient Manuscript Digitization and Indexation (AMADI), Automatic Facial Expression Recognition and Analysis (FERA) and the next research planning is Vispro/B-Eye which open for national/international research collaboration.

Prof. Antoine Doucet (La Rochelle University, France)

L3i laboratory, University of La Rochelle, France.
with speech title : Sequential pattern mining for multingual text analysis

Antoine Doucet is a tenured Full Professor at the L3i laboratory of the University of La Rochelle since 2014. Leader of the digital document and contents research group (about 40 people), he is also the director of the ICT department at the French-Vietnam University of Science and Technology of Hanoi (USTH). He is the coordinator of the H2020 project NewsEye running until 2021 and focusing on multilingual access to historical newspapers (grant 770299).

His main research interests lie in the fields of information retrieval, natural language processing and (text) data mining. The central focus of his work is on the development of methods that scale to very large document collections and that do not require prior knowledge of the data. Antoine Doucet obtained a PhD in computer science from the University in Helsinki (Finland) in 2005, and holds a French habilitation (HDR) since 2012.

Currently, he is a project coordinator on NewsEye and here is his Curriculum Vitae.

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86	Mr.	Linganathan	Thillainathan	Traconsult Sdn Bhd	Malaysia
87	Dr.	Agung	Trisetyarso	Universitas Bina Nusantara	Indonesia
88	Mr.	Muhammad Zahid	Tunio	Dawood University Engineering & Technology (DUET)	Pakistan
89	Mr.	Cagin	Turkoglu	Kocaeli University	Turkey
90	Mr.	Iñigo	Urteaga	Columbia University	USA
91	Mr.	Vaibhav	Vaijapurkar	University of Pune, Maharashtra	India
92	Mr.	Seshu Babu	Vakamudi	Senior Research Engineer in UURMI Systems, Hyderabad	India
93	Mrs.	Nandhini	Varadharajan	Associate	India
94	Prof.	Lemuel Clark	Velasco	Mindanao State University-Iligan Institute of Technology	Philippines
95	Dr.	Sunu	Wibirama	Universitas Gadjah Mada	Indonesia
96	Dr.	Adi	Wibowo	Diponegoro University	Indonesia
97	Mr.	Hesam	Yousefian	Roozbeh Inistitute of Higher Education	Iran
98	Dr.	S	Zafaruddin	Bar-Ilan University	Israel
99	Dr.	Shuai	Zhao	Big Switch Networks	USA

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BINUS University is committed to becoming a world-class knowledge institution, by delivering high academic quality and producing high impact research in the areas of science, technology, engineering, the social sciences, and the arts and humanities. Dissemination of research, sharing knowledge, and developing new ideas through academic conferences is a key element of realizing this vision. In this vein, we proudly present the BINUS Joint International Conference (BJIC) to be held from the 3rd to the 8th of September 2018.

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Please visit each conference website for further information.

"Binus Joint International Conference (BJIC 2018)"

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Table of Contents

The **1st 2018 INAPR (Indonesian Association for Pattern Recognition) International Conference** had been listed at IEEE Conference number 44351 (https://conferences.ieee.org/conferences_events/conferences/conferencedetails/44351).

Papers in **book 1st 2018 INAPR International Conference** for media communication only which is spread among the authors, Keynote speakers, and other academic colleagues in the 1st 2018 INAPR International Conference at Friday, 7 September 2018 at Bina Nusantara University, Alam Sutera Campus, Tangerang, Banten, Indonesia.

Each paper which is shown in this **book 1st 2018 INAPR International Conference** can be appeared at **proceeding of 1st 2018 INAPR International Conference** where the authors of each paper should :

1. Present their paper
2. Submit the paper's revision to spitswarnars@googlemail.com

Failing to do the requirement will be subjected to eliminated from **proceeding of 1st 2018 INAPR International Conference**

The 1st 2018 INAPR International Conference Schedule

Time	Activity
7.30-8.30	Registration
8.30-8.35	Welcome speech by Harco Leslie Hendric Spits Warnars,Ph.D as 1st 2018 INAPR International Conference General Chair
8.35-8.40	Welcome speech by Prof. Tirta Nugraha Mursitama, S.Sos., M.M., Ph.D. As Binus Joint International Conference (BJIC) 2018 General Chair and BINUS Vice Rector of Research and Technology Transfer (RTTO).
8.40-8.45	Welcome Speech by Prof. Dr. Ir. Nicolas Gascoin as Science and Technology Cooperation Attache of Institut Français d'Indonésie (IFI) France Embassy.
8.45-8.50	Welcome speech by DR. Suryadiputra Liawatimena as chapter chair of The Indonesia Section Computer Society Chapter (TISCSC)
8.50-8.55	Welcome speech by DR. Anto Satriyo Nugroho as President of Indonesian Association for Pattern Recognition (INAPR)
8.55-9.10	Traditional Dance opening
9.10-9.15	**Opening and Photo Session together**
9.15-10.15	Keynote Speech 1 **Prof. Dr. Pitoyo Hartono** (Department of Electrical and Electronics Engineering, Chukyo University) with title : Transparent Hierarchical Classifier

10.15-10.30	Coffee break 1 and photo session
10.30-11.30	Keynote Speech 2 **Dr. Setiawan Hadi, M.Sc.CS. (***Computer Vision Research Laboratory University of Padjadjaran, Indonesia.***)** With title: Amadi: learning patterns from the past for better future
11.30-13.00	L u n c h and Friday praying for Muslim

13.00-15.00 (15 Minutes presentation per paper) ***Session:*** 1:13.00-13.15 2:13.15-13.30 3:13.30-13.45 4:13.45-14.00 5:14.00-14.15 6:14.15-14.30 7:14.30-14.45 8:14.45-15.00	**Room A0701** 1.Paper PR1 2.Paper PR7 3.Paper PR6 4.Paper PR4 5.Paper PR8 6.Paper PR5 7.Paper PR2 8.Paper PR9 Session Chair : ***to be confirmed***	**Room A0704** 1.Paper CS1 2.Paper CS7 3.Paper CS3 4.Paper CS9 5.Paper CS2 6.Paper CS10 7.Paper CS6 8.Paper CS8 Session Chair : to be confirmed	**Room A0705** 1.Paper IS1 2.Paper IS15 3.Paper IS2 4.Paper IS6 5.Paper IS3 6.Paper IS16 7.Paper IS4 8.Paper IS17 Session Chair : to be confirmed
	Room A0707 1. Paper PR11 2.Paper PR16 3.Paper PR13 4.Paper PR19 5.Paper PR17 6.Paper PR12 7.Paper PR14 8.Paper PR20 Session Chair : ***to be confirmed***	**Room A0708** 1. Paper PR23 2.Paper CS11 3.Paper PR24 4.Paper CS12 5.Paper PR25 6.Paper CS13 7.Paper PR26 8.Paper CS14 Session Chair : to be confirmed	**Room A0804** 1. Paper CS17 2.Paper IS8 3.Paper IS10 4.Paper IS11 5.Paper CS18 6.Paper IS9 7.Paper IS12 8.Paper IS14 Session Chair : ***to be confirmed***
15.00- 15.30	Coffee break

15.30- 16.15 (15 Minutes presentation per paper) ***Session:*** 9:15.30-15.45 10:15.45-16.00 11:16.00-16.15	**Room A0701** 9. Paper PR22 10. Paper PR3 11. Paper PR10 Session Chair : ***to be confirmed***	**Room A0704** 9. Paper CS4 10. Paper CS19 11. Paper CS5 Session Chair : ***to be confirmed***	**Room A0705** 9. Paper IS7 10. Paper IS5 11. Paper IS18 Session Chair : ***to be confirmed***
	Room A0707 9. Paper PR15 10. Paper PR18 11. Paper PR21 Session Chair : ***to be confirmed***	**Room A0708** 9. Paper CS15 10. Paper CS16 Session Chair : ***to be confirmed***	**Room A0804** 9. Paper CS20 10. Paper IS13 Session Chair : ***to be confirmed***

16.15-17.15	Keynote Speech 3 **Prof. Antoine Doucet (**La Rochelle University, France) with title : Sequential pattern mining for multingual text analysis
18.30 - 20.00	**Gala Dinner at Momentum Cafe** **ruko prominence 38 H No. 25, Pinang, Banten 15143** **And Closing Ceremony (best paper award)**
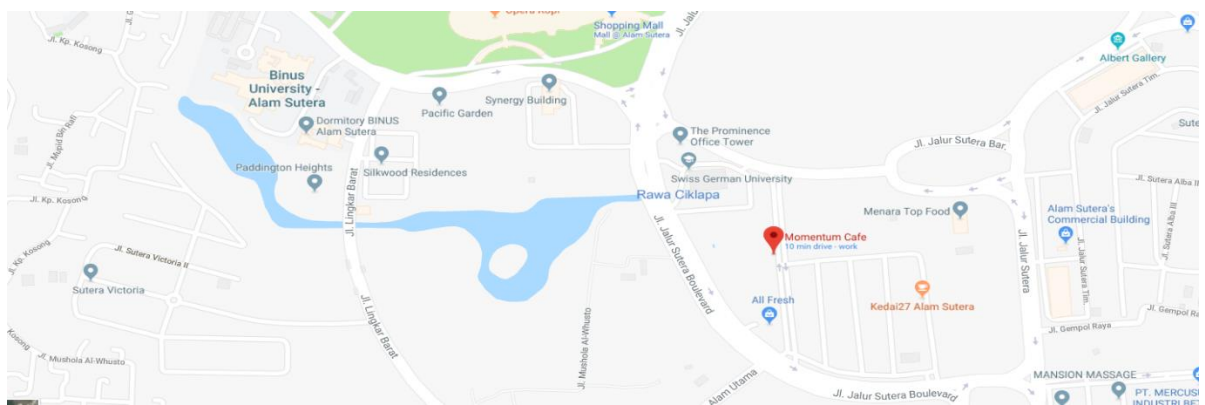
The conference will be running in 6 parallel sessions where 4 rooms (rooms A0701, A0704, A0705, A0707) parallel session with 11 papers and 2 rooms (rooms A0708 and A0804) parallel sessions with 10 papers. Next are the menu of papers' presentation composition:

1. Room number A0701 and A0707 for presentation 22 papers Pattern Recognition (PR) only.
2. Room number A0704 for presentation 11 papers Miscellaneous in Computer Science (CS) only.
3. Room number A0705 for presentation 11 papers Miscellaneous in Information Systems (IS) only.
4. Room number A0708 for presentation 4 papers Pattern Recognition (PR) and 6 papers Miscellaneous in Computer Science (CS).
5. Room number A0804 for presentation 3 papers Miscellaneous in Computer Science (CS) and 7 papers Miscellaneous in Information Systems (IS).

The papers' allocation is not ordered by papers number based on papers's distribution purposes where all the authors can mix up with others and at the end the networking between authors can be created in order to build long term research networking and knowledge sharing based on similarity authors' research interest.

Paper Code	Paper Title (Authors)	Room (sesi) time	Page
	Pattern Recognition (PR)		
PR1	*Sign Language Recognition Using Modified Convolutional Neural Network Model* (*Suharjito, Herman Gunawan, Narada Thiracitta, Ariadi Nugroho*)	*A0701(1)-13.00-13.15*	1
PR2	*The Comparison of Some Hidden Markov Models for Sign Language Recognition* (*Suharjito, Herman Gunawan, Narada Thiracitta, Gunawan Witjaksono*)	*A0701(7)-14.30-14.45*	6
PR3	*Feature Extraction Methods in Sign Language Recognition System: A Literature Review* (*Suharjito, Fanny Wiryana, Gede Putra Kusuma, Amalia Zahra*)	*A0701(10)-15.45-16.00*	11
PR4	*Sentence Level Indonesian Sign Language Recognition Using 3D Convolutional Neural Network and Bidirectional Recurrent Neural Network* (*Meita Chandra Ariesta, Fanny Wiryana, Suharjito, Amalia Zahra*)	A0701(4)-13.45-14.00	16
PR5	*Lightweight Spatial Pyramid Convolutional Neural Network for Traffic Sign Classification* (*Reza Fuad Rachmadi, Gou Koutaki, Kohichi Ogata*)	USD 355 A0701(6)-14.15-14.30	23
PR6	*A Fuzzy-Euclidean Intelligent Fitness Model (FEIFM) Implementation for Selecting Personal Vehicle* (*Inayatulloh, Lingga Pratama, Faninda Nurul Fatia, Muhammad Yusuf Firstra Efendi, Oviani Viandari, Ditdit Nugeraha Utama*)	*A0701(3)-13.30-13.45*	29
PR7	*Facial Attractiveness Classification using Deep Learning* (*Ricky Anderson, Aryo pradipta Gema, Suharjito, Sani M. Isa*)	*A0701(2)-13.15-13.30*	34
PR8	*Image Size, Color Depth, Age variant on Face Recognition using Convolution Neural Network*	*A0701(5)-14.00-14.15*	39

	(Hady Pranoto, Widodo Budiharto, Harco Leslie Hendric Spits Warnars, Tokuro Matsuo, Yaya Heryadi)		
PR9	*Facial Emotion Recognition using Computer Vision* *(Jonathan, Andreas Pangestu Lim, Paoline, Gede Putra Kusuma, Amalia Zahra)*	*A0701(8)14. 45-15.00*	46
~~PR10~~	~~*The Improved Artificial Neural Network based on Cosine Similarity for Facial Emotion Recognition*~~	~~*A0701(11)- 16.00-16.15*~~	-----
~~PR11~~	~~*Virtual Assistant Using Lstm Networks In Indonesian*~~	~~*A0707(1) 13.00-13.15*~~	-----
PR12	*Lstm And Simple Rnn Comparison In The Problem Of Sequence To Sequence On Conversation Data Using Bahasa Indonesia* *(Yulius Denny Prabowo, Harco Leslie Hendric Spits Warnars, Widodo Budiharto, Achmad Imam Kistijantoro, Yaya Heryadi, Lukas)*	*A0707(6)14. 15-14.30*	51
PR13	*A New Adaptive Thresholding Technique for Binarizing Ancient Document (Khairun Saddami, Putri Afrah, Viska Mutiawani, Fitri Arnia)*	*A707(3)- 13.30-13.45*	57
~~PR14~~	~~*Document Classification Using Stemming Porter and K-Nearest Neighbor Method*~~	~~*A707(7)- 14.30-14.45*~~	-----
PR15	*One More Reason to Reject Manuscript about Machine Learning for Structural Health Monitoring* *(Fergyanto E. Gunawan, Benfano Soewito, Nico Surantha, Tuga Mauritsius)*	*A0707(9)- 15.30-15.45*	62
PR16	*Indonesian Traditional Weapons Recognition Using Backpropagation (Bambang Prasetya Adhi, Widodo, Reva Setia Anugrah)*	*A0707(2)- 13.15-13.30*	67
PR17	*Batik Parang Rusak Detection Using Geometric Invariant Moment (Farida, Rezzy Eko Caraka, Tjeng Wawan Cenggoro, Bens Pardamean)*	*A0707(5)14. 00-14.15*	71
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PR21	*Preliminary Review on Population Based Approaches for Physician Scheduling* *(Mira Hidayati, Antoni Wibowo, Syariza Abdulrahman)*	*A0707(11)- 16.00-16.15*	90
PR22	*Association Rules Mining for Identifying Popular Ingredients on YouTube Cooking Recipes Videos* *(Boby Siswanto, Putri Thariqa)*	*A0701(9)- 15.30-15.45*	95
PR23	*Indonesian's Dangdut Music Classification Based on Audio Features* *(Ferdinand Mahardhika, Harco Leslie Hendric Spits Warnars, Yaya Heryadi, Lukas)*	*A0708(1)- 13.00-13.15*	99
PR24	*Comparison of Similarity Coefficients on Morphological Rodent Tuber (Iwan Binanto, Harco Leslie Hendric Spits Warnars, Bahtiar Saleh Abbas, Yaya Heryadi, Nesti Fronika Sianipar, Lukas, Horacio Emilio Perez Sanchez)*	*A0708(3)- 13.30-13.45*	104
~~PR25~~	~~*White Blood Cell Detection and Classification using YOLO*~~	~~*A0708(5)- 14.00-14.15*~~	-----
PR26	*A Fish Classification on Images using Transfer Learning and Matlab (Suryadiputra Liawatimena, Yaya Heryadi, Lukas, Agung Trisetyarso, Antoni Wibowo, Bahtiar Saleh Abbas, Erland Barlian)*	*A0708(7)- 14.30-14.45*	108
There are 4 papers Sign language recognition, 2 papers for traffic and vehicle, 4 papers for face recognition, 2 papers pattern in Bahasa Indonesia, 3 papers Document and manuscript, 3 papers using images for recognition, 3 papers current			

pattern recognition algorithm, 1 paper for cooking recipes video, 1 paper about Dangdut Music and 3 papers pattern recognition in bioinformatics.

However there are 4 papers such as paper PR10, PR11, PR14 and PR25 who do not do the requirement to include in 1st INAPR 2018 Proceeding, so we eliminate those papers.

Miscellaneous in Computer Science (CS)

Paper Code	Paper Title (Authors)	Room (sesi) time	Page
CS1	*Business Intelligence for Construction Company Acknowledgement Reporting System* (Abba Suganda Girsang, Sani Muhamad Isa, Herry Saputra, M. Apriadin Nuriawan, Reginald Putra Ghozali, Emil Robert Kaburuan)	*A0704(1)- 13.00-13.15*	113
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CS4	*Data Warehouse Development for Flight Reservation system* (Yoel Frans Alfredo, Abba Suganda Girsang, Sani Muhamad Isa, Ahmad Nurul Fajar)	*A0704(9)- 15.30-15.45*	134
CS5	*Business Solution for Choosing Products Using Data Warehouse in Payment Solution* (Ivan Alexander, Rian Rassetiadi, Samuel Garcia, Abba Suganda Girsang, Sani Muhamad Isa)	*A0704(11)- 16.00-16.15*	141
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CS7	*A Proposed surveillance model in an Intelligent Transportation System (ITS)* (Arman Syah Putra, Harco Leslie Hendric Spits Warnars, Ford Lumban Gaol, Benfano Soewito, Edi Abdurachman)	*A0704(2)- 13.15-13.30*	156
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CS13	*Hoax News Detection on Social Media: A Survey* (Priati Assiroj, Meyliana, Achmad N. Hidayanto, Harjanto Prabowo, Harco Leslie Hendric Spits Warnars)	*A0708(6)- 14.15-14.30*	186
CS14	*Mining Unstructured Data in Social Media for Natural Disaster Management in Indonesia*	*A0708(8)- 14.45-15.00*	192

	(Rakhmat Arianto, Harco Leslie Hendric Spits Warnars, Ford Lumban Gaol, Agung Trisetyarso)		
CS15	*Implementation of Gyroscope Sensor to Presentation Application on Android Smartphone* (Natalia Chandra, Raymond Surya Chin, Eric Cardova, Meidica Dyah Pratiwi, Nadia)	*A0708(9)- 15.30-15.45*	197
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IS5	*Information System Strategic Planning at PT Eonchemicals Using the Framework EA3 Cubes* (Budiman Adi Wubawa, Harisno, Victory Haris Kusumawardhana, Harco Leslie Hendric Spits Warnars)	*A0705(10)- 15.45-16.00*	250
IS6	*Smart Travel System Based on Service Oriented Architecture* (Rayan Nurbadi, Arinda Amyus, Brolyn Pratama, Abiyyu Fawwaz Kanz, Ahmad Nurul Fajar)	*A0705(4)- 13.45-14.00*	256
IS7	*The Collaboration of DevOps Automation and SOA to Accelerate Software Development Culture*	*A0705(9)- 15.30-15.45*	262

	(Fakhri Nurullah, Gunawan Wang, Emil Robert Kaburuan, Ahmad Nurul Fajar)		
IS8	*Strategic Planning Of Information Systems And Information Technology At Agricultural Research And Development Agency, Ministry Of Agriculture* (Mohammad Andi Ismanto, Harisno, Victory Haris Kusumawardhana, Harco Leslie Hendric Spits Warnars)	*A0804(2)-13.15-13.30*	267
IS9	*Cloud Computing Adoption Strategy Planning at Agricultural Central Data and Information System, Ministry of Agriculture with Roadmap for Cloud Computing Adoption (ROCCA) Model* (Tommy K. Bunyamin, Harisno, Victory Haris Kusumawardhana, Harco Leslie Hendric Spits Warnars)	*A0804(6)-14.15-14.30*	274
IS10	*Executive Information Systems for Cabin Base Aircraft Maintenance at PT. GMF AeroAsia Tbk* (Lahuddin, Haryanto, Davy Jonathan, Harco Leslie Hendric Spits Warnars)	*A0804(3)-13.30-13.45*	283
IS11	*Designing Knowledge Management System at PT. Metropolitan Kentjana Tbk, Pondok Indah Mall unit.* (Jarot S. Suroso, Daniel Panggabean)	*A0804(4)-13.45-14.00*	289
IS12	*Terminal Automation System: Automation Solution in the Oil and Gas Industry (A Case of ERP and Operational Distribution Supply Chain Integration in Tank Terminal)* (Gunawan Wang, Johnson Fransisco Gunawan Saputra)	*A0804(7)-14.30-14.45*	296
IS13	*Analysis of Factors Affecting the Admission of E-Filing Systems in Jakarta* (Soraya Pratiwi, Andry Hartanto, Fergyanto E. Gunawan, Mulia Denavi)	*A0804(10)-15.45-16.00*	302
IS14	*Developing of Indonesian Intelligent e-Health model* (Ferry Sudarto, Dedy Prasetya Kristiadi, Harco Leslie Hendric Spits Warnars, Michael Yoseph Ricky, Kiyota Hashimoto)	*A0804(8)-14.45-15.00*	307
IS15	A Literature Review on The Challenges of Adopting Cloud Computing for Startup in Indonesia (Jarot S. Suroso, Septia Redisa Sriratnasari)	*A0705(2)-13.15-13.30*	315
IS16	*Factors Affecting the Usage of Mobile Commerce using Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT)* (Helga Laksita Asastani, Harisno, Victory Haris Kusumawardhana, Harco Leslie Hendric Spits Warnars)	*A0705(6)-14.15-14.30*	322
IS17	*Information System Design for Deep Learning Based Plant Counting Automation* (Tjeng Wawan Cenggoro, Arif Budiarto, Reza Rahutomo, Bens Pardamean)	*A0705(8)-14.45-15.00*	329
IS18	*Financial Data Statistics Programs* (Prana Ugiana Gio, Rezzy Eko Caraka, Elly Rosmaini, Rizki Syahputra, Irna Triannur Lubis, Devidayanty Siregar, Yuni Shara, Bens Pardamean)	*A0705(11)-16.00-16.15*	333
There are 5 papers Information Systems (IS) Framework such as COBIT 5, Big Data Framework, Zachman, EA3 ubes, 2 papers IS development with Service Oriented Architecture (SOA), 5 papers Strategic IS such as Executive IS (EIS), Knowledge Management (KM), 2 papers development IS web based such as E-filling and e-Health and 4 papers for startup, implementation Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT), IS design and financial data statistics program.			

The 1st 2018 INAPR International Conference List of Papers per Room

1. **Room number A0701 and A0707 for presentation 22 papers Pattern Recognition (PR) only.**

Room A0701

Sesi	jam	Paper code	Title
1	13.00-13.15	PR1	*Sign Language Recognition Using Modified Convolutional Neural Network Model*
2	13.15-13.30	PR7	*Facial Attractiveness Classification using Deep Learning*
3	13.30-13.45	PR6	*A Fuzzy-Euclidean Intelligent Fitness Model (FEIFM) Implementation for Selecting Personal Vehicle*
4	13.45-14.00	PR4	*Sentence Level Indonesian Sign Language Recognition Using 3D Convolutional Neural Network and Bidirectional Recurrent Neural Network*
5	14.00-14.15	PR8	*Image Size, Color Depth, Age variant on Face Recognition using Convolution Neural Network*
6	14.15-14.30	PR5	*Lightweight Spatial Pyramid Convolutional Neural Network for Traffic Sign Classification*
7	14.30-14.45	PR2	*The Comparison of Some Hidden Markov Models for Sign Language Recognition*
8	14.45-15.00	PR9	*Facial Emotion Recognition using Computer Vision*
9	15.30-15.45	PR22	*Association Rules Mining for Identifying Popular Ingredients on YouTube Cooking Recipes Videos*
10	15.45-16.00	PR3	*Feature Extraction Methods in Sign Language Recognition System: A Literature Review*
11	16.00-16.15	PR10	*The Improved Artificial Neural Network based on Cosine Similarity for Facial Emotion Recognition*

Room A0707

Sesi	jam	Paper code	Title
1	13.00-13.15	PR11	*Virtual Assistant Using Lstm Networks In Indonesian*
2	13.15-13.30	PR16	*Indonesian Traditional Weapons Recognition Using Backpropagation*
3	13.30-13.45	PR13	*A New Adaptive Thresholding Technique for Binarizing Ancient Document*
4	13.45-14.00	PR19	*Nonlinear α-Regression Quantile Using Kernel Principal Component Analysis and Adaptive Genetic Algorithm*
5	14.00-14.15	PR17	*Batik Parang Rusak Detection Using Geometric Invariant Moment*
6	14.15-14.30	PR12	*Lstm And Simple Rnn Comparison In The Problem Of Sequence To Sequence On Conversation Data Using Bahasa Indonesia*
7	14.30-14.45	PR14	*Document Classification Using Stemming Porter and K-Nearest Neighbor Method*
8	14.45-15.00	PR20	*Using Machine Learning Techniques to Earlier Predict Student's Performance*
9	15.30-15.45	PR15	*One More Reason to Reject Manuscript about Machine Learning for Structural Health Monitoring*
10	15.45-16.00	PR18	*Generalized Spatio Temporal Autoregressive Rainfall-Enso Pattern In East Java Indonesia*
11	16.00-16.15	PR21	*Preliminary Review on Population Based Approaches for Physician Scheduling*

2. Room number A0704 for presentation 11 papers Miscellaneous in Computer Science (CS) only.

Room A0704

Sesi	jam	Paper code	Title
1	13.00-13.15	CS1	*Business Intelligence for Construction Company Acknowledgement Reporting System*
2	13.15-13.30	CS7	*A Proposed surveillance model in an Intelligent Transportation System (ITS)*
3	13.30-13.45	CS3	*Building Datawarehouse for Educational Institutions in 9 Steps*
4	13.45-14.00	CS9	*Smart Home Component using Orange Technology for Elderly people: A Systematic Literature*
5	14.00-14.15	CS2	*Bussiness Intelligence For a Digital Music Content Provider*
6	14.15-14.30	CS10	*SMARTD Web-Based Monitoring And Evaluation System*
7	14.30-14.45	CS6	*Data Warehouse implementation for Mixing Process in Tire Manufacture*
8	14.45-15.00	CS8	*Intelligent Traffic Monitoring System (ITMS) for Smart City Based on IoT Monitoring*
9	15.30-15.45	CS4	*Data Warehouse Development for Flight Reservation system*
10	15.45-16.00	CS19	*Django Web Framework Software Metrics Measurement Using Radon and Pylint*
11	16.00-16.15	CS5	*Business Solution for Choosing Products Using Data Warehouse in Payment Solution Company*

3. Room number A0705 for presentation 11 papers Miscellaneous in Information Systems (IS) only.

Room A0705

Sesi	jam	Paper code	Title
1	13.00-13.15	IS1	*Learning Framework in the Industrial Age 4.0 in Higher Education*
2	13.15-13.30	IS15	A Literature Review on The Challenges of Adopting Cloud Computing for Startup in Indonesia
3	13.30-13.45	IS2	*Evaluation of IT Governance on Core Banking System Development Project Using Framework COBIT 5: Case Study at PT Bank KEB Hana Indonesia*
4	13.45-14.00	IS6	*Smart Travel System Based on Service Oriented Architecture*
5	14.00-14.15	IS3	*Developing Garuda Smart City Model with Big Data Framework*
6	14.15-14.30	IS16	*Factors Affecting the Usage of Mobile Commerce using Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT)*
7	14.30-14.45	IS4	*The Application of Zachman Framework in Improving Better Decision Making*
8	14.45-15.00	IS17	*Information System Design for Deep Learning Based Plant Counting Automation*
9	15.30-15.45	IS7	*The Collaboration of DevOps Automation and SOA to Accelerate Software Development Culture*
10	15.45-16.00	IS5	*Information System Strategic Planning at PT Eonchemicals Using the Framework EA3 Cubes*
11	16.00-16.15	IS18	*Financial Data Statistics Programs*

4. **Room number A0708 for presentation 4 papers Pattern Recognition (PR) and 6 papers Miscellaneous in Computer Science (CS).**

Room A0708

Sesi	jam	Paper code	Title
1	13.00-13.15	PR23	*Indonesian's Dangdut Music Classification Based on Audio Features*
2	13.15-13.30	CS11	*Adaptive Game Design using Case-based Reasoning Method for High Performance Computing Learning*
3	13.30-13.45	PR24	*Comparison of Similarity Coefficients on Morphological Rodent Tuber*
4	13.45-14.00	CS12	*Gamification in the e-Learning Process for children with Attention Deficit Hyperactivity Disorder (ADHD)*
5	14.00-14.15	PR25	*White Blood Cell Detection and Classification using YOLO*
6	14.15-14.30	CS13	*Hoax News Detection on Social Media: A Survey*
7	14.30-14.45	PR26	*A Fish Classification on Images using Transfer Learning and Matlab*
8	14.45-15.00	CS14	*Mining Unstructured Data in Social Media for Natural Disaster Management in Indonesia*
9	15.30-15.45	CS15	*Implementation of Gyroscope Sensor to Presentation Application on Android Smartphone*
10	15.45-16.00	CS16	*The Implementation of E-money in Mobile Phone: A Case Study at PT Bank KEB Hana*

5. **Room number A0804 for presentation 3 papers Miscellaneous in Computer Science (CS) and 7 papers Miscellaneous in Information Systems (IS).**

Room A0804

Sesi	jam	Paper code	Title
1	13.00-13.15	CS17	*Big Data implementation for Inventory warehouse systems*
2	13.15-13.30	IS8	*Strategic Planning Of Information Systems And Information Technology At Agricultural Research And Development Agency, Ministry Of Agriculture*
3	13.30-13.45	IS10	*Executive Information Systems for Cabin Base Aircraft Maintenance at PT. GMF AeroAsia Tbk*
4	13.45-14.00	IS11	*Designing Knowledge Management System at PT. Metropolitan Kentjana Tbk, Pondok Indah Mall unit.*
5	14.00-14.15	CS18	*High Performance Computing (HPC) Implementation: A Survey*
6	14.15-14.30	IS9	*Cloud Computing Adoption Strategy Planning at Agricultural Central Data and Information System, Ministry of Agriculture with Roadmap for Cloud Computing Adoption (ROCCA) Model*
7	14.30-14.45	IS12	*Terminal Automation System: Automation Solution in the Oil and Gas Industry (A Case of ERP and Operational Distribution Supply Chain Integration in Tank Terminal)*
8	14.45-15.00	IS14	*Developing of Indonesian Intelligent e-Health model*
9	15.30-15.45	CS20	*Automation Processing Halstead Metrics Application's Results*
10	15.45-16.00	IS13	*Analysis of Factors Affecting the Admission of E-Filing Systems in Jakarta*

The 1ˢᵗ 2018 INAPR Best paper Awards address to 3 papers such as :

1. Lightweight Spatial Pyramid Convolutional Neural Network Classifier for Traffic Sign Classification.

   By : Reza Fuad Rachmadia, Gou Koutakia and Kohichi Ogataa

2. A New Adaptive Thresholding Technique for Binarizing Ancient Document

   By : Khairun Saddami, Putri Afrah, Viska Mutiawani, Fitri Arnia

3. Evaluation of IT Governance on Core Banking System Development Project Using Framework COBIT 5: Case Study at PT Bank KEB Hana Indonesia
   By : Vivi Regina Aprilia, Harisno, Victory Haris Kusumawardhana

These 3 papers had been selected as best paper based on scoring upon 3 factors such as similarity papers' score, review papers' score and review papers' span score including the full attendance of author team in 1ˢᵗ 2018 INAPR International Conference 7 Sept 2018 from morning till evening, from opening session till Gala Dinner at Momentum Café.

Here the detail of similarity papers' score, review papers' score and review papers' span score:

No	Title	Similarity Score	review papers' score	review papers' span score	Total
1	Lightweight Spatial Pyramid Convolutional Neural Network Classifier for Traffic Sign Classification.	18	4.5	2.7	*4.905*
2	A New Adaptive Thresholding Technique for Binarizing Ancient Document	15	4.6	2.2	*4.76*
3	Evaluation of IT Governance on Core Banking System Development Project Using Framework COBIT 5: Case Study at PT Bank KEB Hana Indonesia	25	3.8	2.7	*4.695*

Comparison of Similarity Coefficients on Morphological Rodent Tuber

[1,2]Iwan Binanto
[1]Computer Science Department,
BINUS Graduate Program – Doctor of
Computer Science
Bina Nusantara University
Jakarta, Indonesia 11480

[2]Informatics Department,
Sanata Dharma University,
Yogyakarta, Indonesia 55002
iwan@usd.ac.id

[1]Harco Leslie Hendric Spits
Warnars, [2]Bahtiar Saleh Abbas,
[3]Yaya Heryadi
Computer Science Department,
BINUS Graduate Program,
Doctor of Computer Science
Bina Nusantara University
Jakarta, Indonesia 11480
[1]spits.hendric@binus.ac.id,
[2]bahtiars@binus.edu,
[3]yayaheryadi@binus.edu

[1,2]Nesti Fronika Sianipar
[1]Food Technology Department,
Faculty of Engineering,
Bina Nusantara University,
Jakarta, Indonesia 11480

[2]Research Interest Group
Biotechnology,
Bina Nusantara University,
Jakarta, Indonesia 11480
nsianipar@binus.edu

Lukas
Cognitive Engineering Research Group
(CERG),
Faculty of Engineering,
Universitas Katolik Indonesia
Atma Jaya,
Jakarta, Indonesia 12930
lukas@atmajaya.ac.id

Horacio Emilio Perez Sanchez
Bioinformatics and High Performance
Computing Research Group (BIO-
HPC), Universidad Católica de Murcia
(UCAM), Guadalupe, Spain 30107
hperez@ucam.edu

Abstract— **Many comparisons of similarity coefficient done by researchers, especially in the field of biology. This comparison aims to find the most appropriate similarity coefficient for some cases. Many results found that Sorensen-dice coefficient and Jaccard coefficient is close or even identical. But Jaccard coefficient can not handle properly for sets with real-value or weighted sets or any pair of vectors. So, Jaccard coefficient redefined as Generalized Jaccard Coefficient. This paper shows the correlation between Sorensen-dice coefficient with Generalized Jaccard Coefficient using Spearman's correlation as predecessors research did and using ANOVA to ensure the results. This research find that the comparison between them is less similar from predecessors research.**

Keywords— Generalized Jaccard Similarity, Sorensen-Dice Similarity, similarity coefficient, comparison, rodent tuber

I. INTRODUCTION

The similarity is necessary to examine the objects of investigation; in this case, the mutant of Rodent Tuber (Typhonium flagelliforme Lodd.) derived from breeding with its parent, called control plant. The research of Rodent Tuber was performed by Sianipar, et al. in [1]–[5] utilizing NTSys, which is proprietary software. One of their research objectives is to find similarity. By the discovery of similarity, it will be easier to find its dissimilarity, because the real purpose of the breeding is to find the diversity of produced mutants [6] [7].

One of Sianipar's investigations is the morphological observation of Rodent Tuber, which has been given gamma irradiation. According to this investigations, gamma irradiation at 6 Gy's dose was able to increase the number of shoots and leaves, and also the height of the plant of the Rodent clones which are compared to the control plants [4]. This paper using the data from [4] as in Table I.

Sianipar et al. measure the similarity between the mutants of Rodent Tuber and the control plant using Sorensen-Dice coefficient [1]–[5]. The formula of Sorensen-Dice coefficient is:

$$SDC(A,B) = \frac{2\,|A \cap B|}{|A| + |B|} \qquad (1)$$

Beside of Sorensen-Dice coefficient, there are many coefficient similarities, one of them is Jaccard coefficient which had approximately identical results in [8], [9] or has close result in [10] or a very close result in [11] to Sorensen-Dice coefficient. The Jaccard coefficient created for analyses in phytology [12] and works well with binary data as well as Sorensen-Dice coefficient. Many research using Jaccard coefficient for measuring similarities in a various field [8]–[17]. The formula of Jaccard coefficient is:

$$J(A,B) = \frac{|A \cap B|}{|A \cup B|} \qquad (2)$$

Jaccard coefficient is simple and effective in many applications [13], [18] but it can not handle properly for sets with real-value or weighted sets [18] or any pair of vectors [19], therefore it redefine and explained well as the Generalized Jaccard Coefficient in [19], for short we call it GJS, and also introduced and used in [18]–[22] as:

$$GJS(A,B) = \frac{\sum_i min(A_i, B_i)}{\sum_i max(A_i, B_i)} \qquad (3)$$

This paper discusses Generalized Jaccard Coefficient compared to Sorensen-Dice Coefficient (result from proprietary software namely NTSys) using Spearman's correlation as [8]–[11] did.
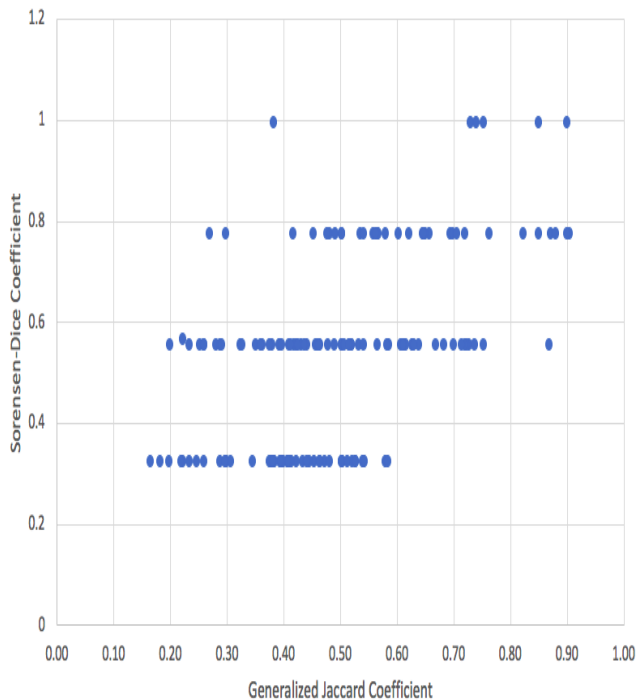

Fig. 1. Plot Sorensen-Dice and Generalized Jaccard coefficient

II. LITERATURE REVIEW

Rodent Tuber is a plant native to Indonesia that has been used as traditional medicine for many years. This plant contains detoxification and anti-cancer compounds. These anticancer compounds exist in all parts of the plant, including roots, tubers, stems, and leaves. Unfortunately, this plant does not have much genetic diversity, so it becomes an obstacle regarding obtaining plants that have higher anticancer compounds. Sianipar et al. began to develop mutants using gamma radiation [23]. To test the genetic diversity of the mutant plants produced, Sianipar et al. did a similarity test using the NTSys software with Sorensen-Dice coefficient [1]–[5].

Duarte et al. in [8] compared eight similarity coefficients using the Spearman's correlation and dendrogram to test similarity in common beans based on the RAPD marker. One of the result is Sorensen-Dice, and the Jaccard coefficient has an identical result. Murguia et al. in [9] compared nine similarity coefficients to estimate the effect of biogeographic classification; the result is Sorensen-Dice and Jaccard coefficient had identical results. Silva et al. in [10] compared eight similarity coefficient using Spearman's correlation, and the result is Sorensen-Dice and Jaccard coefficient had a close result. Dalirsefat et al. in [11] compared three similarity coefficient one of the comparison tools is the Spearman's correlation and of the result of a correlation value between Sorensen-Dice and Jaccard coefficient is one which means exactly same.

Shrivastava (2016) in [19] said that GJS (A, B) is often used to compare web documents, histograms (especially images), gene sequences, etc. Those are weighted sets or pair of vectors. Weighted sets or any pair of vectors are more commonly found than binary sets. If A and B are binary or sets, then the similarity measure is called Jaccard coefficient as mentioned in [8]–[17]. According to [18], [19], Jaccard coefficient cannot handle properly for sets with real-value called weighted sets or any pair of vectors.

III. METHOD

This paper uses raw data and Sorensen-Dice similarity table from [4] as in Table I and Table IV respectively. Generalized Jaccard coefficient calculated with formula (3) and have a result as in Table V. It was done using Microsoft Excel.

To calculate the correlation, each similarity table converted to be 1 column, so we have two columns which are Generalized Jaccard column and Sorensen-Dice column. From here, we can plot the data as in Fig. 1.

Then Spearman's correlation calculated to find the value of correlation between Table IV and Table V. It done using MATLAB with the script as below:

```
a = xlsread('Book2.xlsx','A:A')
b = xlsread('Book2.xlsx','B:B')
[RHO] = corr(a,b,'Type','Spearman');
```

The script generates RHO value 0.5052, which is the value of Spearman's correlation.

To ensure the correlation between Generalized Jaccard coefficient and Sorensen-Dice coefficient, we construct a hypothesis which are:

H_0: No correlation between Generalized Jaccard coefficient and Sorensen-Dice coefficient

H_a: There is a correlation between Generalized Jaccard coefficient and Sorensen-Dice coefficient

This hypothesis evaluated with ANOVA using Microsoft Excel and the result provided as in Table II.

TABLE I. RAW DATA FROM [4]

Clone	Shoot	Leaf	Plant Height (cm)
control	0	1	3.5
6-3-3-6	1	6	4
6-9-3	2.5	3.5	4
6-9-4	0.4	4	12.5
6-2-5-3	0.5	7	12
6-3-2-5	1.5	8	13.5
6-1-1-2	3.5	2	6
6-9-1	2.5	11	4.5
6-2-4-1	0	2	3
6-6-3-7	0.5	6	7.5
6-6-3-6	1	6	12.5
6-2-7	0	5.5	12
6-2-6-3	0	5	5.5
6-1-2	4.5	15	8.3
6-1-1-6	1	2	5
6-2-8-2	2.5	11.5	6.5
6-9-5	0	12.5	10.3
6-3-3-10	0	1.5	7.5

IV. RESULTS AND DISCUSSIONS

Duarte et al. in [8] concluded that the result is Sorensen-Dice and the Jaccard coefficient has an identical result. Murguia et al. in [9] had a result that Sorensen-Dice and Jaccard coefficient had identical results. Silva et al. in [10] concluded that Sorensen-Dice and Jaccard coefficient had a close result. Dalirsefat et al. in [11] had the result that correlation value between Sorensen-Dice and Jaccard coefficient is one which means exactly same. They made a comparison between Sorensen-dice coefficient and Jaccard coefficient where both are used binary data. This paper uses Generalized Jaccard coefficient for real-value data. According to [19], Jaccard coefficient similar to Generalized Jaccard coefficient. But in this research, the result of Spearman's correlation is 0.5052 as above, which means there is a moderate positive correlation, as in Table III [24]. It is not close, very close, nor even identical.

TABLE II. ANOVA SINGLE FACTOR

SUMMARY

Groups	Count	Sum	Average	Variance
GJS	153	75.8055923	0.49546139	0.02869388
DICE	153	84.09	0.54960784	0.03544327

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.22428566	1	0.22428566	6.99393895	0.0086034	3.87222952
Within Groups	9.74884679	304	0.03206857			
Total	9.97313245	305				

TABLE III. INTERPRETING CORRELATION COEFFICIENT [24]

Correlation Value	Interpretation
0.90 to 1.00 (-0.90 to -1.00)	Very High Positive/Negative Correlation
0.70 to 0.90 (-0.70 to -0.90)	High Positive/Negative Correlation
0.50 to 0.70 (-0.50 to -0.70)	Moderate Positive/Negative Correlation
0.30 to 0.50 (-0.30 to -0.50)	Low Positive/Negative Correlation
0.00 to 0.30 (0.00 to -0.30)	Negligible Correlation

TABLE IV. RESULT OF SORENSEN-DICE COEFFICIENT

	control	6-3-3-6	6-9-3	6-9-4	6-2-5-3	6-3-2-5	6-1-1-2	6-9-1	6-2-4-1	6-6-3-7	6-6-3-6	6-2-7	6-2-6-3	6-1-2	6-1-1-6	6-2-8-2	6-9-5	6-3-3-10
control	1																	
6-3-3-6	0.56	1																
6-9-3	0.78	0.56	1															
6-9-4	0.78	0.33	0.56	1														
6-2-5-3	0.56	0.33	0.33	0.78	1													
6-3-2-5	0.33	0.78	0.33	0.56	0.78	1												
6-1-1-2	0.56	0.33	0.78	0.56	0.33	1	1											
6-9-1	0.56	0.56	0.78	0.33	0.33	0.33	0.56	1										
6-2-4-1	1	0.56	0.78	0.78	0.56	0.33	0.56	0.56	1									
6-6-3-7	0.56	0.56	0.33	0.56	0.78	0.56	0.56	0.33	0.56	1								
6-6-3-6	0.33	0.78	0.33	0.56	0.78	1	0.33	0.33	0.33	0.56	1							
6-2-7	0.56	0.56	0.33	0.78	1	0.78	0.33	0.33	0.56	0.78	0.78	1						
6-2-6-3	0.56	0.56	0.33	0.56	0.78	0.56	0.56	0.33	0.56	1	0.56	0.78	1					
6-1-2	0.33	0.33	0.56	0.33	0.33	0.33	0.78	0.78	0.33	0.56	0.33	0.33	0.56	1				
6-1-1-6	0.56	0.56	0.56	0.56	0.33	0.56	0.78	0.33	0.56	0.56	0.56	0.33	0.56	0.56	1			
6-2-8-2	0.33	0.33	0.56	0.33	0.33	0.33	0.78	0.78	0.33	0.56	0.33	0.33	0.56	1	0.56	1		
6-9-5	0.56	0.33	0.33	0.78	0.78	0.56	0.33	0.56	0.57	0.56	0.56	0.78	0.56	0.56	0.33	0.56	1	
6-3-3-10	0.78	0.33	0.56	0.78	0.56	0.33	0.78	0.33	0.78	0.78	0.33	0.56	0.78	0.56	0.78	0.56	0.56	1

TABLE V. RESULT OF GENERALIZED JACCARD COEFFICIENT

	control	6-3-3-6	6-9-3	6-9-4	6-2-5-3	6-3-2-5	6-1-1-2	6-9-1	6-2-4-1	6-6-3-7	6-6-3-6	6-2-7	6-2-6-3	6-1-2	6-1-1-6	6-2-8-2	6-9-5	6-3-3-10
control	1																	
6-3-3-6	0.75	1																
6-9-3	0.45	0.68	1															
6-9-4	0.27	0.43	0.42	1														
6-2-5-3	0.23	0.53	0.37	0.82	1													
6-3-2-5	0.20	0.48	0.38	0.73	0.85	1												
6-1-1-2	0.39	0.45	0.65	0.42	0.38	0.38	1											
6-9-1	0.25	0.61	0.56	0.34	0.47	0.52	0.44	1										
6-2-4-1	0.73	0.45	0.50	0.30	0.26	0.22	0.43	0.3	1									
6-6-3-7	0.32	0.72	0.50	0.63	0.72	0.61	0.50	0.5	0.36	1								
6-6-3-6	0.23	0.56	0.40	0.87	0.90	0.85	0.41	0.4	0.26	0.72	1							
6-2-7	0.26	0.50	0.38	0.87	0.90	0.76	0.38	0.4	0.29	0.70	0.90	1						
6-2-6-3	0.43	0.72	0.58	0.53	0.54	0.46	0.52	0.5	0.48	0.75	0.54	0.60	1					
6-1-2	0.16	0.40	0.36	0.40	0.50	0.54	0.41	0.6	0.18	0.50	0.48	0.44	0.38	1				
6-1-1-6	0.56	0.58	0.64	0.42	0.38	0.35	0.70	0.4	0.63	0.52	0.41	0.38	0.61	0.29	1			
6-2-8-2	0.22	0.54	0.49	0.41	0.54	0.58	0.49	0.9	0.24	0.60	0.51	0.46	0.51	0.74	0.39	1		
6-9-5	0.20	0.42	0.30	0.56	0.69	0.67	0.30	0.6	0.22	0.58	0.63	0.64	0.46	0.70	0.29	0.71	1	
6-3-3-10	0.50	0.38	0.41	0.53	0.46	0.39	0.58	0.3	0.47	0.64	0.46	0.51	0.56	0.32	0.62	0.37	0.39	1

V. Conclusions

In previous research on the comparison between Jaccard coefficient and Sorensen-Dice coefficient [8]–[11], showing the results that both have close correlations up to identical. But Jaccard coefficient can not handle properly for sets with real-value or weighted sets [18] or any pair of vectors [19], so the Generalized Jaccard coefficient is used. In this study, Sorensen-Dice coefficient compared with Generalized Jaccard coefficient and the result is there is a moderate correlation with the Spearman's correlation value is 0.5052. This result less similar than the previous research in [8]–[11]. Because of this, we are not recommending to use Generalized Jaccard coefficient if already use Sorensen-Dice coefficient to avoid confusion.

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