



# PROCEEDINGS

**2017 3rd International Conference on Science  
in Information Technology (ICSITech)**

*“Theory and Application of IT for Education, Industry  
and Society in Big Data Era”*

**Universitas Pendidikan Indonesia**  
Department of Computer Science Education  
Bandung, Indonesia, October 25-26, 2017

Partners



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# 2017 3<sup>rd</sup> International Conference on Science in Information Technology (ICSITech)

October 25-26, 2017

Bandung, Indonesia

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# **PROCEEDING**

2017 3<sup>rd</sup> International Conference on Science  
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Version: 2017-10-20

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## Foreword from Conference Chair

Dear distinguished guests, keynote speakers, and participants,

Welcome to ICSITech 2017!

Universitas Pendidikan Indonesia is honored to be the host of this year's Conference on Science in Information Technology (ICSITech). The ICSITech is jointly organized with Universitas Ahmad Dahlan, Universitas Mulawarman, UPN "Veteran" Yogyakarta, Universitas Muhammadiyah Surakarta, UTM Big Data Centre, Universiti Teknologi Malaysia, Universiti Putra Malaysia, Universiti Malaysia Sabah, and Universitas Budi Luhur. Since this is the third conference, we wish to repeat the success of the two previous conferences. We do hope this annual conference will continue to be held in the next coming years (2018 in Malaysia, 2019 in Yogyakarta, etc.) with increasing quality. For this year's conference, we proudly present the theme of ICSITech 2017, "Theory and Application of IT for Education, Industry, and Society in Big Data Era". The theme is taken from our university's identity as a university which consistently takes part in education and responds to the development of science, technology, art, society demands, and global change.

Ladies & gentlemen,

We are pleased to inform you that the ICSITech 2017 has been approved by IEEE for technical co-sponsorship; therefore, the papers which are accepted and presented will be further considered to be published in the IEEE Xplore Digital Library. I wish to extend a warm welcome to Prof. Dr. Ir. Fitri Yuli Zulkifli, S.T., M.Sc., as IEEE Indonesia Section Chair. There are 406 papers from 17 countries submitted to the ICSITech 2017 with about 34.7% acceptance ratio. Congratulations for all authors and presenters whose papers are accepted. Thank you for choosing ICSITech 2017 and disseminating your research here.

Today, we are lucky to have three keynote speakers who will broaden our insights about Big Data Era in IT Perspective. They will talk about their expertise and we do hope this event could bring many benefits, especially in the fields of education, industry, and society. We are honored for the presence of Prof. Dr. Tsukasa Hirashima (Hiroshima University), Prof. Dr. Halimah Badioze Zaman (Universiti Kebangsaan Malaysia), and Prof. Ir. Dwi Hendratmo Widyantoro, M.Sc., Ph.D (Institut Teknologi Bandung), thank you very much.

The previous conferences were held in Yogyakarta and Samarinda, respectively. This year, the ICSITech 2017 is taking place in Bandung. The city is nicknamed Parijs van Java. Bandung is one of the favorite travel destinations, especially in Java, with many wonderful tourism destinations and delightful culinary creations. Please enjoy your stay in Bandung.

Finally, we thank all keynote speakers, participants, sponsors, associations, and partners for being a part of this conference. On behalf of the organizing committee, we wish to express our highest appreciation and sincere thanks to all of you who attend this event and we wish you have valuable discussion and networking. I also thank the committee for all efforts to make ICSITech 2017 successful.

Thank you.

**General Chair**

Prof. Dr. Munir, M.IT.

Department of Computer Science Education

Universitas Pendidikan Indonesia, West Java – Indonesia

## **Welcome Message from the Dean of FPMIPA Universitas Pendidikan Indonesia**

I am honored and delighted to welcome all distinguished guests, keynote speakers, and participants to the Conference on Science in Information Technology (ICSITech) 2017. Since 2015, Universitas Pendidikan Indonesia has taken part in organizing the ICSITech. It is our pleasure and honor to get the opportunity of being a host for this year's conference with Computer Science Education Department as the organization in charge. Especially for the Department of Computer Science Education, even though this event is the first experience, the commitment to make this event successful is proved today. Congratulations!

As the dean, I am pleased that our institution has been networking with other partner institutions incorporated in the ICSITech. Together we have learned and worked to organize a high quality conference which can build a relationship between researchers and may create opportunities for joint research or other collaborations. This conference has brought us from various countries and institutions to disseminate our research and have a valuable discussion. We wish a delightful event and networking here.

We are very grateful the ICSITech 2017 is attended by keynote speakers who have expertise related to our conference's theme. Please accept my sincere thanks and appreciation to all of you. We believe that the talks will inspire us and give insight or new idea for doing the next research. Moreover, I also would like to express my gratitude to IEEE for the technical co-sponsorship and the Ministry of Research, Technology, and Higher Education (RISTEKDIKTI) of the Republic of Indonesia for the funding, Indonesian Association of Higher Education in Informatics and Computer Science (APTIKOM) of West Java Region for the support, and our partner institutions for their cooperation and contribution to the ICSITech 2017.

Thank you.

**Dean of FPMIPA Universitas Pendidikan Indonesia**  
Siti Fatimah, M.Si., Ph.D.

## **Welcome Message from the Rector of Universitas Pendidikan Indonesia (UPI)**

I am extremely proud and happy to welcome you to the 2017 3rd International Conference on science in Information Technology (ICSITech) organized by Universitas Pendidikan Indonesia (UPI) as a host, Universitas Ahmad Dahlan (UAD), MULAWARMAN University, UPN “Veteran” Yogyakarta, Universitas Muhammadiyah Surakarta (UMS), UTM Big Data Centre, Universiti Teknologi Malaysia (UTM), Universiti Putra Malaysia (UPM), Universiti Malaysia Sabah (UMS), and Universitas Budi Luhur (UBL).

Since UPI is one of the leading university in computer science education, this conference was held to provide as an event for IT expertise to disseminate their knowledge on the development of computer science education and expand the network connection on the research activities. Furthermore we intend to make the existence of this conference as a motivation for researchers to publish their ideas about theory and application of IT for education, industry, and society in international forums. In line with UPI vision to become a leading and outstanding university in education, producing, developing, and disseminating science and technology to improve people's welfare has become one of our goal along with collaborating in research activities with other universities. Therefore, we are looking forward to collaborating in various research areas.

I am finally welcome the 2017 3<sup>rd</sup> International Conference on Science in Information Technology (ICSITech) participants who delegates their institutions to UPI, hopefully the distinguished participant can participate actively in this conference and enjoy the services we are provide.

Thank you.

**Rector of Universitas Pendidikan Indonesia**  
Prof. Dr. H.R. Asep Kadarohman, M.Si.

## Opening Message

Dear Distinguished Guests, Colleagues, researchers, professionals, ladies and gentlemen,  
Good morning, a prosperous and warm greeting.

On behalf of IEEE Indonesia section, I would like to express my sincere gratitude and welcome you to the 2017 International Conference on Science in Information Technology (ICSITech). ICSITech is hosted by Universitas Pendidikan Indonesia and is jointly organized with Universitas Ahmad Dahlan, Universitas Mulawarman, UPN “Veteran” Yogyakarta, Universitas Muhammadiyah Surakarta, UTM Big Data Centre, Universiti Teknologi Malaysia, Universiti Putra Malaysia, Universiti Malaysia Sabah, and Universitas Budi Luhur. ICSITech 2017 is technically co-sponsored by the IEEE Indonesia Section with conference record number #40947.

The Conference is aimed to bring researchers, academicians, scientists, students, engineers and practitioners together to participate and present their latest research finding, developments and applications related to current development and innovation in the advanced of research area on Science in Information Technology. Accepted and presented papers will be published in the conference proceedings, and those that are within the scope of IEEE will be submitted to the IEEE Xplore digital library.

Ladies and gentlemen,

IEEE Indonesia Section has conducted many activities over 29 years in Indonesia. In terms of collaboration, IEEE Indonesia section has a good and mutual relationship with ICT organizations, Industries, universities as well as the government in Indonesia. IEEE Indonesia Section has contributed and sponsored about 60 different International conferences annually, and this conference is one of the conferences which were sponsored by IEEE Indonesia Section. I do hope in the near future, some high-quality conferences will be continued and strengthened, so the result will give more benefits and positive impacts to the human being, especially to Indonesian people. Cooperation with international conferences is only one activity among many other activities in IEEE Indonesia section. Some of our other activities are public lectures, intellectual gatherings and workshops, humanitarian and research grants, and many more. Please check our website at [iee.org](http://iee.org) and [iee.id](http://iee.id) for more complete information. We hope with many activities conducted by IEEE Indonesia Section, we can help our government to decrease the digital divide in Indonesia.

Ladies and gentlemen,

In this occasion, I would also like to say welcome to Bandung, which serves beautiful heritages, culinary, culture, with warm, polite and friendly people, a vibrant culture and lifestyle.



Finally, we do hope all of you will have enjoyable and valuable experience during this conference event. Please share your best knowledge in your area of research and professional activities.

Thank you.

**IEEE Indonesia Section Chair**

Prof. Dr. Ir. Fitri Yuli Zulkifli, ST., MSc.

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## Keynote Speakers Biography

### **Prof. Dr. Tsukasa Hirashima (Hiroshima University, Japan)**



Prof. Tsukasa Hirashima received his Ph.D. in 1991 from Osaka University, Japan. He worked at The Institute of Scientific and Industrial Research, Osaka University as a research associate and lecturer from 1991 to 1997. During 1997-2003, he worked in Department of Artificial Intelligence at Kyushu Institute of Technology as an associate professor. He has been a professor of Graduate School, Department of Information Engineering, Hiroshima University since 2004. Prof. Hirashima's contributions in Computers in Education, especially, in artificial intelligence in education include modeling of problem-solving process, error-visualization for error-awareness, information filtering, question/problem generation, learning by problem posing and design method of learning game. Recently, he is interested in Kit-Build concept map on formative assessment, Educational Externalization of Thinking Task by Kit, and Effects of Error-Based Simulation as a Counterexample for Correcting MIF Misconception.

### **Prof. Dr. Halimah Badioze Zaman (Universiti Kebangsaan Malaysia, Malaysia)**



Professor Dato' Dr Halimah Badioze Zaman received her Ph.D. from Loughborough University, United Kingdom, in 1983. She joined Universiti Kebangsaan Malaysia in 1983 and was one of the founders of the Faculty of Information Science and Technology, UKM. She became the Founding Head of Department of Information Science and later Deputy Dean of Research and Development Affairs of the Faculty from 2002-2005. She became a full Professor in Multimedia Technology since 1999. In July 2005-August 2007, she became Visiting Professor at the Department of Computer and Information Engineering, Tamkang University, Taiwan and Guest Writer at Chengchi National University, Taiwan. She is also currently a conjoint Professor at Newcastle University, Australia, and Honorary Professor at Nottingham University, UK and Malaysia Campus. She became the Founding Director of the first Computer Science and Information Technology Centre of Excellence in UKM called Institute of Visual Informatics (IVI) since 2010. She is very active in research in the field of computer science and ICT specifically in Visual Informatics. She was responsible for the creation of the ICT niche in UKM, and is Lead Scholar and Head of the Visual Informatics Research Group. She has worked extensively in the areas of visual informatics namely, multimedia software development, virtual reality, augmented reality, virtual learning, virtual Islamic banking, various virtual, haptic and voice recognition systems for the special population: such as the visually impaired, the physically ill patients as well learners of down syndrome, dyslexia, deaf and autism. She is also active in the field of visualization of big data and data analytics.

**Prof. Ir. Dwi Hendratmo W., M.Sc., Ph.D. (Institut Teknologi Bandung, Indonesia)**



Prof. Ir. Dwi Hendratmo W., M.Sc., Ph.D. received his Ph.D. from Texas A&M University, USA. He work as a professor of School of Electrical Engineering and Informatics Institut Teknologi Bandung. One of his professional memberships is ACM (Association for Computing Machinery) memberships. Prof. Dwi's field of expertise, especially, in machine learning, information retrieval and management, information summarization, information extraction, text mining, sentiment analysis, and e-Learning. Some of his recent publication are vehicle detection and tracking based on corner and lines adjacent detection features, comparison study of neural network and deep neural network on repricing GAP prediction in Indonesian conventional public bank, Fisheye zoom and semantic zoom on citation network visualization, and design of knowledge for conversational recommender system based on product functional requirements. Curently, he is interested in conversational recommender system, text translator machine, and chatbot speaking development.

## 2017 3<sup>rd</sup> ICSITech Schedule

### Day 1: Wednesday, October 25, 2017

07.00 – 07.30	Hospitality & Registration Desks Open
07.30 – 08.30	Opening Ceremony: <ol style="list-style-type: none"><li>1. National Anthem – Indonesia Raya</li><li>2. Culture Performance</li><li>3. Welcome Address – ICSITech 2017 Chairperson</li><li>4. Supporting Address – IEEE Indonesia Section</li><li>5. Welcome Address – Rector of Universitas Pendidikan Indonesia</li></ol>
08.30 – 09.00	Coffee Break
09.00 – 10.20	Keynote Speaker 1 – Tsukasa Hirashima Keynote Speaker 2 – Halimah Badioze Zaman
10.20 – 12.00	Keynote Speaker 3 – Abdurrazag Ali Aburas Keynote Speaker 4 – Dwi Hendratmo
12.00 – 13.00	Lunch and Prayer Time
13.00 – 15.00	Parallel Session 1 (presented by 72 speaker)
15.00 – 15.20	Coffee Break
15.20 – 17.40	Parallel Session 2 (presented by 84 speaker)
17.40 – 18.30	Break
18.30 – 19.00	Invitation to ICSITech 2018
19.00 – 19.15	Best Paper & Best Moderator
19.15 – 19.30	MoU Signing Ceremony
19.30 – 19.45	Closing Ceremony
19.45 – 20.00	Miscellaneous Information
20.00 – 21.30	Gala Dinner

### Day 2: Thursday, October 26, 2017

07.30 – 08.30	City Tour Registration
08.30 – 12.30	City Tour (Dusun Bambu and Cihampelas Walk)
12.30 – 13.30	Back to Hotels

## 2017 3<sup>rd</sup> ICSITech Schedule

### Parallel Class 1 – Room: Ballroom

**Moderator: Enjun Junaeti**

- 13.00 - 13.20      **(1570370412)** Edit Distance Weighting Modification using Phonetic and Typographic Letter Grouping over Homomorphic Encrypted Data  
*Tohari Ahmad (Institut Teknologi Sepuluh Nopember, Indonesia), Kukuh Indrayana (Institut Teknologi Sepuluh Nopember, Indonesia), Waskitho Wibisono (Institut Teknologi Sepuluh Nopember, Indonesia), Royyana M. Ijtihadie (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 13.20 - 13.40      **(1570329954)** Design of Authentication Process for RESTful Web Service Using Seed Based Authentication  
*Auliak Amri (Bandung Institute of Technology, Indonesia), Budi Rahardjo (Bandung Institute of Technology, Indonesia)*
- 13.40 - 14.00      **(1570325250)** Implementation of RFID, GSM and GPS technologies for motorcycle security system  
*Anna Nur Nazilah Chamim (Universitas Muhammadiyah Yogyakarta, Indonesia), Rofiq Mubarak (Universitas Muhammadiyah Yogyakarta, Indonesia), Dwi Verdy Firmansyah (Universitas Muhammadiyah Yogyakarta, Indonesia), Dheny Haryanto (Universitas Muhammadiyah Yogyakarta, Indonesia), Noor Pratama Apriyanto (Universitas Muhammadiyah Yogyakarta, Indonesia), Umniyatul Mahmudah (Universitas Muhammadiyah Yogyakarta, Indonesia), Nia Maharani Raharja (Universitas Muhammadiyah Yogyakarta, Indonesia), Iswanto (Universitas Muhammadiyah Yogyakarta, Indonesia)*
- 14.00 - 14.20      **(1570390569)** Using Capture the Flag in Classroom: Game-based Implementation in Network Security Learning  
*Harsa Wara Prabawa (Universitas Pendidikan Indonesia, Indonesia), Enjun Junaeti (Universitas Pendidikan Indonesia, Indonesia), Yana Permana (Universitas Pendidikan Indonesia, Indonesia)*
- 14.20 - 14.40      **(1570348787)** Team Based Learning in Computer Science Students  
*Brilly Andro Makalew (Bina Nusantara University, Indonesia), Bens Pardamean (Bina Nusantara University, Indonesia)*
- 14.40 - 15.00      **(1570382972)** Physical Document Validation With Perceptual Hash  
*Prasetyo Adi Wibowo Putro (National Crypto Institute, Indonesia)*
- 15.30 - 15.50      **(1570346138)** Designing of Quantum Random Number Generator (QRNG) for Security Application  
*Meilana Siswanto (State Polytechnic of Jember, Indonesia), I Gusti Bagus Baskara Nugraha (State Polytechnic of Jember, Indonesia)*

- 15.50 - 16.10      **(1570384185)** Enhancing Data Security Using DES-based Cryptography and DCT-based Steganography  
*Achmad Solichin (Budi Luhur University, Indonesia), Erwin Wahyu Ramadhan (Budi Luhur University, Indonesia)*
- 16.10 - 16.30      **(1570384398)** Information Security Awareness Level Measurement for Employee: Case Study at Ministry of Research, Technology, and Higher Education  
*Doni Dwi Hantyo Wahyudiwan (Universitas Indonesia, Indonesia), Yudho Giri Sucahyo (Universitas Indonesia, Indonesia), Arfive Gandhi (Universitas Indonesia, Indonesia)*
- 16.30 - 16.50      **(1570331971)** Music Mood Classification Using Audio Power and Audio Harmonicity Based on MPEG-7 Audio Features and SVM  
*Johanes Andre Ridoean (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Dwi Sunaryo (Institut Teknologi Sepuluh Nopember, Indonesia), Dedy Rahman Wijaya (Telkom University, Indonesia)*
- 16.50 - 17.10      **(1570370657)** A Secure Data Sharing Using Identity-Based Encryption Scheme for e-Healthcare System  
*Amang Sudarsono (Polytechnic Institute of Surabaya, Indonesia), Mike Yuliana (Polytechnic Institute of Surabaya, Indonesia), Haryadi Amran Darwito (Polytechnic Institute of Surabaya, Indonesia)*

## **Parallel Class 2 – Room: Lombardy 1**

**Moderator: Yaya Wihardi**

- 13.00 - 13.20      **(1570346186)** Analyzing Knowledge Management in Research Laboratories Based on Organizational Culture  
*Izzah Fadhillah Akmaliah ( University of Indonesia, Indonesia ), Dana Indra Sensuse ( University of Indonesia, Indonesia ), Ika Arthalia Wulandari ( University of Indonesia, Indonesia ), Isnaeni Nurrohmah ( University of Indonesia, Indonesia ), Rahmi Imanda ( University of Indonesia, Indonesia ), Handrie Noprisson ( Universitas Mercu Buana, Indonesia), Elin Cahyaningsih ( University of Indonesia, Indonesia )*
- 13.20 - 13.40      **(1570331900)** Music Tempo Classification Using Audio Spectrum Centroid, Audio Spectrum Flatness, and Audio Spectrum Spread based on MPEG-7 Audio Features  
*Alvin Lazaro (Institut Teknologi Sepuluh Nopember, Indonesia), Rryanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Johannes Andre R. (Institut Teknologi Sepuluh Nopember, Indonesia), Muhammad Nezar Mahardika (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 13.40 - 14.00      **(1570331296)** Heuristic Evaluation Of Learning Object Repository Interfaces  
*Shah Mohd Irwan Mat Ishak (National University of Malaysia, Malaysia), Siti Fadzilah Mat Noor (National University of Malaysia, Malaysia)*
- 14.00 - 14.20      **(1570345104)** Knowledge Management Practices in e-Government  
*Pudy Prima (University of Indonesia, Indonesia), Dana Indra Sensuse (University of Indonesia, Indonesia), Handrie Noprisson (University of Indonesia, Indonesia), Elin Cahyaningsih (University of Indonesia, Indonesia), Yudho Giri Sucahyo (University of Indonesia, Indonesia)*
- 14.20 - 14.40      **(1570332157)** The Role of Knowledge Management in The Success Rate of IT Investment and Its Impact on The Organization Performance A Survey in the Ministry Agencies, Local Governments, Universities and Banks in Indonesia  
*Donny Maha Putra (University of Padjadjaran, Indonesia), Dedy Wahyu Winoto (Institut Teknologi Bandung, Indonesia)*
- 14.40 - 15.00      **(1570345115)** Analysis of Knowledge Management Readiness in the Government Institution  
*Wahyu Indra Satria (Universitas Indonesia, Indonesia), Irwan Munandar (Universitas Indonesia, Indonesia), IGK Rizal (Universitas Indonesia, Indonesia), Elin Cahyaningsih (Universitas Indonesia, Indonesia), Dana Indra Sensuse (Universitas Indonesia, Indonesia), Handrie Noprisson (Universitas Mercu Buana, Indonesia)*

- 15.30 - 15.50      **(1570350843)** Performance Evaluation of Harmony Search Algorithm on GPU-Based System  
*Ebrahim Khajeh (Universiti Teknologi Malaysia, Malaysia), Shafaatunnur Hassan (Universiti Teknologi Malaysia, Malaysia), Siti Mariyam Shamsuddin (Universiti Teknologi Malaysia, Malaysia)*
- 15.50 - 16.10      **(1570344897)** Privacy Risk Assessment of Responding to the Financial Field in Japan  
*Sanggyu Shin (Advanced Institute of Industrial Technology, Japan), Yoichi Seto (Advanced Institute of Industrial Techonology, Japan), Kei Sakamoto (Advanced Institute of Industrial Technology, Japan), Mayumi Sasako (Advanced Institute of Industrial Technology, Japan)*
- 16.10 - 16.30      **(1570330265)** A Model Design of Information Technology Investment for The Government Sector  
*Endah Susilawati (Institut Teknologi Bandung, Indonesia), Kridanto Surendro (Institut Teknologi Bandung, Indonesia)*
- 16.30 - 16.50      **(1570340854)** Software Reliability Measurement Base On Failure Intensity  
*Bambang Krismono Triwijoyo (STMIK Bumigora Mataram, Indonesia), Ford Lumban Gaol (STMIK Bumigora Mataram, Indonesia), Benfano Soewito (STMIK Bumigora Mataram, Indonesia), Harco Leslie Hendric Spits Warnars (STMIK Bumigora Mataram, Indonesia)*
- 16.50 - 17.10      **(1570332009)** Reusability Metric on Procurement of Goods and Services  
*Meida Cahyo Untoro (Institut Teknologi Sepuluh Nopember, Indonesia), Rryanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 17.10 - 17.30      **(1570332114)** Knowledge-Based Graph Compression using Graph Property On Yago  
*Wahyudi (Institut Teknologi Bandung, Indonesia), Masayu Leylia Khodra (Institut Teknologi Bandung, Indonesia), Ary Setijadi Prihatmanto (Institut Teknologi Bandung, Indonesia), Carmadi Machbub ( Institut Teknologi Bandung, Indonesia)*

### **Parallel Class 3 – Room: Lombardy 2**

**Moderator: Muhammad Nursalman**

- 13.00 - 13.20      **(1570369392)** Performance Testing of M2M Middleware Platform  
*Fitra Zul Fahmi (Telkom University, Indonesia), Maman Abdurohman (Telkom University, Indonesia)*
- 13.20 - 13.40      **(1570369402)** Seamless Presence System in Classroom  
*Muhammad Sofyan Qusyairi (Telkom University, Indonesia), Maman Abdurohman (Telkom University, Indonesia), Asep Mulyana (Telkom University, Indonesia)*
- 13.40 - 14.00      **(1570352878)** Software Development Evaluation Process Using CMMI-Dev on Limited Resources Company  
*I Made Sugi Ardana (Bina Nusantara University, Indonesia), Suharjito (Bina Nusantara University, Indonesia)*
- 14.00 - 14.20      **(1570370003)** Food safety knowledge and practices on food virtual shop  
A case study from Indonesia's young adult  
*Fransisca Dini Ariyanti ( Bina Nusantara University, Indonesia), Siti Hadita ( Bina Nusantara University, Indonesia)*
- 14.20 - 14.40      **(1570355789)** Dashboard System for Measuring Green Software Design  
*Noraini Che Pa (Universiti Putra Malaysia, Malaysia), Faizal Karim (Universiti Putra Malaysia, Malaysia), Sa'adah Hassan (Universiti Putra Malaysia, Malaysia)*
- 14.40 - 15.00      **(1570371748)** Analysis of Factors Influencing The Quality of Intranet Website Based on WebQual Approach Case Study In Agency X  
*Jimmy Abdel Kadar (Indonesian Institute of Sciences, Indonesia), Darmawan Napitupulu (Indonesian Institute of Sciences, Indonesia), Rahmi Kartika Jati (Indonesian Institute of Sciences, Indonesia)*
- 15.30 - 15.50      **(1570383335)** Factors Affecting Awareness and Attitude of IT Governance Implementation in The Higher Education Institution: A Literature Review  
*Uky Yudatama (Universitas Indonesia, Indonesia), Bobby A.A.Nazief (Universitas Indonesia, Indonesia), A.N. Hidayanto (Universitas Indonesia, Indonesia), Muhammad Mishbah (Universitas Indonesia, Indonesia)*
- 15.50 - 16.10      **(1570370349)** A sourcing decision model for application maintenance services  
*Hanif-ur-Rehman (Stockholm University, Sweden), Shah Nazir (University of Swabi, Pakistan), Sara Shahzad (University of Peshawar, Pakistan), Thomas Hodosi (Stockholm, Sweden)*



- 16.10 - 16.30      **(1570371726)** IT Service Management Based on Service-Dominant Logic: Case Academic Information System State University of Malang  
*Armada Prastiyan Pratama (Universitas Negeri Malang, Indonesia), Nukleon Jefri Nur Rahman (Universitas Negeri Malang, Indonesia), Aji Prasetya Wibawa (Universitas Negeri Malang, Indonesia), Tinton Dwi Atmaja (Pusat Penelitian Tenaga Listrik dan Mekatronik Lembaga Ilmu Pengetahuan Indonesia, Indonesia)*
- 16.30 - 16.50      **(1570371616)** SIPOC Business Model Process to Prevent Plagiarism in an Electronic Journal  
*Muhammad Rizki Irwanto (Universitas Negeri Malang, Indonesia), Sulu Basthiyan Zamara (Universitas Negeri Malang, Indonesia), Roni Herdianto (Universitas Negeri Malang, Indonesia), Aji Prasetya Wibawa (Universitas Negeri Malang, Indonesia)*
- 16.50 - 17.10      **(1570356698)** Cognitive Age And Chronological Age of the Technostress That Effect On Satisfaction, Performance, And Intention To Continue The Use Of Information Technology In The University  
*Hario Jati Setyadi (Universitas Mulawarman, Indonesia), Putut Pamilih Widagdo (Universitas Mulawarman, Indonesia), Tony Dwi Susanto (Institut Teknologi Sepuluh Nopember, Indonesia)*

**Parallel Class 4 – Room: Sicilia**

**Moderator: Adhi Prahara**

- 13.00 - 13.20      **(1570391467)** Color and Texture Features Extraction on Content-based Image Retrieval  
*Rahmaniansyah Dwi Putri (Universitas Pendidikan Indonesia, Indonesia), Harsa Wara Prabawa (Universitas Pendidikan Indonesia, Indonesia), Yaya Wihardi (Universitas Pendidikan Indonesia, Indonesia)*
- 13.20 - 13.40      **(1570392174)** A Study on the Current Practices of Software Development Processes in Malaysia  
*Yusmadi Yah Jusoh (Universiti Putra Malaysia, Malaysia), Rozi Nor Haizan Nor (Universiti Putra Malaysia, Malaysia), Nor Zakiah Gorment (Universiti Putra Malaysia, Malaysia), Siti Aishah Md Nor (Universiti Putra Malaysia, Malaysia), Suhazli Muhamad (Universiti Putra Malaysia, Malaysia)*
- 13.40 - 14.00      **(1570384866)** Developers' Coordination Issues and its Impact on Software Quality: A Systematic Review  
*A.J. Suali (Universiti Teknologi MARA, Malaysia), S.S.M. Fauzi (Universiti Teknologi MARA, Malaysia), W. A. W. M. Sobri (Universiti Teknologi MARA, Malaysia), M.H.N.M.Nasir (University of Malaya, Malaysia)*
- 14.00 - 14.20      **(1570388618)** Image Enhancement Using Piecewise Linear Contrast Stretch Methods based on Unsharp Masking Algorithms for Leather Image Processing  
*Murinto (Universitas Ahmad Dahlan, Indonesia), Sri Winiarti (Universitas Ahmad Dahlan, Indonesia), Dewi Pramudi Ismi (Universitas Ahmad Dahlan, Indonesia), Adhi Prahara (Universitas Ahmad Dahlan, Indonesia)*
- 14.20 - 14.40      **(1570384079)** Analysis of Knowledge Management Implementation Readiness in A Technology Services Company  
*Prastyawan Aji Nugraha (Universitas Indonesia, Indonesia), Indra Budi (Universitas Indonesia, Indonesia)*
- 14.40 - 15.00      **(1570389362)** A Development of Cloud-Based PHP Learning System  
*Eddy Prasetyo Nugroho (Universitas Pendidikan Indonesia, Indonesia), Wahyudin (Universitas Pendidikan Indonesia, Indonesia), Rizki Cahyana (Universitas Pendidikan Indonesia, Indonesia)*
- 15.30 - 15.50      **(1570383760)** Utilisation of Down and Upsample in Pre-Processing to Enhance Quality of Kinect Depth Compression  
*Christin Erniati Panjaitan (Institut Teknologi Del (IT Del)), Chung-An Shen (National Taiwan University of Science and Technology), Shanq-Jang Ruan (National Taiwan University of Science and Technology)*

- 15.50 - 16.10      **(1570391404)** Depth Inpainting Scheme Based on Edge Guided Non Local Means  
*Adhi Prahara (Universitas Ahmad Dahlan, Indonesia), Andri Pranolo (Universitas Ahmad Dahlan, Indonesia)*
- 16.10 - 16.30      **(1570390827)** Knowledge Management System (KMS) Readiness Level Based on Group Areas of Expertise To Improve Science Education and Computer Science Quality (Cross-Fertilization Principle) (Case Study: Computer Science Program Course FPMIPA UPI)  
*Rizky Rachman Judhie Putra (Indonesia University of Education, Indonesia), Budi Laksono Putro (Indonesia University of Education, Indonesia)*
- 16.30 - 16.50      **(1570383504)** Dissecting University Employee Attendance Log: A Case Study  
*Mohammad Arif Rasyidi (Universitas Internasional Semen Indonesia, Indonesia)*
- 16.50 - 17.10      **(1570391474)** A Model of Geographic Information System using Graph Clustering Methods  
*Tedy Setiadi (Universitas Ahmad Dahlan, Indonesia), Andri Pranolo (Universitas Ahmad Dahlan, Indonesia), Muhammad Aziz (Universitas Ahmad Dahlan, Indonesia), Sukrisno Mardiyanto (Institut Teknologi Bandung, Indonesia), Bayu Hendrajaya (Institut Teknologi Bandung, Indonesia)*
- 17.10 - 17.30      **(1570384171)** Externalization of Tacit Knowledge in a Knowledge Management System Using Chat Bots  
*Narendra U P (Reva University Mangalore Institute of Tech & Engg, India), Dr. Pradeep B S (ACS College of Engineering, India), Dr. M Prabhakar (Reva University, India)*

## **Parallel Class 5 – Room: Palermo**

**Moderator: Rosa Ariani Sukamto**

- 13.00 - 13.20      **(1570371268)** Imagineering: Fostering Constructivism among Pre-service Teachers  
*Dexter M. Balajadia (University of the Assumption, Philippines)*
- 13.20 - 13.40      **(1570371652)** Community and Important Actors Analysis with Different Keywords in Social Network  
*Nanang Cahyana, S.ST (Bandung Institute of Technology, Indonesia), Dr. Ir. Rinaldi Munir, MT. (Bandung Institute of Technology, Indonesia)*
- 13.40 - 14.00      **(1570369409)** Design of a System for Detection of Environmental Variables Applied in Data Centers  
*Leonel Hernández (Institucion Universitaria, Colombia), Yuliana Calderon (Institucion Universitaria, Colombia), Hugo Martinez (Institucion Universitaria, Colombia)*
- 14.00 - 14.20      **(1570345827)** Question Answering System with HMM Speech Recognition  
*Hobert Ho (Tarumanagara University, Indonesia), Viny Christanti Mawardi (Tarumanagara University, Indonesia), Agus Budi Dharmawan (Tarumanagara University, Indonesia)*
- 14.20 - 14.40      **(1570345821)** Development and Evaluation of Software for Smart Devices to Support Educational Experiments on Acceleration  
*Takahiro Hoshino (Nihon University, Japan), Yuki Ota (Nihon University, Japan), Kohei Tomaru (Nihon University, Japan), Yoshio Hamamatsu (Nihon University, Japan)*
- 14.40 - 15.00      **(1570370554)** Social Bookmarking Systems to Enhance Students' Learning Process  
*Ching-Chieh Kiu (Taylor's University, Malaysia), Eng-Lye Lim (Taylor's University, Malaysia)*
- 15.30 - 15.50      **(1570352497)** The Application of ADDIE Model in Developing Adventure Gamebased Multimedia Learning to Improve Students' Understanding of Basic Programming  
*Dimas Restu Hidayanto (Indonesia University of Education, Indonesia), Munir (Indonesia University of Education, Indonesia), Eka Fitriajaya Rahman (Indonesia University of Education, Indonesia), Jajang Kusnendar (Indonesia University of Education, Indonesia)*

- 15.50 - 16.10      **(1570363163)** The Influences of Video Streaming Media Based on Cloud Mobile Learning Against Learning Interests in Every Student Learning Styles  
*Munir (Indonesia University of Education, Indonesia ), Cepi Riana (Indonesia University of Education, Indonesia ), Misrina (Indonesia University of Education, Indonesia )*
- 16.10 - 16.30      **(1570349064)** The Performance Comparison of Forwarding Mechanism between IPv4 and Named Data Networking (NDN). Case Study: A Node Compromised by The Prefix Hijack  
*Yunita Noor Rohmah (Telkom University, Indonesia), Dodi Wisaksono Sudiharto (Telkom University, Indonesia), Anton Herutomo (Telkom University, Indonesia)*
- 16.30 - 16.50      **(1570332257)** Improved Image Quality on Surveillance Embedded IP Camera by Reducing Noises  
*Setiya Purbaya (Telkom University, Indonesia), Endro Ariyanto (Telkom University, Indonesia), Dodi Wisaksono Sudiharto (Telkom University, Indonesia), Catur Wirawan Wijutomo (Telkom University, Indonesia)*
- 16.50 - 17.10      **(1570331711)** Learners Mood Detection using Convolutional Neural Network (CNN)  
*Rosa Ariani Sukamto (Universitas Pendidikan Indonesia, Indonesia), Munir (Universitas Pendidikan Indonesia, Indonesia), Siswo Handoko (Universitas Pendidikan Indonesia, Indonesia)*
- 17.10 - 17.30      **(1570384253)** Analogy Mapping for Different Learning Style of Learners in Programming  
*Rosa Ariani Sukamto (Universitas Pendidikan Indonesia, Indonesia), Rani Megasari (Universitas Pendidikan Indonesia, Indonesia)*

## **Parallel Class 6 – Room: Perugia**

**Moderator: Harsa Wara P.**

- 13.00 - 13.20      **(1570371834)** The Development and Usability Testing of Game Based Learning as A Medium to Introduce Zoology to Young Learners  
*Gustara Sapto Ajie (Universitas Padjadjaran, Indonesia), M. Azhari Marpaung (Universitas Padjadjaran, Indonesia), Agung Kurniawan (Universitas Padjadjaran, Indonesia), Mira Suryani (Universitas Padjadjaran, Indonesia), Ino Suryana (Universitas Padjadjaran, Indonesia), Erick Paulus (Universitas Padjadjaran, Indonesia)*
- 13.20 - 13.40      **(1570384252)** Analysis of the Concept Mapping style in EFL Reading Comprehension Comparison between Kit-build and Scratch-build Concept Mapping from the Viewpoint of Paragraph Structure of Text  
*Banni Satria Andoko (State Polytechnic of Malang, Indonesia), Yusuke Hayashi (Hiroshima University, Japan), Tsukasa Hirashima (Hiroshima University, Japan)*
- 13.40 - 14.00      **(1570371405)** The Effects of Simulation Aided Learning with Various Multimedia Instructional Message Strategies on Polytechnic Malaysia Students' Achievement  
*Mohd Syahrizad Elias (Politeknik Seberang Perai, Malaysia), Ahmad Zamzuri Mohamad Ali (Universiti Pendidikan Sultan Idris, Malaysia)*
- 14.00 - 14.20      **(1570371611)** Burnout and Mobbing in IT Students  
*Juwita Annisa Fauzi (Universitas Negeri Malang, Indonesia), Dhaniyar (Universitas Negeri Malang, Indonesia), Aji Prasetya Wibawa (Universitas Negeri Malang, Indonesia), Eki Nugraha (Universitas Pendidikan Indonesia, Indonesia)*
- 14.20 - 14.40      **(1570371504)** Implementation and Performance Measurement of Microcomputer as Multimedia Server to Supporting E-Learning Infrastructure  
*Puspanda Hatta (Sebelas Maret University, Indonesia), Agus Efendi (Sebelas Maret University, Indonesia), Ahmad Fauzan Aji (Sebelas Maret University, Indonesia), Yoni Yuliawan S (Sebelas Maret University, Indonesia)*
- 14.40 - 15.00      **(1570371671)** Blended Learning in Postgraduate Program  
*Cahya Wahyuning Ilahi (Universitas Negeri Malang, Indonesia), Dyah Ayu Fladya Rizky (Universitas Negeri Malang, Indonesia), Aji Prasetya Wibawa (Universitas Negeri Malang, Indonesia), Eki Nugraha (Universitas Pendidikan Indonesia, Indonesia)*

- 15.30 - 15.50      **(1570371556)** Comparing the Characteristics of Undergraduate Program of Information System in Public and Private Universities  
*Umi Kholifah (Universitas Negeri Malang, Indonesia), Roshina Hila Dini (Universitas Negeri Malang, Indonesia), Aji Prasetya Wibawa (Universitas Negeri Malang, Indonesia), Eki Nugraha (Universitas Pendidikan Indonesia, Indonesia)*
- 15.50 - 16.10      **(1570384267)** Finding the Suitable Process Modeling for AIS Teaching: An Experimental Study  
*Aisya Noor Husni (Universitas Padjadjaran, Indonesia), Hamzah Ritchi (Universitas Padjadjaran, Indonesia), Zaldy Adrianto (Universitas Padjadjaran, Indonesia)*
- 16.10 - 16.30      **(1570371863)** Designing Scaffolding System in a Problem-Posing Learning Environment  
*Ahmad Afif Supianto (Brawijaya University, Indonesia), Yusuke Hayashi (Hiroshima University, Japan), Tsukasa Hirashima (Hiroshima University, Japan)*
- 16.30 - 16.50      **(1570332619)** Utilizing Autonomous Mobile Robot to Increase Interest in STEM  
*Tee Tiong Tay (Tunku Abdul Rahman University College, Malaysia), Zhi Zhang Lim (Tunku Abdul Rahman University College, Malaysia), Yaw Long Chua (University Tenaga Nasional, Malaysia)*
- 16.50 - 17.10      **(1570390477)** Gamification with Concept Attainment Model to Improvement Student Understanding  
*Rasim (Universitas Pendidikan Indonesia, Indonesia), Harsa Wara Prabawa (Universitas Pendidikan Indonesia, Indonesia), Munir (Universitas Pendidikan Indonesia, Indonesia), Ulfah Husnun (Universitas Pendidikan Indonesia, Indonesia)*
- 17.10 - 17.30      **(1570382512)** EFL Learning Media for Early Childhood Through Speech Recognition Application  
*Fajar Satria (Universitas Padjadjaran, Indonesia), Hafiz Aditra (Universitas Padjadjaran, Indonesia), Mohamad Dean Aji Wibowo (Universitas Padjadjaran, Indonesia), Hilmi Luthfiansyah (Universitas Padjadjaran, Indonesia), Mira Suryani (Universitas Padjadjaran, Indonesia), Erick Paulus (Universitas Padjadjaran, Indonesia), Ino Suryana (Universitas Padjadjaran, Indonesia)*

## **Parallel Class 7 – Room: Tuscany 1.1**

**Moderator: Lala Septem Riza**

- 13.00 - 13.20      **(1570345969)** Student Graduation Time Prediction Using Intelligent K-Medoid Algorithm  
*Leonardo Cahaya (Tarumanagara University, Indonesia), Lely Hiryanto (Tarumanagara University, Indonesia), Teny Handhayani (Tarumanagara University, Indonesia)*
- 13.20 - 13.40      **(1570361355)** Evaluating the Emission of CO<sub>2</sub> at Traffic Intersections for the Purpose of Reducing Emission Rate, Case Study: The University of Nigeria, Nsukka  
*Chinedu Duru (University of Nigeria, Nigeria), Nathan David (University of Nigeria, Nigeria), Mamilus Ahaneku (University of Nigeria, Nigeria)*
- 13.40 - 14.00      **(1570386159)** Indonesian Document Retrieval Using Vector Space Method  
*Novi Sofia Fitriasaki (Universitas Pendidikan Indonesia, Indonesia), Khalifa Esha Iftitah (Universitas Pendidikan Indonesia, Indonesia), Rizky Rachman Judhie P (Universitas Pendidikan Indonesia, Indonesia)*
- 14.00 - 14.20      **(1570331716)** Taxi Passenger Hotspot Prediction using Automatic ARIMA Model  
*Mohammad Sabar Jamil (Bandung Institute of Technology, Indonesia), Saiful Akbar (Bandung Institute of Technology, Indonesia)*
- 14.20 - 14.40      **(1570373794)** Identifying Irregularity Electricity Usage of Customer Behaviors using Logistic Regression and Linear Discriminant Analysis  
*Armin Lawi (Universitas Hasanuddin, Indonesia), Supriyadi La Wungo (Universitas Hasanuddin, Indonesia), Salama Manjang (Universitas Hasanuddin, Indonesia)*
- 14.40 - 15.00      **(1570384264)** Speed Control Implementation of BLDC Motor using Sliding Mode Two-Steps LMI Design  
*Muhammad R. A. R. Santabudi (Institut Teknologi Bandung, Indonesia), Arief Syaichu Rohman (Institut Teknologi Bandung, Indonesia), Hanif F. Prasetyo (Institut Teknologi Bandung, Indonesia)*
- 15.30 - 15.50      **(1570384294)** Implementation of Model Predictive Control using Algorithm-3 on Arduino Mega2560 for Speed Control of BLDC Motor  
*Hanif Fauzan Prasetyo (Institut Teknologi Bandung, Indonesia), Arief Syaichu Rohman (Institut Teknologi Bandung, Indonesia), M. R.A.R. Santabudi (Institut Teknologi Bandung, Indonesia)*



- 15.50 - 16.10 **(1570392603)** Upkabs: A Prototype App to Extract Internal Data Potential for Future Interest  
*Herbert Siregar (Universitas Pendidikan Indonesia, Indonesia), Rosa Ariani Sukamto (Universitas Pendidikan Indonesia, Indonesia), Tandry Syawaludin Soedijanto (Universitas Pendidikan Indonesia, Indonesia)*
- 16.10 - 16.30 **(1570375383)** Intelligent Diagnosis System for Acute Respiratory Infection in Infants  
*Subiyanto (Malang, Indonesia), Anggraini Mulwinda (Universitas Negeri Semarang, Indonesia), Dwi Andriani (SMK Gajah Mada Purwodadi, Indonesia)*
- 16.30 - 16.50 **(1570384380)** Forecasting Time Series with Trend and Seasonal Patterns Based on SSA  
*Winita Sulandari (Universitas Gajah Mada, Universitas Sebelas Maret, Indonesia), Subanar (Universitas Gajah Mada, Indonesia), Herni Utami (Universitas Gajah Mada, Indonesia), Suhartono (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 16.50 - 17.10 **(1570345797)** Application of Artificial Neural Network for Predicting Company Financial Performance in Indonesia Stock Exchange  
*Givaldi Ramadhan (Universitas Indonesia, Indonesia), Arian Dhini (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia), Reggia Aldiana Wayasti (Universitas Indonesia, Indonesia)*
- 17.10 - 17.30 **(1570382646)** Analysis on Anomalous Short Term Load Forecasting Using Two Different Approaches  
*Ade Gafar Abdullah (Universitas Pendidikan Indonesia, Indonesia), Bahtiar Hasan (Universitas Pendidikan Indonesia, Indonesia), Yadi Mulyadi (Universitas Pendidikan Indonesia, Indonesia), Dadang Lukman Hakim (Universitas Pendidikan Indonesia, Indonesia), Hasbullah (Universitas Pendidikan Indonesia, Indonesia)*

## **Parallel Class 8 – Room: Tuscany 1.2**

**Moderator: Yudi Wibisono**

- 13.00 - 13.20      **(1570345095)** The Distribution System Simulation Model Of Each Zone Freight Transportation Movement Based On Unlimited The Gravity Model Algorithm  
*Juang Akbardin (Universitas Pendidikan Indonesia, Indonesia), Danang Parikesit (Universitas Gadjah Mada, Indonesia), Agus Taufik Mulyono (Universitas Gadjah Mada, Indonesia), Bambang Riyanto (Universitas Diponegoro, Indonesia)*
- 13.20 - 13.40      **(1570332044)** Non-Linear Optimization of Critical Path Method  
*Yutika Amelia Effendi (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 13.40 - 14.00      **(1570332047)** Discovering Optimized Process Model using Rule Discovery Hybrid Particle Swarm Optimization  
*Yutika Amelia Effendi (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 14.00 - 14.20      **(1570332072)** Petri Net Arithmetic Models for Scalable Business Processes  
*Abd. Charis Fauzan (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Muhammad Ainul Yaqin (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 14.20 - 14.40      **(1570347408)** Dynamic Simulation of Electricity Supply and Demand for Industry Sector in East Java  
*Argyanto Dimas Ningpramuda (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Erma Suryani (Institut Teknologi Sepuluh Nopember, Indonesia), Abd. Charis Fauzan (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 14.40 - 15.00      **(1570341412)** Enabling PID and SSSC for Load Frequency Control using Particle Swarm Optimization  
*Dwi Lastomo (University of PGRI Adi Buana, Indonesia), Widodo (University of PGRI Adi Buana, Indonesia), Herlambang Setiadi (The University of Queensland, Australia), Muhammad Ruswandi Djalal (State Polytechnic of Ujung Pandang, Indonesia)*
- 15.30 - 15.50      **(1570343802)** Small Signal Stability Enhancement of Hybrid Power Systems using RFB Tune with Craiziness PSO  
*Dwi Lastomo (University of PGRI Adi Buana, Indonesia), Atmiasri (University of PGRI Adi Buana, Indonesia), Herlambang Setiadi (The University of Queensland, Australia)*

- 15.50 - 16.10      **(1570345283)** Reliability Index Analysis of Gas and Steam Power Plant using Graph Theory  
*Aninda Maharani (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia), Amar Rachman (Universitas Indonesia, Indonesia)*
- 16.10 - 16.30      **(1570332022)** A Study of Factors that Affect Consumer Loyalty in Automotive Financing Company based on Structural Equation Modeling and Text Mining  
*Aninda Maharani (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia), Sya'bandi Doli (Universitas Indonesia, Indonesia), Erlinda Muslim (Universitas Indonesia, Indonesia), Adila Afifah (Universitas Indonesia, Indonesia)*
- 16.30 - 16.50      **(1570381172)** Retinal Blood Vessel Segmentation and Bifurcation Detection using Combination of Median Filtering and First Order Derivative of Gaussian  
*Ety Sutanty (Gunadarma University, Indonesia), SarifuddinMadenda (Gunadarma University, Indonesia), DewiAgushinta Rahayu (Gunadarma University, Indonesia), Rodiah (Gunadarma University, Indonesia), Diana Tri Susetianingtias (Gunadarma University, Indonesia)*
- 16.50 - 17.10      **(1570331963)** Route Selection based on Real Time Traffic Condition using Ant Colony System and Fuzzy Inference System  
*Erick Alfons Lisangan (Atma Jaya University of Makassar, Indonesia), Sean Coonery Sumarta (Atma Jaya University of Makassar, Indonesia)*
- 17.10 - 17.30      **(1570331718)** Optimizing COCOMO II Parameters using Particle Swarm Method  
*Kholed Langsari (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia)*

## **Parallel Class 9 – Room: Tuscany 1.3**

**Moderator: Andri Pranolo**

- 13.00 - 13.20      **(1570332635)** Effect of Imbalance Ratio and Some Data Intrinsic Factors on Imbalanced Datasets Classification  
*Salisu Musa Borodo (Universiti Teknologi Malaysia, Malaysia), Siti Mariyam Shamsuddin (Universiti Teknologi Malaysia, Malaysia), Aida Ali (Universiti Teknologi Malaysia, Malaysia)*
- 13.20 - 13.40      **(1570332134)** Clustering and Visualization of Community Complaints and Proposals using Text Mining and Geographic Information System  
*Arian Dhini (Universitas Indonesia, Indonesia), I.B.N. Sanditya Hardaya (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia), Hardono (Universitas Indonesia, Indonesia)*
- 13.40 - 14.00      **(1570332142)** Application of Text Mining for Classification of Community Complaints and Proposals  
*I. B. N. Sanditya Hardaya (Universitas Indonesia, Indonesia), Arian Dhini (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia)*
- 14.00 - 14.20      **(1570332141)** Electricity Distribution Clustering and Configuration Study using KM-MST  
*Enrico Laoh (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia), Arian Dhini (Universitas Indonesia, Indonesia)*
- 14.20 - 14.40      **(1570331934)** Data Mining Approach for Short-Term Load Forecasting by Combining Wavelet Transform and Group Method of Data Handling (WGMDH)  
*Trisna Yuniarti (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia), Erlinda Muslim (Universitas Indonesia, Indonesia), Enrico Laoh (Universitas Indonesia, Indonesia)*
- 14.40 - 15.00      **(1570345118)** Opinion Mining from Online Reviews in Bali Tourist Area  
*Puteri Prameswari (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia), Enrico Laoh (Universitas Indonesia, Indonesia)*
- 15.30 - 15.50      **(1570332088)** Comparison of Behavioral Similarity use TARs and Naïve Algorithm for Calculating Similarity in Business Process Model  
*Dewi Rahmawati (Institut Teknologi Sepuluh Nopember, Indonesia), Lusiana Nurul Aini (Institut Teknologi Sepuluh Nopember, Indonesia), Rryanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Chastine Fatichah (Institut Teknologi Sepuluh Nopember, Indonesia), Dwi Sunaryono (Institut Teknologi Sepuluh Nopember, Indonesia)*

- 15.50 - 16.10      **(1570331847)** Fraud Detection on Event Log of Bank Financial Credit Business Process using Hidden Markov Model Algorithm  
*Dewi Rahmawati (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Chastine Fatichah (Institut Teknologi Sepuluh Nopember, Indonesia), Dwi Sunaryono (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 16.10 - 16.30      **(1570332083)** Classify Epilepsy and Normal Electroencephalogram (EEG) Signal Using Wavelet Transform and K-Nearest Neighbor  
*Dewi Rahmawati (Institut Teknologi Sepuluh Nopember, Indonesia), Umy Chasanah N.R. (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 16.30 - 16.50      **(1570390614)** Tracking Online Fraud Using Regular Expression  
*Fiftin Noviyanto (Universitas Ahmad Dahlan, Indonesia), Dewi Soyusiawaty (Universitas Ahmad Dahlan, Indonesia), Nur Rochmah (Universitas Ahmad Dahlan, Indonesia), Dyah Puji Astuti (Universitas Ahmad Dahlan, Indonesia), Rinaldi Munir (Institut Teknologi Bandung, Indonesia), Masayu Leylia Khodra (Institut Teknologi Bandung, Indonesia)*
- 16.50 - 17.10      **(1570331923)** Book Recommendation Using Neo4j Graph Database in BibTeX Book Metadata  
*I Nyoman Pande Wahyu Dharmawan (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 17.10 - 17.30      **(1570364467)** Anomalous Trajectory Detection from Taxi GPS Traces Using Combination of iBAT and DTW][Natya Taniarza  
*Natya Taniarza, Saiful Akbar (Institut Teknologi Bandung, Indonesia)*

## **Parallel Class 10 – Room: Tuscany 3.1**

### **Moderator: Rasim**

- 13.00 - 13.20      **(1570371765)** Handling Imbalance in Churn Prediction using ADASYN and Backpropagation Algorithm  
*Annisa Aditsania (Telkom University, Indonesia), Adiwijaya (Telkom University, Indonesia), Aldo Lionel Saonard (Telkom University, Indonesia)*
- 13.20 - 13.40      **(1570365107)** Detection of Kidney Disease Using Various Intelligent Classifiers  
*Haya Alasker (Prince Sattam Bin Abdulaziz University, Singapore), Shatha Alharkan (Prince Sattam Bin Abdulaziz University, Singapore), Wejdan Alharkan (Prince Sattam Bin Abdulaziz University, Singapore), Amal Zaki (Prince Sattam Bin Abdulaziz University, Singapore)*
- 13.40 - 14.00      **(1570368100)** Behavioral Tracking Analysis on Learning Management System with Apriori Association Rules Algorithm  
*Dino Aviano (Indonesia University of Education, Indonesia), Budi Laksono Putro (Indonesia University of Education, Indonesia), Eddy Prasetyo Nugroho (Indonesia University of Education, Indonesia)*
- 14.00 - 14.20      **(1570371309)** Predicting Degree-Completion Time with Data Mining  
*Masna Wati (Universitas Mulawarman, Indonesia), Haeruddin (Universitas Mulawarman, Indonesia), Wahyu Indrawan (Universitas Mulawarman, Indonesia)*
- 14.20 - 14.40      **(1570384097)** The Expert System of Children's Digestive Tract Diseases Diagnostic using Combination of Forward Chaining and Certainty Factor Methods  
*Indryani Astuti (Universitas Pendidikan Indonesia, Indonesia), Heri Sutarno (Universitas Pendidikan Indonesia, Indonesia), Rasim (Universitas Pendidikan Indonesia, Indonesia)*
- 14.40 - 15.00      **(1570340341)** A Performance of Modified Fuzzy C-Means (FCM) and Chicken Swarm Optimization (CSO)  
*Suprihatin (Universitas Ahmad Dahlan, Indonesia), Iwan Tri Riyadi Yanto (Universitas Ahmad Dahlan, Indonesia), Nursyiva Irsalinda (Universitas Ahmad Dahlan, Indonesia), Tuti Purwaningsih (Universitas Ahmad Dahlan, Indonesia), Havaluddin (Mulawarman University, Indonesia), Aji Prasetya Wibawa (State University of Malang, Indonesia)*
- 15.30 - 15.50      **(1570332092)** Text Document Clustering using Self Organizing Map: Theses and Dissertations of Universitas Indonesia  
*Yantine Arsita Br. Panjaitan (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia), Asma Rosyidah (Universitas Indonesia, Indonesia)*

- 15.50 - 16.10      **(1570345810)** Association Rule Mining for Building Book Recommendation System in Online Public Access Catalog (OPAC)  
*Santi Mariana (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia), Arian Dhini (Universitas Indonesia, Indonesia), Asma Rosyidah (Universitas Indonesia, Indonesia), Puteri Prameswari (Universitas Indonesia, Indonesia)*
- 16.10 - 16.30      **(1570345075)** Data Mining Application to Detect Financial Fraud in Indonesia's Public Companies  
*Adila Afifah Rizki (Universitas Indonesia, Indonesia), Isti Surjandari (Universitas Indonesia, Indonesia), Reggia Aldiana Wayasti (Universitas Indonesia, Indonesia)*
- 16.30 - 16.50      **(1570371383)** Comparative Study of Conjugate Gradient to Optimize Learning Process of Neural Network for Intrusion Detection System (IDS)  
*Untari N. Wisesty (Telkom University, Indonesia), Adiwijaya (Telkom University, Indonesia)*
- 16.50 - 17.10      **(1570390023)** Detection of Kidney Disease Using Various Intellegent Classifiers  
*Haya Alasker (Prince Sattam Bin Abdulaziz University, Saudi Arabia), Shatha Alharkan (Prince Sattam Bin Abdulaziz University, Saudi Arabia), Wejdan Alharkan (Prince Sattam Bin Abdulaziz University, Saudi Arabia), Amal Zaki (Prince Sattam Bin Abdulaziz University, Saudi Arabia)*

## Parallel Class 11 – Room: Tuscany 3.2

**Moderator: Wawan Setiawan**

- 13.00 - 13.20      **(1570371734)** Preprocessing Matrix Factorization for Solving Data Sparsity on Memory-Based Collaborative Filtering  
*M. Iqbal Ardimansyah (Telkom University, Indonesia), Arief Fatchul Huda (Telkom University, Indonesia), Z.K.A. Baizal (Telkom University, Indonesia)*
- 13.20 - 13.40      **(1570371673)** A Proposed Framework: Group-based Image Analysis To Enhance Accuracy of Image Classification for Tumor Diagnostic  
*Mazniha Berahim (Universitas Mulawarman, Malaysia), Noor Azah Samsudin (Universitas Mulawarman, Malaysia), Shelena Soosay Nathan (Universitas Mulawarman, Malaysia)*
- 13.40 - 14.00      **(1570371688)** Segmentation of Retinal Blood Vessels Using Gabor Wavelet and Morphological Reconstruction  
*Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia), Tri Lestari (Universitas Gadjah Mada, Indonesia), Rezty Amalia Aras (Universitas Gadjah Mada, Indonesia), Igi Ardiyanto (Universitas Gadjah Mada, Indonesia)*
- 14.00 - 14.20      **(1570364888)** Enhanced Pixel Value Differencing Steganography with Government Standard Algorithm  
*Heri Nurdiyanto (Yogyakarta State University, Indonesia), Robbi Rahim (Akademi Perekam Medik dan Infokes Imelda, Indonesia), Saiful Nurarif (STMIK Triguna Dharma, Indonesia), Mukhlis Ramadhan (STMIK Triguna Dharma, Indonesia)*
- 14.20 - 14.40      **(1570335842)** FAST Corner Detection in Polygonal Approximation of Shape  
*Ema Rachmawati (Institut Teknologi Bandung, Indonesia), Iping Supriana (Institut Teknologi Bandung, Indonesia), Masayu Leylia Khodra (Institut Teknologi Bandung, Indonesia)*
- 14.40 - 15.00      **(1570347404)** Improving the Accuracy of COCOMO II Using Fuzzy Logic and Local Calibration Method  
*Muhammad Baiquni (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Sarwosri (Institut Teknologi Sepuluh Nopember, Indonesia), Sholiq (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 15.30 - 15.50      **(1570331961)** Cover Song Recognition Based on MPEG-7 Audio Features  
*Mochammad Faris Ponighzwa R. (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Dwi Sunaryono (Institut Teknologi Sepuluh Nopember, Indonesia)*



- 15.50 - 16.10      **(1570362551)** Development of EduGame Integrated To Facebook Application  
*Wawan Setiawan (Indonesia University of Education, Indonesia ), M. Fajar Kuntoro (Indonesia University of Education, Indonesia ), Sarah Hafitrian (Indonesia University of Education, Indonesia )*
- 16.10 - 16.30      **(1570357045)** The Use of Scale Invariant Feature Transform (SIFT) Algorithms To Identification Garbage Images Based on Product Label  
*Wawan Setiawan (Indonesia University of Education, Indonesia ), Asep Wahyudin (Indonesia University of Education, Indonesia ), Widyanto G.R. (Indonesia University of Education, Indonesia )*
- 16.30 - 16.50      **(1570382885)** Determine Focus Based On Eye Gazing Direction  
*Wawan Setiawan (Universitas Pendidikan Indonesia, Indonesia), Muhammad Nursalman (Universitas Pendidikan Indonesia, Indonesia), Munir (Universitas Pendidikan Indonesia, Indonesia), Ricko Devian Anugrah (Universitas Pendidikan Indonesia, Indonesia)*
- 16.50 - 17.10      **(1570345375)** Patterns of Fraud Detection using Coupled Hidden Markov Model  
*Kelly R. Sungkono (Institut Teknologi Sepuluh Nopember, Indonesia), Rryanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia)*
- 17.10 - 17.30      **(1570352730)** Myanmar Optical Character Recognition using Block Definition and Featured Approach  
*Zu Zu Aung (University of Technology, Myanmar), Cho Me Me Maung (University of Technology, Myanmar)*

## Parallel Class 12 – Room: Tuscany 3.3

**Moderator: Indra Riyanto**

- 13.00 - 13.20      **(1570370604)** Broadband Quality of Service Experience Measuring mobile networks from consumer perceived  
*Edy Budiman (Universitas Mulawarman, Indonesia), Dikwan Moeis (STMIK Professional Makassar, Indonesia), Rendra Soekarta (Universitas Muhammadiyah Sorong, Indonesia)*
- 13.20 - 13.40      **(1570361818)** Integrated Multi Criteria Decision Making for a Destitute Problem  
*Edy Budiman (Universitas Mulawarman, Indonesia), Nataniel Dengen (Universitas Mulawarman, Indonesia), Haviluddin (Universitas Mulawarman, Indonesia), Wahyu Indrawan (Universitas Mulawarman, Indonesia)*
- 13.40 - 14.00      **(1570371374)** Comparison Of Weighted Product Method And Technique For Order Preference By Similarity To Ideal Solution Method: Complexity And Accuracy  
*Novi Sofia Fitriasaki (Universitas Pendidikan Indonesia, Indonesia), Syifa Afifah Fitriani (Universitas Pendidikan Indonesia, Indonesia), Rosa Ariani Sukanto (Universitas Pendidikan Indonesia, Indonesia)*
- 14.00 - 14.20      **(1570371555)** Design for Performance Monitoring System Using Earned Value Analysis Method for Non-Profit Organizations  
*Arief Samuel Gunawan (Institut Teknologi Harapan Bangsa, Indonesia), Cut Fiarni (Institut Teknologi Harapan Bangsa, Indonesia), Yosephine Ryana (Institut Teknologi Harapan Bangsa, Indonesia)*
- 14.20 - 14.40      **(1570370928)** Borneo Biodiversity: exploring endemic tree species and wood characteristics  
*Ummul Hairah (Universitas Mulawarman, Indonesia), Andi Tejawati (Universitas Mulawarman, Indonesia), Edy Budiman (Universitas Mulawarman, Indonesia), Fahrul Agus (Universitas Mulawarman, Indonesia)*
- 14.40 - 15.00      **(1570344628)** Smart Flyers Mobile Application  
*Li Nyen Thin (University Sains Malaysia, Malaysia), Mohd Heikal Husin (University Sains Malaysia, Malaysia)*
- 15.30 - 15.50      **(1570345048)** Mobile Application Development with Augmented Reality for Promoting Tourism Objects in Southwest Sumba  
*David Kadi (Universitas Atma Jaya Yogyakarta, Indonesia), Suyoto (Universitas Atma Jaya Yogyakarta, Indonesia), Albertus Joko Santoso (Universitas Atma Jaya Yogyakarta, Indonesia)*

- 15.50 - 16.10      **(1570370571)** Multi Criteria Evaluation for Regional Function Based on Geographic Information System  
*Rina Marina Masri (Indonesia University of Education, Indonesia ), Iskandar Muda Purwaamijaya (Indonesia University of Education, Indonesia )*
- 16.10 - 16.30      **(1570346095)** Real-Time Location Recommendation System for Field Data Collection  
*Aris Prawisudatama (Institut Teknologi Bandung, Indonesia), I Gusti Bagus Baskara Nugraha (Institut Teknologi Bandung, Indonesia)*
- 16.30 - 16.50      **(1570371196)** Implementation of Android-based Augmented Reality as Learning and Teaching Media of Dicotyledonous Plants Learning Materials in Biology Subject  
*Cut Nurul Qamari (Syiah Kuala University, Indonesia), Muhammad Ridha Ridwan (Bandung Institute of Technology, Indonesia)*
- 16.50 - 17.10      **(1570371791)** Automatic Coffee Grinding and Brewing Process with NUC140 Microcontroller  
*Febriyandika Tarang Boro (Universitas Budi Luhur , Indonesia), Indra Riyanto (Universitas Budi Luhur , Indonesia), Krisna Adiyarta (Universitas Budi Luhur , Indonesia)*
- 17.10 - 17.30      **(1570364024)** A Cost-Effective Interactive Platform for the Management of a Small Scale Lap-Based Jogging Competition using Low-Frequency RFID Technology  
*Pawut Satitsuksanoh (Assumption University, Thailand), Rachsuda Jiamthapthaksin (Assumption University, Thailand), Pisal Setthawong (Assumption University, Thailand), Se Won Kim (Assumption University, Thailand)*

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# Mobile Application Development with Augmented Reality for Promoting Tourism Objects in Southwest Sumba

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**Abstract**—Southwest Sumba is a regency located on the island of Sumba and falls under the jurisdiction area of the province of East Nusa Tenggara. This regency is well-known for its wide variety of and interesting tourism objects, such as its nature, culture, and marine tourism. Nevertheless, one of the things that proved to be obstacles in promoting tourism objects to potential visitors is the lack of information about their very own existence. Therefore, any form of location-based information services is particularly needed to be developed so that this so-called information can be accessed in real time, direct routes to tourism objects, and one that can quickly provide information regarding tourism objects. In this research, location-based information services are developed in a form of a mobile app that combines Location Based Service (LBS) with Augmented Reality (AR). This particular application use markerless method planted in AR to track object of Point Of Interest (POIs) for tourism objects. Furthermore, each POIs of tourism objects is tracked based on three different coordinate points for each location and can make it easier for tourists to obtain information regarding tourism objects.

**Keywords**—augmented reality; LBS; southwest sumba; tourism objects

## I. INTRODUCTION

Tourism object is defined as interesting places, historic buildings and social activities that become a typical tradition of a local community in a particular region. The natural condition, the beauty of a building and the unique characteristic of a social life in every tourism object become the tourists attraction for both domestic and foreign tourists. The tourists attraction also has a close relationship with tourism products [1]. Many tourists visit different tourism objects to take part in local customs, beliefs, history, cuisine, culture, and sporting activities [2]. The development of tourism objects gradually plays an important role in the regional economy and national economy [3].

Southwest Sumba is a regency also known as Sumba Barat Daya (SBD) is located on Sumba island, East Nusa Tenggara province. This regency is famous for its numerous and interesting tourism objects to visit such as nature tourism, cultural tourism and marine tourism. Domestic and foreign tourists visit in this regency is growing each year as indicated by an increasing number of tourists who rent hotel rooms

around said tourism object areas. Nonetheless, location information service are still limited, particularly when it comes to accurate information regarding tourists' travel experience and the projected number of tourists visiting each year [4]. The search for thorough and clear information becomes an important consideration for tourists because the first step before deciding a tour is to search information regarding any tourist destination [5]. A tourist destination can continue to attract tourists through enhanced quality of information and a unique experience [6].

The rapid growth of information technology based on mobile technology goes together with the sophistication of mobile device features and the operating system support [7] in affecting the appearance of LBS applications on mobile devices – which has been widely developed in recent years. For instance, there have been a few of those which have been developed, such as tourist [8] applications, wallet [9], leadership [10], psychology [11], steganography [12], etc. With the growing popularity of smart phone devices and the development of Global Positioning System (GPS) [13], LBS is often used to provide location services in a place that one will go to visit in real time.

In other cases, LBS-based applications were developed with Augmented Reality (AR) technology [14]. LBS supported by AR will utilize the camera screen to display Augmented view. The icons on Augmented view are usually gray 2D icons representing each interesting object which is often referred to as Point of Interest (POI) [15]. AR is a technology that allows users to seamlessly view and interact in real time with cyber images, overlaid over the actual world [16]. AR becomes interesting when combined with LBS as its ability to display computer graphics via camera video cameras and the addition of uncomplicated video graphics makes it easier and simpler to grant any developer's wishes [17]. Thus, developing a system consisting of LBS with AR becomes the main focus of this research. With these concepts, the development of the system is then expected to provide information in regards with the location of the tourism object around the user's location more accurately and quicker. The information will be displayed in the form of POIs based on three different coordinate points from

each of the existing tourism objects. Icons for tourism objects' POIs represent the detailed information, such as location maps, distances, routes, and other information related to the system. Users, in this case tourists, will obtain information regarding tourist locations more easily especially ones that is projected to be a proper tourist destination. The ease of information retrieval is not only the end result of the development of this system, but also the presentation of information is expected to provide and facilitate with more interactive and interesting experience using a combination of LBS and AR.

## II. LITERATURE VIEW

Cranmer, Jung, Dieck, and Miller, in their research argued that Augmented Reality (AR) is a new technology that is very much needed in the field of tourism because it can be used to support the tourists' quandary when looking for tourist destinations in the nearest location. Interesting and unique tourism potentials attract a great deal of research activities focused on the development of tourism objects. However, the exploration of the utilization of AR technology is still small in number in earlier studies compared to other theme. The sustainability of tourism objects in the tourism sector plays an prominent role in maintaining the sustainability of tourism objects that are closely related to their natural condition, cultural authenticity, and the social life of the community [18].

Dieck and Jung, in their study presented the acceptance model for Augmented Reality (AR) mobile – an area that received only limited attention in information systems research. The proposed model suggested that the acceptability of AR mobile within young female travelers in the United Kingdom (UK) has a chance which is dependent on seven external dimensions such as the information and system quality, cost per usage, recommendations, and innovative personnels, risk and facilitating conditions [19].

Waruwu, Bayupati, and Putra, in their research conducted the development of mobile applications with Augmented Reality (AR) for tourism in Bali. They suggested that E-tourism in Bali needs to be optimized, thus information technology can help travelers provide new experiences when traveling. By applying AR technology, they created the Dewata AR application to display 3-dimensional objects, video, and audio information regarding the Tanah Lot Temple. The app works by scanning tourism object brochures using Android smartphones or tablets, which will then display 3-dimensional objects, videos, and audio information about said the tourism objects [20].

Based on the discussed literature review, it is proposed a research that aims to help and facilitate the tourists to obtain information about tourism objects far more quickly, effectively and interestingly in the regency of southwest Sumba.

## III. RESEARCH METHOD

In this study, for the system development, the markerless method is employed by utilizing the GPS based tracking which is one of an AR technique whose development is directed to mobile technology. It is because in a mobile device there is

navigation system, compass, and gyro sensor which increase the accuracy and stabilize within the user movement and alignment [21]. AR technology enables GPS based tracking techniques – using GPS features – to provide data obtained from GPS systems and digital compass. It will then display the results in the form of directions toward a destined place for users in real time. In fact, it can be displayed in 3D graphs. GPS plays a prominent role in AR because it can provide the user's position directly via satellite and indicate which direction to take [22]. GPS tracking requires features of mobile technology devices to be able to track an object, such as GPS, digital camera, accelerometer, magnetometer, solid state compass, optical sensor, wireless sensor etc. GPS based tracking is also one type of markerless tracking method that can know the location around. Objects blocked by real-world environmental conditions can be traced to display information about a location without having to detect markers [23]. Thus, the markerless method may play a role in displaying POIs icons from tourism objects located in southwest Sumba regency without having to assign any markers for a place or a location as a tracking orientation and it does support the tracking positions.

## IV. ANALYSIS AND DESIGN

In this phase, the information needs analysis expected by the user in the system development is carried out to provide information about the existing tourism objects in the regency of southwest Sumba. Tourism objects in this regency is scattered almost in every location adjacent to each other. Tourists who travel here are generally dominated by foreign tourists rather than domestic. General facilities and infrastructure have been built by many local governments. In addition for the sake of the public, it also benefit access to the location of tourism. However, its specific development for the tourism sector is still relatively low and progress slowly – indicated by the many hoops tourists had to go through when traveling here. Sometimes, most of them had a hard time obtaining clear information about the existence of a tourism object and they only rely on the services of the tour guides whose numbers are still limited. For tourists who do not use the services of tour guides, they seek for a more manual way by often asking the nearby-living they met on their way. The question asked is usually related to the information needed: the number of locations of tourism objects, its addresses, its descriptions, and directions or routes to the nearest location of tourism objects.

In addition to the manual manner as explained earlier, there are also tourists who look for them by referring to the hardcopy of maps' location or even just browse through the internet while traveling with the sole aim of obtaining clear and relevant information. However, such an effort does not produce satisfactory results because it will only further take the joy out of their traveling experience. Searching for information through the Internet does not help because there is no website that specifically provides detailed information related to the existence of attractions in the regency of southwest Sumba. Websites that are currently owned by local governments only display information regarding the profile of the department of tourism offices. Therefore, it is necessary to develop a system

that can help and facilitate the tourists to obtain information in an interesting and interactive manner when traveling to one of the tourism objects in the regency of southwest Sumba. The combination of LBS with AR is used in this research to develop the tourism object system in the regency.

Furthermore, the results of the analysis are illustrated by object-oriented methodology through a use case, i.e. a modeling which gives description in regards with the behavior of system to build. Actors involved in this system can understand the features that exist inside in accordance with their respective roles through the use case diagram. In relation to the creation of a tourism object system, the created use case serves a function to describe all activities that users can perform on the tourism objects' POIs channel and displayed in the Fig. 1 of the system model.

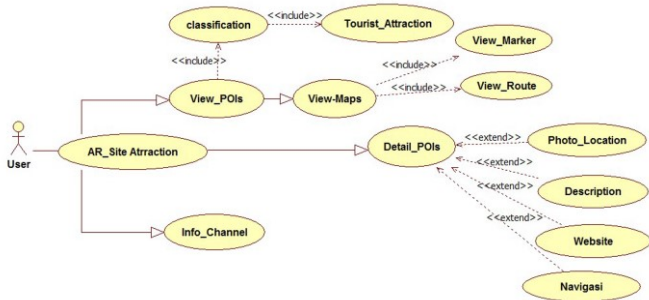


Fig. 1. The model for the tourism object system.

In Fig. 1, it illustrates the interaction between the actors with the tourism object system. They can access into the system of tourism objects and see the display on the system which appears in the View POIs. Inside, there is a classification for tourism objects. Through View POIs, actors can see the maps in which there are markers and routes. Furthermore, in regards to POIs details, they can see photo location, description, website, and navigation. While in the info channel, it displays information regarding the channel itself according to the selected item.

The architecture or design of the system is used to explain how to systematically define the system elements into the module structure more systemically with the aim that the structure design can meet the needs of the current system and in the foreseeable future. The architectural design of the tourism objects system can be shown in the Fig. 2.

In Fig. 2, the architectural design of the tourism objects shows modules of the system of tourism objects that are distinguished according to their respective levels. At level one, it is categorized as the first module; the level two is categorized as the second module; level three is categorized as module three; and level four is categorized as the fourth module. For more details about the modules in the system architecture design, it will be explained in the discussion section.

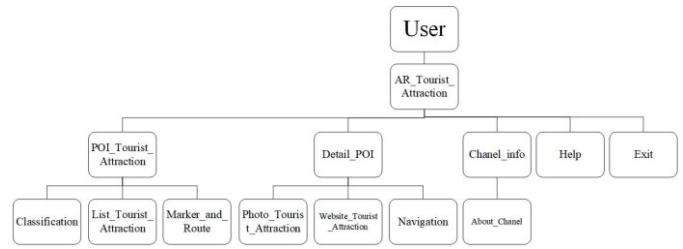


Fig. 2. The architectural design of the tourism object system.

## V. RESULT AND DISCUSSION

In its practice, the built-in tourism objects system uses four modules. Each module has its own role and function to form a wholly unified system. Each section of the system authentication is briefly defined; for user permissions, users can check in the first module, for the main interface for users to interact with the system is in the second module section. Meanwhile, POIs representing each tourism objects to meet the user's needs for information are in the third module, and finally the classification for tourism objects– in accordance with the type that also provides information about each tourism objects – is in the fourth module.

The first module part of the tourism object system is used to verify the system to the user, where users' registration is required in order to access further into the system through a validation notification on its page. Notifications are provided and related to a checking mechanism whether the user has registered into the system or not. If not registered in the system, the user is then required to register according to required valid data. If all the data is proper, the system will automatically respond by giving notification back indicating that the user has access to the system and can interact into the system by doing a number of activities.

The second module is the main interface of the system of tourism objects that appear the first time when the user successfully logged on into the system. Via this interface, a number of information can be seen and they are easily selected by users in different and interesting forms. This interface appears based on LBS that can locate the users' position when the GPS feature on the smartphone is enabled.

The third module is used to display the initial interface of a tourism object system consisting of POIs of tourism objects, POI details, and Info Channel. These interfaces will be displayed on the system when AR automatically accesses the camera's smartphone screen, then displays icons from POIs of tourism objects, POI details, and info channel via Augmented view.

The fourth module is used to display the classification of tourism objects and other information specifically related to the object selected by the user. Photos of tourism' objects, their description, website, distance, and directions to the location of a tourism objects into a number of important information obtained when the user is around the location of the tourism objects that will be determined as the designated tourist.

Users who interact with the system will be able to perform a number of activities within the system using a mobile device. The system utilizes the features of the existing LBS on the smartphone – GPS – to provide user a position directly via satellite and indicate the direction to take in getting to the location of tourist destinations. The active GPS is used by AR through its browser interface to display tourism' objects POIs on the smartphone's camera screen automatically. The POIs displayed can be easily seen and selected by the user because

the system can access the database from the POIs channel at any time when needed. POIs displayed to the user consist of POIs of natural tourism, cultural tourism, and marine tourism.

Information regarding these tourism' objects which are displayed on POIs is obtained based on the point of coordinates of longitude and latitude of each of these tourism objects. The coordinates of each tourism object are shown in the Table I.

TABLE I. THE COORDINATES (LONGITUDE, LATITUDE) OF THE TOURISM OBJECTS IN SOUTHWEST SUMBA

Tourism Objects	POIs 1		POIs 2		POIs 3	
	<i>Longitude</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Latitude</i>
Mananga Aba Beach	119.312503	-9.363950	119.296674	-9.357324	119.297801	-9.358425
Oro Beach	119.269058	-9.368531	119.265574	-9.371755	119.267981	-9.371585
Kawona Beach	119.288799	-9.359408	119.295083	-9.358516	119.287379	-9.359833
Waikelo New Beach	119.229914	-9.385446	119.230663	-9.386717	119.232202	-9.387934
Waikelo Old Beach	119.222331	-9.390744	119.217994	-9.391181	119.222385	-9.392223
Newa Beach	119.241223	-9.379010	119.237288	-9.386428	119.241578	-9.383042
Kawona Beach	119.197675	-9.377055	119.197694	-9.377545	119.198344	-9.377544
Watu Maladong Beach	119.104503	-9.713817	119.104481	-9.713508	119.104871	-9.713763
Wamana Beach	119.087730	-9.711579	119.087748	-9.711281	119.088286	-9.711540
Ratenggaro Beach	119.003280	-9.629832	119.002147	-9.629260	119.002166	-9.629831
Wainyapu Beach	119.005846	-9.632271	119.005784	-9.632608	119.006074	-9.633516
Mandorak Beach	118.958367	-9.498213	118.954583	-9.498633	118.954840	-9.499819
Pero Beach	118.985346	-9.607024	118.985327	-9.607341	118.985648	-9.607341
Tanjung Karoso Beach	118.935011	-9.553565	118.939276	-9.557439	118.943882	-9.561983
Sumba Cultural House	119.213947	-9.433828	119.215716	-9.433536	119.214162	-9.434814
Pasola Customs of War	118.947024	-9.541654	118.945825	-9.541696	118.946983	-9.540767
Manola Village	119.214595	-9.565280	119.214522	-9.567130	119.217854	-9.567130
Totok Kalada Village	119.307709	-9.469120	119.307607	-9.468925	119.305318	-9.469204
Bondo Kapumbu Village	119.307591	-9.439244	119.307597	-9.439353	119.307547	-9.439352
Ratenggaro Village	119.003090	-9.627360	119.004050	-9.627086	119.003111	-9.626731
Wainyapu Village	119.027252	-9.643825	119.028354	-9.641963	119.028302	-9.642143
Mbuku Bani Village	118.949013	-9.541273	118.949002	-9.541442	118.949056	-9.540936
Umbu Koba Village	119.220391	-9.600415	119.220352	-9.601313	119.220987	-9.601268
Wee Lewo Village	119.322025	-9.598443	119.322027	-9.599418	119.321595	-9.599416
Toda Village	118.979050	-9.590882	118.979055	-9.591043	118.979123	-9.591032
Bongu Village	118.990709	-9.589757	118.990709	-9.589968	118.990848	-9.590000
Weekelosawa Lake	119.341088	-9.594172	119.341256	-9.594126	119.341106	-9.594168
Wee Wini Lake	119.144382	-9.406492	119.144553	-9.406977	119.144596	-9.406154
Pabeti Lakera Waterfall	119.220363	-9.601289	119.220380	-9.600451	119.224547	-9.598957
Weekurri saltwater lake	118.959862	-9.490969	118.959341	-9.490969	118.959641	-9.490752
Dikira Waterfall	119.272610	-9.620143	119.272743	-9.621334	119.272305	-9.621360
Rambe Manu Cave Site	119.016884	-9.475473	119.016890	-9.475579	119.016794	-9.475590

In Table I, it indicates that the existing tourism objects in the regency of southwest Sumba have POIs based on the longitude and latitude. Each POI is adjusted to its location points (longitude, latitude) in which there are POIs representing each location of tourism' objects. Therefore, it will ease to facilitate the tracking based on three different location points when the user searches for the location of the tourism objects.

Based on the description of the coordinates of longitude and latitude of each of the tourism objects, then obtained interface system display on the implementation that will be generated. The initial interface in this system is limited to show and discuss two views only, because the design of the display is considered to be more specific and to-the-core from the system development results. The interface of POIs tourism objects can be shown in the Fig. 3.



Fig. 3. The interface of tourism objects' POIs.

The interface in the Fig. 3 is used to display POIs from the existing tourism' objects in southwest Sumba regency. Mananga Aba Beach, Oro Beach, and Kawona Beach are POIs that appear in the initial interface. In this interface, users can view POIs Icons by directing the position of the camera screen according to the location of points on the radar in the upper right corner of the camera screen. The radar angle is approximately 45 degrees. The color of the dots on the radar will change when the direction is pointed right and information regarding the tourism objects also will automatically appear on the marker icon, the name of the tourism object, and the distance.

Furthermore, the interface of the navigation for tourism' objects in the Fig. 4.



Fig. 4. Tourism object navigation interface.

The interface in Fig. 4 is featured to display the navigation of a tourism' object according to one of the POIs of a pre-selected tourism objects. Navigation can be viewed by the user in the form of map of location and route to the tourism objects using support from Google Maps that has been integrated with the system.

Based on the two figures, it is shown that the developed application can display POIs of tourism objects and show the route from the current location to the location of the desired tourism' objects more easily and quickly. Thus, tourists can directly see the map of locations and routes to the location of the desired tourism' objects. For comparison between applications created by the author (AR\_SBDApps) and the evaluation and effectiveness of AR with other applications (TripAdvisor, Google Travel), it can be shown in the Table II.

TABLE II. THE COMPARISON AND EVALUATION OF APPLICATION EFFECTIVENESS

The Effectivity	TripAdvisor	Google Travel	AR_SBDApps
Displaying information regarding tourism' objects, hotels, restaurants	✓	✓	✓
Displaying flight information	✓	✓	
Displaying Route to the location based on the user's position			✓
Search for a more specific and easy tourism objects			✓

## VI. CONCLUSION

In this paper, we present a design on the development of a tourism object system using a combination of LBS from mobile devices with AR technology. The information that will be provided in this system is real time POI display of tourism objects in southwest Sumba regency with Augmented view using camera screen from mobile device, i.e. smartphone. In Augmented view, it displays information in the form of icon images of the tourism' objects location, description, address, website, distance and route to tourist location. Thus, it can be said that with just a few more touches, this system can automatically facilitate the tourists' needs to get detailed information about the location of said tourism' object in a more quick, effective, interactive and interesting manner.

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