



2019 International Conference on Information and Communications Technology (ICOTACT) took place 24-25 July 2019 in Yogyakarta, Indonesia.

IEEE catalog number: CFP19L86-ART  
ISBN: 978-1-7281-1655-6

Copyright and Reprint Permission: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved. Copyright © 2019 by IEEE.

Organizing Committee

## General Chair

Arief Setyanto (Universitas AMIKOM Yogyakarta, Indonesia)

## Publication Chair

Akhmad Dahlan (Universitas Amikom Yogyakarta, Indonesia)

## Secretary

Nila Puspitasari (Universitas AMIKOM Yogyakarta, Indonesia)

## Treasurer

Sumarni Adi (Universitas AMIKOM Yogyakarta, Indonesia)

## Chair of Technical Program Committee

Kusrini Kusri (AMIKOM Yogyakarta University, Indonesia)

Emha Taufiq Luthfi (Universitas AMIKOM Yogyakarta, Indonesia)

Ferry Wahyu Wibowo (Universitas Amikom Yogyakarta, Indonesia)

## Additional Reviewers

Intan Ermahani A. Jalil	Universiti Teknikal Malaysia Melaka	Malaysia
Mohd Helmy Abd Wahab	Universiti Tun Hussein Onn Malaysia	Malaysia
Mohd Hakim Abdul Hamid	Faculty of Information Technology and Communication, UTeM	Malaysia
David Agustriawan	Indonesia International Institute for Life Sciences (i3L)	Indonesia
Mohd Khairul Ikhwan Bin Ahmad	Universiti Tun Hussein Onn Malaysia	Malaysia
Anas Mohammad Ramadan AISobeh	Yarmouk University	Jordan
Ahmad Ashari	Gadjah Mada University	Indonesia
Aslina Baharum	Universiti Malaysia Sabah	Malaysia
Aashish Bardekar	Sipna College of Engineering and Technology, Amravati	India
Indra Budi	Faculty of Computer Science	Indonesia
Maria Chiara Caschera	CNR	Italy
Mu-Song Chen	Electrical Engineering, Da-Yeh University	Taiwan
Wichian Chutimaskul	King Mongkut's University of Technology Thonburi	Thailand
Domenico Ciuonzo	University of Naples Federico II, IT	Italy
Gaia Codeluppi	University of Parma	Italy
Ahmad Nurul Fajar	Bina Nusantara University	Indonesia
Alireza Ghasempour	ICT Faculty	USA
Razvan Andrei Gheorghiu	Politehnica University of Bucharest	Romania
Hamdani Hamdani	Universitas Mulawarman	Indonesia
Byeong-jun Han	Soongsil University	Korea
Seng Hansun	Universitas Multimedia Nusantara	Indonesia
K Haribabu	BITS Pilani	India
Aslinda Hassan	Universiti Teknikal Malaysia Melaka	Malaysia
Roberto Carlos Herrera Lara	National Polytechnic School	Ecuador
Tonny Hidayat	Universitas AMIKOM Yogyakarta	Indonesia
Danial Hooshyar	Korea University	Korea
Ramkumar Jaganathan	VLB Janakiammal College of Arts and Science	India
Biao Jiang	The City University of New York	USA
Sokratis K. Katsikas	Norwegian University of Science and Technology	Norway
Hasan Ali Ali Khattak	COMSATS University, Islamabad	Pakistan
Suryadiputra Liawatimena	Bina Nusantara University	Indonesia
Pavel Loskot	Swansea University	United Kingdom (Great Britain)
Prita Dewi Mariyam	Universitas Indonesia	Indonesia
Othman Mohd	Universiti Teknikal Malaysia Melaka	Malaysia
Amrit Mukherjee	Jiangsu University	P.R. China
Syibrah Naim	Universiti Sains Malaysia	Malaysia
Ponrudee Netisopakul	King Mongkut's Institute of Technology Ladkrabang	Thailand
Md Asri Ngadi	Universiti Teknologi Malaysia	Malaysia
Ruzelita Ngadيران	Universiti Malaysia Perlis	Malaysia
Hea Choon Ngo	Universiti Teknikal Malaysia Melaka	Malaysia
Atsushi Nunome	Kyoto Institute of Technology	Japan
Nitish Ojha	DIT University, Dehradun	India
Henry Novianus Palit	Petra Christian University	Indonesia
Jae-Hyun Park	Chung-Ang University	Korea
Kiran Sree Pokkuluri	Shri Vishnu Engineering College for Women	India
Gede Pramudya Ananta	Universiti Teknikal Malaysia Melaka	Malaysia
Lesnanto Multa Putranto	UGM	Indonesia
Yuansong Qiao	Athlone Institute of Technology	Ireland
Basit Qureshi	University of Bradford	United Kingdom (Great Britain)
Ali Rafiei	University of Technology Sydney	Australia
Hemant Kumar Rath	Tata Consultancy Services	India
Bagus Rintyarna	Sepuluh Nopember Institute of Technology	Indonesia
Sayantam Sarkar	Vijaya Vittala Institute of Technology	India
Riyanarto Sarno	Institut Teknologi Sepuluh Nopember	Indonesia
Anindita Septiarini	Universitas Mulawarman	Indonesia
Amel Serrat	USTO MB	Algeria
Iwan Setyawan	Satya Wacana Christian University	Indonesia
Aditi Sharma	Quantum University, Roorkee, Uttarakhand	India

China Venkateswarlu Sonagiri	Institute of Aeronautical Engineering	India
Ickho Song	Korea Advanced Institute of Science and Technology	Korea
Yi-Jen Su	Shu-Te University	Taiwan
Andi Sunyoto	Universitas AMIKOM Yogyakarta	Indonesia
Nico Surantha	Bina Nusantara University	Indonesia
Takuji Tachibana	University of Fukui	Japan
Srinivasulu Tadisetty	Kakatiya University College of Engineering and Technology	India
Ivanna Timotius	Satya Wacana Christian University	Indonesia
Julian L Webber	Osaka University	Japan
Leong Wen Chek	University of Malaya	Malaysia
Ferry Wahyu Wibowo	Universitas Amikom Yogyakarta	Indonesia
Teguh Wibowo	Gadjah Mada University	Indonesia
Dedy Rahman Wijaya	Telkom University	Indonesia
Yuhang Ye	Athlone Institute of Technology	Ireland
Thaweesak Yingthawornsuk	King Mongkut's University of Technology Thonburi	Thailand
Chau Yuen	Singapore University of Technology and Design	Singapore
Go Yun Il	Heriot-Watt University Malaysia	Malaysia
Sri Utami Zuliana	UIN Sunan Kalijaga	Indonesia
Nur Zareen Zulkarnain	Universiti Teknikal Malaysia Melaka	Malaysia

# 2019 International Conference on Information and Communications Technology (ICOIACT)

## 1: Parallel Session 1-A

<i>An Approach for High Bandwidth Wireless Communications with Arbitrary IQ Mismatch</i> Franz G Aletsee (Augsburg University of Applied Sciences, Germany), Reinhard Stolle (Hochschule Augsburg, Germany) .....	1
<i>Identification and Prevention of Cyber Attack in Smart Grid Communication Network</i> Neeraj Singh (S V National Institute of Technology Surat, India), Vasundhara Mahajan (SVNIT, Surat, Gujarat & IIT Roorkee, India) .....	5
<i>Design of Vivaldi Antenna for UWB Respiration Radar</i> Tyas Oksi Praktika (Telkom University, Indonesia), Aloysius Adya Pramudita (Telkom University, Indonesia), Yuyu Wahyu (Indonesia Institute of Science LIPI, Indonesia) .....	11
<i>ADS-B Microstrip Antenna Receiver Design for Cubesat with Slot</i> Essa Alkautsar Suteja (Telkom University, Indonesia), Agus D. Prasetyo (Telkom University, Indonesia), Bagas Satriyotomo (Telkom University, Indonesia), Desio Hasbin Dafi (Telkom University, Indonesia), Edwar Edwar (Telkom University, Indonesia) .....	17

## Parallel Session 1-B

<i>Performance Evaluation of Active Queue Management in Fat Tree Architecture on Data Center Network</i> Lathifah Alfath (University of Indonesia, Indonesia) .....	22
<i>Mobile-Based Geographic Information System For Culinary Tour Mapping In Indonesia</i> Erick Fernando (Bina Nusantara University, Indonesia), Muhamad Irsan (Universitas Islam Syekh Yusuf, Indonesia & Universiti Kebangsaan Malaysia, Malaysia), Dina Fitria Murad, Dfm (Bina Nusantara University, Indonesia), Surjandy Surjandy (Bina Nusantara University, Indonesia), Djameludin Djameludin (Universitas Islam Syekh Yusuf (UNIS), Indonesia) .....	28
<i>Learning Support System using Chatbot in "Kejar C Package" Homeschooling Program</i> Dina Fitria Murad, Dfm (Bina Nusantara University, Indonesia), Muhamad Irsan (Universitas Islam Syekh Yusuf, Indonesia & Universiti Kebangsaan Malaysia, Malaysia), Erick Fernando (Bina Nusantara University, Indonesia), Silvia Murad (Universitas Islam Syekh Yusuf (UNIS), Indonesia), Michael Wijaya (Bina Nusantara University, Indonesia) .....	32
<i>The Design of Two-Way Relationship Tourism Planning System with User Centered Design (UCD)</i> Yohandes Efindo (Universitas Gadjah Mada, Indonesia), Lukito Edi Nugroho (Universitas Gadjah Mada, Indonesia), Ridi Ferdiana (Universitas Gadjah Mada, Indonesia) .....	38

## Parallel Session 1-C

<i>An Image Steganography Algorithm using LSB Replacement through XOR Substitution</i> Touhid Bhuiyan (Daffodil International University, Bangladesh), Afjal H. Sarower (Daffodil International University, Bangladesh), Md. Rashed Karim (Daffodil International University, Bangladesh), Md. Maruf Hassan (Daffodil International University Dhaka Bangladesh & Cyber Security Centre, DIU, Bangladesh) .....	44
<i>A Novel Pseudo-Random Number Generator Algorithm based on Entropy Source Epoch Timestamp</i> Domingo Villanueva Origenes, Jr (Technical Institute of the Philippines, Philippines) .....	50
<i>A Modified Tiny Encryption Algorithm Using Key Rotation to Enhance Data Security for Internet of Things</i> Rey M. De Leon (Technological Institute of Philippines, Philippines), Ariel Sison (Emilio Aguinaldo College, Philippines), Ruji Medina (Technological Institute of Technology, Philippines) .....	56
<i>40 Gb/s Balanced Parallel Scheme in Dispersion Compensating Fiber Performance for DWDM in the Long Haul Network</i> Brian Pamukti (Telkom University, Indonesia) .....	61

## Parallel Session 1-D

<i>Effectiveness Comparison of the AES and 3DES Cryptography Methods on Email Text Messages</i> Rini Indrayani (Universitas Amikom Yogyakarta, Indonesia), Subektiningsih Subektiningsih (Universitas Amikom Yogyakarta, Indonesia), Pramudhita Ferdiansyah (Universitas Amikom Yogyakarta, Indonesia), Dhimas Adi Satria (Universitas Amikom Yogyakarta, Indonesia) .....	66
<i>Security Concern of Financial Technology for Online Transportation Passenger in Indonesia</i> Surjandy Surjandy (Bina Nusantara University, Indonesia), Erick Fernando (Bina Nusantara University, Indonesia), Firman Anindra (Universitas Nasional & BINUS University, Indonesia), Meyliana Meyliana (Bina Nusantara University, Indonesia), Theresia Meidiana Santoso (Bina Nusantara University, Indonesia), Willy Widjaja (Bina Nusantara University, Indonesia), Anindya Wardhana (Bina Nusantara University, Indonesia) .....	70
<i>Dual Protection on Message Transmission based on Chinese Remainder Theorem and Rivest Cipher 4</i> H. Kevin Cahyono (Dian Nuswantoro University, Indonesia), Christy Atika Sari (Dian Nuswantoro University, Indonesia), De Rosal Ignatius Moses Setiadi (Dian Nuswantoro University, Indonesia), Eko Hari Rachmawanto (Dian Nuswantoro University, Indonesia) .....	74
<i>Collecting the Tourism Contextual Information data to support the tourism recommendation system</i> Rico Y Saputra (Universitas Gadjah Mada, Indonesia), Lukito Edi Nugroho (Universitas Gadjah Mada, Indonesia), Sri Suning Kusumawardani (Universitas Gadjah Mada, Indonesia) .....	79

Parallel Session 2-A

<i>StegoCrypt Scheme using LSB-AES Base64</i>	
Fahmi Anwar (Dian Nuswantoro University, Indonesia), Eko Hari Rachmawanto (Dian Nuswantoro University, Indonesia), Christy Atika Sari (Dian Nuswantoro University, Indonesia), De Rosal Ignatius Moses Setiadi (Dian Nuswantoro University, Indonesia)	85
<i>Segmentation of Plasmodium using Saturation Channel of HSV Color Space</i>	
Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia), Fathin Tantowi (Universitas Gadjah Mada, Indonesia), Raymond Anggara (Universitas Gadjah Mada, Indonesia), TM Aldibra (Universitas Gadjah Mada, Indonesia), Rizki Nurfauzi (Gajah Mada University, Indonesia), Eka Frannita (Universitas Gadjah Mada, Indonesia), Alifia Prananda (Universitas Gadjah Mada, Indonesia)	91
<i>Tuberculosis Detection in Chest X-Ray Images Using Optimized Gray Level Co-Occurrence Matrix Features</i>	
Imam Junaedi (Brawijaya University, Indonesia)	95
<i>Rain Removal Using Guided Image Filtering For Surveillance Videos</i>	
Aditya Pratama Nusantara (Institut Teknologi Sepuluh Nopember, Indonesia), Budi Setiyono (Institut Teknologi Sepuluh Nopember, Indonesia), Dwi Ratna Sulistyoningrum (Sepuluh Nopember Institute of Technology, Indonesia), Izah Amalia (Institut Teknologi Sepuluh Nopember, Indonesia)	100
<i>The Analysis Effect of Cluster Numbers On Fuzzy C-Means Algorithm for Blood Vessel Segmentation of Retinal Fundus Image</i>	
Wiharto Wiharto (Universitas Sebelas Maret, Indonesia), Esti Suryani (University of Sebelas Maret, Indonesia)	106
<i>Wood Classification with Transfer Learning Method and Bottleneck Features</i>	
Vajrayudha Ristiawanto (Telkom University, Indonesia), Budhi Irawan (Telkom University, Indonesia), Casi Setianingsih (Telkom University, Indonesia)	111
<i>Prototype of Pornographic Image Detection using YCbCr and Color Space (RGB) Methods at Computer Vision</i>	
Kusrini Kusrini (AMIKOM Yogyakarta University, Indonesia), Hanif Fatta (Universitas AMIKOM Yogyakarta, Indonesia), Sofyan Pariyasto (University AMIKOM Yogyakarta, Indonesia), Wahyu Wijaya Widiyanto, www (University AMIKOM Yogyakarta, Indonesia)	117
<i>Reduction of Inter-Cell Interference (ICI) by Fractional Frequency Reuse (FFR) in Orthogonal Frequency Division Multiple Access (OFDMA)</i>	
Azlina Idris (Universiti Teknologi MARA, Malaysia)	123

Parallel Session 2-B

<i>Temple Rock Damage Detection System in Digital Image at Borobudur Conservation Center</i>	
Ulfa Lutfiyana (Universitas Amikom Yogyakarta, Indonesia), Kusrini Kusrini (AMIKOM Yogyakarta University, Indonesia)	129
<i>Classification of Palm Gesture Pattern by Using Statistical Features</i>	
Hendra Ari Winarno (Universitas Gadjah Mada & Electrical and Information Technology Engineering, Indonesia), Indah Soesanti (Universitas Gadjah Mada, Indonesia), Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia)	135
<i>A Programmable Artificial Neural Network Coprocessor for Handwritten Digit Recognition</i>	
Geranun Boonyuu (King Mongkut's Institute of Technology Ladkrabang, Thailand), Sumeek Wisayataksin (King Mongkut's Institute of Technology Ladkrabang, Thailand)	139
<i>Cirebon Mask Classification using Robust k- Nearest Neighbour</i>	
Felix Indra Kurniadi (Tanri Abeng University, Indonesia), Fendy Hendriyanto (Tanri Abeng University, Indonesia)	143
<i>Analysis on Digital Elevation Model Data for 3D Modeling</i>	
Novandi Rezeki (Universitas AMIKOM Yogyakarta, Indonesia), Ema Utami (Universitas Amikom Yogyakarta, Indonesia), Irwan Oyong (Universitas AMIKOM Yogyakarta, Indonesia)	147
<i>Adaptive Background Subtraction for Monitoring System</i>	
Afit Miranto (Universitas Lampung, Indonesia), Sri Ratna Sulistyanti (University of Lampung, Indonesia), Arinto Setyawan (University of Lampung, Indonesia)	153
<i>Segmentation and Recognition of Handwritten Lontara Characters Using Convolutional Neural Network</i>	
Asri Hidayat (Universitas Hasanuddin, Indonesia), Ingrid Nurtanio (Hasanuddin University, Indonesia), Zulkifli Tahir (Hasanuddin University, Indonesia)	157
<i>A Developed Analysis Models for Industry 4.0 toward Smart Power Plant System Process</i>	
Harry Indrawan (PT PLN (Persero), Indonesia), Nur Cahyo (PT PLN (Persero), Indonesia), Arionmaro Simaremare (PT PLN (Persero), Indonesia), Siti Aisyah (PT PLN (Persero), Indonesia), P Paryanto (Universitas Diponegoro (UNDIP), Indonesia), Patrick Munyensanga (Universitas Diponegoro (UNDIP), Indonesia)	162

Parallel Session 2-C

<i>An Improve Image Watermarking using Random Spread Technique and Discrete Cosine Transform</i>	
Ajib Susanto (Universitas Dian Nuswantoro, Indonesia), De Rosal Ignatius Moses Setiadi (Dian Nuswantoro University, Indonesia), Eko Hari Rachmawanto (Dian Nuswantoro University, Indonesia), Ibnu Utomo Wahyu Mulyono (Dian Nuswantoro University, Indonesia), Christy Atika Sari (Dian Nuswantoro University, Indonesia)	168
<i>Block-Based Arnold Chaotic Map for Image Encryption</i>	
Eko Hari Rachmawanto (Dian Nuswantoro University, Indonesia), De Rosal Ignatius Moses Setiadi (Dian Nuswantoro University, Indonesia), Christy Atika Sari (Dian Nuswantoro University, Indonesia), Heru Agus Santoso (Dian Nuswantoro University, Indonesia), Fauzi Adi Adi Rafrastara (Universitas Dian Nuswantoro, Indonesia), Edi Sugiarto (Dian Nuswantoro University, Indonesia)	174

<i>Image Steganography using Inverted LSB based on 2nd, 3rd and 4th LSB pattern</i>	
Fauzi Adi Rafrastara (Universitas Dian Nuswantoro, Indonesia), Raka Prahasiwi (Dian Nuswantoro University, Indonesia), De Rosal Ignatius Moses Setiadi (Dian Nuswantoro University, Indonesia), Eko Hari Rachmawanto (Dian Nuswantoro University, Indonesia), Christy Atika Sari (Dian Nuswantoro University, Indonesia)	179
<i>Copyright Embedding Analysis in Color Image Channel based on Non-Blind DCT Method</i>	
Fauzi Adi Rafrastara (Universitas Dian Nuswantoro, Indonesia), Arvin Vega Hadinata (Dian Nuswantoro University, Indonesia), De Rosal Ignatius Moses Setiadi (Dian Nuswantoro University, Indonesia), Eko Hari Rachmawanto (Dian Nuswantoro University, Indonesia), Christy Atika Sari (Dian Nuswantoro University, Indonesia)	185
<i>Strawberry Ripeness Classification System Based On Skin Tone Color using Multi-Class Support Vector Machine</i>	
Indrabayu A (Hasanuddin University, Indonesia), Nurhikma Arifin (Hasanuddin University, Indonesia), Intan Sari Areni (Hasanuddin University, Indonesia)	191
<i>Multimodal Interfaces: A Study on Speech-Hand Gesture Recognition</i>	
Jude Joseph Lamug Martinez (Bina Nusantara University & Binus International, Indonesia), Sindy Dewanti (Binus University, Indonesia)	196
<i>Recognition Pattern of Arca Siwa Prambanan Temple with Canny and Backpropagation Algorithm</i>	
Arif Fridasari (Universitas Amikom Yogyakarta, Indonesia), Ema Utami (Universitas Amikom Yogyakarta, Indonesia)	201
<i>A Comparative Study MD5 and SHA1 Algorithms to Encrypt REST API Authentication on Mobile-based Application</i>	
De Rosal Ignatius Moses Setiadi (Dian Nuswantoro University, Indonesia), Afif Faishal Najib (Dian Nuswantoro University, Indonesia), Eko Hari Rachmawanto (Dian Nuswantoro University, Indonesia), Christy Atika Sari (Dian Nuswantoro University, Indonesia), Md Kamruzzaman Sarker (Wright State University, USA), Nova Rijati (Universitas Dian Nuswantoro, Indonesia)	206

## Parallel Session 2-D

<i>Optical Fiber Network Design in East Nusa Tenggara Based on Palapa Ring Project</i>	
Yohanes Galih Adhiyoga (Universitas Indonesia, Indonesia), Fetty Amelia (Universitas Indonesia, Indonesia), Dody Rachmat (Universitas Indonesia, Indonesia), B. Pratiknyo Adi Mahatmanto (Universitas Indonesia, Indonesia), Catur Apriono (Universitas Indonesia, Indonesia)	212
<i>Data Distribution on the Goodness Behaviour System with Blackboard Based Architecture</i>	
Asa Hari Wibowo (Universitas Gadjah Mada, Indonesia), Lukito Edi Nugroho (Universitas Gadjah Mada, Indonesia), Selo Sulisty (Gadjah Mada University, Indonesia)	217
<i>Dual Band Antenna with Parasitic Patch for Satellite Applications</i>	
Harshal Nigam (Rajasthan Technical University, Kota & SKIT M&G, Engineering College, Jaipur, India), Monika Mathur (Rajasthan Technical University & Swami Keshvanand Institute of Technology, Management and Gramothan, India), Mukesh Arora (SKIT Jaipur, India)	222
<i>Optimization of Hyper Parameter Bandwidth on Naïve Bayes Kernel Density Estimation for the Breast Cancer Classification</i>	
Theopilus Bayu Sasongko (Universitas AMIKOM Yogyakarta, Indonesia), Oki Arifin (Politeknik Negeri Lampung, Indonesia), Hanif Fatta (Universitas AMIKOM Yogyakarta, Indonesia)	226
<i>An Improved LBlock-s Key Schedule Algorithm</i>	
Arif Rahman Hakim (Sekolah Tinggi Sandi Negara, Indonesia), Zahra Zakia Nusron (Sekolah Tinggi Sandi Negara, Indonesia)	232
<i>Self-Complementary Bow-tie Antenna Design for UWB Respiration System</i>	
Solihatul Jannah (Telkom University, Indonesia), Aloysius Adya Pramudita (Telkom University, Indonesia), Yuyu Wahyu (Indonesia Institute of Science LIPI, Indonesia)	237
<i>A Control-Theoretical Perspective in Retail Telecommunication Industry Using Dynamic Simulation Model</i>	
Tiar Anindya Putri (Institut Teknologi Sepuluh Nopember, Indonesia), Rryanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Erma Suryani (Institut Teknologi Sepuluh Nopember, Indonesia)	243

## Parallel Session 3-A

<i>Hybrid NDP Proxy in OpenFlow Network</i>	
Fauzi Dwi Setiawan Sumadi (University of Muhammadiyah Malang, Indonesia), Ade Rega Susanto (University of Muhammadiyah Malang, Indonesia), Syaifuddin Syaifuddin (University of Muhammadiyah Malang, Indonesia), Didih Rizki Chandranegara (Universitas Muhammadiyah Malang, Indonesia)	249
<i>A Design of Digital Signature Mechanism in NDN-IP Gateway</i>	
Dian Abadi Arji (University of Indonesia, Indonesia), Fandhy Bayu Rukmana (University of Indonesia, Indonesia), Riri Fitri Sari (University of Indonesia, Indonesia)	255
<i>An Introduction to a Dynamic Data Size Reduction Approach in Fog Servers</i>	
Mohammadreza Pourkiani (University of Rostock, Germany), Masoud Abedi (University of Rostock, Germany)	261
<i>Improving the Quality of Service in WBSN Based Healthcare Applications by Using Fog Computing</i>	
Mohammadreza Pourkiani (University of Rostock, Germany), Masoud Abedi (University of Rostock, Germany), Mohammad Amin Tahavori (Polytechnic University of Milan, Italy)	266
<i>Blind Compressive Sensing for Cooperative Cognitive Radio with Semi-Orthogonal RPC Matrix and l2-Minimization</i>	
Ahmed Ebian (Ain Shams University & Telecom Egypt, Egypt)	271

<i>LTE-Advanced Network Planning Using Inter-band Non-Contiguous Carrier Aggregation Technology at Soreang-Pasir Koja Highway</i> Yuyun Siti Rohmah (Telkom University, Indonesia), Sugondo Hadiyoso (Telkom University & Institut Teknologi Bandung, Indonesia), Budi Prasetya (Institut Teknologi Bandung & Telkom University, Indonesia) .....	276
<i>Wall Effect compensation for Detection Improvement of Through the Wall Radar</i> Fauzan Nur A (Telkom University, Indonesia), Dharu Arseno (Telkom University, Indonesia), Aloysius Adya Pramudita (Telkom University, Indonesia) .....	281
<i>Classification of Spice Types Using K-Nearest Neighbor Algorithm</i> Kaharuddin Kaharuddin (University of AMIKOM Yogyakarta, Indonesia), Kusri Kusri (AMIKOM Yogyakarta University, Indonesia), Vera Wati (University of AMIKOM Yogyakarta, Indonesia), Elvis Pawan (University Of AMIKOM Yogyakarta, Indonesia), Patmawati Hasan (University Of AMIKOM Yogyakarta, Indonesia) .....	285

### Parallel Session 3-B

<i>A Swing Routing Approach to Improve Performance of Shortest Geographical Routing Protocol for Wireless Sensor Networks</i> Novi Trisman Hadi (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia), Waskitho Wibisono (Institut Teknologi Sepuluh Nopember, Indonesia) .....	291
<i>Experimental Measurement of Time Reversal-OFDM Technique for Underwater Acoustic Communication in the Presence of Gaussian Noise</i> Yuning Widiarti (Institut Teknologi Sepuluh Nopember & Politeknik Perkapalan Negeri Surabaya, Indonesia), Suwadi Suwadi (ITS, Indonesia), Wirawan Wirawan (Institut Teknologi Sepuluh Nopember, Indonesia) .....	297
<i>Method to Uncover IP Spoofing Attack On Network Forensics Using NFAT And IP Correlation As Combined Approach</i> Suryo Utomo (Institut Teknologi Bandung & Badan Narkotika Nasional, Indonesia), Bayu Pramudiono (Badan Narkotika Nasional, Indonesia), Andika Muharam (Universitas Mercu Buana Jakarta, Indonesia) .....	302
<i>Hjorth Descriptor as Feature Extraction for Classification of Familiarity in EEG Signal</i> Sugondo Hadiyoso (Telkom University & Institut Teknologi Bandung, Indonesia), Inung Wijayanto (Telkom University & Universitas Gadjah Mada, Indonesia), Hannisa Sanggarini (Telkom University, Indonesia) .....	306
<i>Investigation of Human Emotion Pattern Based on EEG Signal Using Wavelet Families and Correlation Feature Selection</i> Dwi Utari Surya (Brawijaya University, Indonesia) .....	310
<i>A Study of Arousal Classification Based on EEG Signal and Support Vector Machine</i> Nur Arvia Sofyan (Telkom University, Indonesia), Inung Wijayanto (Telkom University & Universitas Gadjah Mada, Indonesia), Sugondo Hadiyoso (Telkom University & Institut Teknologi Bandung, Indonesia), Rita Purnamasari (Bandung Institute of Technology, Indonesia) .....	316
<i>Analysis of Daubechies Wavelet and Neural Network for Audio Classification</i> Yulianto Mustaqim (Student of University & AMIKOM Yogyakarta, Indonesia), Ema Utami (Universitas Amikom Yogyakarta, Indonesia), Suwanto Raharjo (Informatics Engineering of Institut Sains & Teknologi AKPRIND Yogyakarta, Indonesia) .....	322
<i>A simple real-time system for the detection of Myocardial Ischemia in the ST segment and T wave ECG signal</i> Prihatin Oktivasari (Politeknik Negeri Jakarta, Indonesia) .....	327

### Parallel Session 3-C

<i>Hoax Web Detection For News in Bahasa Using Support Vector Machine</i> Muhammad Abdillah Rahmat (Hasanuddin University, Indonesia), Indrabayu A (Hasanuddin University, Indonesia), Intan Sari Areni (Hasanuddin University, Indonesia) .....	332
<i>Emotional Programmer's Behavior in Responding to Problems Using the Decision Tree</i> Agus Setiyono (STMIK Nusa Mandiri, Indonesia), Windu Gata (STMIK Nusa Mandiri, Indonesia) .....	337
<i>Missing Values Estimation on Multivariate Dataset: Comparison of Three Type Method's Approach</i> Yoga Pristyanto (Universitas AMIKOM Yogyakarta, Indonesia), Irfan Pratama (Universitas Mercubuana Yogyakarta, Indonesia) .....	342
<i>LTL Similarity and Classification using Fuzzy Rules for Evaluating Environment Sustainability Business Process Indicator</i> Lia Ninda Safitri (Institute Technology Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Kelly Sungkono (Institut Teknologi Sepuluh Nopember, Indonesia) .....	348
<i>Comparative Method of Moora and Copras Based on Weighting of the Best Worst Method in Supplier Selection at ABC Mining Companies in Indonesia</i> Ryco Setyono (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia) .....	354
<i>Comparison Of MOORA and COPRAS Methods Based on Geographic Information System For Determining Potential Zone of Pasir Batu Mining</i> Adiba Ajrina (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), R. V. Hari Ginardi (Institut Teknologi Sepuluh Nopember, Indonesia) .....	360
<i>Application of Gravitational Search Algorithm to Detect Insulin Resistance in Intravenous Glucose Tolerance Test</i> Ilim Abdul Mafahir (Bogor Agricultural University, Indonesia) .....	366
<i>Predictive System Based Multi-layered Clustering Model and Least Absolute Shrinkage and Selection Operator (LASSO)</i> Fevi Febianti (Institut Teknologi Bandung, Indonesia), Bambang Pharmasetiawan (Institut Teknologi Bandung, Indonesia), Kusprasapta Mutijarsa (Institut Teknologi Bandung, Indonesia) .....	371



Parallel Session 3-D

<i>Designing Determining Teacher Engagement Based On The Indonesian Teacher Engagement Index Using Artificial Neural Network</i> Sasmoko Sasmoko (Bina Nusantara University, Indonesia), Jurike Moniaga (Bina Nusantara University, Indonesia), Yasinta Indrianti (Research Interest Group in Educational Technology Bina Nusantara University, Indonesia), Yogi Udjaja (Bina Nusantara University, Indonesia), Christina Natasha (Bina Nusantara University, Indonesia) .....	377
<i>Predicting the Potential Telemarketing Costumers using Data Mining Approach</i> Annisa Nurul Puteri (Hasanuddin University, Indonesia), Dewiani Dewiani (Universitas Hasanuddin, Indonesia), Zulkifli Tahir (Hasanuddin University, Indonesia) .....	383
<i>Classification Talent of Employee Using C4.5, KNN, SVM, RBFN</i> Cecilia Stephanie (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia) .....	388
<i>Software Quality Prediction Using Data Mining Techniques</i> Baydaa Mohammed Merzah (Al Nahrain University Iraq Baghdad, Iraq) .....	394
<i>Optimal Sample Temperature of Electronic Nose For Detecting Beef And Pork Mixture</i> Sinarring Laga (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia) .....	398
<i>Umrah Electronic Guide</i> Lolwah Alshabanat (General Authority of Zakat and Tax, Saudi Arabia), Areej AlHogail (King Saud University & College of Computing and Information Sciences, Saudi Arabia), Nourah Abdulelah Almusharraf (Al-Imam Muhammad Ibn Saud Islamic University, Saudi Arabia), Arwa Ali Mahdi, Alkharis (Imam Muhammad ibn Saud Islamic University, Saudi Arabia), Bashair Almusharraf (Imam Muhammad Ibn Saud Islamic University, Saudi Arabia) .....	403
<i>Quotation Extraction from Indonesian Online News</i> Achmad Choirudin Emcha (Universitas Gadjah Mada, Indonesia), Widy Widyanan (Gadjah Mada University, Indonesia), Teguh Bharata Adji (Universitas Gadjah Mada, Indonesia) .....	408
<i>The Architecture of Tourism Recommendation System Based on Context-Awareness and Two-Way Relationship</i> Vivin Mahat Putri (Universitas Gadjah Mada, Indonesia), Lukito Edi Nugroho (Universitas Gadjah Mada, Indonesia), Adhitya Erna Permasari (Universitas Gadjah Mada, Indonesia) .....	413

Parallel Session 4-A

<i>miRNA Based Gene Regulation of Bladder Cancer in A Specific Population of Caucasian Race and Different Sexes</i> Margareta Deidre Valeska (Indonesia International Institute for Life Sciences (i3L), Indonesia), David Agustriawan (Indonesia International Institute for Life Sciences (i3L), Indonesia & AsiaUniversity, Taiwan) .....	418
<i>Identification of microRNA Targeting Cancer Gene of Colorectal Carcinoma in Caucasian Population</i> Stefanus Bernard (Indonesia International Institute for Life Sciences, Indonesia), David Agustriawan (Indonesia International Institute for Life Sciences (i3L), Indonesia & AsiaUniversity, Taiwan) .....	423
<i>The Application of Extended Weighted Tree Similarity Algorithm for Similarity Searching</i> Akrilvalerat Deainert Wierfi (Universitas AMIKOM Yogyakarta, Indonesia), Ema Utami (Universitas Amikom Yogyakarta, Indonesia), Andi Sunyoto (Universitas AMIKOM Yogyakarta, Indonesia) .....	428
<i>Chili Commodity Price Forecasting in Bandung Regency using the Adaptive Synthetic Sampling (ADASYN) and K-Nearest Neighbor (KNN) Algorithms</i> Hasmita S (Telkom University, Indonesia), Fhira Nhita (Telkom University, Indonesia), Deni Saepudin (Telkom University, Indonesia), Annisa Aditsania (Telkom University, Indonesia) .....	434
<i>Time-Series Data Forecasting and Approximation with Smoothing Technique</i> Irfan Pratama (Universitas Mercubuana Yogyakarta, Indonesia), Putri Taqwa Prasetyaningrum (Mercu Buana University of Yogyakarta & Faculty of Information Technology, Indonesia), Putri Wahyu Setyaningsih (Universitas Mercubuana Yogyakarta, Indonesia) .....	439
<i>Business Trends Based on News Portal Websites for Analysis of Big Data Using K-Means Clustering</i> Wahyu Hidayat (University of Amikom Yogyakarta, Indonesia), Ainul Yaqin (Universitas Amikom Yogyakarta, Indonesia) .....	445
<i>The Effect of Feature Selection on Classification Algorithms in Credit Approval</i> Yoga Pristyanto (Universitas AMIKOM Yogyakarta, Indonesia), Sumarni Adi (Universitas AMIKOM Yogyakarta, Indonesia), Andi Sunyoto (Universitas AMIKOM Yogyakarta, Indonesia) .....	451
<i>Best Parameter Selection Of Rabin-Karp Algorithm In Detecting Document Similarity</i> Anggit Dwi Hartanto (Universitas Amikom Yogyakarta, Indonesia), Andy Syaputra (Universitas Amikom Yogyakarta, Indonesia), Yoga Pristyanto (Universitas AMIKOM Yogyakarta, Indonesia) .....	457

Parallel Session 4-B

<i>Clustering of Javanese News in Krama Alus Level with Javanese Stemming</i> Denis Eka Cahyani (Universitas Sebelas Maret, Indonesia) .....	462
<i>Sentiment Analysis on Grab User Reviews Using Support Vector Machine and Maximum Entropy</i> Annisa Uswatun Khasanah (Universitas Islam Indonesia, Indonesia), Bella Azis Dewanti Putri (Universitas Islam Indonesia, Indonesia), Abdullah Azzam (Industrial Engineering, Indonesia) .....	468

<i>The Impact of Using Domain Specific Features on Lexicon Based Sentiment Analysis on Indonesian App Review</i> Bayu Trisna Pratama (Universitas Amikom Yogyakarta, Indonesia), Ema Utami (Universitas Amikom Yogyakarta, Indonesia), Andi Sunyoto (Universitas AMIKOM Yogyakarta, Indonesia) .....	474
<i>Social Media Mapping for Business Communication</i> Anggit Subekti (Universitas Gadjah Mada, Indonesia), Ridi Ferdiana (Universitas Gadjah Mada, Indonesia), Paulus Insap Santosa (Universitas Gadjah Mada, Indonesia) .....	480
<i>Accuracy Measurement on Indonesian Non-formal Affixed Word Stemming With Levenhstein</i> Rahardyan Bisma Setya Putra (Universitas Amikom Yogyakarta, Indonesia), Ema Utami (Universitas Amikom Yogyakarta, Indonesia), Suwanto Raharjo (Informatics Engineering of Institut Sains & Teknologi AKPRIND Yogyakarta, Indonesia) .....	486
<i>Literature Review of Automatic Text Summarization: Research Trend, Dataset and Method</i> Adhika Pramita Widyassari (Dian Nuswantoro University, Indonesia), Edy Noersasongko (Dian Nuswantoro University, Indonesia), Abdul Syukur (Dian Nuswantoro University, Indonesia), Affandy Affandy (Universitas Dian Nuswantoro, Indonesia), Ahmad Zainul Fanani (Universitas Dian Nuswantoro, Indonesia), Ruri Basuki (University of Dian Nuswantoro, Indonesia) .....	491
<i>Real Time Face Expression Classification Using Convolutional Neural Network Algorithm</i> Vera Wati (University of AMIKOM Yogyakarta, Indonesia), Kusri Kusri (AMIKOM Yogyakarta University, Indonesia), Hanif Fatta (Universitas AMIKOM Yogyakarta, Indonesia) .....	497

#### Parallel Session 4-C

<i>Implementation of Rabin Karp Algorithm for Essay Writing Test System on Organization xyz</i> M Misbah Musthofa (Universitas Amikom Yogyakarta, Indonesia), Ainul Yaqin (Universitas Amikom Yogyakarta, Indonesia) .....	502
<i>Implementation of Naive Bayes Algorithm for Spam Comments Classification on Instagram</i> Beta Priyoko (Universitas Amikom Yogyakarta, Indonesia), Ainul Yaqin (Universitas Amikom Yogyakarta, Indonesia) .....	508
<i>Improving Random Forest Method to Detect Hatespeech and Offensive Word</i> Kristiawan Nugroho (Dian Nuswantoro University, Indonesia), Edy Noersasongko (Dian Nuswantoro University, Indonesia), Purwanto (Dian Nuswantoro University, Indonesia), Muljono Muljono (Dian Nuswantoro University, Indonesia), Ahmad Zainul Fanani (Universitas Dian Nuswantoro, Indonesia), Affandy Affandy (Universitas Dian Nuswantoro, Indonesia), Ruri Basuki (University of Dian Nuswantoro, Indonesia) .....	514
<i>Information Retrieval of Physical Force Using the TF-IDF</i> Dany Widiyatmoko (STMIK NUsa Mandiri Jakarta Indonesia, Indonesia), Agus Setiyono (STMIK Nusa Mandiri, Indonesia) .....	519
<i>Mobile-Based Translation System for Cebuano Language with Object Detection for Travel Assistance using Neural Machine Translation</i> Alonica R Villanueva (Technological Institute of the Philippines, Philippines), Reagan Balongcas (Technological Institute of the Philippines, Philippines), Aura Joy Aura Joy Baltazar (Technological Institute of the Philippines, Philippines), Bon Eric Rosete (Technological Institute of the Philippines, Philippines), Kim Omar Roxas (Technological Institute of the Philippines, Philippines), Johnathan Richard Barrios (Technological Institute of the Philippines, Philippines), Maria Cecilia Venal (Technological Institute of the Philippines, Philippines) .....	523
<i>Text Normalization for Indonesian Abbreviated Word Using Crowdsourcing Method</i> Danny Sebastian (Duta Wacana Christian University, Indonesia), Kristian Nugraha (Duta Wacana Christian University, Indonesia) .....	529
<i>Hate Speech Detection in Indonesian Language on Instagram Comment Section Using Maximum Entropy Classification Method</i> Elvira Erizal (Telkom University, Indonesia), Budhi Irawan (Telkom University, Indonesia), Casi Setianingsih (Telkom University, Indonesia) .....	533
<i>Decision Support System Employee Recommendation using Fuzzy Sugeno Method as a Job Search Service</i> Kusnawi Kusnawi (AMIKOM University, Indonesia), Joang Ipmawati (University Of Nahdlatul Ulama Yogyakarta, Indonesia), Darma Kusumandaru Tri Prasetyo Utomo (Universitas Amikom Yogyakarta, Indonesia) .....	539

#### Parallel Session 4-D

<i>Fuzzy K-Nearest Neighbor for Restaurants Business Sentiment Analysis on TripAdvisor</i> Baiq Billyan (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia), Kelly Sungkono (Institut Teknologi Sepuluh Nopember, Indonesia), Irene Tangkawarow (Institut Teknologi Sepuluh Nopember & Universitas Negeri Manado, Indonesia) .....	543
<i>Citation Detection on Scientific Journal Using Support Vector Machine</i> Raynaldi Amanullah (Amikom University, Indonesia), Ema Utami (Universitas Amikom Yogyakarta, Indonesia), Andi Sunyoto (Universitas AMIKOM Yogyakarta, Indonesia) .....	549
<i>Discover the Indonesian Digital Workers in Online Gig Economy Platforms</i> A Labib Fardany Faisal (Universitas Indonesia, Indonesia), Yudho Suchahyo (University of Indonesia, Indonesia), Yova Ruldeviyani (Universitas Indonesia, Indonesia), Arfive Gandhi (Universitas Indonesia, Indonesia) .....	554
<i>Apriori Algorithm Optimization using Temporary Table</i> Arif Dwi Laksito (Universitas Amikom Yogyakarta, Indonesia), Kusri Kusri (AMIKOM Yogyakarta University, Indonesia) .....	560
<i>Performance Improvement of Recommender Hybrid Techniques Using GRU for Rating Calculation</i> Fernaldy Akbar Faudzan (Institut Teknologi Bandung, Indonesia), Bambang Pharmasetiawan (Institut Teknologi Bandung, Indonesia), Kusprasapta Mutjarsa (Institut Teknologi Bandung, Indonesia) .....	566

<i>A Conceptual Framework of Adaptive Mobile POI Recommendations</i> Emanuel Ristian Handoyo (Universitas Gadjah Mada, Indonesia), Selo Sulisty (Gadjah Mada University, Indonesia), Paulus Insap Santosa (Universitas Gadjah Mada, Indonesia), Bimo Sunarfri Hantono (Universitas Gadjah Mada, Indonesia) .....	572
<i>The Best Features Selection Method and Relevance Variable for Web Phishing Classification</i> Sumarni Adi (Universitas AMIKOM Yogyakarta, Indonesia), Yoga Pristyanto (Universitas AMIKOM Yogyakarta, Indonesia), Andi Sunyoto (Universitas AMIKOM Yogyakarta, Indonesia) .....	578
<i>Implementation and Monitoring of Optimization of VLAN Networks with HTB and Multiple Hotspot Servers on University Scale Networks (Case Study: Immanuel Christian University)</i> Azriel Christian Nurcahyo (Universitas AMIKOM Yogyakarta & Magister Teknik Informatika AMIKOM, Indonesia), Ema Utami (Universitas Amikom Yogyakarta, Indonesia), Suwanto Raharjo (Informatics Engineering of Institut Sains & Teknologi AKPRIND Yogyakarta, Indonesia) .....	584

## Parallel Session 5-A

<i>Recommendations for Tourism Sites Using the Mamdani Fuzzy Logic Method and Floyd Warshall Algorithm (Case Study in Yogyakarta)</i> Baltra Pramajuri (Universitas Atma Jaya Yogyakarta, Indonesia), Alfredo Gormantara (Universitas Atma Jaya Yogyakarta, Indonesia), Erni Widarti (Universitas Atma Jaya Yogyakarta, Indonesia), Albertus Joko Santoso (Universitas Atma Jaya Yogyakarta, Indonesia) .....	590
<i>Convolutional Adversarial Neural Network (CANN) for Fault Diagnosis within a Power System</i> Ika Oktavianti (University of Sriwijaya, Indonesia), Steve Chan (Harvard University, USA) .....	596
<i>Somnolence Detection System Utilizing Deep Neural Network</i> Alonica R Villanueva (Technological Institute of the Philippines, Philippines), Renzo Leru Benemerito (Technological Institute of the Philippines, Philippines), Mark Jetro Cabug-Os (Technological Institute of the Philippines, Philippines), Royce Chua (Technological Institute of the Philippines, Philippines), Cyrille Kristein Rebeca (Technological Institute of the Philippines, Philippines), Menchie Miranda (Technological Institute of the Philippines, Philippines) .....	602
<i>A Comparison of Efficiency Improvement for Long Short-Term Memory Model Using Convolutional Operations and Convolutional Neural Network</i> Manop Phankokkrud (King Mongkut's Institute of Technology Ladkrabang, Thailand), Sirirat Wacharawichanant (Silpakorn University, Thailand) .....	608
<i>An Application of Convolutional Neural Network-Long Short-Term Memory Model for Service Demand Forecasting</i> Manop Phankokkrud (King Mongkut's Institute of Technology Ladkrabang, Thailand), Sirirat Wacharawichanant (Silpakorn University, Thailand) .....	614
<i>Query Optimization for Distributed Databases uses a Semi-join Based Approach (SBA) with the SDD-1 Algorithm</i> Ahmad Fikri Zulfikar (University of Pamulang & University of Bina Nusantara, Indonesia) .....	619
<i>Performance Evaluation of Single Board Computer for Hadoop Distributed File System (HDFS)</i> Adnan Adnan (Universitas Hasanuddin, Indonesia), Zulkifli Tahir (Hasanuddin University, Indonesia), Muhammad Arfah Asis (Hasanuddin University, Indonesia) .....	624

## Parallel Session 5-B

<i>Ship Heading Control for Dubins Path Tracking and Collision Avoidance using Model Predictive Control</i> Dian Kusuma Rahma Putri (Institut Teknologi Sepuluh Nopember, Indonesia), Subchan Subchan (Institut Teknologi Sepuluh Nopember, Indonesia), Dieky Adzkiya (Institut Teknologi Sepuluh Nopember, Indonesia), Tahiyatul Asfihani (Institut Teknologi Sepuluh Nopember, Indonesia) .....	628
<i>An Investigation of RTOS-Based Sensor Data Management Performance for Tel-USat On Board Data Handling (OBDH) Subsystem</i> Alif Rachman Harfian (Telkom University, Indonesia), Dharu Arseno (Telkom University, Indonesia), Edwar Edwar (Telkom University, Indonesia), Bagas Satriyotomo (Telkom University, Indonesia) .....	634
<i>Robust Predictive Controller Application on Inventory Controlling with Imperfect Delivery Process</i> Sutrisno Sutrisno (Diponegoro University, Indonesia), Widowati Widowati (Diponegoro University, Indonesia) .....	639
<i>Position Control of a Ship-Mounted Two-DoF Manipulator</i> Edwar Yazid (Research Center for Electrical Power and Mechatronics, Indonesian Institute of Sciences, Indonesia), Hendri Saputra (Indonesian Institute of Sciences, Indonesia), Midriem Mirdanies (Indonesian Institute of Sciences (LIPI), Indonesia), Rahmat Babu (Indonesian Institute of Sciences, Indonesia) .....	643
<i>Development and Control Segway by LQR adjustable Gain</i> Surachat Chantarachit (Rajamangala University of Technology Thanyaburi, Thailand) .....	649
<i>Smoothed A-Star Algorithm for Nonholonomic Mobile Robot Path Planning</i> Syaiful Ardy Gunawan (Universitas Gadjah Mada, Indonesia), Gilang Nugraha Putu Pratama (Universitas Gadjah Mada & Sekolah Tinggi Teknologi Adisutjipto, Indonesia), Adha Imam Cahyadi (Universitas Gadjah Mada, Indonesia), Bondhan Winduratna (Universitas Gadjah Mada, Indonesia), Yohannes Chrysostomos Hendro Yuwono (Universitas Gadjah Mada, Indonesia), Oyas Wahyunggoro (UGM, Indonesia) .....	654
<i>Tuning of Fractional-Order PID Controller for Electro-Hydraulic Servo Valve System</i> Anggara Truna Negara (Gadjah Mada University, Indonesia) .....	659
<i>Battery State of Charge Estimation Based on Coulomb counting Combined with Recursive Least Square and PI controller</i> Agus Kustiman (Universitas Gadjah Mada, Indonesia), Bobby Dewangga (Universitas Gadjah Mada, Indonesia), Oyas Wahyunggoro (UGM, Indonesia), Adha Imam Cahyadi (Universitas Gadjah Mada, Indonesia) .....	663

## Parallel Session 5-C

<i>Optimized Altitude Control for Quadrotor UAV in Virtual Environment</i> Ibnu Masngut (Universitas Gadjah Mada, Indonesia), Gilang Nugraha Putu Pratama (Universitas Gadjah Mada & Sekolah Tinggi Teknologi Adisutjipto, Indonesia), Adha Imam Cahyadi (Universitas Gadjah Mada, Indonesia), Samiadji Herdjunto (Universitas Gadjah Mada, Indonesia)	669
<i>A New Industrial Robotics and Software Development Resolved the Position and the Speed Control</i> Dechrit Maneetham (Rajamangala University of Technology Thanyaburi & TDS Thailand Company, Thailand)	674
<i>Time and Cost Optimization in Feasibility Test of CCTV Project using CPM and PERT</i> Muhammad Bintang (Institut Teknologi Sepuluh Nopember, Indonesia), Kelly Sungkono (Institut Teknologi Sepuluh Nopember, Indonesia), Riyanarto Sarno (Institut Teknologi Sepuluh Nopember, Indonesia)	678

## Parallel Session 5-D

<i>A Feasibility Study of Sliding Mode Controller Application for Hybrid Diesel-Electric Drive in Robot Defense System</i> Ika Syamsiana (State Polytechnic of Malang, Indonesia), Fajar Khold (State Polytechnic of Malang, Indonesia), R. Edy Purwanto (State Polytechnic of Malang, Indonesia)	684
<i>Self Service System for Library Automation: Case Study at Telkom University Open Library</i> Nyoman Karna (Telkom University, Indonesia), Donny Pratama (Telkom University, Indonesia), Muhammad Ramzani (Telkom University, Indonesia)	689
<i>Determining the Robust Counterpart of Flight Retiming Model</i> Khusnul Novianingsih (Universitas Pendidikan Indonesia, Indonesia)	694
<i>Optimal Control of the Spread of Dengue Fever Using Dynamic Programming</i> Hartono Hartono (Sanata Dharma University, Indonesia)	698
<i>Modeling and Simulation of Floating Droplet Using Multi-phase Lattice Boltzmann Method</i> Kumara Ari Yuana, Yun (Universitas Gadjah Mada & Universitas Amikom Yogyakarta, Indonesia)	704
<i>Balloon Trajectory: Monitoring, Prediction, and Analysis</i> Haryono Haryono (LAPAN, Indonesia)	709

## Parallel Session 6-A

<i>Terahertz Bow-tie Antenna-coupled Bolometer Impedance Matching by Transmission Line Matching Network</i> Arie Pangesti Aji (Universitas Indonesia, Indonesia), Eko Tjipto Rahardjo (Universitas Indonesia, Indonesia), Catur Apriono (Universitas Indonesia, Indonesia)	715
<i>Rectangular Linear Array Microstrip Antenna Design for Terahertz Imaging</i> Intan Nurfitri (Universitas Indonesia, Indonesia), Catur Apriono (Universitas Indonesia, Indonesia)	719
<i>Single-Phase DC-AC Inverter with Transformer and Transformerless and Low Power Dissipation Filter for Photovoltaic-Based Home-Scale Electric Power Systems</i> Ikhsan Hidayat (Hasanuddin University, Indonesia), Faizal Samman (University of Hasanuddin, Indonesia), Rhiza Sadjad (Hasanuddin University, Indonesia)	723
<i>Performance Comparative study on DC-DC Boost Converters with Non-Isolated Configurations</i> Moh Afandy (Universitas Hasanudin, Indonesia), Faizal Samman (University of Hasanuddin, Indonesia), A Ejah Umraeni Salam (Electrical Engineering & Hassanuddin University, Indonesia)	728
<i>Decomposition Wavelet Transform As Identification Of Outer Race Bearing Damage Through Stator Flow Analysis In Induction Motor</i> Iradiratu Diah Prahmana karyatanti (Universitas Hang Tuah, Indonesia), Belly Yan Dewantara (Universitas Hang Tuah, Indonesia), Choirun Hida Hidayanto (Hang Tuah University, Indonesia)	733
<i>comparison of Simple Battery Model and Thevenin Battery Model for SOC Estimation Based on OCV Method</i> Susanna Susanna (GadjahMada University & Government Education, Indonesia), Oyas Wahyunggoro (UGM, Indonesia), Adha Imam Cahyadi (Universitas Gadjah Mada, Indonesia), Bobby Dewangga (Universitas Gadjah Mada, Indonesia)	738

## Parallel Session 6-B

<i>Composite liquid insulators characteristics of palm and diala-b oil as transformer oil</i> Rizal Achmadsyah (Universitas Gadjah Mada, Indonesia), Sasongko Pramono Hadi (Gadjah Mada University, Indonesia), Sariya Sariya (Gadjah Mada University, Indonesia)	744
<i>Effect of Distributed Photovoltaic Generation Installation on Voltage Profile: A Case Study of Rural Distribution System in Yogyakarta Indonesia</i> Anugrah Fitrah Gusnanda (Universitas Gadjah Mada, Indonesia), Sariya Sariya (Gadjah Mada University, Indonesia), Lesnanto Multa Putranto (UGM, Indonesia)	750

<i>FPGA-Based Electronic Pulse Generator for Single-Phase DC/AC Inverter</i> Muhamad Rusdi (Hasanuddin University, Indonesia), Faizal Samman (University of Hasanuddin, Indonesia), Rhiza Sadjad (Hasanuddin University, Indonesia)	756
<i>Harmonic Mitigation Using Shunt Hybrid Power Filter in Departement of Electrical Engineering Universitas Negeri Malang Electrical Power System</i> Langlang Gumilar (Universitas Negeri Malang, Indonesia), Muhammad Afnan Habibi (Universitas Negeri Malang, Indonesia), Dwi Prihanto (Universitas Negeri Malang, Indonesia), Hendro Wicaksono (Karlsruhe Institute of Technology, unknown)	761
<i>Analysis Performance Vertical Axis Wind Turbine Based on Pitch Angels to Output Power</i> Langlang Gumilar (Universitas Negeri Malang, Indonesia), Arya Kusumawardana (Universitas Negeri Malang, Indonesia), Dwi Prihanto (Universitas Negeri Malang, Indonesia), Hendro Wicaksono (Karlsruhe Institute of Technology, unknown)	767
<i>Transformation of Thunderstorm Mechanisms into Computational Intelligence Applied to the Load Dispatch</i> AN Afandi (Universitas Negeri Malang, Indonesia & Kumamoto University, Japan), Yunis Sulistyorini (IKIP Budi Utomo, Indonesia)	773
<i>Optimal Sizing and Siting of PV-Based Distributed Generation for Losses Minimization of Distribution using Flower Pollination Algorithm</i> Tegar Prasetyo (Universitas Gadjah Mada, Indonesia), Sarjiya Sarjiya (Gadjah Mada University, Indonesia), Lesnanto Multa Putranto (UGM, Indonesia)	779
<i>Analysis of Load Fluctuation Effect on the Excitation Current of the Three-Phase Synchronous Generator at the Diesel Power Plant</i> Ja'a Khusnul Huda (Universitas Negeri Malang, Indonesia), AN Afandi (Universitas Negeri Malang, Indonesia & Kumamoto University, Japan)	784

#### Parallel Session 6-C

<i>Effect of Temperature Change of Liquid Isolator Based on Composite Diallyl Ether and Palm Oil as Transformer Oil</i> Dian Bagus Fachrurrozi (Universitas Gajah Mada, Indonesia), Sasongko Hadi (Universitas Gajah Mada, Indonesia), Danang Wijaya (UGM, Indonesia)	789
<i>Transmission Line Switching For Loss Reduction And Reliability Improvement</i> Atul Kumar Yadav (SVNIT SURAT, India), Vasundhara Mahajan (SVNIT, Surat, Gujarat & IIT Roorkee, India)	794
<i>Performance Comparison of Standard Boost Converter and Two-Phase Boost Converter</i> Beauty Anggraheny Ikawanty (Institut Teknologi Sepuluh Nopember (ITS) & Politeknik Negeri Malang (POLINEMA), Indonesia), Mochamad Ashari (Institut Teknologi Sepuluh Nopember (ITS) - Surabaya, Indonesia), Taufik Taufik (California Polytechnic State University, San Luis Obispo, USA), Dodi Garinto (Indonesian Power Electronics Center (IPEC) & Politeknik Manufaktur Astra, Indonesia)	800
<i>The Effect of Irradiance on Distribution Power System Stability in Large-Scale Grid-Connected Photovoltaic</i> Muammar Zainuddin (Universitas Ichsan Gorontalo, Indonesia), Frengki Surusa (Universitas Ichsan Gorontalo, Indonesia)	805
<i>Optimal Design of Stator Slot Geometry for High-Speed Spindle Induction Motor Applications</i> Wawan Purwanto, WP (Universitas Negeri Padang & UNP, Indonesia)	811
<i>Dynamic Economic Dispatch for 150 kV Selselbar power generation systems using Artificial Bee Colony Algorithm</i> Haripuddin Arsyad (Hasanuddin University, Indonesia), Ansar Suyuti (Hasanuddin of University, Indonesia), Sri Said (Hasanuddin University, Indonesia), Yusri Syam Akil (Hasanuddin University, Indonesia)	817
<i>A Power Sharing Loop Control Method for Input-series Output-parallel Flyback-type Micro-Inverter Using Droop Method</i> Sandi Kurniawan (State Polytechnic of Malang, Indonesia), Ferdian Ronilaya (State Polytechnic of Malang, Indonesia), Mohammad Hidayat (State Polytechnic of Malang, Indonesia), Erfan Rohadi (Politeknik Negeri Malang, Indonesia), Indrazno Siradjudin (State Polytechnic of Malang, Indonesia), Rachmat Sutjipto (State Polytechnic of Malang, Indonesia)	823
<i>First Time User Experience Assessment on Web based Online Examination</i> Krisnawati Krisnawati (University of AMIKOM Yogyakarta, Indonesia), Mardhiya Hayaty (Universitas AMIKOM Yogyakarta, Indonesia), Bayu Setiaji (Universitas AMIKOM Yogyakarta, Indonesia), Arief Setyanto (Universitas AMIKOM Yogyakarta, Indonesia)	829

#### Parallel Session 6-D

<i>Performance Evaluation of TEC1-12706 Thermoelectric Cooler Module at Low Temperature Experimentally</i> Elvira Salsabila (Telkom University, Indonesia), Tri Ayodha Ajiwiguna (Telkom University, Indonesia), Asep Suhendi (Telkom University, Indonesia)	835
<i>State of Charge Estimation for Lithium Polymer Battery using Kalman Filter under Varying Internal Resistance</i> John Fisher Jefferson Pakpahan (Universitas Gajah Mada, Indonesia), Bobby Dewangga (Universitas Gajah Mada, Indonesia), Gilang Nugraha Putu Pratama (Universitas Gajah Mada & Sekolah Tinggi Teknologi Adisutjipto, Indonesia), Adha Imam Cahyadi (Universitas Gajah Mada, Indonesia), Samiadji Herdjunto (Universitas Gajah Mada, Indonesia), Oyas Wahyunggoro (UGM, Indonesia)	839
<i>Development of Flywheel Regenerative Capture System (FRCS) to Improve Electric Vehicle (EV) Energy Captured System</i> Agung Prijo Budijono (Institut Teknologi Sepuluh Nopember Surabaya (ITS), Indonesia)	845
<i>Designing Knowledge Management System with Big Data for Hospital Inpatient Services (Case Study at Islamic Hospital XYZ Pekanbaru)</i> Tommi Rahman Perdana (Bina Nusantara University, Indonesia), Siti Mujiatun (Bina Nusantara University, Indonesia), Sfenrianto Sfenrianto (Bina Nusantara University, Indonesia), Emil R. Kaburuan (IDEAS LAB, Indonesia)	851

<i>Redesign of E-Participation using User-Centered Design Approach for Improving User Experience</i> Wahid Hasim (Universitas Gadjah Mada, Indonesia), Sunu Wibirama (Universitas Gadjah Mada, Indonesia), Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia) .....	857
<i>Designing Enterprise Architecture in Hospitals Group</i> Jordan Hakiki Sipahutar (Binus University, Indonesia), Faizal Asrul Pasaribu (Binus University, Indonesia), Bastian Paskal Situmorang (Binus University, Indonesia), Sfenrianto Sfenrianto (Bina Nusantara University, Indonesia), Emil R. Kaburuan (IDEAS LAB, Indonesia) .....	862
<i>The Effect of Data Acquisition Techniques in Profiling Analysis Based On Twitter</i> Sumami Adi (Universitas AMIKOM Yogyakarta, Indonesia), Anggit Dwi Hartanto (Universitas Amikom Yogyakarta, Indonesia), Ema Utami (Universitas Amikom Yogyakarta, Indonesia), Suwanto Raharjo (Informatics Engineering of Institut Sains & Teknologi AKPRIND Yogyakarta, Indonesia), Irwan Oyong (Universitas AMIKOM Yogyakarta, Indonesia) .....	868

#### Parallel Session 7-A

<i>Pregnancy Monitoring Mobile Application User Experience Assessment</i> Gunawan Wicahyono (Amikom University Yogyakarta, Indonesia), Arief Setyanto (Universitas AMIKOM Yogyakarta, Indonesia), Suwanto Raharjo (Informatics Engineering of Institut Sains & Teknologi AKPRIND Yogyakarta, Indonesia), Arief Munandar (Universitas AMIKOM Yogyakarta, Indonesia) .....	872
<i>Extending UTAUT2 to Explore Digital Wallet Adoption in Indonesia</i> Muhtarom Widodo (Institut Teknologi Sepuluh Nopember, Indonesia), Mohammad Irawan (Institut Teknologi Sepuluh Nopember, Indonesia), Rita Ambarwati (Universitas Muhammadiyah Sidoarjo, Indonesia) .....	878
<i>Development of Educational Software for Electrical Engineering Subjects using MATLAB</i> Naim Nani Fadzlina (Universiti Teknologi Mara, Malaysia), Nur Syahida Mat Nusi (Universiti Teknologi MARA, Malaysia), Suzi Seroja Sarnin (University Technology MARA, Malaysia), Norsuzila Ya'acob (Universiti Teknologi Mara, Malaysia) .....	884
<i>Readiness Indicators of Human Resources Aspects for MOOC Implementation</i> Ertanto Yohan Khrysdianto (Universitas Gadjah Mada, Indonesia), Sri Suning Kusumawardani (Universitas Gadjah Mada, Indonesia), Paulus Insap Santosa (Universitas Gadjah Mada, Indonesia) .....	889
<i>Performance Analysis of Grid Interfaced Photovoltaic Systems for Reliable Agri- Microgrids using PVsyst</i> Totappa Shivlingappa Hasarmani (BVDUCOE & BVCOEL Pune, India), Rajesh Holmukhe (Bharati Vidyapeeth University College of Engineering Pune India, India), Santosh Tamke (Sensycon Controls, India) .....	894

#### Parallel Session 7-B

<i>Data Transmission in Machine to Machine Communication Protocols for Internet of Things Application: A Review</i> Thongdy Keophilavong (Indonesia, Indonesia) .....	899
<i>New Home Energy Management Using IoT In Smart Family</i> Gabriel Tamtama (Universitas Atma Jaya, Indonesia), Paulus Suryanto (Universitas Atma Jaya, Indonesia), Suyoto Suyoto (Universitas Atma Jaya Yogyakarta, Indonesia) .....	905
<i>A Review: Design of Smart Home Electrical Management System Based on IoT</i> Melky Radja (Universitas Atma Jaya Yogyakarta, Indonesia), Andi Wahyu Rahardjo Emanuel (Universitas Atma Jaya Yogyakarta, Indonesia) .....	910
<i>Performance Analysis Spectrum Sensing using Eigenvalue-Moment-Ratio for Internet of Things Devices</i> Yasi Dani (Sekolah Tinggi Teknologi Kreatif Bina Nusantara Bandung, Indonesia), Mochammad Haldi Widiyanto (Sekolah Tinggi Teknologi Kreatif Bina Nusantara Bandung, Indonesia), Davy Ronald Hermanus (Sekolah Tinggi Teknologi Kreatif Bina Nusantara Bandung, Indonesia), Johan Muliadi Kerta (Sekolah Tinggi Teknologi Kreatif Bina Nusantara Bandung, Indonesia) .....	916
<i>Selection of Scholarship Acceptance Using AHP and TOPSIS Methods</i> Patmawati Hasan (University Of AMIKOM Yogyakarta, Indonesia), Ema Utami (University of AMIKOM Yogyakarta & University of AMIKOM Yogyakarta, Indonesia), Selviana Yunita (Universitas Of AMIKOM Yogyakarta, Indonesia), Elvis Pawan (University Of AMIKOM Yogyakarta, Indonesia), Kaharuddin Kaharuddin (University of AMIKOM Yogyakarta, Indonesia) .....	920

#### Parallel Session 7-C

<i>Knowledge Management System Design for IT Troubleshooting (Case Study Biro TI BPK RI)</i> Mohammad Noversada Aprirashka (Universitas Gadjah Mada, Indonesia) .....	926
<i>Master Data Management Maturity Model: A Case Study at Statistics Business Register in BPS-Statistics Indonesia</i> Dewi Krismawati (Universitas Indonesia, Indonesia), Yova Ruldeviyani (Universitas Indonesia, Indonesia), Rinaldi Rusli (Universitas Indonesia, Indonesia) .....	931
<i>Solving Multi-objective Vehicle Routing Problem Using Hyper-heuristic Method By Considering Balance of Route Distances</i> Sasmi Hidayatul Y T (Institut Teknologi Sepuluh Nopember, Indonesia), Arif Djunaidy (Institut Teknologi Sepuluh Nopember, Indonesia), Ahmad Muklason (Institut Teknologi Sepuluh Nopember, Indonesia) .....	937
<i>Designing Cost Measurement System in A Small Scrum Based Software Company Using Activity Based Costing Model (Case Study: ABC Company)</i> Eko Agus Pramono (Institut Teknologi Sepuluh Nopember, Indonesia), Erma Suryani (Institut Teknologi Sepuluh Nopember, Indonesia) .....	943



# Recommendations for Tourism Sites Using the Mamdani Fuzzy Logic Method and Floyd Warshall Algorithm (Case Study in Yogyakarta)

Balra Agusti Pramajuri  
Universitas Atma Jaya Yogyakarta  
Yogyakarta, Indonesia 55281  
pramajuri@gmail.com

Alfredo Gormantara  
Universitas Atma Jaya Yogyakarta  
Yogyakarta, Indonesia 55281  
alfredohappy0105@gmail.com

Erni Widarti  
Universitas Atma Jaya Yogyakarta  
Yogyakarta, Indonesia 55281  
widarti0508@gmail.com

Albertus Joko Santoso  
Universitas Atma Jaya Yogyakarta  
Yogyakarta, Indonesia 55281  
albjoko@staff.uajy.ac.id

**Abstract**—Tourism is one of the activities carried out for recreation or leisure in a place with a variety of purposes and objectives. In Indonesia, many cities provide attractive tourism places, and one of them is the city of Yogyakarta. Because it has interesting and diverse tourism places, Yogyakarta is in great demand by local and foreign tourists. Thus to be able to maximize the visits of tourists who come to Yogyakarta, we need a system that is able to provide information on tourist attractions to tourists precisely in accordance with what the tourists want. The proposed system uses the Fuzzy Logic method and Floyd Warshall Algorithm which are combined, so as to obtain results in the form of recommendations for tourist attractions based on the costs of tourists, the length of time and distance needed to reach the tourist attractions.

**Keywords**—Tourism, Fuzzy Logic, Floyd Warshall, Yogyakarta.

## I. INTRODUCTION

Yogyakarta is one of the provinces in Indonesia known as the city of Education. In addition, Yogyakarta is also one of the most popular tourist attractions. Tourism in Yogyakarta is one of the main contributors to the economy in the Yogyakarta area. Yogyakarta has a variety of tourism places ranging from religious tourism, historical tourism, museums, beaches, and many others. Based on Yogyakarta tourism statistics [1] annual tourist arrivals continue to increase. Tourists visiting the city of Yogyakarta come from various regions in Indonesia and from various countries. With a high tourist attraction, the development of a tourism recommendation system will greatly help tourists to provide information and maximize tourist visits in the city of Yogyakarta. For tourists, information about tourism objects, costs that will be incurred when traveling, the length of time that will be spent, and the distance between tourist attractions is very necessary to be a parameter of tourists. With the rapid development of technology today, the tourism recommendation system can be used to provide tourism information to tourists appropriately.

One of the most frequently used recommendation algorithms is fuzzy logic. Fuzzy method is a powerful method to solve the problem of the representation of uncertainty knowledge. The advantages of Fuzzy methods that are used are methods that have been widely applied in research, by producing satisfactory results in accuracy so that it is expected to have high accuracy in producing information.

Mamdani Fuzzy Logic is a suitable method for recommendations on tourist attractions. Mamdani Fuzzy Logic is used because of its simple structure. Mamdani Fuzzy Logic uses the min-max or max-product operation with a set of predetermined rules, namely IF ... AND ... THEN before. In addition, the algorithm used is the Floyd Warshall algorithm which is useful for solving route search problems. This algorithm can also be applied to a road route search application that is closest from one area to another, with this method the results can be optimized.

The purpose of the proposed system is to provide recommendations for tourism places in Yogyakarta by using the Mamdani Fuzzy Logic method and recommendations for travel routes using the Floyd Warshall algorithm so that it is expected to have high accuracy in producing information. This paper is organized as follows. Section 2 outlines some studies related to the use of algorithms in this study. Section 3 describes in depth our proposed approach. Section 4 presents the results of the analysis and experiments in the proposed system. Section 5 discusses related work. Finally, we conclude with some future works

## II. RELATED WORK

The tourism industry is growing from year to year. With the existence of social media, many tourism places are published so that tourists want to visit, both domestic and foreign tourists. For tourists, information about tourist attractions in a country is very important so that they are not wrong in determining their tourist destination with the cost and distance they want.

To make it easier for tourists to determine tourist attractions that will be their destination, a system is built using the Fuzzy method which in this system accommodates tourism object recommendation information. Some previous studies also used Fuzzy methods in tourism systems, there are several methods used, among others, Fuzzy Rule Based method [2], Fuzzy Set and Dominance-Based Rough Set [3], Neuro-Fuzzy Model method [4], and others. With the existence of a tourism recommendation system, it is very beneficial for tourists because they can provide advice or recommendations on tourist attractions [5] which is right for the user's needs

According to [3] based on the tourism systems approach, risk factors are divided into two dimensions, namely internal



risk, and external risk and seven criteria namely political, economic, cultural-social, technological, environmental health, functional, and safe security. Another paper discusses a comprehensive multimodel approach to developing a conscious context recommendation system in the field of tourism information support [6]. In addition, it can use several methods and approaches to develop the tourism system. According to [7] the use of SWOT (Strength, Weakness, Opportunity, and Threat) approaches and Fuzzy logic methods are used for sustainable tourism development strategies. The SWOT analysis is a tool commonly used to analyze external and internal environments [8] simultaneously to obtain a systematic approach and support for decision situations. Data or information about attractions can be taken from the history of visitors, from the amount of digital data increasing rapidly. One example is the development of concepts in the field of historical tourism applications using a multi-agent, event-oriented design method with a central information center [9].

Some studies also use Mamdani Fuzzy Logic to obtain better accuracy results [10] [11] [12]. To facilitate route planning [13] of tourism, the Floyd Warshall algorithm is used [14]. Where Floyd Warshall's algorithm can reduce the complexity of calculations to simplify the method of finding the shortest path [15] and is very suitable for use in mapping-based applications [16]. The system to be designed consists of two concepts, namely a combination of Mamdani Fuzzy logic methods and Floyd Warshall algorithm. Fuzzy logic used will be applied as a method in the system inference engine part [17] [18] [19]. Input from the system will be processed using Fuzzy logic and the Floyd Warshall algorithm is used to determine the route [20] which is in accordance with user input.

Based on previous research, the study wanted to combine Mamdani Fuzzy Logic and Floyd Warshall algorithm for recommendations on tourist sites in Yogyakarta. Actually in this study also uses Location Based Services (LBS) to support the Floyd Warshall algorithm.

### III. ARCHITECTURE DESIGN

This section will display the architectural design of the system that will be created and explain the fuzzification process in depth. Figure 1 illustrates the initial and final stages of the system to be made. From the system to be designed, it is divided into two stages. The first stage is the Fuzzy method that will determine the recommendations of tourist objects, after that, the second stage is the selection of routes based on the results of recommendations using the Floyd Warshall algorithm (see figure 1).

In Figure 1, the first process carried out is that the user enters three parameters, namely price, distance and vacation time. From the parameters specified each membership function is created. To help the process of making membership functions, the process of fuzzyfication is done by converting non-fuzzy variables into fuzzy variables. After generating a number of recommendations about tourist places with distances measured from the user's point when accessing the system, then the system will search for the best route using the Floyd Warshall algorithm and display the results of these routes to the system for use by users so that they can be utilized.

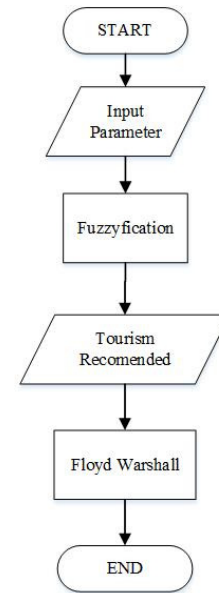


Fig. 1. System Architecture Design

#### A. The Function of membership and Fuzzification

From the three input parameters specified, each membership function is created from the fuzzy variables that have been made as in the table below. The first variable is the price that has a cheap, medium and expensive fuzzy set. Previously lower prices were 15,000 lower, medium prices from 10,000 to 55,000 and expensive prices greater than 50,000. For cheap and expensive sets using the trapezium membership function and the set is using the triangle membership function as shown in Figure 2.

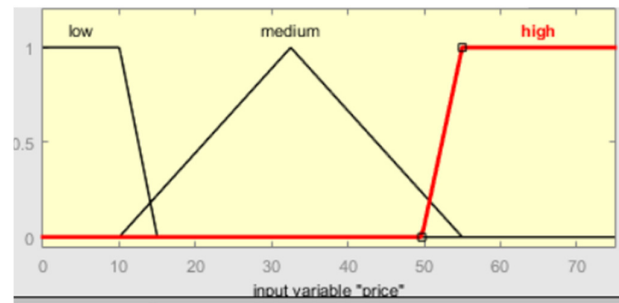


Fig. 2. Price Membership Function

In Figure 2 uses a scale  $10^4$  on the x axis. From the membership function the price can be formulated as follows:

$$\mu_{Low Price}(x) = \begin{cases} 1; & x < 10.000 \\ \frac{15.000-x}{15.000-10.000}; & 10.000 \leq x \leq 15.000 \\ 0; & x > 15.000 \end{cases} \quad (1)$$

$$\mu_{Medium Price}(x) = \begin{cases} \frac{55.000-x}{55.000-32.500}; & 32.500 \leq x \leq 55.000 \\ \frac{x-10.000}{32.500-10.000}; & 10.000 \leq x \leq 32.500 \\ 0; & x \leq 10.000 \text{ or } x \geq 55.000 \end{cases} \quad (2)$$

$$\mu_{High Price}(x) = \begin{cases} 1; & x \geq 55.000 \\ \frac{55.000-x}{55.000-50.000}; & 50.000 \leq x \leq 55.000 \\ 0; & x \leq 50.000 \end{cases} \quad (3)$$

Furthermore, the distance variable has 3 fuzzy sets, which are close, medium and far. The size of the distance has been determined to be closer to less than 20 km, the medium

between 17.5 km - 42.5 km and far greater than 40 km. For near and far sets also use the trapezoid membership function and the set is using the triangle membership function as shown in figure 3.

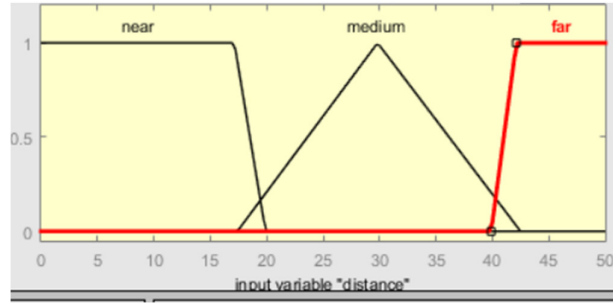


Fig. 3. Distance Membership Function

From the membership membership function in Figure 3, it can be formulated as follows.

$$\mu_{Near\ Distance}(y) = \begin{cases} 1; & y \leq 17,5 \\ \frac{20-y}{20-17,5}; & 17,5 \leq y \leq 20 \\ 0; & y \geq 20 \end{cases} \quad (4)$$

$$\mu_{Medium\ Distance}(y) = \begin{cases} \frac{42,5-y}{42,5-30}; & 30 \leq y \leq 42,5 \\ \frac{y-17,5}{30-17,5}; & 17,5 \leq y \leq 30 \\ 0; & y \leq 17,5 \text{ or } y \geq 40 \end{cases} \quad (5)$$

$$\mu_{Far\ Distance}(y) = \begin{cases} 1; & y \geq 42,5 \\ \frac{42,5-y}{42,5-40}; & 40 \leq y \leq 42,5 \\ 0; & y \leq 40 \end{cases} \quad (6)$$

The last variable is the time variable which means the length of vacation time. The time variable has 3 sets, namely fast, medium and long. For the duration of the vacation, it has been determined quickly to be smaller than 30 minutes, medium between 20 minutes to 100 minutes and far greater than 90 minutes. For the fast and old set also uses the trapezoid membership function and the set is using the triangle membership function as shown in Figure 4.

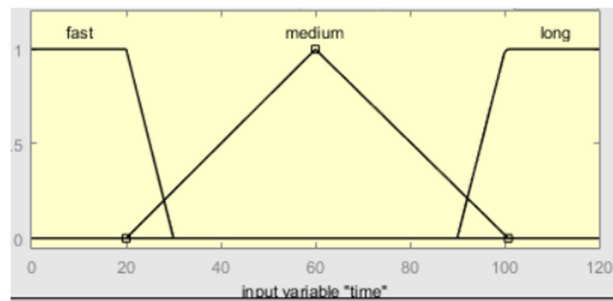


Fig. 4. Time Membership Function

From the time membership function in figure 4 it can be formulated as follows:

$$\mu_{Fast\ Time}(z) = \begin{cases} 1; & z \leq 20 \\ \frac{20-z}{30-20}; & 20 \leq z \leq 30 \\ 0; & z \geq 30 \end{cases} \quad (7)$$

$$\mu_{Medium\ Time}(z) = \begin{cases} \frac{100-z}{100-60}; & 60 \leq z \leq 100 \\ \frac{z-20}{60-20}; & 20 \leq z \leq 60 \\ 0; & z \leq 20 \text{ or } z \geq 100 \end{cases} \quad (8)$$

$$\mu_{Long\ Time}(z) = \begin{cases} 1; & z \geq 100 \\ \frac{100-z}{100-90}; & 90 \leq z \leq 100 \\ 0; & y \leq 90 \end{cases} \quad (9)$$

## B. Rules

From the 3 inputs that become fuzzy variables and each variable has 3 fuzzy sets, the number of rules can be formed are 27 rules as in table 1.

TABLE I. Rules

Rule	Price (x)	Distance (y)	Time (z)	Conclusion (v)
R1	Low	Near	Fast	Possible
R2	Low	Near	Medium	Possible
R3	Low	Near	Long	Possible
R4	Low	Medium	Fast	Possible
R5	Low	Medium	Medium	Possible
R6	Low	Medium	Long	Impossible
R7	Low	Far	Fast	Impossible
R8	Low	Far	Medium	Possible
R9	Low	Far	Long	Impossible
R10	Medium	Near	Fast	Possible
R11	Medium	Near	Medium	Possible
R12	Medium	Near	Long	Possible
R13	Medium	Medium	Fast	Possible
R14	Medium	Medium	Medium	Possible
R15	Medium	Medium	Long	Possible
R16	Medium	Far	Fast	Possible
R17	Medium	Far	Medium	Possible
R18	Medium	Far	Long	Impossible
R19	High	Near	Fast	Possible
R20	High	Near	Medium	Possible
R21	High	Near	Long	Possible
R22	High	Medium	Fast	Possible
R23	High	Medium	Medium	Possible
R24	High	Medium	Long	Possible
R25	High	Far	Fast	Impossible
R26	High	Far	Medium	Possible
R27	High	Far	Long	Possible

In this research, the rules use the additive (sub) method which will sum up the fuzzy set solution  $\mu$  obtained to produce the best recommendation place.

## C. Floyd Warshall Algorithm

The Floyd Warshall algorithm is the most common method to use in finding the shortest route. This algorithm has input from a graph that is very directional and weighty, in the form of node points from each route that can be traversed. Floyd Warshall algorithm is very suitable to use because the results of accurate and precise results so that it can provide a solution in finding the closest route from star point to point to be seventh.

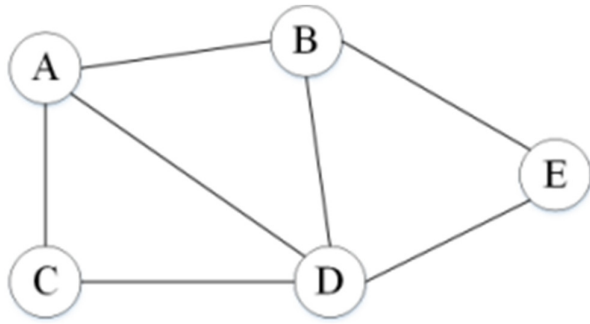


Fig. 5. Example of Graph or Route

To help calculate the distance between each point of the tourist spot with the start point, the HTML 5 function for geolocation will be used so that the user point is located in the form of latitude and longitude. By using the latitude and longitude can calculate the distance from the user's point to the tourist attractions to be addressed as well as the distance of tourist attractions with others so that it can form graph or route as in Figure 5.

IV. ANALYSIS AND RESULTS

A. System Result Design

This design emphasizes the use of fuzzy methods to find the best place for recommendations and the use of the Floyd Warshall algorithm to find the best route. In the design of this system, there are several inputs needed which can be seen in Figure 6.

Figure 6 shows that there are three inputs needed by the system, namely price, distance and time. After that, the system will provide output in the form of recommendations for several tourist attractions that have been calculated based on previous inputs using the fuzzy logic method.

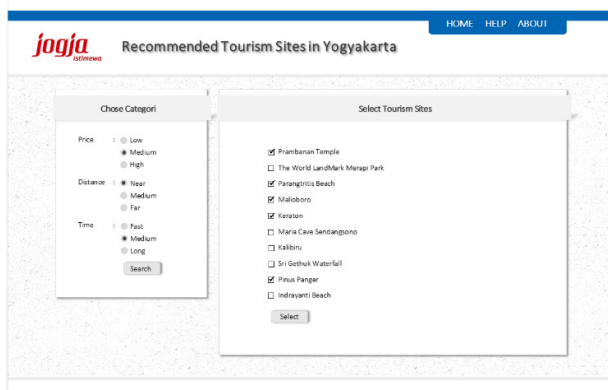


Fig. 6. Input by User

Then the system will calculate the best routes that can be traversed so that the trip becomes more optimum. The system will take the initial position by taking the point the user accesses the system with the geolocation function. The data obtained will be in the form of latitude and longitude which will be used in the calculation of the Floyd Warshall algorithm. Previously, data collection in the form of latitude and longitude has been carried out from each tourist spot in the Yogyakarta area so that it can issue the best route output such as the system design in Figure 7.

From Figure 7 it can be seen that there is a route that is the order of places to be visited by utilizing the Google Maps API so that it helps to get the optimum route.

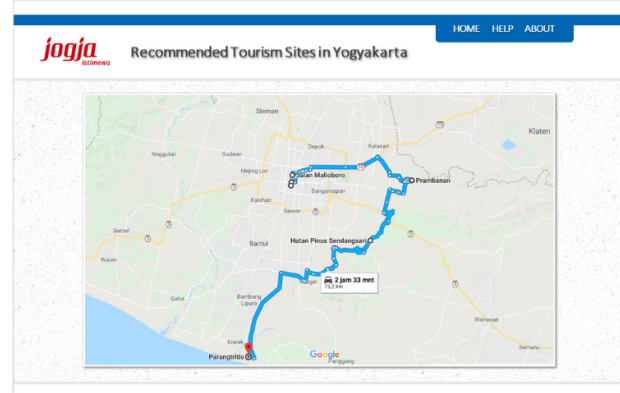


Fig. 7. Output System

B. Recommendation System Testing

In this section, an example of a system test will be shown where the first user input is the price in the medium category, the second distance is in the near and third category in the medium category.

In testing the system, 10 samples of tourism data were collected including Malioboro, Palace, Prambanan Temple, Indrayanti Beach, Parangtritis Beach, Maria Sendangsono Cave, The World Land Mark Merapi Park, Sri Getuk Waterfall, Kalibiru and Pine Pengger Forest

Previous rules have been determined in the system. In accordance with user input, the input is in accordance with rule 11 where the conclusion is possible.

TABLE II. Membership Degree Based on Price

No.	Price	Degree of Membership		
		Low	Medium	High
1.	Free	1	0	0
2.	10.000	1	0	0
3.	40.000	0	0.67	0
4.	10.000	1	0	0
5.	15.000	0	0.22	0
6.	Free	0	0	0
7.	15.000	0	0.22	0
8.	10.000	1	0	0
9.	10.000	1	0	0
10.	5.000	1	0	0

TABLE III. Membership Degree Based on Distance

No.	Distance (km)	Degree of Membership		
		Near	Medium	Far
1.	2.3	1	0	0
2.	0.55	1	0	0
3.	17.8	0.88	0.024	0
4.	65.8	0	0	1
5.	26.6	0	0.728	0
6.	30.3	0	0.976	0
7.	25.6	0	0.648	0
8.	34.4	0	0.648	0
9.	35.9	0	0.528	0
10.	21.3	0	0.304	0

TABLE IV. Membership Degree Based on Time

No.	Time (minute)	Degree of Membership		
		Fast	Medium	Long
1.	10	1	0	0
2.	2	1	0	0
3.	54	0	0.85	0
4.	107	0	0	1
5.	52	0	0.8	0
6.	64	0	0.9	0
7.	54	0	0.85	0
8.	73	0	0.675	0
9.	66	0	0.85	0
10.	46	0	0.65	0

In this research, taking a sample starting point at the zero kilometer point of the city of Jogjakarta to calculate the distance and time to tourist attractions so that the distance and time can change according to the user's access point to the system and also information obtained from the Google Map API. After calculating the degree of membership in each variable we obtain the weight of each place of recommendation, for determining the location of tourist attractions in accordance with the initial input, Price: Moderate, Distance: Near and Time: Medium.

TABLE V. Weight of Tourist Attractions

No.	Tourist Attraction	Price	Distance	Time	Result
1.	Malioboro	0	1	0	1
2.	Keraton	0	1	0	1
3.	Prambanan Temple	0.67	0.88	0.85	2.4
4.	Indrayanti Beach	0	0	0	0
5.	Parangtritis Beach	0.22	0	0.8	1.02
6.	Maria Cave Sendangsono	0	0	0.9	0.9
7.	The World Land Mark Merapi Park	0.22	0	0.85	1.07
8.	Sri Getuk Waterfall	0	0	0.675	0.675
9.	Kalibiru	0	0	0.85	0.85
10.	Pine forests Pengger	0	0	0.65	0.65

The results of the tests above show the level of strength of the value of the degree of membership. The higher the value of the membership level the greater the opportunity for a recommendation of tourist attractions. From table 5, it can be seen that the highest value of member membership is Prambanan Temple, making it the highest place in system recommendations, while Indrayanti Beach has a value of 0 so it does not become a recommendation from the system.

## V. CONCLUSION

Tourism is one of the main roles in the economy in the Yogyakarta area. Yogyakarta has a variety of tourism places ranging from religious tourism, historical tourism, museums, beaches, and many others. With a high tourist attraction, the development of a tourism recommendation system will greatly help tourists to provide information and maximize tourist visits in the city of Yogyakarta. The recommended system for tourism places uses the Fuzzy Logic method and the Floyd Warshall algorithm. The use of Fuzzy Logic to be able to determine tourist attractions in accordance with 3 input

variables, namely price, distance and duration of the vacation. The results will be recommended by several tourist attractions, after that the best route will be determined for tourist attractions where users access the system using the Floyd Warshall algorithm.

In the future, tourism recommendation research using Fuzzy Logic can increase the number of Fuzzy variables and sets. Additional variables may be selected by the type of transportation. In addition, it can also integrate tourism recommendations with the selection of hotels.

## VI. REFERENCE

- [1] D. P. DIY, "Statistik Kepariwisata DIY tahun 2017," *Dinas Pariwisata DIY*, p. 114, 2017.
- [2] N. Q. Vinh, "Fuzzy Rule-based Analysis of Promotional Efficiency in Vietnam ' s Tourism Industry," vol. 5, pp. 47–70, 2015.
- [3] R. Ayashi, H. Faraji Sabokbar, N. Banaitiene, A. Banaitis, A. Hosseini, and A. Ayashi, "Risk Assessment in Tourism System Using a Fuzzy Set and Dominance-Based Rough Set," *Technol. Econ. Dev. Econ.*, vol. 22, no. 4, pp. 554–573, 2018.
- [4] G. Atsalakis, E. Chnargiannaki, and C. Zopounidis, "Tourism Demand Forecasting Based on a Neuro-Fuzzy Model," *Int. J. Corp. Financ. Account.*, vol. 1, no. 1, pp. 60–69, 2014.
- [5] D. Gavalas, C. Konstantopoulos, and K. Mastakas, "Mobile recommender systems in tourism," *J. Netw. Comput. Appl.*, vol. 39, pp. 319–333, 2014.
- [6] A. M. Kashevnik, A. V. Ponomarev, and A. V. Smirnov, "A multimodel context-aware tourism recommendation service: Approach and architecture," *J. Comput. Syst. Sci. Int.*, vol. 56, no. 2, pp. 245–258, 2017.
- [7] C. Paper, H. R. Feili, and K. Branch, "SWOT Analysis for Sustainable Tourism Development Strategies using Fuzzy Logic SWOT Analysis for Sustainable Tourism Development Strategies," *Int. Conf. Sci. Eng. Technol. Era*, no. November, pp. 0–10, 2017.
- [8] İhsan Yüksel, Metin Dağdeviren, and Gülsüm Alicioğlu, "Evaluation of Tourism Sector Based on the Internal Environment by Using a Fuzzy Approach," vol. 896, pp. 937–944, 2019.
- [9] A. Ivanovs, A. Varfolomeyev, O. Petrina, D. Korzun, and H. Soms, "Smart Space based Recommendation Service for Historical Tourism," *Procedia Comput. Sci.*, vol. 77, pp. 85–91, 2016.
- [10] W. B. Zulfikar, Jumadi, P. K. Prasetyo, and M. A. Ramdhani, "Implementation of Mamdani Fuzzy Method in Employee Promotion System," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 288, no. 1, 2018.
- [11] Sivaraos, A. Z. Khalim, M. S. Salleh, D. Sivakumar, and K. Kadirgama, "Mamdani-Fuzzy Modeling Approach for Quality Prediction of Non-Linear Laser Lathing Process," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 318, no. 1, 2018.
- [12] M. A. Cerna and E. A. Maravillas, "Landslide Hazard GIS-based Mapping Using Mamdani Fuzzy Logic in Small Scale Mining Areas of Surigao del Norte , Philippines," *Proc. World Congr. Eng. Comput. Sci.*,

- vol. II, no. December, 2015.
- [13] A. Aziz and A. F. Logic, "Floyd Warshall Algorithm with FIS Sugeno for Search Evacuation Route Optimization," *Int. Semin. Appl. Technol. Inf. Commun. Floyd*, pp. 147–151, 2017.
- [14] R. Xu, D. Miao, L. Liu, and J. Panneerselva, "An Optimal Travel Route Plan for Yangzhou Based on the Improved Floyd Algorithm," *Proc. - 2017 IEEE Int. Conf. Internet Things, IEEE Green Comput. Commun. IEEE Cyber, Phys. Soc. Comput. IEEE Smart Data, iThings-GreenCom-CPSCo-SmartData 2017*, vol. 2018–Janua, pp. 168–176, 2018.
- [15] Y. M. Liao and J. Zhong, "FLOYD algorithm based on the shortest path in GIS," *Commun. Comput. Inf. Sci.*, vol. 267 CCIS, no. PART 1, pp. 574–579, 2012.
- [16] X. Chen and S. Qin, "Approach to high efficient hierarchical pathfinding of indoor mobile service robots based on grid map and Floyd-Warshall algorithm," *Ieee*, pp. 6476–6483, 2017.
- [17] I. B. Olenych and A. F. Gukaliuk, "Application of the Fuzzy Modeling for Optimization of Transport Routes," *Univers. J. Comput. Math.*, vol. 5, no. 4, pp. 87–92, 2017.
- [18] E. Pourjavad and R. V. Mayorga, "A comparative study and measuring performance of manufacturing systems with Mamdani fuzzy inference system," *J. Intell. Manuf.*, pp. 1–13, 2017.
- [19] A. Nanda and A. K. Rath, "Mamdani fuzzy inference based hierarchical cost effective routing (MFIHR) in WSNs," *Proc. - 7th IEEE Int. Adv. Comput. Conf. IACC 2017*, pp. 397–401, 2017.
- [20] Risald, A. E. Mirino, and Suyoto, "Best routes selection using Dijkstra and Floyd-Warshall algorithm," *Proc. 11th Int. Conf. Inf. Commun. Technol. Syst. ICTS 2017*, vol. 2018–Janua, pp. 155–158, 2018.