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2016 2nd ICSITech Schedule

Day 1: Wednesday, October 26th, 2016

07:00 – 07:30 **Registration** – Room: Grand Ballroom (2nd Floor)

07:30 – 08:15 **Opening Ceremony** – Room: Grand Ballroom (2nd Floor)
07:30 – 07:45 **Pre-Opening Session**
Welcome Messages:
1. 07:45 – 07:50 ICSITech 2016 Chairman: Ramadiani, Ph.D.
2. 07:50 – 07:55 Dean of CSIT UNMUL : Dr. Nataniel Dengen, M.Si.
3. 07:55 – 08:05 Rector of UNMUL : Prof. Dr. H. Masjaya, M.Si
4. 08:05 – 08:15 IEEE Indonesia Section : Satriyo Dharmanto

08:15 – 08:45 **Invited Speech** by
Awang Faroek Ishak (Professor, Governor East Kalimantan, Indonesia)

08:45 – 09:00 **Coffee Break I** – Room: Grand Ballroom (2nd Floor)

09:00 – 10:40 **Keynote Speech Session 1** – Room: Grand Ballroom (2nd Floor)
Moderator : Dr. Ummi Rabaah Hashim

Time-Series Data Analysis – A few case studies with Bio-signals
by **Goutam Chakraborty**
(Professor, Intelligent Informatics Lab., Faculty of Software & Information Science, Iwate Prefectural University, Japan)

The Rise of Machine Learning to Unlock the Power of Big Data
by **Rayner Alfred**
(Assoc. Professor, Faculty of Computing and Informatics, Universiti Malaysia Sabah, Malaysia)

10:40 – 12:00 **Parallel Class Session I-A : Informatics Track** – Room : Grand Ballroom (2nd Floor)
Moderator : Dr. Mohammad Syafrullah

10:40 – 11:00 **(1570305408)** Vehicle Detection and Tracking Based on Corner and Lines Adjacent Detection Features
M.D. Enjat Munajat (Institute of Technology Bandung, Indonesia), Dwi H. Widyantoro (Institute of Technology Bandung, Indonesia), Rinaldi Munir (Institute of Technology Bandung, Indonesia)

11:00 – 11:20 **(1570308101)** Car Detection Based on Road Direction on Traffic Surveillance Image
Adhi Prahara (Universitas Ahmad Dahlan, Indonesia), Murinto (Universitas Ahmad Dahlan, Indonesia)

11:20 – 11:40 **(1570307547)** Dataset Feature Reduction Using Independent Component Analysis with Contrast Function of Particle Swarm Optimization on Hyperspectral Image Classification

Murinto (Universitas Gadjah Mada, Indonesia), Agus Harjoko (Universitas Gadjah Mada, Indonesia)

11:40 – 12:00 **(1570307646)** Comparison of Two Different Types of Morphological Method for Feature Extraction of Retinal Vessels in Colour Fundus Images
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)

10:40 – 12:00 Parallel Class Session I-B : Informatics Track – Room : VIP CP I (1st Floor)
Moderator : Dr. Aji Prasetya Wibawa

10:40 – 11:00 **(1570286251)** Implementation of Moving Average and Soft Computing Algorithm to Support Planting Season Calendar Forecasting System on Mobile Device
Fhira Nhita (Telkom University, Indonesia), Deni Saepudin (Telkom University, Indonesia), Danang Triantoro (Telkom University, Indonesia), Adiwijaya (Telkom University, Indonesia), Untari Novia Wisesty (Telkom University, Indonesia)

11:00 – 11:20 **(1570297470)** Agile Person Identification Through Personality Test and kNN Classification Technique
Rintaspon Bhannarai (Chiang Mai University, Thailand), Chartchai Doungsaard (Chiang Mai University, Thailand)

11:20 – 11:40 **(1570295341)** The use of Triple Exponential Smoothing Method (Winter) in Forecasting Passenger of PT Kereta Api Indonesia with Optimization Alpha, Beta, and Gamma Parameters
Wawan Setiawan (Indonesia University of Education, Indonesia), Enjun Juniati (Indonesia University of Education, Indonesia), Ida Parida (Indonesia University of Education, Indonesia)

11:40 – 12:00 **(1570306457)** Comparison of SARIMA, NARX and BPNN Models in Forecasting Time Series Data of Network Traffic
Haviluddin (Mulawarman University, Indonesia), Nataniel Dengen (Mulawarman University, Indonesia)

10:40 – 12:00 **Parallel Class Session I-C : Informatics Track** – Room : Lamaru Meeting Room (1st Floor)
Moderator : Dr. Lala Septem Riza

10:40 – 11:00 **(1570275378)** Application of The Modified EzStego Algorithm for Hiding Secret Messages in The Animated GIF Images
Rinaldi Munir (Institut Teknologi Bandung, Indonesia)

11:00 – 11:20 **(1570294628)** SMS Authentication Code Generated by Advance Encryption Standard (AES) 256 bits Modification Algorithm and One Time Password (OTP) to Activate New Applicant Account
Eddy Prasetyo Nugroho (Indonesia University of Education, Indonesia), Rizky Rahman J. P. (Indonesia University of Education, Indonesia), Judhie Putra (Indonesia University of Education, Indonesia), Iman Muhamad Ramadhan (Indonesia University of Education, Indonesia)

11:20 – 11:40 **(1570305026)** Privacy and Security of Sharing Referral Medical Record for Health Care System
Mike Yuliana (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia), Haryadi Amran Darwito (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia), Amang Sudarsono (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia), Gabymars Yofie (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia)

11:40 – 12:00 **(1570279688)** Distributed infrastructure for efficient Management of Network Services. Case: Large Company in mining sector in Colombia
Leonel Hernández (Institucion Universitaria – ITSA, Colombia)

10:40 – 12:00 **Parallel Class Session I-D : Informatics Track** – Room : VIP CP II A (1st Floor)
Moderator : Dr. Krisna Adiyarta

10:40 – 11:00 **(1570307546)** Designing an Intelligent UI/UX System Based on the Cognitive Response for Smart Senior
You-Dong Yun (KOREA University, Korea), Chanhee Lee (KOREA University, Korea), Heui-Seok Lim (KOREA University, Korea)

11:00 – 11:20 **(1570285026)** Response Models for Series of Commands in Gaming Environment
Ida Bagus Kerthyayana Manuaba (Bina Nusantara University, Indonesia)

11:20 – 11:40 **(1570250672)** Virtual Player of Melodic Abstraction Instruments for Automatic Gamelan Orchestra
Khafiizh Hastuti (Dian Nuswantoro University, Indonesia), A. Zainul Fanani (Dian Nuswantoro University, Indonesia), Arry Maulana Syarif (Dian Nuswantoro University, Indonesia)

11:40 – 12:00 **(1570293169)** Location And Time Based Reminder System On Android Mobile Device
Nur Rokhman (Gadjah Mada University, Indonesia), Lubab Saifuddin (Gadjah Mada University, Indonesia)

10:40 – 12:00 **Parallel Class Session I-E : Information System Track** – Room : VIP CP II B (1st Floor)
Moderator : Dr. Rusydi Umar

10:40 – 11:00 **(1570244188)** Path Analysis Method to Identify Factors Affecting Consumer Interest on Online Shopping
Ratna Purwaningsih (University of Diponegoro, Indonesia), Belan Adison (University of Diponegoro, Indonesia)

11:00 – 11:20 **(1570251888)** Critical Success Factors for the Internet Technology Adoption by SMEs and Its Impact for The Performance
Aries Susanty (Diponegoro University, Indonesia), Diana Puspita Sari (Diponegoro University, Indonesia), Debby Anastasia (Diponegoro University, Indonesia)

11:20 – 11:40 **(1570284754)** Antecedents of the Adoption of Online Games Technologies:The Study of Adolescent Behavior in Playing Online Games
Bernardinus Harnadi (Soegijapranata Catholic University, Indonesia)

11:40 – 12:00	**(1570286598)** The Determinants Affecting E-Loyalty: Hospitality Industry in Indonesia *Viany Utami Tjhin (Bina Nusantara University, Indonesia), Reza Tavakoli (Bina Nusantara University, Indonesia), Shofwatunnikma (Bina Nusantara University, Indonesia), Robertus Nugroho Perwiro Atmojo (Bina Nusantara University, Indonesia)*
10:40 – 12:00	**Parallel Class Session I-F : Information System Track** – Room : Meratus Board Room (1st Floor) *Moderator : Dr. Ramadiani*
10:40 – 11:00	**(1570285340)** Thai Text Topic Modeling System for Discovering Group Interests of Facebook Young Adult Users *Rachsuda Jiamthapthaksin (Assumption University, Thailand)*
11:00 – 11:20	**(1570307472)** A Proposed Method for Predicting US Presidential Election by Analyzing Sentiment in Social Media *Andy Januar Wicaksono (Universitas Atma Jaya Yogyakarta, Indonesia), Suyoto (Universitas Atma Jaya Yogyakarta, Indonesia), Pranowo (Universitas Atma Jaya Yogyakarta, Indonesia)*
11:20 – 11:40	**(1570308121)** The Assessment of Hospitality and Tourism SMEs Awareness on the Use of Mobile Technology and Internet Services – A Case Study of Hotel Businesses in Thailand *Sakuna Anuvareepong (Assumption University, Thailand)*
11:40 – 12:00	**(1570308596)** Bias Aware Lexicon-Based Sentiment Analysis of Malay Dialect on Social Media Data: A Study on The Sabah Language *Mohd Hanafi Ahmad Hijazi (Universiti Malaysia Sabah, Malaysia), Lyndia Libin (Universiti Malaysia Sabah, Malaysia), Rayner Alfred (Universiti Malaysia Sabah, Malaysia), Frans Coenen (University of Liverpool, United Kingdom)*
12:00 – 13:00	**Lunch Break** – Room : Ballroom (4th Floor)
13:00 – 14:50	**Keynote Speech Session 2** *Moderator : Dr. Aji Prasetya Wibawa*
	Introduction to an Intelligent UI/UX for aging people by **HeuiSeok Lim** (Professor, Department of Computer Science and Engineering, College of Informatics,Korea University, Kore)
	Enhancing Service Quality Through Servive Level Agreement (SLA) Full Implementation by **Rodziah Atan** (Assoc. Professor, Faculty of Computer Science & Information Technology, Universiti Putra Malaysia, Malaysia)
14:50 – 15:10	**Coffee Break**
15:10 – 17:30	**Parallel Class Session II-A : Informatics Track** – Room : Grand Ballroom (2nd Floor) *Moderator : Dr. Mohammad Syafrullah*

15:10 – 15:30 **(1570284736)** A New Framework for Measuring Volume of Axisymmetric Food Products using Computer Vision System Based on Cubic Spline Interpolation
Joko Siswantoro (Universitas Surabaya, Indonesia), Endah Asmawati (Universitas Surabaya, Indonesia)

15:30 – 15:50 **(1570308741)** Segmentation of Optic Disc on Retinal Fundus Images Using Morphological Reconstruction Enhancement and Active Contour
Hanung Adi Nugroho (Universitas Gadjah Mada, Indonesia), Ilcham (Universitas Gadjah Mada, Indonesia), Abdul Jalil (Universitas Gadjah Mada, Indonesia), Igi Ardiyanto (Universitas Gadjah Mada, Indonesia)

15:50 – 16:10 **(1570241804)** Marker-Based Tracking Using Temporal Coherence in Computer Facial Animation System
Samuel Gandang Gunanto (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia), Mochamad Hariadi (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia), Eko Mulyanto Yuniarno (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia)

16:10 – 16:30 **(1570293628)** Smart Poster Implementation on Mobile Bulletin System using NFC Tags and Salt Tokenization Case Study: Universitas Multimedia Nusantara
Audy (Universitas Multimedia Nusantara, Indonesia), Marcel Bonar Kristanda (Universitas Multimedia Nusantara, Indonesia), Seng Hansun (Universitas Multimedia Nusantara, Indonesia)

16:30 – 16:50 **(1570294442)** Automated Tool for the Calculation of Cognitive Complexity of a Software
Dinuka Rukshani Wijendra (Sri Lanka Institute of Information Technology, Sri Lanka), Kamalanath Priyantha Hewagamage (University of Colombo School of Computing, Sri Lanka)

16:50 – 17:10 **(1570294495)** Implementation of the Cellular Automata Algorithm for Developing an Educational Game
Nurul Fauzia (Universitas Pendidikan Indonesia, Indonesia), Dedi Rohendi (Universitas Pendidikan Indonesia, Indonesia), Lala Septem Riza (Universitas Pendidikan Indonesia, Indonesia)

17:10 – 17:30 **(1570295120)** UCPabc as an Integration Model for Software Cost Estimation
Renny Sari Dewi (Universitas Internasional Semen Indonesia, Indonesia), Grandys Frieska Prassida (Universitas Internasional Semen Indonesia, Indonesia), Sholiq (Institut Teknologi Sepuluh Nopember, Indonesia), Apol Pribadi Subriadi (Institut Teknologi Sepuluh Nopember, Indonesia)

15:10 – 17:50 **Parallel Class Session II-B : Informatics Track** – Room : VIP CP I (1st Floor)
Moderator : Prof. Dr. Munir

15:10 – 15:30 **(1570308794)** A New Approach on Prediction of Fever Disease by Using a Combination of Dempster Shafer and Naïve Bayes
Yani Mulyani (Universitas Pendidikan Indonesia, Indonesia), Eka Fitrajaya Rahman (Universitas Pendidikan Indonesia, Indonesia), Herbert (Universitas Pendidikan Indonesia, Indonesia), and Lala Septem Riza (Universitas Pendidikan Indonesia, Indonesia)

15:30 – 15:50 **(1570305265)** Implementation of Medical Error Prevention System for Hypertension Disease Based on Fuzzy
Reni Soelistijorini (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia), Mike Yuliana (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia), Ira Prasetyaningrum (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia), Lina Pratiwi (Electronic Engineering Polytechnic Institute of Surabaya, Indonesia)

15:50 – 16:10 **(1570295233)** Integrated ANN And Bidirectional Improved PSO for Optimization of Fertilizer Doze On Palawija Plants
Imam Cholissodin (University of Brawijaya, Indonesia), Candra Dewi (University of Brawijaya, Indonesia), Eunike Endariahna Surbakti (University of Brawijaya, Indonesia)

16:10 – 16:30 **(1570241505)** Classification Method of Multi-class on C4.5 Algorithm for Fish Diseases
Sucipto (STMIK Amikom Yogyakarta, Indonesia), Kusrini (STMIK Amikom Yogyakarta, Indonesia), Emha Luthfi Taufiq (STMIK Amikom Yogyakarta, Indonesia)

16:30 – 16:50 **(1570286055)** Model Assessment of Land Suitability Decision Making for Oil Palm Plantation
Hamdani (Mulawarman University, Indonesia), Anindita Septiarini (Mulawarman University, Indonesia), Dyna Marisa Khairina (Mulawarman University, Indonesia)

16:50 – 17:10 **(1570260619)** A System to Diagnose Learning Disability in Children of Special Need
Munir (Universitas Pendidikan Indonesia, Indonesia), Rasim (Universitas Pendidikan Indonesia, Indonesia), Chepy Cahyadi (Universitas Pendidikan Indonesia, Indonesia), Lala Septem Riza (Universitas Pendidikan Indonesia, Indonesia)

17:10 – 17:30 **(1570291952)** Web Based Fuzzy Expert System For Lung Cancer Diagnosis
Rodiah (Gunadarma University, Indonesia), Emy Haryatmi (Gunadarma University, Indonesia), Fitrianingsih (Gunadarma University, Indonesia), Herio Susanto (Gunadarma University, Indonesia)

15:10 – 17:50 **Parallel Class Session II-C : Informatics Track** – Room : Lamaru Meeting Room (1st Floor)
Moderator : Dr. Ummi Rabaah Hashim

15:10 – 15:30 **(1570283964)** Cloud Computing Sensitive Data Protection using Multi Layered Approach
Haifaa Jassim Muhasin (University Putra Malaysia, Malaysia), Rodziah Atan (University Putra Malaysia, Malaysia), Marzanah binti A.Jabar (University Putra Malaysia, Malaysia), Salfarina binti Abdullah (University Putra Malaysia, Malaysia)

15:30 – 15:50 **(1570305703)** Wireless Communication with Batching Method Based on Xbee-PRO S2B Module for Sensing of Wind Speed
Nurul Hiron (Siliwangi University, Indonesia), Asep Andang (Siliwangi University, Indonesia)

15:50 – 16:10 **(1570307947)** Dynamic Bandwidth Management Based on Traffic Prediction Using Deep Long Short Term Memory
Tjeng Wawan Cenggoro (Bina Nusantara University, Indonesia), Ida Siahaan (Bina Nusantara University, Indonesia)

16:10 – 16:30 **(1570258159)** Energy Efficient Opportunistic Routing Algorithm for Underwater Sensor Network: A Review
Mohd Murtadha Mohamad (Universiti Teknologi Malaysia, Malaysia), Mohammad Taghi Kheirabadi (Islamic Azad University, Iran)

16:30 – 16:50 **(1570288850)** Development of Instrumentation, Control and Navigation (ICON) for ATGM (Anti Tank Guided Missile)
Herma Yudhi Irwanto (Indonesian National Institute of Aeronautics and Space, Rocket Technology Center, Indonesia)

16:50 – 17:10 **(1570304813)** Investigations of PV Balancer Architectures on Practical Solar Photo Voltaic System
Dokala Udaykiran (V R Siddhartha Engineering College, India), P.V.R.L. Narasimham (V R Siddhartha Engineering College, India), N. Gouthamkumar (V R Siddhartha Engineering College, India), Darisi Sudheerkumar (V R Siddhartha Engineering College, India)

17:10 – 17:30 **(1570305927)** A Wireless Sensor Networks Localization using Geometric Triangulation Scheme for Object Tracking in Urban Search and Rescue Application
Prima Kristalina (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia), Aries Pratiarso (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia), Tessy Badriyah (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia), Erik Dwi Putro (Politeknik Elektronika Negeri Surabaya (PENS), Indonesia)

17:30 – 17:50 **(1570285604)** Profile of a typical mobile SMS user in emergency situations (empirical study in an urban flood prone area)
Dinar Mutiara Kusumo Nugraheni (Flinders University, Australia, Diponegoro University, Indonesia), Denise de Vries (Flinders University, Australia)

15:10 – 17:30 **Parallel Class Session II-D : Informatics Track** – Room : VIP CP II A (1st Floor)
Moderator : Dr. Krisna Adiyarta

15:10 – 15:30 **(1570303586)** Knowledge of Extraction from Trained Neural Network by Using Decision Tree
Soleh Ardiansyah (Kalimantan Institute of Technology, Indonesia), Mazlina Abdul Majid (Universiti Malaysia Pahang, Malaysia), Jasni Mohamad Zain (Universiti Malaysia Pahang, Malaysia)

15:30 – 15:50 **(1570306281)** A Framework of Fuzzy Partition Based on Artificial Bee Colony for Categorical Data Clustering
Iwan Tri Riyadi Yanto (Universitas Ahmad Dahlan, Indonesia), Younes Saadi (University of Malaya, Malaysia), Dedy Hartama (Tunas Bangsa AMIK and STIKOM, Indonesia), Dewi Pramudi Ismi (Universitas Ahmad Dahlan, Indonesia), Andri Pranolo (Universitas Ahmad Dahlan, Indonesia)

15:50 – 16:10 **(1570307816)** Enhancing Modified Cuckoo Search Algorithm by using MCMC Random Walk
Noor Aida Husaini (Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia), Rozaida Ghazali (Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia), Iwan Tri Riyadi Yanto (*Universitas Ahmad Dahlan, Indonesia*)

16:10 – 16:30 **(1570308074)** Modelling of Network Traffic Usage Using Self-Organizing Maps Techniques
Haviluddin (Mulawarman University, Indonesia), Hendra Yuni Irawan (SMK Negeri 7 Samarinda, Indonesia), Achmad Fanany Onnilita Gaffar (State Polytechnic of Samarinda, Indonesia), Arda Yunianta (Mulawarman University, Indonesia), Awang Harsa Kridalaksana (Mulawarman University, Indonesia), Zainal Arifin (Mulawarman University, Indonesia), Mulaab Mulyo (Trunojoyo University, Indonesia), Andri Pranolo (Universitas Ahmad Dahlan, Indonesia), Bayu Kresnapati (Mulawarman University, Indonesia), Fauzi Rahman (Mulawarman University, Indonesia)

16:30 – 16:50 **(1570308081)** Soft Maximal Association rule for web user mining
Iwan Tri Riyadi Yanto (Ahmad Dahlan University, Indonesia), Arif Rahman (Ahmad Dahlan University, Indonesia), Youes Saaadi (University of Malaya, Malaysia)

16:50 – 17:10 **(1570285611)** Parallelized GA-PSO Algorithm for Solving Job Shop Scheduling Problem
Paulus Mudjihartono (Assumption University, Thailand, Universitas Atma Jaya Yogyakarta, Indonesia), Rachsuda Jiamthapthaksin (Assumption University, Thailand), Thitipong Tanprasert (Assumption University, Thailand)

17:10 – 17:30 **(1570286325)** State-of-the-Art Vietnamese Word Segmentation
Song Nguyen Duc Cong (Assumption University, Bangkok, Thailand), Quoc Hung Ngo (University of Information Technology, Ho Chi Minh City, Vietnam), Rachsuda (Assumption University, Bangkok, Thailand)

15:10 – 17:50 **Parallel Class Session II-E : Information System Track** – Room : VIP CP II B (1st Floor)
Moderator : Dr. Rusydi Umar

15:10 – 15:30 **(1570240800)** Innovation and practice in the teaching of digital media technology major
Song Jinyu (Zhejiang Sci-Tech University, China), Zhang Xinyu (Zhejiang Sci-Tech University, China)

15:30 – 15:50 **(1570293662)** User Difficulties in E-Learning System
Ramadiani (University of Mulawarman, Indonesia), Rodziah binti Atan (Universiti Putra Malaysia, Malaysia), Mohd. Hasan Selamat (Universiti Putra Malaysia, Malaysia), Rusli Abdullah (Universiti Putra Malaysia, Malaysia), Noraini Che Pa (Universiti Putra Malaysia, Malaysia), Azainil (University of Mulawarman, Indonesia)

15:50 – 16:10 **(1570308055)** Enhancing E-Learning System to Support Learning Style Based Personalization

Kusuma Ayu Laksitowening (Telkom University, Indonesia), Amarilis Putri Yanuarifiani (Telkom University, Indonesia), Yanuar Firdaus Arie Wibowo (Telkom University, Indonesia)

16:10 – 16:30 **(1570265788)** Push Notification System to Mobile Game Player Using Distributed Event-Based System Approach
Fiona Yunisa (Bina Nusantara University, Indonesia), Suharijto (Bina Nusantara University, Indonesia)

16:30 – 16:50 **(1570307558)** A Survey On Data-Driven Approaches In Educational Games
Danial Hooshyar (Korea University, South Korea), Chanhee Lee (Korea University, South Korea), Heuiseok Lim (Korea University, South Korea)

16:50 – 17:10 **(1570286443)** Game Play Analytics to Measure the Effect of Marketing on Mobile Free-To-Play Games
Tuang Dheandhanoo (Thammasat University, Thailand), Sittichai Theppaitoon (GAMEINDY Co., Ltd., Thailand), Pisal Setthawong (Assumption University, Thailand)

17:10 – 17:30 **(1570244610)** An Empirical Evaluation of ERP Values Using RBV Approach in Indonesia
Dwi Hastuti (University of Lambung Mangkurat, Indonesia), Juhriyansyah Dalle (University of Lambung Mangkurat, Indonesia), Husnul Khatimi (University of Lambung Mangkurat, Indonesia)

15:10 – 17:50 **Parallel Class Session II-F : Information System Track** – Room : Meratus Board Room (1st Floor)
Moderator : Dr. Fahrul Agus

15:10 – 15:30 **(1570307907)** Certificate Policy and Certification Practice Statement for Root CA Indonesia
Arfive Gandhi (Universitas Indonesia, Indonesia), Yudho Giri Sucahyo (Universitas Indonesia, Indonesia), Tomi Sirait (Universitas Indonesia, Indonesia)

15:30 – 15:50 **(1570241891)** IT Governance and Business Alignment in Support of a Divestment Strategy
Annamaré Wolmarans (University of Pretoria, South Africa), Neels Kruger (University of Pretoria, South Africa), Neil Croft (University of Pretoria, South Africa)

15:50 – 16:10 **(1570307147)** E-Gov Readiness Assessment To Determine E-Government Maturity Phase
Aji Supriyanto (Gadjah Mada University, Indonesia), Khabib Mustofa (Gadjah Mada University, Indonesia)

16:10 – 16:30 **(1570308006)** Automatic Generation of Content Security Policy to Mitigate Cross Site Scripting
Samer Attallah Mhana (Universiti Putra Malaysia, Malaysia), Jamilah Binti Din (Universiti Putra Malaysia, Malaysia), Rodziah Binti Atan (Universiti Putra Malaysia, Malaysia)

16:30 – 16:50 **(1570295022)** The Effect Of Task Technology Fit Toward Individual Performance On The Generation X (1956-1980) Using Information Technology

Putut Pamilih Widagdo (Mulawarman University, Indonesia), Ramadiani (Mulawarman University, Indonesia), Tony Dwi Susanto (Institute of Technology Ten November, Indonesia)

16:50 – 17:10 **(1570295470)** PLAKDA - An IoT Platform for the Production of Mekong Basin Styled Fermented Fish (Plara)
Tuul Triyason (King Mongkut's University of Technology, Thailand), Pisal Setthawong (Assumption University, Thailand)

17:10 – 17:30 **(1570295659)** Big Data Properties Designed for Customer Engagement Information via Multi-Channel Digital Services
Panant Krairojananan (Assumption University, Thailand), Sakuna Anuvareepong (Assumption University, Thailand)

17:30 – 17:50 **(1570307651)** Measuring Quality of Service for Mobile Internet Services
Edy Budiman (Universitas Mulawarman, Indonesia), Oki Wicaksono (Universitas Mulawarman, Indonesia)

17:50 – 19:00 **Break**

19:00 – 20:30 **Gala Dinner**

20:30 – 21:30 **Closing Ceremony**

1. Welcome speech by Governor of East Kalimantan
2. Welcome speech by Rector of Mulawarman University
3. Best Paper Award
4. Memorandum of Understanding Signing Ceremony
5. Invitation to 2017 3rd ICSITech by Rector of Universitas Pendidikan Indonesia
6. Miscellaneous Information
7. Closing

Day 2: Thursday, October 27th, 2016

08:00 – 16.00 **City Tour**

Table of Contents

Classification Method of Multi-class on C4.5 Algorithm for Fish Diseases

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***Abstract*—The background of the research is to analyze data derived from an elucidation of catfish and carp diseases in Kediri, East Java, Indonesia. The research shows that data about fish's disease history have not been used effectively because it is only be collected. Data about fish's symptom history used by fish trainer only present the number of fish that get disease. Data about fish's history should be also optimized to discover the relationship among fish's disease. Thus, anticipation about disease that always attack fish could be prevented earlier. The research is done to understand the relationship history among fish's disease. Then the accuracy of relationship quality is measured to acquire the quality of data properly so it can be worked to identify fish's disease. Data relationship quality among fish's disease symptoms should be understood to know how is the accuracy of datum classification obtained. A proper method is required to extract information from data obtained. There are many data-mining classification algorithms such as CART, CHAID, Rain Forest, and C4.5. But, the C4.5 algorithm is appropriate for this research used to form decision tree for data quality assessed from accurate performance of some multi-class fish diseases. This research uses 1120 data involving six diseases. The data were obtained from Agriculture Board (fishery subdivision) of Kediri Regency. The result shows that C4.5 algorithm is well to do for both a low and high accuracy class at 55.3 and 88.4 percent.**

Keywords— classification; C4.5 algorithm; multi-class

I. INTRODUCTION

Data mining is an extraction of process or the comprehension of data which has not yet known previously. Yet, it can be understood and useful for the huge database functions to make an important decision [1]. Data mining is commonly defined as knowledge discovery in database involving the discovering activity, the using of data to have sequences of data and the rule or pattern of the huge data [2]. One of the techniques in data mining is the classification technique. Classification is a process to find a frame or function denoting and distinguishing the concept and data class. The goal of classification is to predict the class of an object which has a label which is not yet detected in data (which is then projected) into the detected label [2]. Data nominal is a form of data which is used in process of classification.

One of the classification techniques is where the researchers refer to is algorithm C4.5. Algorithm C4.5 is an algorithm decision tree. This has an input in form of sample training and samples. Training samples contain of example data which is benefited to build an assessed tree. The samples are data field functions as a parameter in performing data classification [3]. The application of algorithm C4.5 functions to generate the level of data accuracy as the dataset containing of noisy data, the missing data and large amount data [4].

Algorithm C4.5 is one of decision tree induction algorithm namely ID3 (Iterative Dichotomiser 3), developed by J. Ross Quinlan. In the procedure of algorithm ID3, input samples are as training, training labels and attributes [5]. The construction of tee functions to divide data recursively with the result that each part consists of data derived from the same class. Data split is used to divide the data based on the type of attributes used in the split. C4.5 algorithms can handle numerical continuous and discrete data. the Split for numeric attributes puts sample in the right order based attribute - continue A, it then forms minimum inception (threshold) M of examples existing in the majority class of each adjacent partition, and merge adjacent partitions with the same majority class. The split for discrete attribute A has value form (A) X where $X \subset$ domain (A) [5].

The utilization of C4.5 algorithm to produce the level of data accuracy has been absolutely proved in previous research. Those researches are C4.5 algorithm used to predict the student achievement. The result shows that the accuracy prediction get up to 80 - 84% so that effective model prediction achievement can help education management department in finding the student bad-behavior and give the student guidance [6]. Besides, there is another C4.5 algorithm research aims to build a classification model used for upgrade the student achievement. The result indicates that C4.5 algorithm is useful and applicable to study the application of student achievement assessment [7]. The other research also suggests the assembling of C4.5 algorithm using programming model of Map Reduce presenting the use and scalability of time [8]. The use of C4.5 algorithm in health case is so to find the important parameter reflecting the influences of diabetes on kidney. The result shows that algorithm runs perfectly and effectively to find the important parameter which reflect influences of diabetes on kidney [9].

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To increase the efficiency of academic performance in educational department, a comparative analysis on classification algorithm has been conducted. Some of classification algorithm are Classification Model, Decision Tree Algorithm (DT), C4.5 classifier, CART, Ensemble learning. The result shows that none of algorithm has accuracy which is significantly better than the others [10]. Based on these findings, the researchers finally encourage to do research using C4.5 algorithm on the elucidation history of fish disease. The result of this research hopefully useful to find an accurate performance analysis output in researched fish disease. So the result can be used to predict the forthcoming fish disease.

II. METHODOLOGY

Based on the formulated method of this research, the researchers use action research method. Action research is a method focuses directly on social action. It is a function of resolving the society problem which is commonly founded in our society such as hospital, factory, school, and etc. [11]. The procedure of data mining uses classification technique where the fish disease as its object. This research provides or applies the standard process of data mining namely CRISP-DM [11][12].

The sequence of the research is begun from observation level. In this level, some cases or problems are founded, then that problem and cases are formulated, and goal of the research are shown. This level also protrudes the planning during the research. In this research, the researchers want to analyze the data of fish history of Kediri. The data is derived from elucidation of fish disease with the result that the data is useful to predict fish disease in forthcoming era.

The second step of this research procedure is “reflect”. In this step, the data used in this research are obtained. Data description, exploration, verification are also discussed. From this step, the data amounted to 1120 data; the researchers acquired 987 data for further process. The next step is “plan” where the choice of variable is done in this step and so the choice of C4.5 algorithm by deciding the data assessment with confusion matrix. The last step is the implementation of algorithm to know the quality of elucidation data. The following shown Fig. 1 presents the procedure of this research.

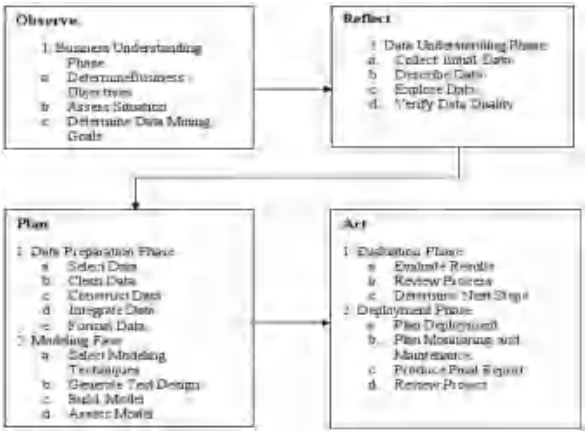

Fig. 1. Diagram of research procedure

The procedure of data mining constitutes analyzing process of data derived from different perspective and concluding them into important information. Technically, data mining can be defined as processes to find the correlation or pattern of thousand fields taken from a big relational database [13]. The calculation of classification by C4.5 algorithm produces decision trees by way of Gain Ration [5]. Equation (1), (2), (3), and (4) show the forms of C4.5 algorithm.

- Entropy, shown in (1).

$$\text{Entropy}(S) = \sum_{i=1}^{n} - pi * \log_2 pi \quad (1)$$

where *S* is The set of cases, *n* is total partition of attribute A, and *Pi* for the proportion of *Si* toward *S*.

- Gain Info, calculated by (2).

$$\text{Gain}(S,A) = \text{Entropy}(S) - \sum_{i=1}^{n} - \frac{|Si|}{|S|} * \text{Entropy}(Si) \quad (2)$$

where *S* is the set of cases, *A* for Attribute, *n* for total partition of attribute *A,* |*Si*| is total cases of partition *i*, and |*S*| is total cases of S

- Split Info, calculated by (3).

$$\text{Split Info}(S,A) = - \sum_{i=1}^{n} \frac{|Si|}{|S|} \log_2 \frac{|Si|}{|S|} \quad (3)$$

where *S* is space (data) of samples used for training, *A* is an attribute, and *Si* is total samples of attribute *i*.

- Gain Ratio, use as in (4)

$$\text{Gain Ratio}(S,A) = \text{Gain}(S,A) / \text{SplitInfo}(S,A) \quad (4)$$

where *S* is space (data) of samples used for training, *A* is attribute, *Gain(S,A)* for gain information of attribute *A*, and *Split Info(S,A)* for split information of attribute *A*.

III. IMPLEMENTATION

The identifying process of fish disease in Kediri is begun from the collection of data by elucidation provider of agriculture official (fishery subdivision) of Kediri. The process is done by analyzing indication that refer to the determination of fish diseases and pests. The fish disease based on data amounts to 6 diseases namely aeromonas sp, aeromonas hydrophiladan, ichtyophtirius sp, pseudomonas, saprolegiasis, and aeromonas punctate. The analysis of data exploration shows some criteria of symptom and indication which had an effect on the fish disease. The selection of symptom and

indication is seen in Fig 1. The chosen criteria are used as data to use in classification process of mining data. Table I is such criteria of the fish disease.

There are ten criteria which had an effect on the fish disease. The information arrangement is done based on criteria proposed in Table I. The dominant attribute is an attribute of case criteria which is usually found analysis process. That attribute consists of essential data in identifying process of the fish disease. The fish disease has all attributes amounting to 10 symptoms namely skin, liver, spleen, kidney, body color behavior, being mucous, temperature O_2 and ph. Table. I presents variables and their indications on fish disease:

TABLE I. VARIABLES AND THEIR INDICATIONS OF FISH DISEASE

No	Variables	Indication	No	Variables	Indication
1	pH	6	7	Behavior	Swim very weak
		>=5			Slowly growth
2	Skin	Rough			Normal
		Normal			Appetite loss
		Ulcer	8	Slimy	No
3	Liver	Normal			Yes
		Bleeding	9	Temperature	20-25
4	Spleen	Normal			26-30
		Bleeding	10	O_2	4ppm
5	Kidneys	Normal			>=5ppm
		Bleeding			6ppm
6	Body color	Normal			
		Dark			
		Pale			

The collected data then processed using classification by C4.5 algorithm to find the new comprehension functioning for accomplishing and protecting the further attracting symptom and indication. The analysis using classification method by C4.5 algorithm is firstly done by way of data leaning process of abnormal data. Abnormal data are such as an empty data, duplicated data. The process of data cleaning aims to have an actual data.

The following is steps included in C4.5 (Fig. 2):

a) Inputing data about fish disease history

b) Calculating Gain Ratio, Split Info and entropy from each variable of training data

c) Creating the root node of the selection of the attributes involving the greatest Gain Ratio

d) Calculating Gain Ratio, Split Info and entropy from each attribute by removing the attributes which had been chosen previously

e) Creating an internal node of selecting attributes that have the greatest Gain Ratio

f) Checking whether all tattributes have been set in the tree. If not, then repeat the process d and e, then continuing the process

g) The decision of rule is generated based on what is made previously

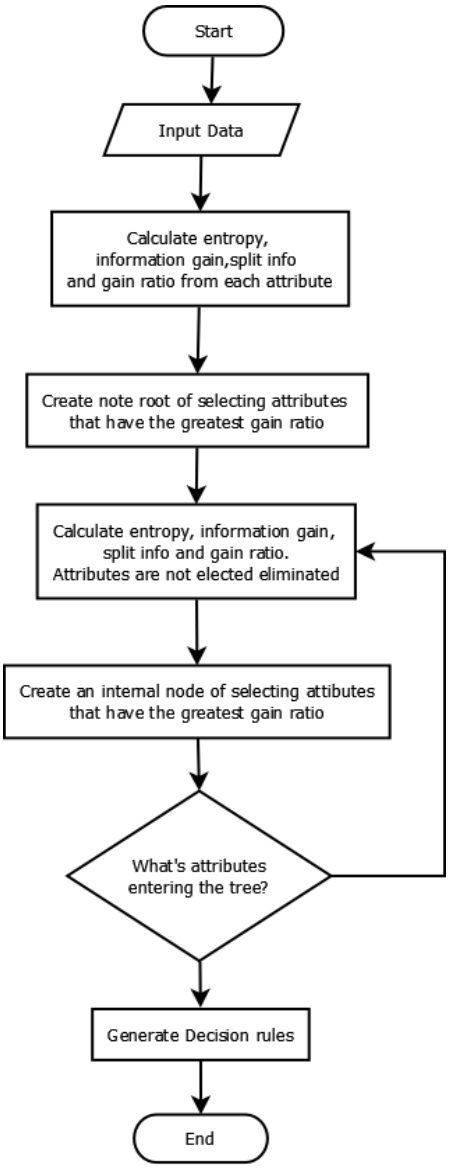

Fig. 1. Flowchart C4.5 algorithm

IV. RESULTS

The trial of data mining application is assessed. The data are assessed by comparing between data training and data testing which respectively amounted to 85%: 15%. Data training amounted to 85% is best of history data before 2014 and 15% of data testing is partly derived from elucidation data of 2015. The following are the result of partition applied in the fish disease.

Survey data partition is obtained by way of dividing each class (diseases) based on percentage to do namely 85% and 15%. The next process is the process of mining to get the decision tree. This trial is done to form a tree of disease cases

by C4.5 algorithm. based on the decision tree, some following rules are obtained. Table II shows the sample of disease rule.

TABLE II. DISEASE RULE SAMPLE

No	Rule
1	If (skin == Ulcer and o2 == 4ppm) then Pseudomonas (id = 2)
2	If (skin == Ulcer and o2 == 6ppm) then Saprolegiasis (id = 3)
3	If (skin == Ulcer and o2 == >=5ppm) then Saprolegiasis (id = 4)
4	If (skin == Rough and body_color == Dark) then Aeromonas sp (id = 6)
5	If (skin == Rough and body_color == Normal) then Aeromonas sp (id = 7)
6	If (skin == Rough and body_color == Pale) then Ichtyophtirius sp (id = 8)
7	If (skin == Normal and behavior == Swim Very Weak) then Ichtyophtirius sp (id = 10)
8	If (skin == Normal and behavior == Appetite Loss) then Aeromonas punctata (id = 11)
9	If (skin == Normal and behavior == Normal) then Ichtyophtirius sp (id = 12)
10	If (skin == Normal behavior == Slow Growth) then Ichtyophtirius sp (id = 13)

Table III presents variables of disease.

TABLE III. DATA PARTITION OF DISEASE

Total Data (987 Data)	Data Training (839 Data)	Data Testing (148 Data)
Aeromonas Sp (175 Data)	140	35
Aeromonas hydrophiladan (90 Data)	72	18
Ichtyophtirius Sp (286 Data)	229	57
Pseudomonas (65 Data)	52	13
Saprolegiasis (279 Data)	223	56
Aeromonas punctata (92 Data)	74	18

The result of data classification by C4.5 algorithm in Table IV is based on the data in Table III.

TABLE IV. VALUES RESULTS OF PERFORMANCE

Class	Original Results	Results C4.5 Class Diseases					
		1	*2*	*3*	*4*	*5*	*6*
1	6	5	0	1	0	0	0
2	5	3	0	2	0	0	0
3	48	1	0	44	0	2	1
4	13	2	0	0	10	1	0
5	56	0	0	4	2	49	1
6	4	0	0	0	0	2	2

The result as illustrated in Table IV shows that there some of original data are obtained. To know the data compatibility, a performance assessment should be done. In this assessment, the percentage of precision, recall and accuracy are assessed. The performance calculation can be done by comparing the result of original data in each disease class. The result of these comparisons is done in each performance assessment.

Precision is data taken based on information lacked for. In binary classification, precision can be made the same with positive predictive value. Equation (5) is a rule of precision.

$$\text{Precision} = (TP / (TP+FP)) * 100\% \quad (5)$$

Recall is the removal data which is taken successfully from relevant data with query. In binary classification, recall is well-known as sensitivity. The appearance of relevant data taken is agreeing with query can be seen with recall. Equation (6) is the role of recall.

$$\text{Recall} = (TP / (TP+FN))* 100\% \quad (6)$$

Accuracy is percentage of the total of the identified and assessed data. Equation (7) is the rule of accuracy.

$$\text{Accuracy} = (TP+TN)/ (TP+TN+FP+FN))*100\% \quad (7)$$

The formula which is used for it is seen in Table V [14]

TABLE V. CONFUSION MATRIX

		True Values	
		True	***False***
Prediction	***True***	TP Correct result	FP Unexpected result
	False	FN Missing result	TN Correct absence of result

The result of data tabulation performance shows three assessment of each class. This research focuses on finding the performance based on the accuracy assessment. C4.5 algorithm which is used in this research presents kind of accuracy performance in each class. Table V shows the lowest accuracy on class *Aeromonas punctata* at 55,3%. This percentage is from 74 data training and 18 from data testing. The highest accuracy class is in Ichtyophtirius Sp at 88.4%. The percentage is obtained from 229 data training and 57 data testing. The important influence of percentage performance in class (disease) of this research is influenced by the amount of data in each class and partition of used data. The result of performance average is seen in Table VI.

TABLE VI. EVALUATION MEASURE RESULTS

Class	Precision	Recall	Accuracy
Aeromonas sp	83.5%	96.7%	76.0%
Aeromonas hydrophiladan	0.0%	0.0%	57.9%
Ichtyophtirius sp	97.0%	98.2%	88.4%
Pseudomonas	96.7%	94.8%	76.7%
Saprolegiasis	78.0%	77.3%	68.3%
Aeromonas punctata	66.7%	70.0%	55.3%

V. DISCUSSION & CONCLUSION

The finding of this research shows that the probability of fish disease is based on an attribute performance. As a result, algorithm can be used to assess the fish disease performance where both the lowest class and the highest class accuracy are founded which is respectively at 55.3% and 88.4%. The further research can be done be increasing the best performance. It can be by way of spread the data scale and methods to reduce impropriate data so that the accuracy of the lowest class can be improved

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