

**TH**

**ICISS  
2021**

# **INTERNATIONAL CONFERENCE ON ICT FOR SMART SOCIETY**

**“Digital Twin For Smart Society”**

**PROCEEDING**

*ISBN : 978-1-6654-1697-9*

*Online ISSN : 2640-0545*

**02 — 04  
AGS. 2021**

**SMART CITY & COMMUNITY  
INNOVATION CENTER  
ITB**

<https://iciss.goesmart.id/>



**IEEE**



# ADVISORY BOARD

## GENERAL CHAIR

## KEYNOTE SPEAKERS

• **Minister of Communication & Information Technology**  
*Republic of Indonesia*

• **Minister of Education & Culture**  
*Republic of Indonesia*

• **Rector Bandung Institute of Technology (ITB)**

• **Prof. Suhono Harso Supangkat (ITB)**

**Prof. Suhono Harso Supangkat**  
(Bandung Institute of Technology)

• **Prof. Carlo Ratti**  
(Director of MIT Senseable City Lab, Founding Partner  
at Carlo Ratti Associati Design and Innovation Office )

• **Prof. Suhono Harso Supangkat**  
(Smart City & Community Innovation Centre - ITB)

• **Dr. Robby Soetanto B.Eng., M.Eng.,  
Ph.D., PGCert FHEA**  
(Researcher of Construction Engineering Management  
at Loughborough University, England)

• **Prof. Dr. Mohamed Essaidi**  
(IEEE Global Cities Alliance, MEA Chair)

• **Prof. Tomaz Janowski, Ph.D.**  
(Head Department of Informatics in Management,  
Gdansk University of Technology, Poland)

• **Dr. Jalaluddin Abdul Malek**  
(Associate Professor of Social Science and Humanities  
University Kebangsaan Malaysia)

• **Prof. Dr. Toshio Obi**  
(Director of APEC e-Government Research Center,  
Senior Researcher at Institute of Digital Government,  
Waseda University, Japan)

• **Prof. Benjamin Koo**  
(Director of International of iCenter, Founder of iCenter  
at Tsinghua University, Beijing, China)

• **Ryan Lai**  
(Regional Business Development Manager, Advantech  
International)

• **Dr. Ir. Hammam Riza, M.Sc. IPU**  
(Agency for the Assessment and Application of Tech-  
nology, Government of the Republic of Indonesia)

• **Arief Pribadi**  
(Technical Director NUTANIX Indonesia)

# ORGANIZING COMMITTEE

# PROGRAM COMMITTEE



**Fadhil Hidayat**

(Bandung Institute of Technology)

•**Jaka Sembiring**

(Bandung Institute of Technology)

•**Arry Akhmad Arman**

(Bandung Institute of Technology)

•**Suhardi**

(Bandung Institute of Technology)

•**IGB Baskara Nugraha**

(Bandung Institute of Technology)

•**Fetty Fitriyanti Lubis**

(Bandung Institute of Technology)

•**Yoanes Bandung**

(Bandung Institute of Technology)

•**Achmad Iman Kistijantoro**

(Bandung Institute of Technology)

•**Ayu Latifah**

(Bandung Institute of Technology)

•**Fariz Azmi Pratama**

(Bandung Institute of Technology)

•**Okyza Maherdy Prabowo**

(Bandung Institute of Technology)

•**Radiant Victor Imbar**

(Bandung Institute of Technology)

•**Ade Chandra Nugraha**

(Bandung Institute of Technology)

# 1<sup>st</sup> DAY

AGS 02<sup>th</sup> 2021

Time	Activity
<i>1<sup>st</sup> Day, August 2<sup>nd</sup> 2021</i>	
<b>OPENING AND KEYNOTE CLUSTER 1</b>	
16:00 – 16:10	<b>Opening Session:</b> <ul style="list-style-type: none"> <li>· <b>Fadhil Hidayat</b> <i>Chairman</i></li> <li>· <b>Mr. Suhono H. Supangkat</b> <i>General Chairman</i></li> </ul>
16:10 – 17:00	<b>Speaker:</b> <ul style="list-style-type: none"> <li>· <b>Prof. Carlo Ratti (Director Senseable City Lab, MIT)</b></li> </ul> <b>Question and Answer</b>
17:00 – 17.20	<b>Speaker:</b> <p><b>Ginandjar (Director of Marketing &amp; Solutions Lintasarta)</b></p>
17:20 – 17.25	<b>Photo Session</b>

# 2<sup>nd</sup> DAY

AGS 03<sup>th</sup> 2021

Time	Activity
<i>2<sup>nd</sup> Day, August 3<sup>rd</sup> 2021</i>	
08:00 – 09:00	<b>Registration</b>
<b>KEYNOTE CLUSTER 2</b>	
09:00 – 09:20	<b>Speaker:</b> <p><b>Prof. Dr Toshio Obi (Director of APEC e-Government Research Center, Senior Researcher at Institute of Digital Government, Waseda University, Japan)</b></p> <b>Question and Answer</b>
09:20 – 09:40	<b>Speaker:</b> <p><b>Ryan Lai (Regional Business Development Manager, Advantech International)</b></p>
09:40 – 10:00	<b>Speaker:</b> <p><b>Prof Hsueh-Yung Benjamin Koo (Founders of iCenter@Tsinghua University and Professor of Tsinghua University, China)</b></p>
10:00 – 10:05	<b>Photo Session</b>

<b>PARALLEL SESSIONS 1</b>		
<b>10:05 – 12:05</b>	<b>Room 1</b>	<b>Room 2</b>
	<b>Cluster I:</b> <b>Digital Twin</b> <b>Smart society and</b> <b>technology</b> <b>Moderator: Fiqri</b>	<b>Cluster II :</b> <b>Data Processing</b>  <b>Moderator: Dina</b>
	<b>Room 3</b>	<b>Room 4</b>
	<b>Cluster III :</b> <b>Smart Communities</b>  <b>Moderator: Raudhatul</b>	<b>Cluster IV:</b> <b>Smart Society and</b> <b>Technology</b> <b>Moderator: Sandra</b>
	<b>Room 5</b>	<b>Room 6</b>
	<b>Cluster V:</b> <b>Citizen Science for Smart</b> <b>Society</b> <b>Moderator: Sigit</b>	<b>Cluster VI :</b> <b>Infrastructure and</b> <b>Ecosystem Integration</b> <b>Moderator: Yudha</b>
<b>12:05 – 13:00</b>	<b>Break session</b>	
<b>PARALLEL SESSIONS 2</b>		
<b>Virtual Conference</b>		
<b>13:00 – 14:30</b>	<b>Room 1</b>	<b>Room 2</b>
	<b>Cluster I:</b> <b>Citizen Science for Smart</b> <b>Society</b> <b>Governance of Smart Society</b> <b>Moderator: Raudhatul</b>	<b>Cluster II :</b> <b>Data Processing</b> <b>Infrastructure &amp; Ecosystem</b> <b>Integration</b> <b>Moderator: Fiqri</b>
	<b>Room 3</b>	<b>Room 4</b>
	<b>Cluster III :</b> <b>Data Processing</b> <b>Moderator: Hafid Galih</b>	<b>Cluster IV:</b> <b>Smart Society and Technology</b> <b>Moderator: Sigit</b>
	<b>Room 5</b>	<b>Room 6</b>
	<b>Cluster V:</b> <b>Smart Society and Technology</b> <b>Moderator: Ramadida</b>	<b>Cluster VI :</b> <b>Citizen Science for Smart</b> <b>Society</b> <b>Moderator: Husni</b>

<b>KEYNOTE CLUSTER 3</b>	
<b>14:30 – 15:00</b>	<b>Speaker:</b> <ul style="list-style-type: none"><li>· <i>Dr. Robby Soetanto B.Eng., M.Eng., (Researcher of Construction Engineering Management at Loughborough University, England)</i></li></ul>
<b>15:00 – 15:30</b>	<b>Speaker:</b> <ul style="list-style-type: none"><li>· <i>Prof. Dr. Mohamed Essaïdi (IEEE Global Cities Alliance, MEA Chair)</i></li></ul>
<b>15:30 – 16.00</b>	<b>Speaker:</b> <ul style="list-style-type: none"><li>· <i>Prof. Tomasz Janowski, Ph.D. (Head, Department of Informatics in Management, Gdańsk University of Technology, Poland)</i></li></ul>
<b>16:00 – 16.05</b>	<b>Photo Session</b>

# 3<sup>rd</sup> DAY

AGS 04<sup>th</sup> 2021

Time	Activity	
<b>3<sup>rd</sup> Day, August 4<sup>th</sup> 2020</b>		
08:00 – 09:00	Registration	
<b>PARALLEL SESSIONS 3</b>		
<b>Virtual Conference</b>		
09:00 – 10:30	Room 1	Room 2
	Cluster I: Smart Communities Moderator: Ramadida	Cluster II : The AIoT Technology Moderator: Dina
	Room 3	Room 4
	Cluster III : The AIoT Technology Moderator: Sandra	Cluster IV: Governance of Smart Society Moderator: Husni
	Room 5	Room 6
	Cluster V : Smart Society and Technology Moderator: Hafid Galih	Cluster VI: Data Processing Moderator: Yudha
<b>KEYNOTE CLUSTER 4</b>		
10:30 – 11:00	Speaker: <ul style="list-style-type: none"> <li>Dr. Jalaluddin Abdul Malek (Associate Professor of Social Science and Humanities University Kebangsaan Malaysia)</li> </ul>	
11:00 – 11:20	Speaker: <ul style="list-style-type: none"> <li>Dr. Ir. Hammam Riza, M.Sc. (Head, Assessment and Application of Technology (BPPT) – Indonesia)</li> </ul>	
11:20 – 11:40	Speaker: <ul style="list-style-type: none"> <li>Arief Pribadi (Technical Director Nutanix Indonesia)</li> </ul>	
11:40 – 11:45	Photo Session	
11:45 – 11:55	Plenary meeting for Statement	
11:55 – 12:50	Declaration and Closing	

## **2021 International Conference on ICT for Smart Society (ICISS)**

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 reprint or republication permission, email to IEEE Copyrights Manager at [pubs-permissions@ieee.org](mailto:pubs-permissions@ieee.org). All rights reserved. Copyright ©2021 by IEEE.

IEEE Catalog Number 53185\_CFP2113V-ART

ISBN 978-1-6654-1697-9

Online ISSN 2640-0545

# Welcome to ICISS 2021

---

**Dear Colleagues,**

It is my great pleasure to welcome you to the International Conference on ICT for Smart Society 2021.

I would like to welcome our keynote speakers and all the honourable guests.

First, we would like to introduce our annual conference which was initiated by the Smart City and Community Innovation Center of Bandung Institute of Technology to promote smart society initiatives. The first ICISS was held in 2013 in Jakarta. And then, subsequently, we held the subsequent events in several other cities: Bandung, Surabaya, Tangerang Selatan, and Semarang. We were planning to hold the conference at ITB. However, because of pandemic circumstances, we have to deliver this year's conference virtually over the Internet.

This conference is a special conference with a specific topic on information and communication technology for smart city and society, including cutting-edge technology, governance, and socio-economic aspects of smart society. This year we raise digital twin for smart society as the main theme of the conference.

We would like to thank our keynote speakers,

1. Prof. Carlo Ratti, Director of MIT Senseable City Lab, Founding Partner at Carlo Ratti Associati Design and Innovation Office
2. Ginandjar, Director of Marketing & Solutions Lintasarta
3. Prof. Suhono Harso Supangkat, Smart City & Community Innovation Centre – Bandung Institute of Technology ITB
4. Prof. Dr Toshio Obi, Director of APEC e-Government Research Center, Senior Researcher at Institute of Digital Government, Waseda University, Japan
5. Ryan Lai, Regional Business Development Manager, Advantech International

6. Prof Hsueh-Yung Benjamin Koo, Founders of iCenter@Tsinghua University and Professor of Tsinghua University, China
7. Dr. Robby Soetanto B.Eng., M.Eng., Researcher of Construction Engineering Management at Loughborough University, England
8. Prof. Dr. Mohamed Essaaidi, IEEE Global Cities Alliance, MEA Chair
9. Prof. Tomasz Janowski, Ph.D., Head Department of Informatics in Management, Gdańsk University of Technology, Poland
10. Dr. Jalaluddin Abdul Malek, Associate Professor of Social Science and Humanities University Kebangsaan Malaysia
11. Dr. Ir. Hammam Riza, M.Sc., Head Assessment and Application of Technology (BPPT) – Indonesia
12. Arief Pribadi, Technical Director Nutanix Indonesia

We also would like to thank our sponsors and also the IEEE Indonesia Section for its support for the publication and technical guidance in delivering this conference.

We do hope that you enjoy your attendance at the ICISS 2021!  
Thank you for your participation.

**Fadhil Hidayat – Organizing Comittee ICISS 2021**

## Table Of Contents

<b>Cluster I : Digital Twin and Smart Society &amp; Technology</b> .....	1
The Ethics of Smart City Planning: Examining Post-Utilitarianism in Malaysian Blueprints <i>Jalaluddin Abdul Malek*, Seng Boon Lim, Sukri Palutturi</i> .....	1
A Workspace Design Prediction: Concept Overview Using the Digital Twin <i>Ayu Latifah*, Suhono Harso Supangkat, Agus Ramelan, Fachrur Razy Rahman, Moh. Afandy</i> .....	1
A Reference Framework for the Performance-Based Decision Support of City Authorities in Urban Freight Transport <i>Thomas Otte*, Tobias Meisen</i> .....	2
Weather Adaptive Intelligent Street Lighting System With Automatic Fault Management Using Boltuino Platform <i>Dipanjana Saha*, Sk Mahammad Sorif, Pallav Dutta</i> .....	2
Implementation of Efficient Anonymous Certificate-Based Multi-Message and Multi-Receiver Signcryption On Raspberry Pi-Based Internet of Things Monitoring System <i>Muhammad Fadhillah Fajari*, Dion Ogi</i> .....	3
Smart Government using Digital Twin in Japan <i>Toshio Obi*, Naoko Iwasaki</i> .....	3
<b>Cluster II : Smart Communities</b> .....	4
Online learning effect on student learning effectiveness <i>Tanty Oktavia*, Yoshe Ariel, Christopher Darren, Ryan Chistiano Giri, Nathania Joyce Irene, Hadista Azzahra, Ford Lumban Gaol, Takaaki Hosoda</i> .....	4
Development of smart campus model <i>Radiant Victor Imbar*, Suhono Harso Supangkat, Armein Z. R. Langi</i> .....	4
Conceptual Framework for the Development of IoT based Virtual Laboratory for Learning <i>Ainun Amaliah*, Yusep Rosmansyah</i> .....	5
Interconnection System Simulation Analysis of Transient Micro-grid Stability in Indonesia <i>Agus Ramelan*, Chico Hermanu Brillianto A., Feri Adriyanto, Muhammad Hamka Ibrahim, Gilang Satria Ajie, Ayu Latifah</i> .....	5
Research Network Analysis, Agenda Mapping and Research Productivity Monitoring: Insights from a Higher Education in the Philippines <i>Alfio I. Regla*, Melvin Ballera</i> .....	6
Developing AI Bots with Minimax Algorithm for Surakarta Board Game <i>Radisa Hussein Rachmadi, Rainamira Azzahra, Rayhan Ali Darmawan, Patrick Alvin Nigo, Nunung Nurul Qomariyah*</i> .....	6
Image Recognition on Rupiah Currency using Augmented Reality for Learning Media <i>Dewi Tresnawati*, Asri Mulyani, Dzikri Gumilang Pramudita</i> .....	7
Mapping of Smart Economy Research Themes: A Nine-Year Review <i>Agung Purnomo*, Albert Verasius Dian Sano, Hendro Nindito, Evaristus Didik Madyatmadja, Corinthias P.M. Sianipar</i> .....	7

Smart Strategies of the Regional Preparation for the Plan of Moving the New Capital in the Regency of Kutai Kartanegara <i>Rini Rachmawati*, Eko Haryono, Amandita Ainur Rohmah, Farah Dewi Permatasari, Rifqi Fathurrahman</i> .....	7
The Impact of Online Learning System Collaborator on Students' Ability <i>Steven Adrian, Jovan Tandy, Sultan Ardiyansyah, Adhitya, Gabriella Evangeline, Dendy, Tanty Oktavia*, Ford Lumban Gaol, Takaaki Hosoda</i> .....	8
<b>Cluster III : The AIoT Technology</b> .....	<b>8</b>
Environmental sensors in the world of smart life technologies <i>Peter Broniš*, Igor Balazovič, Peter Kaššák</i> .....	8
Design of Power Monitoring System Based on Internet of Things (IoT) with Calibration Interface <i>Hoedi Prasetyo*, Yustina Tri Tularsih, Fenty Pandansari, Steven Budi Prasetya, Anggono Priyandono, Angga Satrya Dermawan</i> .....	8
The IoT and Cloud-Based Smart Home Automation for a Better Energy Efficiency <i>Rosida Nur Aziza*, Puji Catur Siswipraptini, Malik Abdul Jabbar, Riki Ruli A. Siregar</i> .....	9
A Preliminary Prototype of LoRa-Based Wireless Sensor Network for Forest Fire Monitoring <i>Agus Ramelan*, Muhammad Hamka Ibrahim, Chico Hermanu Brillianto A., Feri Adriyanto, Muhammad Rizqi Subeno, Ayu Latifah</i> .....	10
Internet of Things-based Cat Detector System for Monitoring Stray Cats <i>Alfin Fernandha Pratama*, Aisyah Kholifah, Birra Nafiisa, Muhammad Alfaris, Moechammad Sarosa</i> .....	10
Smart Video Surveillance System For Level Crossing : A Systematic Literature Review <i>Rian Putra Pratama*, Suhono Harso Supangkat</i> .....	11
Interview Bot for Improving Human Resource Management <i>Sinung Suakanto*, Joko Siswanto, Tien Kusumasari, Ilham Reza Prasetyo, Margareta Hardiyanti</i> .....	11
SEMPIR : Sequence Multiple Point of Interest Recommender System for Overland Tourism <i>Sinung Suakanto*, Rachmadita Andreswari, Erza Putra Albasori</i> .....	11
<b>Cluster IV : Governance of Smart Society</b> .....	<b>12</b>
Effectiveness of Microducts as Alternative to Deploying Optical Cables to Support Smart Infrastructure <i>Edi Yusuf Wirawan*, Riyanto Jayadi, Gapurendro Ardhyogi</i> .....	12
Insulator Detection via CNN for UAS Onboard Computers <i>Alif Ijlal Wafi*, Rinaldi Munir</i> .....	12
Application of Drone Technology for Mapping and Monitoring of Corn Agricultural Land <i>Susan Rachmawati, Arman Syah Putra*, Abednego Priyatama, Dudi Parulian, Dona Katarina, Muhammad Tri Habibie, Matdio Siahaan, Endah Prawesti Ningrum, Alsen Medikano, V.H Valentino</i> .....	13

E-Voucher System Development for Social Assistance with Blockchain Technology <i>Juniardi Akbar*</i> , <i>Rinaldi Munir</i> .....	14
Vulnerability Analysis of Wireless LAN Networks Using Penetration Testing Execution Standard: A Case Study of Cafes in Palembang <i>Fairuz Zahirah Lidanta*</i> , <i>Ahmad Almaarif</i> , <i>Avon Budiyo</i> .....	14
Smart Engineering Platform: An Overview of New Engineering Taxonomy <i>Kusprasapta Mutijarsa*</i> , <i>Marco William Langi</i> , <i>Yoanes Bandung</i> , <i>Armein Z R Langi</i> ....	14
Monthly Rainfall Prediction Using the Facebook Prophet Model for Flood Mitigation in Central Jakarta <i>Andi Sulasikin*</i> , <i>Yudhistira Nugraha</i> , <i>Juan Intan Kanggrawan</i> , <i>Alex L. Suherman</i> .....	15
IT Governance Framework for Academic Information System at Higher Education Institutions: A Systematic Literature Review <i>M. Ramaddan Julianti*</i> , <i>Ford Lumban Gaol</i> , <i>Benny Ranti</i> , <i>Suhono Harso Supangkat</i> ....	15
Data Privacy in Disaster Situation: A review <i>Ade Sutedi*</i> , <i>Erwin Gunadhi</i> , <i>Deni Heryanto</i> , <i>Ridwan Setiawan</i> .....	16
Strategic Planning and Knowledge Management Approaches as input to remote area strategic plans: A Case study in Aru Islands Regency Maluku Province <i>Ilona Irena Gutandjala*</i> , <i>Suhono Harso Supangkat</i> , <i>Ford Lumban Gaol</i> , <i>Benny Rianti</i> ...	16
The effect of plastic bag ban policy towards waste complaints in Jakarta through JAKI and Qlue <i>Vicky Feliren</i> , <i>Yudhistira Nugraha*</i> , <i>Bahrul Ilmi Nasution</i> , <i>Clarissa Febria Finola</i> , <i>Juan Intan Kanggrawan</i> , <i>Alex Lukmanto Suherman</i> .....	17
Knowledge Management Toward Poverty Reduction <i>Mahfudh Ahmad*</i> , <i>Harjanto Prabowo</i> , <i>Harco Leslie Hendric Spits Warnars</i> .....	17
<b>Cluster V : Smart Society and Technology</b> .....	<b>18</b>
Smart Attendance Recording System using RFID and eCertificate using QR Code-based Digital Signature <i>Radiant Victor Imbar*</i> , <i>Bernard Sutedja</i> , <i>Meliana Christianti</i> .....	18
Hidden Neuron Analysis for Detection Cataract Disease Based on Gray Level Co-occurrence Matrix and Back Propagation Neural Network <i>Tiara Sri Mulati</i> , <i>Fitri Utamingrum*</i> .....	18
Designing Machine Learning Model for Predictive Maintenance of Railway Vehicle <i>Hafid Galih Pratama Putra*</i> , <i>Suhono Harso Supangkat</i> , <i>I Gusti Bagus Baskara Nugraha</i> , <i>Fadhil Hidayat</i> , <i>Kereta Api Indonesia</i> .....	19
Multilayer Convolutional Parameter Tuning based Classification for Geological Igneous Rocks <i>Agus Nursikuwagus*</i> , <i>Rinaldi Munir</i> , <i>Masayu Leylia Khodra</i> .....	19
Registration of Land and Building Certificate Ownership using Blockchain Technology <i>Aidil Rezkil Suljztan Syawaludin*</i> , <i>Rinaldi Munir</i> .....	19
Anomaly Detection Techniques in Smart City: A Review from a Framework Perspective <i>Gardyan Priangga Akbar</i> , <i>Eric Edgari</i> , <i>Bently Edyson</i> , <i>Nunung Nurul Qomariyah*</i> , <i>Ardimas Andi Purwita</i> .....	20
Comparing Deep Learning-based Architectures for Logo Recognition	

<i>Gardyan Priangga Akbar, Eric Edgari, Bently Edyson, Nunung Nurul Qomariyah*, Ardimas Andi Purwita</i> .....	21
Automation in Financial Reporting by using Predictive Analytics in SAP Analytics Cloud for Gold Mining Industry: a Case Study	
<i>Muhardi Saputra*, Sabil Nararya</i> .....	21
A Tree-based Mortality Prediction Model of COVID-19 from Routine Blood Samples	
<i>Nunung Nurul Qomariyah*, Ardimas Andi Purwita, Sri Dhuny Atas Asri, Dimitar Kazakov</i> .....	22
Spatial Data Infrastructure Integrated With Geospatial Artificial Intelligence : A Systematic Literature Review	
<i>Yudha Setya Nugroho*, Suhono Harso Supangkat</i> .....	22
An Effective Wind Power Prediction using Latent Regression Models	
<i>Benamar Bouyeddou, Fouzi Harrou*, Ahmed Saidi, Ying Sun</i> .....	23
WPS: Application for Generating Answer of Word Problem in Bahasa Indonesia	
<i>Vessa Rizky Oktavia*, Umi Yuhana, Chastine Fatichah</i> .....	23
Mobile Collaborator System Application for E-commerce Drugstore	
<i>Tanty oktavia*, Michael, Ford Lumban Gaol, Takaaki Hosoda</i> .....	24
Maximizing Small Spaces Using Smart Portable Desk for Online Learning Purpose	
<i>Andi Pramono*, Ida Bagus Ananta Wijaya, Bambang Kartono Kurniawan</i> .....	24
Analysis Of Shopping Intention Using E-Commerce During Pandemic	
<i>Tanty oktavia*, Ford Lumban Gaol, Takaaki Hosoda, Alessandro Bryan Wijaya, Fendy Tio, Liza Azzahra Malaysiani, Sandi Sanjaya, Yessin Rio Martin</i> .....	24
Recreating Traditional Indonesian Batik with Neural Style Transfer in AI Artistry	
<i>Michael Joseph, Jeconiah Richard, Calvin S. Halim, Rowin Faadhilah, Nunung Nurul Qomariyah*</i> .....	25
A Knowledge Growing System-based Decision Making-Support System Application for Forces Command and Control in Military Operations	
<i>Arwin Datumaya Wahyudi Sumari*, Krista Bella Dwi Rahayu Nur Widyasari, Vivin Ayu Lestari</i> .....	25
Implementation of the IoT-Based Electrical Quantity Monitoring System at the Electrical Installation Laboratory, Metal Industry Polytechnic of Morowali	
<i>Fachrur Razy Rahman*, Ayu Latifah, Moh. Afandy, Mohammad Wirandi, Muh. Fahim Azhari</i> .....	26
Implementation of Secure Parking Based on Cyber-Physical System using One-time Password Gong et al. Scheme to Overcome Replay Attack	
<i>Hannyfah Dzaikra Syahla, Dion Ogi*</i> .....	26
Smart Government using Digital Twin in Japan	
<i>Hilmi Aulawi*, Essy Karundeng, Wahyu Andriyas Kurniawan, Yosep Septiana, Ayu Latifah</i> .....	27
<b>Cluster VI : Citizen Science for Smart Society</b> .....	<b>27</b>
The Smart Mobility Insight of Bus Rapid Transit (BRT) PurwokertoPurbalingga Ridership Trans Jateng	
<i>Dwi Mustika Kusumawardani, Yudha Saintika*, Fauzan Romadlon</i> .....	27

Mapping-Based Using Geographic Information Systems for Smart Transportation <i>Leni Fitriani*, Sinta Dianti, Dede Kurniadi, Asri Mulyani, Ridwan Setiawan</i> .....	28
Gamification System Design and Implementation on the Kewirus Launchpad Startup Educational Platform <i>Salma Fedora*</i> .....	28
Prototype Development of Onboard Training Monitoring System for Merchant Marine Polytechnic Students <i>Akhmad Kasan Gupron*, Rizqiya W. Saputra, Putri Rizkiah Akhmad Kasan Gupron*, Rizqiya W. Saputra, Putri Rizkiah</i> .....	29
Gamification in the Learning Community for Culinary Basics Course at Higher Education <i>Winanti*</i> .....	29
Eye Movement Detection using Histogram Oriented Gradient and K-Nearest Neighbors <i>Imam Faris, Fitri Utaminingrum*</i> .....	30
Blended Learning Platform: A Requirement Analysis <i>Sabam Parjuangan*, Meliyanti Meliyanti,</i> .....	30
E-Business Startup: "Universia" As University Collaborator System <i>Tanty oktavia*, Kaslie, Ford Lumban Gaol, Takaaki Hosoda</i> .....	31
Viloc: An Android Mobile App Used for Indoor-Trapped Victim Location Visualization <i>Farrel Fatah Muhammad Atiq*, Yoanes Bandung</i> .....	31
Developing an Application to Hire a Private Tutor Using Scrum Method <i>Evelin*, Ryan Vieri Kwa, Suclinton, Maria Susan Anggreainy</i> .....	32
Schizophrenia Detection Based on Electroencephalogram Using Support Vector Machine <i>Ivan Kurnia Laksono, Elly Matul Imah*</i> .....	32
Prototype of Home Power Monitoring Tool for Electrical Outlet Using ESP32 <i>Firdaus Jonathan*, Tri Wahyu Oktaviana Putri</i> .....	33
<b>Cluster VII : Data Processing</b> .....	<b>33</b>
Knowledge Management System Analysis of Smart Regency Mobile-Apps Service with Software Usability Measurement Inventory (SUMI) Approach <i>Aang Kisnu Darmawan*, Mohammad Bhanu Setyawan, Adi Fajaryanto Cobantoro, Fauzan Masykur, Anwari, Tony Yulianto</i> .....	33
When Homecoming is not Coming: 2021 Homecoming Ban Sentiment Analysis on Twitter Data Using Support Vector Machine Algorithm <i>Lidia Sandra*, Ford Lumbagaol</i> .....	34
An Overview of Fractal Processing of Noise-Like Auditory Signals <i>Armein Z. R. Langi*, Marco William Langi, Kusprasapta Mutijarsa, Yoanes Bandung</i> ...	35
A Signal-Size Estimator Based on Correlation-Dimension For Auditory Signals <i>Marco William Langi, Kusprasapta Mutijarsa, Yoanes Bandung, Armein Z R Langi*</i> .....	35
A Fractal Characterization of Cough Signals for Covid-19 Pre-Screening Applications <i>Yoanes Bandung*, Marco William Langi, Kusprasapta Mutijarsa, Armein Z R Langi</i> .....	35
Development of Information Retrieval Method and Haversine Formula to Determine Clinic Recommendation in Jember <i>Fadhel Akhmad Hizham*, Raden Venantius Hari Ginardi</i> .....	36

Student Study Timeline Prediction Model Using Naïve Bayes Based Forward Selection Feature <i>Fitri Nuraeni*</i> , <i>Yoga Handoko Agustin</i> , <i>Sri Rahayu</i> , <i>Dede Kurniadi</i> , <i>Yosep Septiana</i> , <i>Sri Mulya Lestari</i> .....	36
Comparison of SMOTE Sampling Based Algorithm on Imbalanced Data for Classification of New Student Admissions <i>Yoga Handoko Agustin*</i> , <i>Fitri Nuraeni</i> , <i>Dede Kurniadi</i> , <i>Yosep Septiana</i> , <i>Asri Mulyani</i> , <i>Wiyoga Baswardono</i> .....	36
Investigation of In-home Augmented Reality assisted Rehabilitation Therapies for Disabled Patient <i>Iwin Thanakumar Joseph S*</i> , <i>Karunakaran V</i> , <i>Benson Edwin Raj S</i> , <i>Leela Jancy P</i> .....	37
COBY: COVID-19 Telegram Chatbot by Employing Machine Learning <i>Muhammad Naufaldi</i> , <i>Sunny Jovita</i> , <i>Christensen Mario Frans</i> , <i>Muhammad Lukman Ismail Hanafi</i> , <i>Nunung Nurul Qomariyah*</i> .....	37
Short Message Service Filtering with Natural Language Processing in Indonesian Language <i>Vincentius Gabriel Tandra</i> , <i>Yowen</i> , <i>Ravel Tanjung</i> , <i>William Lucianto Santoso</i> , <i>Nunung Nurul Qomariyah*</i> .....	38
Morphological Preprocessing for Low-Resolution Face Recognition using Common Space <i>Ghali Marzani*</i> , <i>Nanik Suciati</i> , <i>Shintami Chusnul Hidayati</i> .....	38
Evaluating Deep Learning for CT Scan COVID-19 Automatic Detection <i>Aimee Putri Hartono*</i> , <i>Callista Roselynn</i> , <i>Clarissa Angelita Indriyani</i> , <i>Claudia Rachel Wijaya</i> , <i>Nunung Nurul Qomariyah</i> , <i>Ardimas Andi Purwita</i> .....	39
Optimized Gaussian Process Regression by Bayesian Optimization to Forecast COVID-19 Spread in India and Brazil: A Comparative Study <i>Yasminah Alali</i> , <i>Fouzi Harrou*</i> , <i>Ying Sun</i> .....	39
Predicting COVID-19 Spread using SimpleTime-Series Statistical Models <i>Badriya Khayyat</i> , <i>Fouzi Harrou*</i> , <i>Ying Sun</i> .....	40
Detection of railroad anomalies using machine learning approach <i>Ade Chandra Nugraha*</i> , <i>Santi Sundari</i> , <i>Suhono Harso Supangkat</i> , <i>I Gusti Bagus Baskara Nugraha</i> , <i>Sumarni Sumarni</i> .....	40
Image Classification Using TensorFlow GPU <i>Derrick Yeboah*</i> , <i>Mahamat Saleh Adoum Sanoussi</i> , <i>George K. Agordzo</i> .....	41

## **Cluster I : Digital Twin and Smart Society & Technology**

### ***The Ethics of Smart City Planning: Examining Post-Utilitarianism in Malaysian Blueprints***

*Jalaluddin Abdul Malek\**, Seng Boon Lim, Sukri Palutturi

\*Correspondence : [jbam@ukm.edu.my](mailto:jbam@ukm.edu.my)

*Abstract - The ethics of technology- or data-driven smart city development is facing criticism for being oriented toward the data deterministic and containing instrumental rationality and realist epistemology assumptions. Allegedly, therefore, it is willfully ignoring data privacy and rights, citizen autonomy, and deontology. Such ethics of utilitarianism are hegemonic; the majority of leaders agree with these ethics but have displayed less concern for post-utilitarianism-humanistic issues. Thus, taking the cases of the Malaysian Shared Prosperity Vision (SPV) 2030 and three other administrative levels of smart city blueprints, this article aims to examine the degree of utilitarianism involved, compared to post-utilitarianism ethics. Keyword occurrence and co-occurrence analyses were applied in this study. The findings reveal that the ethics of utilitarianism is pervasively demonstrated in top-down policies that follow the principle of maximum good for the majority of citizens, and that prioritize technology and instant utility while subjugating potentially harmful future humanistic issues. Post-utilitarianism values only appeared minimally and discursively in all the local level blueprints except the SPV. The authors argue that the 'lost in translation' post-utilitarianism aspects should be examined within a practical ethical framework in the local smart city planning context. The ethics of the 'common good for all' should not necessitate sacrificing the inclusivity of minority groups, citizen autonomy and obligation, and potential future data privacy and/or security infringements.*

*Keywords - deontology, justice, inclusive development, respect for autonomy, rights, smart urbanism*

---

### ***A Workspace Design Prediction: Concept Overview Using the Digital Twin***

*Ayu Latifah\**, Suhono Harso Supangkat, Agus Ramelan, Fachrur Razy Rahman, Moh. Afandy

\*Correspondence : [33220010@std.stei.itb.ac.id](mailto:33220010@std.stei.itb.ac.id)

*Abstract - One of the topics that have stood out lately is the revolution of the fourth industry is the technology of the Internet of Things (IoT) which emerged in this revolution providing a lot of research so that it can have an influence on every aspect of the economy. One of the technologies that are at the forefront of today's revolution is Digital Twin, which is facilitated by advanced data analytics and IoT technology. In designing a building, especially that which is used as a workspace, it is often faced with various types of uncertainty, which are difficult to predict but may have an important effect in the future. One way to manage this uncertainty is by utilizing Digital Twin technology to identify a change and plan a good prediction so that it has an important influence on future designs. Utilizing Digital Twin technology is expected to be an opportunity to produce very well-organized predictions for creating and envisioning the future from a sensible workspace design.*

*Keywords - data analytics, digital twin, internet of things, the industrial revolution, working space.*

---

## **A Reference Framework for the Performance-Based Decision Support of City Authorities in Urban Freight Transport**

Thomas Otte\*, Tobias Meisen

\*Correspondence : [thomas.otte@ima.rwth-aachen.de](mailto:thomas.otte@ima.rwth-aachen.de)

*Abstract - Urban freight transport is one major contributor to the existing externalities of urban transport (e.g., congestion, pollutant emissions). While the extent of these externalities is often the result of decentral and extra-urban decision-making processes of involved actors (e.g., tour planning and routing of fleet operators), the responsibility to implement corrective as well as preventive measures is typically centralized in the hands of the city authorities. In conformity with their key functions, the authorities have to meet, the often oppositely aligned, societal expectations, business needs as well as existing political objectives. Amplified by this constellation, selecting effective measures with positive cost-benefit relations for the society from an existing plethora of measures leads to complex decision scenarios and embodies a particularly challenging endeavor. In order to supplement existing approaches to support the decision-making of city authorities in urban freight transport (e.g., modeling and simulation; stakeholder involvement procedures), performance-based procedures from the domain of information management embody promising approaches. As one fundamental step towards their realization, this paper presents a reference framework to define the system boundaries, to relate the involved system components, and to establish a consistent perspective as well as a uniform understanding for scholars and practitioners. In this context, the framework development process is presented along with a pre-defined set of requirements.*

*Keywords - urban freight transport, smart city, city information management, decision support system, digital shadow*

---

## **Weather Adaptive Intelligent Street Lighting System With Automatic Fault Management Using Boltuino Platform**

Dipanjan Saha\*, Sk Mahammad Sorif, Pallav Dutta

Correspondence : [dipanjansaha019@gmail.com](mailto:dipanjansaha019@gmail.com)

*Abstract - Streetlighting is an important feature of any city since it improves night vision and makes roadways safer. However, it consumes a significant amount of electricity. In the manual system the streetlights are powered for a set period of time with maximum intensity even when there's adequate light available. This wastage of electricity can be avoided by extinguishing the lights automatically and controlling the intensity of the light. The saved energy can be productively used for different purpose like transportation, commercial, residential and so on. A faulty streetlamp can lead to accident and encourage crime. In the current streetlight system fault detection conduct through manual inspection by electrical inspector or by getting complaint. So, the manual fault detection takes longer time to detect the fault and further rectification. This paper presents a weather friendly streetlight control and maintenance system based on the Boltuino (Bolt IoT+ Arduino) platform. The main objective of this proposed system is to make the conventional streetlight system more energy efficient, weather adaptive, easier to monitor and*

control detecting fault automatically and minimize the manpower. The technique utilizes LDR with power efficient LED (Light Emitting Diode) to control the light intensity. The IR sensors are used to sense the activity of the traffic so that it can send signal for LEDs to get brighten up for the following particular portion of the road. The LEDs can be act accordingly to the weather. The system can also detect any faulty streetlight and inform the authority by text message with the streetlight pole location. So that servicing can be initiate immediately. The proposed project has accomplished an improved performance with respect to the existing systems.

Keywords : Smart Street Lighting, Internet of Things, Fault Detection, Weather Adaptive, Power Saving.

---

### **Implementation of Efficient Anonymous Certificate-Based Multi-Message and Multi-Receiver Signcryption On Raspberry Pi-Based Internet of Things Monitoring System**

Muhammad Fadhilah Fajari\*, Dion Ogi

\*Correspondence : [m.fadhilah@student.poltekssn.ac.id](mailto:m.fadhilah@student.poltekssn.ac.id)

Abstract - Internet of things as a technology that connect internet and physical world has been implemented in many diverse fields and has been proven very useful and flexible. In every implementation of technology that involve internet, security must be a great concern, including the implementation of IoT technology. A lot of alternatives can be used to achieve security of IoT. Ming et al. has proposed novel signcryption scheme to secure IoT of monitoring health data. In this work, proposed signcryption scheme from Ming et al. has been successfully implemented using Raspberry Pi and ESP32 and has proven work in securing IoT data.

Keywords : Data Security, Internet of Things, Signcryption

---

### **Smart Government using Digital Twin in Japan**

Toshio Obi\*, Naoko Iwasaki

\*Correspondence : [obi.waseda@waseda.jp](mailto:obi.waseda@waseda.jp)

Abstract - This paper summarizes the lessons learned from the case studies of Digital Twin in Japan on building an AI government and smarter city for a resilient society. This paper suggests that Indonesia had better work with Japan toward the establishing smarter AI digital government utilizing DX technology such as AI. As for the aging society issues that Japan is facing with, similar issues will occur in Indonesia in the future. As for digital strategy in Indonesia, it is meaningful to introduce Digital Twin based upon our research on successful case studies.

Keywords : digital twin, smart government, smart city, DX

---

## **Cluster II : Smart Communities**

### **Online learning effect on student learning effectiveness**

*Tanty Oktavia\*, Yoshe Ariel, Christopher Darren, Ryan Chistiano Giri, Nathania Joyce Irene, Hadista Azzahra, Ford Lumban Gaol, Takaaki Hosoda*

*\*Correspondence : [toktavia@binus.edu](mailto:toktavia@binus.edu)*

*Abstract - Pandemic COVID-19 has been giving the impact that large to the entire community in Indonesia because the pandemic of this, many activities are obstructed, and regulations protocol Health implemented by the government make its people must adjust themselves to abide by the rules that exist. Likewise, in the education sector, this pandemic make learning should be done in online. Learning process would be not as same when face-to- face and each university also has a method of learning that is different to improve the quality of learning that is given to the students. Higher education as learning environment also wanted to know the level of effectiveness of learning online are given and the attitude / behavior of students during follow online learning procedure. This study aims to determine the effect that significant to the effectiveness of the learning of students who do study via online (E-Learning). The sample was determined using the questionnaire collection method and the results of the questionnaire were collected as research data. Then the data is processed and tested (by testing the validity, reliability, etc.). The results show that internal factors have significant correlation to the effectiveness of e-learning.*

*Keywords : Effectiveness, Online Learning, e-learning, higher education*

---

### **Development of smart campus model**

*Radiant Victor Imbar\*, Suhono Harso Supangkat, Armein Z. R. Langi*

*\*Correspondence : [33220018@mahasiswa.itb.ac.id](mailto:33220018@mahasiswa.itb.ac.id)*

*Abstract - The challenges of higher education in the era of industrial revolution 4.0 are global competition and technological progress. Universities must be able to adapt to the fourth industrial revolution to be competitive and recruit new students in the face of such fierce competition. Universities in Indonesia must build a smart campus if they want to become more competitive. Before implementing a smart campus, it is necessary to build a smart campus model that becomes a reference for universities to implement smart campuses. The Smart Campus model created will refer to the Garuda Smart Campus Model and be integrated with the Higher Education model and the Smart System model can be a reference for universities to simulate the Smart Campus that will be implemented and can be the foundation for measuring the intelligence level of campus so that it can be a reference for colleges to simulate the Smart Campus that will be implemented.*

*Keywords - smart campus, smart campus model, smart system*

---

### **Conceptual Framework for the Development of IoT based Virtual Laboratory for Learning**

Ainun Amaliah\*, Yusep Rosmansyah

\*Correspondence : [ainunamaliah3@gmail.com](mailto:ainunamaliah3@gmail.com)

*Abstract - The technological trend of using the Internet of Things (IoT) and case studies in the education field has become a solution to improve the efficiency of the laboratory learning process and improve STEM (science, technology, engineering and mathematics) educational knowledge. At present, the Internet of Things technology and mobile application technology are used to monitor the overall activities of the laboratory, including virtual laboratory activities (Vlab), which monitor the laboratory environment through sensors, thereby providing an energy-efficient intelligent environment for information and communication technology (ICT). And convenience. The proposed Vlab conceptual framework based on the Internet of Things is used to develop Vlab-IoT prototypes and can be used as a guide for developing educational software (such as Vlab-IoT).*

*Keywords - Education, Virtual Laboratory, Internet of Things*

---

### **Interconnection System Simulation Analysis of Transient Micro-grid Stability in Indonesia**

Agus Ramelan\*, Chico Hermanu Brillianto A., Feri Adriyanto, Muhammad Hamka Ibrahim, Gilang Satria Ajie, Ayu Latifah

\*Correspondence : [agusramelan@staff.uns.ac.id](mailto:agusramelan@staff.uns.ac.id)

*Abstract - Global economic development causes higher energy demand. The superiority of technology in distributed power generation from renewable energy sources is a solution to these problems. The writers designed a system modeling in ETAP software to design a micro-grid interconnection system that utilized the potential sources of solar and wind energy in Indonesia. This design is combined with models in the ETAP software such as wind turbine, photovoltaic, inverter, energy storage, generator, user-side loads, industrial system loads, transmission-distribution, transformers, and conventional power grid. The simulation of the micro-grid interconnection system is designed in operating conditions in order to analyze the load flow and transient stability analysis when a three-phase fault occurs on the main bus. This system is modeled in graphical form to determine the effect of errors on stress recovery to return to normal operating conditions. The use of wind turbine in a micro-grid system causes the transient stability conditions in the main bus voltage to fluctuate. To maintain calm on the main bus, a variable pitch control setting is required on the wind turbine generator. The effect of energy storage on the micro-grid interconnection system in the event of an error can reduce the voltage drop on the main bus.*

*Keywords - micro-grid, interconnection system, transient stability, energy drift*

---

## **Research Network Analysis, Agenda Mapping and Research Productivity Monitoring: Insights from a Higher Education in the Philippines**

Alfio I. Regla\*, Melvin Ballera

\*Correspondence : [aregla.it@tip.edu.ph](mailto:aregla.it@tip.edu.ph)

*Abstract - Research is the fundamental role of a higher education institution or HEI in the Philippines to spur knowledge generation and transfer in the community. The collection of research and its activities can foster collaboration between academe and industry to contribute to economic development. As the institution's collects its unstructured research data the challenge to determine its growing research areas, alignment to the research agenda suggested by the funding agency, authors topic of interest and the authors collaboration is challenging. This study aims to determine the growing research areas and its alignment to the harmonized research agenda suggested by the Department of Science and Technology (DOST) for 2017 and 2022, researchers' topics or interest and authors collaboration from the collection of research outputs. Through the categorization of topic per paper the study finds out the growing areas of Technological Institute of the Philippines (TIP) and plot its research areas alignment to the DOST research agenda and visualize using the Tableau tools. Meanwhile, through social network analysis (SNA) with Gephi the study is able to show the authors collaboration networks and using the Latent Dirichlet Allocation (LDA) topic modeling technique can provide clusters of topics representing researchers' topics of interest. Moreover, the visualization results can be a helpful tool for the research management and research decision and policy makers to recommend research area to focus and direction to increase research productivity.*

*Keywords - SNA, LDA, research alignment, research data visualization*

---

## **Developing AI Bots with Minimax Algorithm for Surakarta Board Game**

Radisa Hussein Rachmadi, Rainamira Azzahra, Rayhan Ali Darmawan, Patrick Alvin Nigo, Nunung Nurul Qomariyah\*

\*Correspondence : [nunung.qomariyah@binus.edu](mailto:nunung.qomariyah@binus.edu)

*Abstract - Surakarta Board Game is a traditional Indonesian board game that has been forgotten all over the world, especially in Indonesia where it originally came from. This game is still in its early stages of development, even though this game has been published through a book by Sid Sackson since 1970. Due to this we wanted to create an AI for this game in order to raise awareness of this beautiful Indonesian board game. Therefore, we were able to develop and create a simple Surakarta Board Game AI player implementing the Minimax algorithm. Minimax is a well-known decision-making and game-theory technique for finding the best move for a player, given that the opponent likewise plays optimally. Additionally, in this paper, we investigated the performance of our developed AI player including the chance of winning and the time taken for each game. Several experiments were carried out by opposing AI with a random player. Through developing this game, we will be able to help the survival of Indonesian culture.*

*Keywords - surakarta board game, minimax algorithm, game AI player*

---

### **Image Recognition on Rupiah Currency using Augmented Reality for Learning Media**

Dewi Tresnawati\*, Asri Mulyani, Dzikri Gumilang Pramudita

\*Correspondence : [dewi.tresnawati@sttgarut.ac.id](mailto:dewi.tresnawati@sttgarut.ac.id)

*Abstract - The use of technology in learning media has been widely used. One of the technologies that can be used to support the learning process is Augmented Reality technology. So far, the way of working done in Augmented Reality is by scanning a marker that is made specifically to be able to bring up scanned information. Therefore, a design was made to create an Augmented Reality application that does not require a special marker but simply by utilizing existing objects, in this case using banknotes in rupiah currency and then displaying information about the images contained in the banknotes. The results of the study indicate that the application can run, and can help in learning the introduction of currency and culture according to the images contained in the banknotes.*

*Keywords - Augmented Reality, image recognition, learning media, Multimedia Development Life Cycle*

### **Mapping of Smart Economy Research Themes: A Nine-Year Review**

Agung Purnomo\*, Albert Verasius Dian Sano, Hendro Nindito, Evaristus Didik Madyatmadja, Corinthias P.M. Sianipar

\*Correspondence : [agung.purnomo@binus.ac.id](mailto:agung.purnomo@binus.ac.id)

*Abstract - Research on the smart economy as a part of a smart city continues to develop but is limited to one country and/or one field. From a bibliometric review, this study aims to visually study mapping and research trends in the field of the smart economy on an international scale. This study used bibliometric techniques with secondary data from Scopus. Analyze and visualize data using the VOSViewer program and the analyze search results function on Scopus. This study analyzed 125 scientific documents published from 2011 to 2020. According to the research, the Peter the Great St. Petersburg Polytechnic University, Russia, and Mboup, G. had the most active individual scientists and in smart economy research. Computer science and Advances in 21st Century Human Settlements were the most studied and disseminated outlet of smart economy research. There was one category map of collaborative researchers from around the world. Based on the identification of a collection of knowledge generated from nine years of publication, this research proposes a grouping of smart economy research themes: Economy, Application of smart cities, Smart technology, Smart cities character, Economy of urban, Education and Smart environment, abbreviated as EASSEES research themes.*

*Keywords - bibliometric, research themes, research mapping, smart economy, smart city.*

---

### **Smart Strategies of the Regional Preparation for the Plan of Moving the New Capital in the Regency of Kutai Kartanegara**

Rini Rachmawati\*, Eko Haryono, Amandita Ainur Rohmah, Farah Dewi Permatasari, Rifqi Fathurrahman

\*Correspondence : [rindirachma@ugm.ac.id](mailto:rindirachma@ugm.ac.id)

*Abstract - The study of moving the capital needs to be conducted from the regional readiness. The Regency of Kutai Kartanegara is located in the East Kalimantan's Province, Indonesia where part of its territories belong to the plan for the new capital. The aim of this research is to identify the conditions, issues, and smart strategies in the preparation of the region for the location plan of the new capital in the Regency of Kutai Kartanegara. The data are obtained by conducting an in-depth interview with the policy makers and relevant administration authorities related to the development of the new capital. The result shows that the respective regency has given good responses related to the plan for the new capital in the Regency of Kutai Kartanegara. It has even made some smart strategies to anticipate the possibilities and impacts due to the presence of the new capital in the regency of Kutai Kartanegara.*

*Keywords - new capital, smart strategies*

---

### **The Impact of Online Learning System Collaborator on Students' Ability**

*Steven Adrian, Jovan Tandy, Sultan Ardiyansyah, Adhitya, Gabriella Evangeline, Dendy, Tanty Oktavia\*, Ford Lumban Gaol, Takaaki Hosoda*

*\*Correspondence : [toktavia@binus.edu](mailto:toktavia@binus.edu)*

*Abstract - Pandemic Covid-19 has change learning process to use online learning platform to limit interaction between participant of learning and reduce the Covid-19. This shifting has a major impact on education. Even though, many things have been done by education institution, lecturers, and students in adapting to online learning. In this study focus to check the effect of online learning on students' ability to understand the learning process. In this research, we use quantitative approach. To collect the data, this study uses a questionnaire method and in data analysis this study uses descriptive methods. In the results of this research can conclude that there is a positive influence from online learning on student's ability to understand the material. Therefore, higher education institution have to consider online learning to be good so that in the future it can continue to be developed or upgrade so that it can make it easier for students to understand the material and learn effectively and efficiently.*

*Keywords - online learning, material, positive, effect, ability*

---

### **Cluster III : The AIoT Technology**

#### **Environmental sensors in the world of smart life technologies**

*Peter Broniš\*, Igor Balažovič, Peter Kaššák*

*\*Correspondence : [peter.bronis@gmail.com](mailto:peter.bronis@gmail.com)*

*Abstract - This paper proposes the creation of sensoric network and digital platform to store and process measured data. Motivation for the research was to improve life in the city and to build capacity in Smart Life technologies. In first part we provide literature review on the sensors and their use in smart cities environment. We designed the sensoric network based on the low-cost sensors being placed on over two hundred locations over the city. We describe the parameters of the sensors used in our planned network. Then we designed the platform that will facilitate data*

collection, processing and interpretation. The short description of the platform and technologies used are provided. The technologies used are based on open-source principles

Keywords - smartlife, sensors, digital platform, smart city

---

### **Design of Power Monitoring System Based on Internet of Things (IoT) with Calibration Interface**

Hoedi Prasetyo\*, Yustina Tri Tularsih, Fenty Pandansari, Steven Budi Prasetya, Anggono Priyandono, Angga Satrya Dermawan

\*Correspondence : [hoedi.prasetyo@atmi.ac.id](mailto:hoedi.prasetyo@atmi.ac.id)

*Abstract - In a power monitoring system, accuracy is subject to change. Therefore, a calibration interface on the system's dashboard is required. This research aims to propose a design of a power monitoring system with a calibration interface based on Internet of Things technology. For the hardware, this research proposes the use of CT sensors, Arduino, and Raspberry Pi. Node-RED is utilized to process the data and to create the dashboard. The proposed design consists of two dashboard pages. The first page is the monitoring page, which displays the measurement of voltage, current, frequency, true power, apparent power, and power factor. The second page is the setting page, which allows the user to calibrate the measurement by adjusting the parameter value on the dashboard. The proposed power monitoring system in this research offers simplicity to maintain the system's accuracy.*

Keywords - power monitoring system, internet of things, node-red, calibration interface

---

### **The IoT and Cloud-Based Smart Home Automation for a Better Energy Efficiency**

Rosida Nur Aziza\*, Puji Catur Siswipraptini, Malik Abdul Jabbar, Riki Ruli A. Siregar

\*Correspondence : [rosida@itpln.ac.id](mailto:rosida@itpln.ac.id)

*Abstract - This paper proposes a prototype of an improved smart home automation system, with the integration of IoT, cloud technologies, and intelligence embedding. The automation and the ability for users to control their home appliances remotely are enabled with the use of IoT. Since a smart home also requires to consider the importance of energy efficiency while offering a certain level of comfort, the energy consumption is also monitored by placing several current and voltage sensors. The Raspberry Pi microcontroller board is used to gather and process information from sensors and allows the uploading of the data to the cloud database. A fuzzy-based algorithm is employed for helping the smart home controller to provide the right decisions based on the current home condition when the application runs in automatic mode. Meanwhile KMeans Algorithms is implemented to cluster the smart home user's energy consumption.*

Keywords - smart home, home automation, IoT, cloud computing

---

### **A Preliminary Prototype of LoRa-Based Wireless Sensor Network for Forest Fire Monitoring**

Agus Ramelan\*, Muhammad Hamka Ibrahim, Chico Hermanu Brillianto A., Feri Adriyanto, Muhammad Rizqi Subeno, Ayu Latifah

\*Correspondence : [agusramelan@staff.uns.ac.id](mailto:agusramelan@staff.uns.ac.id)

*Abstract - Forest fire that occur anywhere carry very dangerous risks ranging from the emergence of fog, air pollution which causes respiratory diseases, loss of living animal populations to cause economic losses in the area. However, with the technology advances, forest fire can be predicted by monitoring remotely so that forest fire can be prevented. Forest fire risk monitoring in an area is carried out using a remote system to prevent users from periodically monitoring and avoid careless by forest fire monitoring users. This report presents forest fire monitoring by applying Long Range (LoRa) technology to monitor conditions in a forest in certain area. This system used Arduino which was equipped with a LoRa shield that has been installed with a temperature, humidity, and air quality sensor. The data from the sensor was sent via the sensor node and the LoRa gateway and stored on the IoT server of UNS Electrical Engineering. Sending data sent from the LoRa gateway to the IoT Server used the HTTP protocol. The data obtained can be displayed and visualized with a graph through a dashboard created using NodeRed.*

*Keywords - forest fire, monitoring, temperature, air quality, IoT, LoRa, HTTP, NodeRed*

---

### **Internet of Things-based Cat Detector System for Monitoring Stray Cats**

Alfin Fernandha Pratama\*, Aisyah Kholifah, Birra Nafiisa, Muhammad Alfari, Moehammad Sarosa

\*Correspondence : [alfin.7007@gmail.com](mailto:alfin.7007@gmail.com)

*Abstract - The population of stray cats in the streets has been on the rise lately. Meanwhile, due to the nature of feral animals that are afraid of humans, combined with human cruelty towards them, the likelihood for these animals to scratch and bite is high. Taming a stray cat is not an easy job and sometimes leads to hostility. Stray cats that are not cared for can contract diseases, some of which can even infect humans, such as febrile fever, pustules, and, in extreme cases, complications that can lead to death. The purpose of this study is to build a monitoring system for the presence of stray cats using IoT (Internet of Things) technology so that animal activists can find out the condition of stray cats and determine the required actions. This system attracts the cat's attention when looking for food so it does not disturb humans. The system's main controller is a Raspberry Pi microcontroller with three input components, namely a camera and two weight sensors. Pi camera as a camera captures images, while the two weight sensors or load cells determine the amount of feed and water available. With this tool, it is expected that activists can monitor the condition of the cat in real-time through images sent to the application and reports on the weight of the feed.*

*Keywords - image processing, internet of things, raspberry pi, load cell*

---

## **Smart Video Surveillance System For Level Crossing : A Systematic Literature Review**

Rian Putra Pratama\*, Suhono Harso Supangkat

\*Correspondence : [23220036@std.stei.itb.ac.id](mailto:23220036@std.stei.itb.ac.id)

*Abstract - A level crossing is an intersection where a railway line crosses a road or path. The government has made regulations that set level crossings throughout Indonesia, Provisions on traffic and road transport in Law No. 22 of 2009. However, data from PT Kereta Api Indonesia (KAI) shows that during 2020 there were 198 accidents and around 5000 trespasses occurred at level crossings. The surveillance system currently used in level crossings is still conventional, which only relies on supervisory officers and some level crossings monitored by CCTV. Research in the field of video surveillance systems with a computer vision approach has been widely carried out in the past decade. Most researches on video surveillance systems try to replace human functions or traditional systems with video processing algorithms. This paper will review the literature on the application of artificial intelligence for the surveillance system level crossings published from 2015 to 2021. The literature review process consists of analyzing the document to determine the scope of the investigation using intelligent video surveillance systems, frameworks, methods and datasets to detect level crossing violators. In the conclusion of this paper, it will be explained about the challenges and opportunities of research on the object detected violations using intelligent video surveillance systems in the future.*

*Keywords - smart system, video surveillance, deep learning, convolutional neural network, systematic review*

---

## **Interview Bot for Improving Human Resource Management**

Sinung Suakanto\*, Joko Siswanto, Tien Kusumasari, Ilham Reza Prasetyo, Margareta Hardiyanti

\*Correspondence : [sinung@telkomuniversity.ac.id](mailto:sinung@telkomuniversity.ac.id)

*Abstract - This study aims to explore the feasibility of implementing a chatbot for an interview process. The development of chatbots evolved rapidly to efficiently collect information in numerous fields, including customer service, health care, and etc. However, there was limited discussion of how chatbots are used to conduct an interview process autonomously. A human-driven interview also has some major limitations, e.g., it may only be conducted on a small-scale and is susceptible to bias. Hence, this study provides the design of a chatbot to conduct an interview, as well as processing the interview result by using Artificial Intelligence (AI) or machine learning. We have identified the difference between the typical chatbot communication method and the interview bot. This finding can be an opportunity to make a new interview bot or improve the implementation of a chatbot. In the end, we also discuss the challenges and benefits of the development of an interview bot.*

*Keywords - chatbot, interview, interview bot, artificial intelligence, machine learning*

---

## **SEMPIR : Sequence Multiple Point of Interest Recommender System for Overland Tourism**

*Sinung Suakanto\**, Rachmadita Andreswari, Erza Putra Albasori

\*Correspondence : [sinung@telkomuniversity.ac.id](mailto:sinung@telkomuniversity.ac.id)

*Abstract - Recommender system is a tool that can help human find their preferences from a massive amount of data based. One of the practical implementation is for geographical recommender system. In this study, we propose such as geographical recommender system that recommend multiple Point of Interest (POI) in sequence manner. The usage of this method is for overland tourism. Overland tourism is one type of tourism that is currently chosen by many travelers or tourists. Tourists who choose the overland method tend to use a long time to visit several destination objects for a long time. The traveler will choose to start from one city and end in another city. Throughout the trip from the city, a traveler will visit several destination objects. Some travelers have problem when they want to plan their itinerary or travel plans within in certain constraints such as certain budget. They find it difficult to visit anything and anywhere within the available budget. This research propose some algorithm solution to solve this problem by developing a recommendation system in list of tourist destinations with a constraint on the budget. The proposed method have several stages. One of the important stages is selecting a list of recommended destination object to be visited. This algorithm would produce set or list of recommended tourist in sequence of destination according to the available budget for a certain duration of time.*

*Keywords - recommender system, geographical recommender, tourist destination recommendation, overland tourism, multiple point of interest*

---

### **Cluster IV : Governance of Smart Society**

#### **Effectiveness of Microducts as Alternative to Deploying Optical Cables to Support Smart Infrastructure**

*Edi Yusuf Wirawan\**, Riyanto Jayadi, Gapurendro Ardhyogi

\*Correspondence: [edi.yusuf@solidblue.id](mailto:edi.yusuf@solidblue.id)

*Abstract- As one of the components smart city, ICT Infrastructure must be effective and efficient and currently fiber-optic network is the best for that. Problems arise when fiber optic installations in urban areas become chaotic and disorganized, resulting in a negative effect on the aesthetics of the city, on the use of utility lines and especially on future maintenance. Currently, subducts are the famous method to lay fiber optics and become a standard in Indonesia. Many providers or ISPs deploy their fiber optics, and it makes the utility lines complete. Therefore, many cities in the developed world have switched to microducts technology. This technology provides efficiency, especially in terms of implementation, both cost and physical dimensions. In this study, we prove that microducts are more effective than solutions subduct. Comparing the physical, capacity, cost and installation between microduct and subduct, we also gather information from some network*

providers and ISP about the effectiveness of microduct. And it has been proven that microducts are very effective and efficient and can be classified as a solution for smart infrastructure.

Keywords - fiber optic, microduct, smart infrastructure

---

### **Insulator Detection via CNN for UAS Onboard Computers**

*Alif Ijlal Wafi\**, *Rinaldi Munir*

\*Correspondence: [alif.iw@outlook.com](mailto:alif.iw@outlook.com)

*Abstract- This paper proposes the usage of single-stage CNN models for detecting insulators in aerial images and measures their applicability in low-power computing settings that often found in UAS onboard systems. In addition to methods in literature, we also design another network based on YOLOv2 modified with SPP (spatial pyramid pooling) block and CloU loss as our baseline. Our results shows that while both using SPP block and optimizing the bounding box regression function increases the overall detection accuracy without significant cost, network architectures that is specifically designed for edge devices are much more suitable on said environments. One of such design is SF-YOLO, with computation cost of 3,842 BFLOP (29% lower than YOLOv3 tiny, 86% lower than ours) while retaining AP50 score higher than 0.9, and thus can be further used for autonomous navigation subsystems with proper edge devices.*

Keywords- UAS, insulator, autonomous, object detection, deep learning, onboard

---

### **Application of Drone Technology for Mapping and Monitoring of Corn Agricultural Land**

*Susan Rachmawati, Arman Syah Putra\**, *Abednego Priyatama, Dudi Parulian, Dona Katarina, Muhammad Tri Habibie, Matdio Siahaan, Endah Prawesti Ningrum, Alsen Medikano, V.H Valentino*

\*Correspondence : [armansp892@gmail.com](mailto:armansp892@gmail.com)

*Abstract- Utilization of technology in agricultural systems has been widely used and applied in industrial areas 4.0, with technology in the agricultural sector it will be greatly helped from the beginning of planting until the harvest comes, one of the uses of technology that has been done is the use of creation technology using images taken from above To find out how the conditions of the planted agricultural plants are, whether they are suitable for harvesting or are still waiting for the process to ripen, with the Drone technology, the imaging system will be easier to monitor because with Drone technology, taking pictures that are initially difficult will become easier. The research method used in this research is to use literature review and conduct experiments on drones that will be used in this experiment, with data testing it will produce research that has a high level of validity, the experiment proves that the use of drone technology is very useful for agriculture, especially corn agriculture. The use of Image processing media has indeed been widely used in research in the field of agriculture, but the use of Drone technology is still rarely used because technology is still the latest technology, and is still not widely applied in many agricultural fields. In this research, we will produce a system proposal that will provide the effectiveness of using drones, in image processing that can be used as monitoring and mapping*

on maize farms in Indonesia, with the experimental use of drones, it will be known how the effectiveness is in determining the level of harvest in a certain area. agricultural land.

Keywords-drone, mapping, monitoring, land, corn farming

---

### **E-Voucher System Development for Social Assistance with Blockchain Technology**

Juniardi Akbar\*, Rinaldi Munir

\*Correspondence : [juniardiakbar@gmail.com](mailto:juniardiakbar@gmail.com)

*Abstract- The system of providing social assistance in Indonesia is still far from perfect. One of the problems that will be discussed in this paper is the problem of distributing social assistance. In its implementation in the field, one of the alternative social assistance distribution systems is the electronic voucher system. However, this system still uses a centralized architecture which has several weaknesses, such as the existence of a single point of failure to transaction data that is still stored by one party, giving rise to potential fraud. Therefore blockchain technology is used in an electronic voucher system for social assistance. By using blockchain technology, the electronic voucher system has data with integrity as a form of government accountability.*

Keywords- blockchain, integrity, social assistance, electronic voucher, decentralized system

---

### **Vulnerability Analysis of Wireless LAN Networks Using Penetration Testing Execution Standard: A Case Study of Cafes in Palembang**

Fairuz Zahirah Lidanta\*, Ahmad Almaarif, Avon Budiyo

\*Correspondence : [fairuzahirah@student.telkomuniversity.ac.id](mailto:fairuzahirah@student.telkomuniversity.ac.id)

*Abstract- Currently, Wireless LAN has been widely used in public places, one of which is cafe. Wireless LAN that are increasingly developing still have problems when implementing this network, one of which is security issues. Thus, this study aims to evaluate the security of WLAN networks in cafe. This can be done using the Vulnerability Assessment and Penetration Testing methods. Penetration Testing Execution Standard (PTES) was used as a standard for this experiment. Penetration testing is conducted by simulating several attacks to the network, namely Unauthorized Access Attack, DoS Attack, and Packet Sniffing. The test results showed that WLAN security in each cafe still has vulnerabilities that can be exploited, where these results state that all attacks carried out were successful.*

Keywords- WLAN, PTES, wireless security, vulnerability analysis, penetration testing, security attacks

---

### **Smart Engineering Platform: An Overview of New Engineering Taxonomy**

Kusprasapta Mutijarsa\*, Marco William Langi, Yoanes Bandung, Armein Z R Langi

\*Correspondence : [kusprasapta.mutijarsa@itb.ac.id](mailto:kusprasapta.mutijarsa@itb.ac.id)

*Abstract- This paper presents an engineering taxonomy capable of engineering multi domain systems. Traditional engineering science approaches have succeeded in developing infrastructure,*

products and applications, but this is not enough to answer the complexity of the issues of living in the 21st century. We develop Smart Engineering Platform (SEP), having five dimensions (i) hard, (ii) soft, (iii) liquid, (iv) vapour, and (v) the spatial engineering. These engineering dimensions have resulted in design dan implementation of hardware, software, liquidware, vapourware, and spatialware. Combining these dimensions results in multidomain systems, such as signal processing systems, competitive systems (e.g, product-services-knowledge-value systems PSKV-S), as well as spiritual computing (immersive environments).

Keywords- Engineering, hard-soft-liquid-vapour-spatial ware, competitive systems, PSKV, spiritual computing

---

### **Monthly Rainfall Prediction Using the Facebook Prophet Model for Flood Mitigation in Central Jakarta**

*Andi Sulasikin\**, Yudhistira Nugraha, Juan Intan Kanggrawan, Alex L. Suherman

\*Correspondence : [andisulasikin.jsc@gmail.com](mailto:andisulasikin.jsc@gmail.com)

Abstract- Jakarta has been known as the city where floods are prevalent. As the vital region in Jakarta where the center of government and business are located, Central Jakarta is inseparable from the flood when the rainfall is remarkably high. Therefore, the Jakarta Provincial Government need a data driven policy to facing potential flood that may occur each year to protect the citizen from the threat of flood disaster. Monthly rainfall prediction can be a reference to determine the possibility of considerable loss and damage due to disaster threats. However, at this moment, it is still challenging to find a fitting forecasting model for this context. This paper reports a comparison of three different time series models: Seasonal Autoregressive Integrated Moving Average (SARIMA), Facebook Prophet, and Long Short-Term Memory (LSTM) to forecast monthly rainfall in Central Jakarta for up to two consecutive years. The result indicates that Facebook Prophet, with the lowest Mean Squared Error (MSE) and Root Mean Squared Error (RMSE), is the fittest model to predict the monthly rainfall in Central Jakarta. It shows that a high amount of rainfall will be seen in January and February 2021, which suggests we need to be prepared to anticipate the potential flood. Facebook Prophet shows promising results in supporting data driven policy for flood mitigation in Jakarta. The development of this model in the future can be used as a baseline study to formulate a data-driven policy for flood mitigation in Jakarta.

Keywords- Jakarta, rainfall, forecasting, Facebook Prophet, flood mitigation

---

### **IT Governance Framework for Academic Information System at Higher Education Institutions: A Systematic Literature Review**

*M. Ramaddan Julianti\**, Ford Lumban Gaol, Benny Ranti, Suhono Harso Supangkat

\*Correspondence : [mohammad.julianti@binus.ac.id](mailto:mohammad.julianti@binus.ac.id)

Abstract - Improving the quality of information technologybased higher education institutions is a must to realizing a transparent, accountable and professional education system and refers to the achievement of higher education institutions (HEI) vision. The role of information technology greatly influences the process of HEI governance, so that HEI must have an information system

framework to support ongoing business processes and can be accessed anytime and anywhere by stakeholders who need it. This study aims to analyze the extent to which higher education institutions implement academic information system governance to support information technology-based education services using the COBIT (Control Objectives for Information and Related Technology) framework approach. Using a systematic literature review method, the author will discuss how to manage the integration of academic information systems with IT governance in higher education institution. The expected result of this research is how to know the role of IT governance in achieving better and more effective academic information system performance towards the alignment of strategic business objectives with the implementation of IT in the HEI environment.

Keywords - IT governance, higher education institutions, academic information system, COBIT framework

---

### **Data Privacy in Disaster Situation: A review**

Ade Sutedi\*, Erwin Gunadhi, Deni Heryanto, Ridwan Setiawan

\*Correspondence : [adesutedi@sttgarut.ac.id](mailto:adesutedi@sttgarut.ac.id)

Abstract - Data is a resource that contains facts or evidence such as disaster events. This information can be used to support the disaster management phase. However, privacy and security issues become a concern when personal data information spread arbitrarily which could be easily abused by irresponsible people and produce inaccurate information (hoax) for other people. The urgency of data privacy in disaster situations is a thing that must consider for security, convenience, and common interest. In this study, a brief review was conducted to find gaps in the previous literature and then provided recommendations for handling data privacy in the disaster management process.

Keywords - data, disaster management, disaster situation, privacy, security

---

### **Strategic Planning and Knowledge Management Approaches as input to remote area strategic plans: A Case study in Aru Islands Regency Maluku Province**

Ilona Irena Gutandjala\*, Suhono Harso Supangkat, Ford Lumban Gaol, Benny Rianti

Correspondence : [Ilona.gutandjala@binus.ac.id](mailto:Ilona.gutandjala@binus.ac.id)

Abstract - Knowledge is an important asset in an organization. Aru Islands District is one of the districts in Maluku Province. The Government of Aru Islands District Maluku has a vision and mission as outlined in the Regional Strategic Plan or commonly referred to as RENSTRA. This vision and mission is an activity that requires a policy direction that is planned and integrated with the strategic environment of all related aspects. The strategic plan is then realized with the implementation of the government with regional autonomy which is the modern governance in realizing quality public services, fast, easy, fair and unlimited for the welfare and progress of the region. In this research will be used a strategic approach as input from the analysis with knowledge management and assessment of the condition of Aru district.

*Keywords - smart strategic planning, knowledge management system, knowledge discovery*

---

***The effect of plastic bag ban policy towards waste complaints in Jakarta through JAKI and Qlue***  
*Vicky Feliren, Yudhistira Nugraha\*, Bahrul Ilmi Nasution, Clarissa Febria Finola, Juan Intan Kanggrawan, Alex Lukmanto Suherman*

*\*Correspondence : [yudhistiranugraha@telkomuniversity.ac.id](mailto:yudhistiranugraha@telkomuniversity.ac.id)*

*Abstract - Plastic bag ban policy has been implemented in Jakarta since July 1st, 2020. However, it is still unclear the impact of this policy on Jakarta to reduce waste. The public complaint can be used as a proxy to see how the public responds to the waste reports distributed in Jakarta. This research aims to look at the plastic bag ban policy's significance towards waste complaints through two applications that citizens used to report, JAKI and Qlue. In this study, non-parametric hypothesis testing was performed since the data are not normally distributed. The result shows that North Jakarta did not show any significant differences in the waste reports after the plastic bag ban policy. On the other hand, the rest of the districts show a considerable difference.*

*Keywords - plastic bag ban, waste, hypothesis testing, public complaint, e-government*

---

***Knowledge Management Toward Poverty Reduction***

*Mahfudh Ahmad\*, Harjanto Prabowo, Harco Leslie Hendric Spits Warnars*

*\*Correspondance : [mahfudh@binus.ac.id](mailto:mahfudh@binus.ac.id)*

*Abstract - Knowledge Management (KM) is a very valuable asset and becomes an added value for anyone who owns it. This research is intended to gain a better understanding of the use of KM and eLearning for the purpose of economic development and poverty alleviation. The main question concerns how KM and eLearning can provide information and decision to the policymaker. This question lends itself to a broader discussion of how the creation, communication, and utilization of eLearning and knowledge can increase capacity in Government (competency and productiveness), design and apply planning more knowledge-based, and come up with greater acknowledgment of program implementation (accountability) and help planning, budget allocation, implementing, monitoring social protection programs. Based on our findings, Local governments need assistance and collaboration in dealing with increasing intricacy and unsureness in poverty targeting. We look into how differential scheme of technological change in using KM are turning government work processes in terms of competence and productivity in their results, we sent questionnaire form to 295 districts and we took peer-to-peer interview from 6 districts in Indonesia and in every district, we visit 3 offices which utilizing the unified database. The conclusion of this paper, that KM and eLearning can support governments as a tool for expanding socio-economic development, such as poverty reduction, especially in the case of rotation and mutation of positions, we have found that KM and eLearning system can fill the gap for the new policymaker to continue the social protection program.*

Keywords - governance, ICT, poverty, knowledge, e-learning

---

### **Cluster V : Smart Society and Technology**

#### **Smart Attendance Recording System using RFID and eCertificate using QR Code-based Digital Signature**

*Radiant Victor Imbar\*, Bernard Sutedja, Meliana Christianti*

\*Correspondence : [33220018@mahasiswa.itb.ac.id](mailto:33220018@mahasiswa.itb.ac.id)

*Abstract - Nowadays, the development of Information Technology is growing very rapidly. The term smart is widely used in the field of Information Technology as a smart system such as a smart library, smart campus. There are many components of technology associated with smart campuses, one of which is the Internet of Things. RFID is one of the Internet of Things solutions that will have a positive impact on universities. This paper will discuss how to implement a smart attendance recording system using RFID and integrate the e-Certificate system for organizing activities at Maranatha Christian University, by a QR Code-based digital signature as a guarantee of the authenticity of the e-Certificate generated.*

Keywords - RFID, internet of things, smart campus

---

#### **Hidden Neuron Analysis for Detection Cataract Disease Based on Gray Level Co-occurrence Matrix and Back Propagation Neural Network**

*Tiara Sri Mulati, Fitri Utaminigrum\**

\*Correspondence : [f3\\_ningrum@ub.ac.id](mailto:f3_ningrum@ub.ac.id)

*Abstract - A cataract is a disease when the lens of the eye becomes cloudy. The most common cause of cataracts is the aging process. Several other conditions can cause cataracts in the lens of the eye, such as diabetes and smoking. It will be caused the decreased vision until blindness. Cataracts are the number one cause of blindness in Indonesia and the world. Blindness due to cataracts is relatively high because many sufferers do not know it. Because of that, a system for detecting cataracts is needed for taking further action quickly. The availability of medical officers and equipment is deficient in rural areas. The proposed method is expected to function as a doctor in detecting eye diseases, especially cataracts, to treat patients quickly. The combination of Gray Level Co-occurrence Matrix (GLCM) as feature extraction and Back-propagation Neural Network (BPNN) classification has been proposed. The proposed method uses four features GLCM, which are contrast, homogeneity, correlation, and energy. The angular orientation of GLCM is formed based on four angular directions, namely, 0°, 45°, 90°, and 135°, and distance between pixel uses 1, 2, 3, and 4. The highest accuracy is on 9 hidden neurons, 4 input layers, and 2 output layers with an accuracy of 0.824.*

Keywords - cataract, eye, feature, GLCM, BPNN

---

### **Designing Machine Learning Model for Predictive Maintenance of Railway Vehicle**

Hafid Galih Pratama Putra\*, Suhono Harso Supangkat, I Gusti Bagus Baskara Nugraha, Fadhil Hidayat, Kereta Api Indonesia

\*Correspondence : [23220095@std.stei.itb.ac.id](mailto:23220095@std.stei.itb.ac.id)

*Abstract - Indonesia's geographical layout makes it challenging to create a single united railroad network with many branches. Instead, the railroad operation is divided by location, mainly between large islands such as Java and Sumatra. Therefore, distributing appropriate resources for each operational area is hard to manage properly. Kereta Api Indonesia, which provides rail transportation services, needs to address and change its various business processes to achieve Digital Transformation. Among them, asset maintenance is crucial in railroad operations. This paper will focus on designing machine learning models using actual data available from railway vehicles such as generator trains to predict their condition for maintenance by utilizing classifying algorithms for machine learning, which can help automate routine checks. As a preliminary research paper, testing and evaluation of the machine learning model are not available yet.*

*Keywords - machine learning, predictive maintenance, trains*

---

### **Multilayer Convolutional Parameter Tuning based Classification for Geological Igneous Rocks**

Agus Nursikuwagus\*, Rinaldi Munir, Masayu Leylia Khodra

\*Correspondence : [agus.nursikuwagus@students.itb.ac.id](mailto:agus.nursikuwagus@students.itb.ac.id)

*Abstract - A framework different CNN has been proposed to solve image classification. The power of CNN and the ability to extract demanding features has to be a target for proposed the new ideas. In the geology domain, issues in ascertaining igneous rock from volcanic eruptions often contrast in classification when explored from the location of the rocks. These domain problems must be resolved, contemplating to have consistency and accelerate rock classification. CNN has used to figure out the problem by expanding in multilayer convolution. Besides, parameter tuning has anointed to get the high accuracy to enhance the CNN model. This study has exploited many parameters tuning such as rescaling, cropping, size of inaccurate filter prediction. The exploration has shown that CNN(64,5) achieves a high accuracy of 98.9% and validation carries out accuracy of 81.1%. This study has confirmed that enumerating the tuning parameter on rescaling and cropping does not boost accuracy, even modifying the filter size and stride. Some results have shown still have an inaccuracy class, specifically in the diorite and limestone. The error forecast is 31.7% of 41 predicted diorite images and 30% of 50 predicted limestone images, respectively.*

*Keywords - multilayer, convolutional, tuning, parameters, classification*

---

### **Registration of Land and Building Certificate Ownership using Blockchain Technology**

Aidil Rezjki Suljzta Syawaludin\*, Rinaldi Munir

\*Correspondence : [riskisultan@yahoo.com](mailto:riskisultan@yahoo.com)

*Abstract - Currently, the certificate ownership system in Indonesia is still done manually. The system has weaknesses and loopholes that can be exploited by irresponsible parties. Some examples of problems that may arise are the loss of physical certificates. To overcome this, a land and building certificate ownership recording system is built using blockchain technology. The development of this system aims to reduce the problems that arose in the manual system. The use of blockchain technology is intended to maintain data integrity. The system utilizes one of the main properties of blockchain technology, the anti-tamper properties that maintain data integrity from parties who try to tamper with stored data. The system is decentralized by involving several peers who run the blockchain network. The technology used to build the blockchain network is Hyperledger Fabric. This is a permissioned blockchain, using a consensus method that does not require large computing resources. The developed system facilitates basic processes in the form of certificate ownership transfer transactions through the functional requirements. The system also improves data transparency by providing various information retrieval features. The developed system is tested with various tests to ensure that the functional and non-functional requirements are met. The system built can be used as a system for recording ownership of land and building certificates, as it is able to record ownership of certificates without problems and facilitates checking and the failsafe methods and can reduce problems in the previous system, for example loss of certificates.*

*Keywords - system, blockchain, certificate, technology, data*

---

### **Anomaly Detection Techniques in Smart City: A Review from a Framework Perspective**

*Gardyan Priangga Akbar, Eric Edgari, Bently Edyson, Nunung Nurul Qomariyah\*, Ardimas Andi Purwita*

\*Correspondence : [okyza@stmik-amikbandung.ac.id](mailto:okyza@stmik-amikbandung.ac.id)

*Abstract - A smart city is a notion in which a city may effectively and efficiently manage its resources in order to improve the quality of life of its residents. With the existence of information technology as an enabler, the city is able to carry out sensing, understanding and acting at a certain level. Anomaly detection is a growing field of research in almost all domains, one of which is smart cities. In a smart city, anomaly detection enters into the context of understanding, where the data received, both cyber physical system sensors and user generated content are processed to obtain unusual data that can affect predictions or forecasts. Many studies have been carried out related to anomaly detection methods and techniques related to the smart city environment but have not been categorized according to the domain or framework that is in accordance with the smart city model. This study aims to present the results of a systematic literature review on anomaly detection techniques categorized according to the Garuda Smart City Model, a model designed for smart city development in Indonesia. Based on the results of a systematic literature review, many research gaps have been found for anomaly detection in a smart city environment related to performance limitations, the effect of implementation methods, and the use of anomaly detection as part of the prediction and forecasting methods*

Keywords - Smart City, Anomaly Detection, Outlier Detection, Predictive Analysis

---

### **Comparing Deep Learning-based Architectures for Logo Recognition**

Gardyan Priangga Akbar, Eric Edgari, Bently Edyson, Nunung Nurul Qomariyah\*, Ardimas Andi Purwita

\*Correspondence : [nunung.qomariyah@binus.edu](mailto:nunung.qomariyah@binus.edu)

*Abstract - Logo recognition is a subset of image recognition and has attracted attentions of many researchers due to its specific problem. That is, logo recognition has a wide intra-class and inter-class variability. For example, distinguishing a new edition of a company's logo and the old one falls into a specific problem that is tailored to logo recognition problem. In this paper, we compare three deep learning-based logo recognition architectures, namely Bianco's architecture, AlexNet, and Xception. Bianco's architecture is chosen as a sample of an architecture that includes many preprocessing pipelines including a logo region proposal. Therefore, in this paper, we want to investigate whether Bianco's architecture performs significantly better compared to the others if a logo region proposal is removed. We compare it with other typical deep convolutional neural network architectures such as AlexNet and Xception. Experiments are carried out on the FlickrLogo-32plus, FlickrLogos 27, BrandLogo, and LogoDet-3K. In addition, we also add the curated dataset with hundreds of logo by using Selenium WebDriver. We found out that Bianco's architecture does not significantly perform better compared to AlexNet, and performs worse compared to Xception. There, we conclude that a logo region proposal is an important preprocessing step in logo recognition.*

Keywords - CNN, logo recognition, computer vision, deep learning

---

### **Automation in Financial Reporting by using Predictive Analytics in SAP Analytics Cloud for Gold Mining Industry: a Case Study**

Muhardi Saputra\*, Sabil Nararya

\*Correspondence : [muhardi@telkomuniversity.ac.id](mailto:muhardi@telkomuniversity.ac.id)

*Abstract - To carry out the monitoring process that carried out by the Board of Directors in the Finance division, an ERP dashboard application system is needed to support monitoring carried out by the Board of Directors in each division, especially the Finance division. However, a dashboard must be integrated with the intended data so that it can display data in real time with one environment to meet the needs, effectiveness and efficiency of the company in displaying data in the form of a dashboard. There are also other features needed such as the dashboard that must be accessible from various platforms such as PCs, Tablets, Smartphones, etc. To provide the effectiveness of decision-making from the data that displayed on the dashboard, a predictive analysis feature is needed to make predictions on existing data for analysis which will help in the decision-making process for the future. For this reason, it requires the implementation of SAP Analytics Cloud so that all the functions needed by the company in increasing the effectiveness*

and efficiency of data display can be realized. The implementation process is carried out using the Accelerated SAP method, where this process has 5 main stages, project preparation, business blueprint, realization, final preparation, and go-live and support. The limit of this research is the realization process of the Accelerated SAP method where this process will focus on the SAP Analytics Cloud finance module implementation process

Keywords - ERP, SAP Analytics Cloud, Financial Report, Dashboard, Predictive Analytics

---

### **A Tree-based Mortality Prediction Model of COVID-19 from Routine Blood Samples**

Nunung Nurul Qomariyah\*, Ardimas Andi Purwita, Sri Dhuny Atas Asri, Dimitar Kazakov

\*Correspondence : [nunung.qomariyah@binus.edu](mailto:nunung.qomariyah@binus.edu)

*Abstract - COVID-19 has been declared by The World Health Organization (WHO) a global pandemic in January, 2020. Researchers have been working on formulating the best approach and solutions to cure the disease and help to prevent such pandemics in the future. A lot of efforts have been made to develop a fast and accurate early clinical assessment of the disease. Machine Learning (ML) has proven helpful for research and applications in the health domain as a way to understand real-world phenomena through data analysis. In our experiment, we collected the retrospective blood samples data set from 1,000 COVID-19 patients in Jakarta, Indonesia, from the period of March to December 2020. We report our preliminary findings on the use of common blood test biomarkers in predicting COVID-19 patient mortality. This study took advantage of explainable machine learning to examine the data set. The resulting models lend themselves to human scrutiny and allow clinicians to interpret them and comment on their viability.*

Keywords - routine blood tests, COVID-19, mortality prediction, machine learning, classification, tree-based models

---

### **Spatial Data Infrastructure Integrated With Geospatial Artificial Intelligence : A Systematic Literature Review**

Yudha Setya Nugroho\*, Suhono Harso Supangkat

\*Correspondence : [23220017@mahasiswa.itb.ac.id](mailto:23220017@mahasiswa.itb.ac.id)

*Abstract - In the era of industrial revolution 4.0, artificial intelligence has become a driver in the high technology sustainability. It is important to acceleration of development planning and decision making for stakeholder based on region zone, point of society and distribution an object with system coordinates. The linkage of information and communications technology (ICT) with spatial data, located in the use of data sharing technology, architecture and data dissemination. The availability of spatial data is increasingly numerous and varied requires a high computing technology that users can access and use spatial data from various sources of spatial data providers. Therefore, the Spatial Data Infrastructure (SDI) was built to facilitate access and exchange of spatial data from various sources of spatial data providers, both government and private, which doing an important role in conducted system and platform interoperability as spatial services. The government of Indonesia has made regulation for national spatial data*

infrastructure (NSDI) in Law Of Presidential Number is 27 of 2014 and and strengthened by onemap policy. The advantages using geospatial artificial intelligence (GeoAI) can reduce duplication of spatial data. The systematic literature review process contain of regulation, method for harvesting spatial data in SDI and several GeoAI model research from 2016 to this year. The conclusion in this paper is find possibility ellaborate the artificial intelligence technology with spatial data infrastructure development from past studies in other country.

Keywords - Artificial Intelligence, Information Technology, Spatial Data Infrastructures, Systematic Literature Review

---

### **An Effective Wind Power Prediction using Latent Regression Models**

Benamar Bouyeddou, Fouzi Harrou\*, Ahmed Saidi, Ying Sun

\*Correspondence : [fouzi.harrou1@gmail.com](mailto:fouzi.harrou1@gmail.com)

Abstract - Wind power is considered one of the most promising renewable energies. Efficient prediction of wind power will support in efficiently integrating wind power in the power grid. However, the major challenge in wind power is its high fluctuation and intermittent nature, making it challenging to predict. This paper investigated and compared the performance of two commonly latent variable regression methods, namely principal component regression (PCR) and partial least squares regression (PLSR), for predicting wind power. Actual measurements recorded every 10 minutes from an actual wind turbine are used to demonstrate the prediction precision of the investigated techniques. The result showed that the prediction performances of PCR and PLSR are relatively comparable. The investigated models in this study can represent a helpful tool for model-based anomaly detection in wind turbines.

Keywords - Power prediction, Wind turbine, regression

---

### **WPS: Application for Generating Answer of Word Problem in Bahasa Indonesia**

Vessa Rizky Oktavia\*, Umi Yuhana, Chastine Fatichah

\*Correspondence : [vessango9@gmail.com](mailto:vessango9@gmail.com)

Abstract - In education field, a lot of automation has been carried out, for example an automatic assessment system. For example in math, there is word problem that has higher complexity than algebraic problem. To be able to create an automatic assessment system, it is necessary to have a system that can automatically issue answers to word problems first. This work introduces WPS: Application of Word Problem Solver, a system that will generate an answer for a word problem. This system will give an answer of word problem that user inputs based on the algorithm and rules inside the program. We used corpus built specifically for word problems which have different characteristics for each problem, depending on the type of operator used. The result of this research is an application that can automatically generate an answer from word problem issues by user with accuracy of 82.5%.

Keywords - smart education, software implementation, rapid application development, natural language, programming

---

### **Mobile Collaborator System Application for E-commerce Drugstore**

Tanty oktavia\*, Michael, Ford Lumban Gaol, Takaaki Hosoda

\*Correspondence : [toktavia@binus.edu](mailto:toktavia@binus.edu)

*Abstract - Mostly Drugstores do not have any system that exclusively connect to access E-commerce system because the marketing concept of drugstores still use conventional store to sell their products. According to this situation, this study will propose e-commerce that accomodate drugstore service. For this study, the analysis methodology consists of seeing the most recent business processes in the e-commerce system system and the current situation in drugstore, interviewing the drugstore owner, and doing a literature research. Then, for the drugstore mobile application, create the Unified Modeling Language (UML). The system design is accomplished through the creation of Object-Oriented Detailed Designs in the form of diagrams, databases, and user interfaces. The drugstore mobile application, which includes features such as recommendation product menus, best-selling product menus, promo product menus, transaction cart menus, order tracking menus, order letter menus, and item receive confirmation menus, is the result of this study.*

*Keywords - Keywords—E-Commerce, Drugstore, pharmaceutical, modeling, system, mobile application*

---

### **Maximizing Small Spaces Using Smart Portable Desk for Online Learning Purpose**

Andi Pramono\*, Ida Bagus Ananta Wijaya, Bambang Kartono Kurniawan

\*Correspondence : [andi.pramono@binus.ac.id](mailto:andi.pramono@binus.ac.id)

*Abstract - Limited land needs in the urban area result in a two-storey house and vertical housing method to solve the city's residents needs. To maximize the space remaining in the house and apartment by placing multifunction furniture to accommodate user activities. The pandemic in early 2020 forced almost everyone to work from home, including lecturers, to give distance learning. Thus, it needs a portable desk that can move from one place to somewhere else at home and be inserted in some parts of the house without building additional space. The methodology in this research departs from an existing movable desk in the office that simplified its shape for home use. Furthermore, supplementing a survey on SOD lecturer of BINUS University to improve the design results on the table. Results of the research can be used for all lecturers who use a particular desk for distance learning purpose.*

*Keywords - small spaces, portable desk, smart furniture, online learning*

---

### **Analysis Of Shopping Intention Using E-Commerce During Pandemic**

Tanty oktavia\*, Ford Lumban Gaol, Takaaki Hosoda, Alessandro Bryan Wijaya, Fendy Tio, Liza Azzahra Malaysiani, Sandi Sanjaya, Yessin Rio Martin

\*Correspondence : [toktavia@binus.edu](mailto:toktavia@binus.edu)

*Abstract - This study aims to investigate people's shopping intentions using e-commerce during the pandemic in Indonesia. The method used in this research is the quantitative method in which the results of the study are used as an assumption and research discussion. Data collection was carried out by questionnaires then measure using t-test. The result can be concluded that the intention to shop using e-commerce during the COVID-19 pandemic is influenced using e-commerce features and e-commerce techniques. These results indicate that the intention to shop using e-commerce can increase if the availability of goods in e-commerce is quite complete, the quality of goods sold is very high, normal prices and technical requirement, such as speed, security, and a good e-commerce design system.*

*Keywords - Shopping Intentions, E-Commerce, COVID-19 Pandemic*

---

### **Recreating Traditional Indonesian Batik with Neural Style Transfer in AI Artistry**

*Michael Joseph, Jeconiah Richard, Calvin S. Halim, Rowin Faadhilah, Nunung Nurul Qomariyah\**

*\*Correspondence : [nunung.qomariyah@binus.edu](mailto:nunung.qomariyah@binus.edu)*

*Abstract - Style transfer is a method of combining two images into one, taking reference of one of the image's styles and the other image's content. Convolutional neural networks have been applied to this method to produce what is known as neural style transfer. Using VGG-Network, the artificial system was able to recreate artistic images by combining different content and style. However research regarding the effects of different models and optimization to the quality of the image produced are limited. The aim of this experiment is to compare between the VGG19 and VGG16. We use data and results from Leon A. Gatys to compare between two different models which are VGG19, and VGG16 in terms of content loss and style loss. This architecture is also applied to the more focal style of Batik in this research to experiment the effects of a dominant color and pattern on another image. With Indonesia's rich culture and its diverse art portfolio, it is only natural that this paper explore neural style transfer's effects on the creative pattern forming of Batik.*

*Keywords - Style transfer, CNN, Deep Learning, Computer Vision, Artificial Intelligence, Batik*

---

### **A Knowledge Growing System-based Decision Making-Support System Application for Forces Command and Control in Military Operations**

*Arwin Datumaya Wahyudi Sumari\*, Krista Bella Dwi Rahayu Nur Widyasari, Vivin Ayu Lestari*

*\*Correspondence : [arwin.sumari@polinema.ac.id](mailto:arwin.sumari@polinema.ac.id)*

*Abstract - Decision-making in Commanding and Controlling (C2) of forces in a Military Operations (MILOPS) is a complex and tiring task, especially it requires a sustainable cognitive activity where the safety of the soldiers and the success of the mission objective are the primary consideration. In this research, we have developed a new Cognitive Artificial Intelligence (CAI)-based application for supporting the commander in carrying out C2 in a MILOPS. The core of the application is Knowledge Growing System (KGS) with ASSA2010 information-inferencing method that computes the three MILOPS primary parameters, namely Weather, Field, and Enemy (WFE). The*

computation results are the most probable route for delivering the forces considering the conditions of the WFE. The results of the test show that the Knowledge Growing System-based Decision Making-Support System for MILOPS (KGS-DMSSMILOPS) application has successfully worked properly.

Keywords - ASSA2010, cognitive, Command and Control, Decision-Making Support System, Knowledge Growing System, Military Operations

---

### **Implementation of the IoT-Based Electrical Quantity Monitoring System at the Electrical Installation Laboratory, Metal Industry Polytechnic of Morowali**

Fachrur Razy Rahman\*, Ayu Latifah, Moh. Afandy, Mohammad Wirandi, Muh. Fahim Azhari

\*Correspondence : [fauzyrahmanpilm@kemenperin.go.id](mailto:fauzyrahmanpilm@kemenperin.go.id)

Abstract - This study aims to determine the value of electrical quantities in the form of voltage, current, power factor, power, and frequency of resistive loads and inductive loads on single-phase power lines in real-time and accurately at the Electrical Installation Laboratory, Metal Industry Polytechnic of Morowali. This research is made in the form of a prototype of an electric quantity monitoring system that can be obtained in real-time using IoT devices. This research uses several IoT devices, such as the Node MCU ESP8266, PZEM004T sensor, Liquid Crystal Display (LCD) & I2C Interface, as well as internet services in the form of think speak as an interface for IoT-based monitoring results. After doing the testing and analysis, then the magnitude of the voltage, current, power factor, power, and frequency at the electrical load of 2 100 W lamps, 2 75 W lamps, 2 9 W lamps, and 2 750 W induction motors respectively are 226.83 V, 14.6693 A, 0.33, 1.103 kW, and 50.13 Hz. The error between the results of monitoring and measurement is 0.046% at 19.00 WITA and 0.11% at 22.00 WITA. Thus the prototype monitoring system can be implemented in the Electrical Installation Laboratory, Metal Industry Polytechnic of Morowali.

Keywords - voltage, current, power factor, power, frequency, IoT, Node MCU ESP8266, PZEM004T sensor, Liquid Crystal Display (LCD), I2C Interface, Thinkspeak.

---

### **Implementation of Secure Parking Based on Cyber-Physical System using One-time Password Gong et al. Scheme to Overcome Replay Attack**

Hannyfah Dzaikra Syahla, Dion Ogi\*

\*Correspondence : [dion.ogi@poltekssn.ac.id](mailto:dion.ogi@poltekssn.ac.id)

Abstract - Cyber-Physical System (CPS) plays a role in industry 4.0 for monitoring, processing, and manipulate real objects. The development of CPS affects various aspects of human life in application services such as smart parking. Smart parking shares the same characteristic as CPS which are using the internet, sensors, actuators, and aggregators in system management. This interconnection of the cyber world and physical world poses a dangerous security challenge because it can affect data confidentiality, data integrity due to replay attacks that modify data, and the availability of parking service data is disrupted due to service failures that stop data from being sent. In this paper, we propose a prototype secure parking system based on a cyber-physical

system using a Raspberry Pi 3 Model B+ that implements an authentication scheme a one-time password developed by Gong et al. which is proven to overcome replay attacks.

Keywords - CPS, One-time Password, Replay Attack, Smart Parking.

---

### **Smart Government using Digital Twin in Japan**

Hilmi Aulawi\*, Essy Karundeng, Wahyu Andriyas Kurniawan, Yosep Septiana, Ayu Latifah

\*Correspondence : [hilmi\\_aulawi@sttgarut.ac.id](mailto:hilmi_aulawi@sttgarut.ac.id)

*Abstract - This study aims to identify e-commerce problems during the Covid-19 pandemic as a basis for providing recommendations for improving e-commerce services. The methods used in this research are Naïve Bayes Classifier (NBC), Text Association, and Focus Group Discussion (FGD). The NBC method is used to classify consumer sentiment, while the Text Association is to find the relationship between words. The data source used is consumer reviews submitted on Twitter for the period January-April 2021. The FGD method is used to classify the results of the Text Association into service marketing mix elements, identify root causes using Fishbone Diagrams and develop recommendations for improvement. The respondents involved in the FGD were e-commerce experts representing practitioners and academics. The result of the improvement recommendation is: educating sellers always to provide accurate product specification information and implementing quality control; increasing mutually beneficial cooperation with logistics service providers, especially concerning service commitments and cutting shipping costs; improve information disclosure of promotional events; improve the refund procedure; optimization of multichannel e-commerce software; increase accuracy in the process of selecting and verifying prospective seller data; improve transaction process monitoring; optimizing the application of a reward and punishment system based on consumer reviews.*

Keywords - e-commerce, fishbone diagram, focus group discussion, naïve bayes classifier, text association

---

### **Cluster VI : Citizen Science for Smart Society**

#### **The Smart Mobility Insight of Bus Rapid Transit (BRT) PurwokertoPurbalingga Ridership Trans Jateng**

Dwi Mustika Kusumawardani, Yudha Saintika\*, Fauzan Romadlon

\*Correspondence : [yudha@ittelkom-pwt.ac.id](mailto:yudha@ittelkom-pwt.ac.id)

*Abstract - The rapid development of technology presents a new paradigm, one of which is in the transportation sector. The concept of smart mobility is one of the components in the realization of a smart city, which is closely related to the transportation sector. The Purwokerto-Purbalingga Bus Rapid Transit (BRT) is the government's effort to encourage the transportation sector towards smart mobility. It requires three crucial categories: accessibility, sustainability, and communication and information technology. This study proves and explains that these three categories can be fulfilled by the Purwokerto- Purbalingga Bus Rapid Transit, especially from women's perception, indicated by an average accessibility score of 4.04, sustainability of 4.22,*

and Information and Communication Technology of 3.80. Efforts that can be taken by the government and Bus Rapid Transit managers include monitoring and evaluating bus stops and bus arrival frequencies as well as developing mobile-based applications that provide real-time information related to bus rapid transit.

Keyword - Smart Mobility, Smart City, Bus Rapid Transit, Transportation

---

### **Mapping-Based Using Geographic Information Systems for Smart Transportation**

Leni Fitriani\*, Sinta Dianti, Dede Kurniadi, Asri Mulyani, Ridwan Setiawan

\*Correspondence : [leni.fitriani@sttgarut.ac.id](mailto:leni.fitriani@sttgarut.ac.id)

*Abstract - In everyday life, transportation plays an essential role in human activities. Smart transportation is expected to help the community with traffic information and carry out public transportation tracking. The purpose of this paper is to design a mapping system that can track the position of public vehicles using a Global Positioning System device based on a geographic information system. The methodology used to achieve the objectives of this paper is the Unified Software Development Process with stages starting from the analysis model, design model, deployment model, implementation model, and testing model, which in this paper is limited to the design model stage. This paper aims to map public transport routes based on geographic information systems, which can help the public or newcomers find information about operating public transport routes.*

Keyword - Geographic Information System, Global Positioning System, Mapping, Smart Transportation

---

### **Gamification System Design and Implementation on the Kewirus Launchpad Startup Educational Platform**

Salma Fedora\*

\*Correspondence : [salma.fedora@gmail.com](mailto:salma.fedora@gmail.com)

*Abstract - Startup has been a business phenomenon that has gotten special attention in the public eyes. However, lack of knowledge represents one of the main reasons why many startups fail. For that reason, Kewirus, an educational technology-based startup that helps in developing entrepreneurship, provides a platform called Kewirus Launchpad to support its users to learn about startups via online courses. Yet, some users find the given material hard to understand and boring, which reduces interest and motivation to continue studying. Apart from that, users find that Kewirus Launchpad is confusing to use. To improve interest and engagement, gamification is applied. Using user-centered- design (UCD) methodology, the gamification in the forms of Tutorial, Reward, Narrative, Quest, along with Leaderboard & Badge on Launchpad indicates that can improve learnability, motivation, and users' comfort in using Launchpad.*

Keywords - gamification, kewirus launchpad, motivation, learnability

---

## **Prototype Development of Onboard Training Monitoring System for Merchant Marine Polytechnic Students**

Akhmad Kasan Gupron\*, Rizqiya W. Saputra, Putri Rizkiah

\*Correspondence : [akqufron2005@gmail.com](mailto:akqufron2005@gmail.com)

*Abstract - Indonesia has many huge challenges in maritime sector as it rank second after Canada as a country that has the longest coastline in the world. The challenges are not only in terms of economic and socio-culture, development and implementation of related technology, or the development of human resources itself but also include all community aspect in country. Merchant Marine Polytechnic Malahayati Aceh is a an educational institution under the Ministry of Transportation of Indonesia which is tasked with educating and training of maritime affairs. Onboard Training is as an educational activity outside the campus by participating in national and international sailing. The role of educational institutions in monitoring the activities of cadets when practicing outside the campus environment is currently being neglected by many factors. This Research are intending to explore the problems appear during training process, from the preparation and registration section, onboard section and after training. The purpose of the research is providing collage the information of cadets during onboard training and reducing knowledge gap between collage and maritime industry with monitoring system application.*

*Keywords - Maritime Engineering, Maritime Education, Maritime Technology*

---

## **Gamification in the Learning Community for Culinary Basics Course at Higher Education**

Winanti\*

\*Correspondence : [winanti@binus.ac.id](mailto:winanti@binus.ac.id)

*Abstract - This paper discusses basic culinary learning in universities using gamification techniques. The learning objectives are carried out to improve maximum learning outcomes, create a sense of pleasure and joy (satisfaction), and increase motivation. Although the author realizes that gamification is not the only learning technique that must be applied. The success of learning can be influenced by various factors including the internal factors of students and lecturers which until now have become the most important factors. Apart from the curriculum, social environment, and methods used, gamification is an alternative to produce maximum value, satisfaction, and motivation. The gamification technique is done by dividing students into several groups, each group consisting of 4 to 6 students. Each half-semester group is given learning by conventional methods and the next half-semester is given learning by gamification. Both will be evaluated through the results of the assessment in the form of statistics. The results obtained by using gamification on average have 10 to 20 points better than conventional methods. Students and lecturers become satisfied, motivated and get maximum test scores and hey become more creative and innovative due to direct student involvement and fast interaction between lecturers and students.*

Keywords - gamification, education, Culinary basic course

---

### **Eye Movement Detection using Histogram Oriented Gradient and K-Nearest Neighbors**

Imam Faris, Fitri Utaminingrum\*

\*Correspondence : [f3\\_ningrum@ub.ac.id](mailto:f3_ningrum@ub.ac.id)

*Abstract - Hand defects will hinder human activities in interacting. In general, people with hand defects will replace the function of the hand with doing an activity in other organs, such as the feet, head, or eyes. Eye movement technologies have been used for different purposes in various industries, from medical, gaming, controlling display menu to assistive technology for people with disabilities. The development of new technologies focused on disability is vital as it improves the quality of life and incorporation into society. Therefore, eye movement detection can later be developed to select menus from the LCD screen. Detection of eye movements is divided into four classes, namely looking up, down, left, and right. The menu on the LCD screen contains options of activities such as calling the nurse, choosing a food menu, and going to the toilet, making it easier for nurses to understand the user's activities. This system is made using Histogram Oriented Gradient combining with Haar Cascade for eye detection and K-Nearest Neighbors as a classifier. Finally, this work shows that the KNN can be used to classify with an average accuracy of 83.33%.*

Keywords - Eye movement, HOG, KNN

---

### **Blended Learning Platform: A Requirement Analysis**

Sabam Parjuangan\*, Meliyanti Meliyanti,

\*Correspondence : [33220021@std.stei.itb.ac.id](mailto:33220021@std.stei.itb.ac.id)

*Abstract - Learning during the pandemic and during the application of new habits in the context of implementing learning that implements the protocol for preventing the spread of Covid-19 has unique and uncertain needs. Unique means that the learning process has special characteristics from pre-pandemic learning. Meanwhile, the meaning of "non-permanent" is a learning process that changes in learning planning, implementation, and evaluation. This causes the need for new innovations in learning platforms that are able to accommodate this unique and variable learning. This article provides an analysis of the requirements of a blended learning platform. Where changes in dynamic forms of learning give rise to various needs in learning. The method used is the survey, and analysis of responses of respondents using user story quality (USQ). The results found in this study are presented in the form of a table containing the item requirements for developing a blended learning platform.*

Keywords- User Story Quality, Blended Learning Platform, Post Covid-19, Requirements, Learning Process

---

### **E-Business Startup: “Universia” As University Collaborator System**

Tanty oktavia\*, Kaslie, Ford Lumban Gaol, Takaaki Hosoda

\*Correspondence :[toktavia@binus.edu](mailto:toktavia@binus.edu)

*Abstract -According to Covid 19 pandemic every process has to shifting to collaborate with digital technology. One of the field that pushes to shift is Education field. Undergraduate education level, is one of many strategies to improve people competency. In Indonesia, the number of people has steadily increased. However, they have to improve their level of competency to compete with their competitor. According to this condition, many prospective student difficult to find information that their need to decide a place to study. There are many consideration factors that will involved in this decision. Therefore, in this research will build university collaborator system that can support analysis from prospective student perspective to choose education institution. To build this business design this study involve some analysis such as industrial competition will be using Porter Five Force’s and supported by Business Model Canvas to define Universia's business model, as well as financial projections for the next seven years. According to the Porter Five Forces model, the information services market around universities still has a lot of room for new entrants. The results of the business model canvas analysis show that, despite being a newcomer to the sector, Universia has a number of value propositions that its competitors do not. Universia's product will be generated in the web based application. The application will be designed using Object Oriented Analysis and Design (OOAD) in conjunction with the Extreme Programming approach, which includes steps such as planning, designing, coding, and testing. The result of this study is a system collaborator that can be bridge between prospective student and university, so the prospective student can easily find the information that their need to choose university.*

*Keywords - E-Business Startup, Business model Canvas, Collaborator, Information Services*

---

### **Viloc: An Android Mobile App Used for Indoor-Trapped Victim Location Visualization**

Farrel Fatah Muhammad Atiq\*, Yoanes Bandung

\*Correspondence :[18216043@std.stei.itb.ac.id](mailto:18216043@std.stei.itb.ac.id)

*Abstract - In cases of disasters, such as earthquakes or fires occurring in urban or industrial areas, it is often to find conditions that trap victims in buildings. Under these conditions, the process of tracking and finding victims becomes critical. However, currently available solutions to find trapped victims still have several limitations, particularly the capabilities, accessibilities, and availabilities of supporting tools. This limitation raises the need for a new solution to support rescue teams by quickly, accurately, and intuitively providing location information of victims. Viloc is a native Android mobile application aimed to assist rescue teams in finding indoor- trapped victims. To achieve this goal, Viloc requires to receive, manage, process, and visualize data quickly, precisely, and intuitively. Based on the scope of its functionalities, Viloc as a system comprises three modules: Cloud Server module, Mobile Application, and Data Processing & Visualization. Functional and performance testing shows that Viloc has successfully*

executed all its functionalities and met the specified performance specifications. In addition, the usability testing gave results as follows: 96.67% completion rate, 98.18% overall relative efficiency, and 87.46% user satisfaction rate.

Keywords - cloud sever, mobile app, data processing, data

---

### **Developing an Application to Hire a Private Tutor Using Scrum Method**

*Evelin\**, Ryan Vieri Kwa, Suclinton, Maria Susan Anggreainy

\*Correspondence : [evelin002@binus.ac.id](mailto:evelin002@binus.ac.id)

*Abstract - "Education is an essential factor in this era. Many parents want their kids to be well educated. There has been an increasing demand for hiring a private tutor in most developing and developed countries in these past several years. Since the demand for a private tutor is increasing, finding a private tutor has been a challenge. So, to tackle that challenge, we decided to build an application to help people find and hire the best private tutor. To build this application, we decided to use the scrum methodology rather than the traditional waterfall model. Since the scrum method offers some advantages that can help us speed the process of building this application, the result of this paper will be an application that can be used to hire a private tutor."*

Keywords - scrum, sprint, education, agile, waterfall

---

### **Schizophrenia Detection Based on Electroencephalogram Using Support Vector Machine**

Ivan Kurnia Laksono, Elly Matul Imah\*

\*Correspondence : [ellymatul@unesa.ac.id](mailto:ellymatul@unesa.ac.id)

*Abstract - Schizophrenia is a mental disorder caused by genetic factors and brain chemical factors. This disease requires early treatment. One way to detect schizophrenia is to use an electroencephalogram (EEG). An EEG is a device used to record signals generated by the brain's electrical activity. This study was conducted on detecting Schizophrenia brain disorders based on EEG signals using the Alexnet Convolutional Neural Network (CNN) algorithm with SVM. CNN is a popular algorithm and state-of-the-art in machine learning, and SVM is still the baseline for comparing the proposed new methods. The dataset used in the study was taken from 32 normal subjects and 49 schizophrenic subjects. The data consisted of 3072 features. The test results show SVM has better performance than CNN, with a maximum accuracy of SVM 0.792 in comparison with CNN accuracy is 0.76. The fastest training time is SVM 0.5 seconds while CNN is 88 seconds, CNN training time is longer because CNN performs convolution calculations on five layers.*

Keywords - Support Vector Machine, Convolutional Neural Network, Electroencephalogram, Schizophrenia.

---

### **Prototype of Home Power Monitoring Tool for Electrical Outlet Using ESP32**

*Firdaus Jonathan\**, *Tri Wahyu Oktaviana Putri*

\*Correspondence : [firdaus1711200@itpln.ac.id](mailto:firdaus1711200@itpln.ac.id)

*Abstract - The use of electricity is increasing from year to year especially during the Covid-19 pandemic where more people are likely to work from home. It will affect the electricity bill. In order to reduce the electric cost in home sector, people must save the electrical usage. The problem is they do not know what equipment or activities in which the electrical outlet consumes more than the other outlets or which outlet is less efficient even though the electrical equipment in that outlet do not need the high power. Thus, the measuring tool of home power monitoring for electrical outlet was designed and prototyped based on internet of things using ESP32. The monitoring results can be seen online through website which gives the data of voltage, current, power, and power factor. The prototype is capable enough for measuring those electrical values which gave the average of relative error is under 20% compared to the measurement using Fluke Clamp-meter by testing non-linear loads or current household loads. The usage of this prototype makes it easier for the home electricity sector to find out which outlet uses the most power than the others.*

*Keywords - ESP32, Internet of Things, Power Monitor, Electricity*

---

### **Cluster VII : Data Processing**

#### **Knowledge Management System Analysis of Smart Regency Mobile-Apps Service with Software Usability Measurement Inventory (SUMI) Approach**

*Aang Kisnu Darmawan\**, *Mohammad Bhanu Setyawan*, *Adi Fajaryanto Cobantoro*, *Fauzan Masykur*, *Anwari*, *Tony Yulianto*

\*Correspondence : [ak.darmawan@gmail.com](mailto:ak.darmawan@gmail.com)

*Abstract- In the Indonesian context, the number of districts is four times the number of cities, so regency development needs serious attention. However, there are still very few studies that explore districts' existence from the perspective of ICT utility governance. This study aims to measure the mobile-based smart regency information system through usability evaluation. The method applies to the adoption of the life cycle of the Knowledge Management System (KM) Model, and Evaluation are the stages used. The measures taken include system analysis, application mapping knowledge, implementation results, and usability assessment. The questionnaire was conducted on ten respondents using the mobile-based smart regency application. The questionnaire was conducted in 5 categories: Effectiveness, Efficiency, Control, Support, and Simplicity. Each of 10 questions, so there are 60 questions and three linkers, namely 4 if all agree, 2 if they don't know, and 0 don't agree. The Median SUMI Scale results for the mobile-based Smart Regency applications are 60, 62.5, 60, 60, and 57.5. The usability evaluation results above the average mean that the mobile-based smart regency information system's usability is in a good category. This research helps in determining knowledge management in mobile smart regency services. The study also provides insight into the factors*

*affecting the success of knowledge management of smart regency services for application developers and policymakers.*

*Keywords- knowledge management system, smart regency, mobile apps, software usability measurement inventory (SUMI)*

---

***When Homecoming is not Coming: 2021 Homecoming Ban Sentiment Analysis on Twitter Data Using Support Vector Machine Algorithm***

*Lidia Sandra\*, Ford Lumbagaol*

*\*Correspondence : [sandra\\_lidia@yahoo.com](mailto:sandra_lidia@yahoo.com)*

*Abstract- Homecoming, more traditionally known as Mudik, has become a trending topic on several social media platforms as soon as the 11-day homecoming ritual ban was announced on 7 April 2021. Opinions, varying from those in favor of and against the ban, start to rapidly appear. Twitter, a social media platform which is now considered to be an extension of oneself and often used to express ones' opinion, has become flooded with comments on the homecoming ritual ban. The swarm of opinions in the form of tweets were then used as a dataset for sentiment analysis in order to understand how people perceive the ban. The algorithm used in this research is the classification algorithm using the Support Vector Machine method. The dataset was classified into three sentiments: positive, negative, and neutral. The use of the Support Vector Machine algorithm yielded a 62% accuracy with this dataset. The sentiment analysis showed that the keyword "mudik" had a neutral sentiment for the most part. Meanwhile, results of engagement analysis show that the largest forms of engagements were retweets and liking tweets that had a neutral sentiment. When the neutral sentiment was removed, we found that the largest sentiment on the homecoming ritual ban was negative. This is likely due to the release of an addendum to the Covid-19 Handling Task Force Circular Number 13 of 2021 on 22 April 2021 that imposes more restrictions on and extends the effective dates of the restrictions related to the homecoming ritual ban; exactly one day before the data scraping of 5000 datasets on tweets from 23 April 2021 was carried out. The researcher had already sampled the tweets with the most engagements (those with the most retweets and likes). It was found that some tweets had a negative sentiment, but the model classified it as having a neutral sentiment. This may be affected by inaccuracies of dataset training as some of the tweets were in Malay rather than Indonesian. A challenge that needs to be overcome is the limited number of datasets for NLP training or sentiment analysis for the Indonesian language in comparison to that of the English language. On the other hand, this has become an opportunity for the researcher to develop a more appropriate training model.*

*Keywords- Twitter Sentiment Analysis, Homecoming, Support Vector Machine*

---

### **An Overview of Fractal Processing of Noise-Like Auditory Signals**

Armein Z. R. Langi\*, Marco William Langi, Kusprasapta Mutijarsa, Yoanes Bandung

\*Correspondence : [azr.langi@gmail.com](mailto:azr.langi@gmail.com)

*Abstract- This paper presents an overview of fractal signal processing for characterizing noise-like auditory signals. Fractal processing is particularly effective for signals exhibiting a kind of self-similarity property. This paper identifies four aspects of signals that may have such a property: (i) signal sets, (ii) signal spectra, (iii) signal measures, and (iv) signal sources. We describe a self-similar characterization of each aspect, and discuss their applicability in processing noise-like signals, especially for intended respiratory pre-screening applications.*

*Keywords- Self-similar, fractal processing, auditory, noise-like, pre-screening*

---

### **A Signal-Size Estimator Based on Correlation-Dimension For Auditory Signals**

Marco William Langi, Kusprasapta Mutijarsa, Yoanes Bandung, Armein Z R Langi\*

\*Correspondence : [azr.langi@gmail.com](mailto:azr.langi@gmail.com)

*Abstract- This paper presents an estimator of fractal signal sizes based on correlation fractal dimension as applied to auditory signals. Correlation fractal dimension has been proposed for characterization of signals coming from chaotic sources. Practical estimations are made possible using a Takens algorithm, producing different estimates in each embedding dimension. The estimator consists of four processes: (i) signal measures creation, (ii) covering-counting, (iii) critical-exponent estimation, and (iv) size calculation. We study the resulting estimates of controlled signals to validate the estimator as well as to come up with a calibration scheme. The paper further discusses a possible application of fractal sizes to characterize coughs to identify the presence of respiratory diseases, such as in Covid-19 pre-screening.*

*Keywords- Correlation dimension, Takens embedding dimension, signal sizes, auditory signals.*

---

### **A Fractal Characterization of Cough Signals for Covid-19 Pre-Screening Applications**

Yoanes Bandung\*, Marco William Langi, Kusprasapta Mutijarsa, Armein Z R Langi

\*Correspondence : [ybandung@gmail.com](mailto:ybandung@gmail.com)

*Abstract- This paper presents a correlation fractal dimension characterization as applied to auditory cough signals. We have obtained cough samples from person with and without Covid-19 disease. Our hypothesis is coughs coming from Covid-19 disease exhibit fractal behavior. To show this, we apply fractal-size measurements on both samples. Preliminary results confirm fractality on Covid-19 cough signals. This result can improve performance of pre-screening for identification the presence respiratory diseases, such as Covid-19.*

*Keywords-Correlation dimension, embedding dimension, coughs, respiratory, pre-screening*

---

### **Development of Information Retrieval Method and Haversine Formula to Determine Clinic Recommendation in Jember**

Fadhel Akhmad Hizham\*, Raden Venantius Hari Ginardi

\*Correspondence : [hizhamfadhel@gmail.com](mailto:hizhamfadhel@gmail.com)

*Abstract- Clinic is a facility where people seek treatment and obtain medical advice and a place where medical students observe cases of illness suffered by patients. Currently, the presence of the Corona Virus (COVID-19) has made many clinics accommodate patients who have been exposed to the virus. From these cases, recommendations for determining the clinic are needed because the conditions are very emergency and positive cases are increasing every day. In this paper, information retrieval methods are added, namely the TF-IDF and BM25 methods to determine clinical recommendations in Jember based on keyword from users and sorted by similarity from the largest to the smallest. Meanwhile, the Haversine Formula method is used to select a clinic with a distance.*

*Keywords- Haversine Formula, information retrieval, Okapi BM25, recommendation system, TF-IDF*

---

### **Student Study Timeline Prediction Model Using Naïve Bayes Based Forward Selection Feature**

Fitri Nuraeni\*, Yoga Handoko Agustin, Sri Rahayu, Dede Kurniadi, Yosep Septiana, Sri Mulya Lestari

\*Correspondence : [fitri.nuraeni@sttgarut.ac.id](mailto:fitri.nuraeni@sttgarut.ac.id)

*Abstract- The student study period is one of the factors that show a student's academic performance. Universities are required to be able to keep students able to complete their studies on time so that there is no buildup of the number of students who have not graduated. Therefore, from the academic data students conducted data mining classification using naïve Bayes algorithm. But because of the many attributes, to speed up this naïve Bayes modeler, it is supported by the selection of the forward selection feature. In the Selection process, the feature generates 5 selected attributes that affect the dataset. While from this classification process obtained the accuracy value of the prediction model naïve Bayes increased from 90.00% to 92.94% after adding a forward selection feature. With this high accuracy score, prediction models can be applied in policymaking to prevent students from graduating on time.*

*Keywords- accuracy, Naïve Bayes, study period, forward selection*

---

### **Comparison of SMOTE Sampling Based Algorithm on Imbalanced Data for Classification of New Student Admissions**

Yoga Handoko Agustin\*, Fitri Nuraeni, Dede Kurniadi, Yosep Septiana, Asri Mulyani, Wiyoga Baswardono

\*Correspondence : [yoga.handoko@sttgarut.ac.id](mailto:yoga.handoko@sttgarut.ac.id)

*Abstract- One of the efforts to get quality students is through selection. The selection process must be balanced with a strategy so that the selected students are truly qualified. Classification*

techniques can be used to see the history of new student admissions who are accepted with the student's lecture history. There are many classification algorithms that can be used, so comparisons need to be made to see the best performance of the algorithm. The classification algorithm used is Decision Tree C4.5, K-Nearest Neighbor, Naïve Bayes and Neural Network. The data used are 546 records in the imbalanced data category. So we need the Smote algorithm to make the data balanced so as not to result in misclassification. The classification results were tested using the Confusion Matrix, ROC and Geometric Mean (G-Mean) as well as a T-Test. The comparison results show that the best performance is on the K-Nearest Neighbor algorithm with an accuracy value of 84.99%, AUC of 0.700, G-Mean 62.95% and the T-test produces a significant difference from other algorithms.

Keywords- Comparison, Classification, Imbalanced Data, SMOTE, New Student Admission

---

### **Investigation of In-home Augmented Reality assisted Rehabilitation Therapies for Disabled Patient**

Iwin Thanakumar Joseph S\*, Karunakaran V, Benson Edwin Raj S, Leela Jancy P

\*Correspondence : [iwinjoseph@karunya.edu](mailto:iwinjoseph@karunya.edu)

*Abstract- Rehabilitation process is highly monotonous and uninspired among the patients which in turn pretend to use such methods. To overcome these limitations in the traditional methods of the rehabilitation process, Augmented Reality (AR) is introduced in this field. AR provides comfortable experience in handling the applications for both patients and medical therapists. This research article provides complete insight into AR technology in various rehabilitation applications, its major design and deployment challenges. It also highlights the major concentration of adapting AR methodologies in clinical practices for in-home usage by the patients in a convenient manner.*

Keywords- Augmented Reality, Rehabilitation, Cognitive Rehabilitation, Physical Rehabilitation.

---

### **COBY: COVID-19 Telegram Chatbot by Employing Machine Learning**

Muhammad Naufaldi, Sunny Jovita, Christensen Mario Frans, Muhammad Lukman Ismail Hanafi, Nunung Nurul Qomariyah\*

\*Correspondence : [nunung.qomariyah@binus.edu](mailto:nunung.qomariyah@binus.edu)

*Abstract- COVID-19 pandemic has been one of the biggest concerns nowadays. People always curious and ask for immediate responses regarding the current situation. The chatbot can be very useful in this kind of situation which allows the system to understand text, which means it can respond appropriately. In order to be able to return the correct responses, the chatbot needs to learn how to classify the text data input from the users. In this paper, we study three different machine learning algorithms to work on text classification problems, namely Naive Bayes, Neural Network, and Support Vector Machine (SVM). An experiment was carried out to study which machine learning algorithms produce the most accurate responses when they are implemented in the Artificial Intelligence (AI) chatbot systems. In order to make sure the tests are consistent and fair, we conducted the experiment on the same dataset, and assessed the accuracy of their*

respective responses. In addition, we have also successfully implemented each of these algorithms as chatbots on a social media platform, Telegram.

Keywords- AI, Chatbot, Natural Language Processing, Text Classification, Support Vector Machine, Neural Network, Naive Bayes, COVID-19.

---

### **Short Message Service Filtering with Natural Language Processing in Indonesian Language**

Vincentius Gabriel Tandra, Yowen, Ravel Tanjung, William Lucianto Santoso, Nunung Nurul Qomariyah\*

\*Correspondence : [nunung.qomariyah@binus.edu](mailto:nunung.qomariyah@binus.edu)

*Abstract-* As the amount of spam on messaging platforms such as emails have increased, the same has happened within Short Message Service (SMS) services as well. Within this study, Natural Language Processing was used on SMS in Indonesian Language (Bahasa), to create an Artificial Intelligence (AI) model capable of distinguishing between spam and other types of messages that are not spam. Within this study, we compared the performance of the Multinomial Naive Bayes Classifier and the Bi-Directional LSTM algorithm. We demonstrated this using code written in Python and the TensorFlow and Scikit libraries to generate reports, graphs and an application to test the performance of the models. Our results reveal that these methods are effective in filtering Bahasa Indonesia spam within SMS inboxes. In addition, we also published the SMS dataset in Bahasa with this paper.

Keywords- SMS, Spam, OTP, Oversampling, Natural Language Processing, Indonesian Language

---

### **Morphological Preprocessing for Low-Resolution Face Recognition using Common Space**

Ghali Marzani\*, Nanik Suciati, Shintami Chusnul Hidayati

\*Correspondence : [ghaliayik@gmail.com](mailto:ghaliayik@gmail.com)

*Abstract-* There are many researches on face recognition, but most have not produced satisfactory results on very low-resolution images. This study proposes the use of morphological preprocessing to improve the performance of common space approach for face recognition on low-resolution images. The morphological preprocessing consists of Top-Hat and Bottom-Hat Transformations, which capable of extracting small elements and handling uneven lighting on images. The k-Nearest Neighbor is used to recognize the face by measuring the distance of deep CNN features of low and high-resolution images in the common space. Experiment on the Yale Face dataset shows that the use of Morphological Preprocessing can increase the face recognition accuracy by 14.59%, 1.00%, and 2.50% for low-resolution images with sizes 24x24, 36x35, and 56x56, respectively.

Keywords- face recognition, low-resolution, preprocessing, morphological

---

### **Evaluating Deep Learning for CT Scan COVID-19 Automatic Detection**

Aimee Putri Hartono\*, Callista Roselynn, Clarissa Angelita Indriyani, Claudia Rachel Wijaya, Nunung Nurul Qomariyah, Ardimas Andi Purwita

\*Correspondence : [aimee.hartono@binus.ac.id](mailto:aimee.hartono@binus.ac.id)

*Abstract-* Aside from Reverse Transcription Polymerase Chain Reaction (RT-PCR), another common method to check for the 2019 novel Coronavirus disease (COVID-19) is by using a chest CT scan. Imaging data is profoundly useful in the diagnosis, detection of complications, and prognostication of COVID-19, displaying various spots in the lungs affected by the viral infection. The complex results often require some time before radiologists can analyze them and are more prone to human errors. Inventions of medical assisting tools, through enhancement of artificial intelligence, are crucial in fighting the COVID-19 pandemic through automation of classifications and the future of medicine. To overcome the above challenges, this paper aims to propose and evaluate the performance between Convolution Neural Network (CNN) and Transfer Learning (TL) in the detection of COVID-19 infections from a Lung CT Scan. Gradient-Weighted Class Activation Mapping (Grad-CAM) will also be utilized to display the infected areas in the lungs for explorative experiments. Transfer-learning using our pre-trained model resulted in a detection accuracy result of 89% while our proposed CNN demonstrated the best result in terms of classification accuracy at 97%. Training time required for the two frameworks are 12 and 22 minutes respectively. By and large, our comparison of using the CNN model versus the pre-trained model gives rise to the conclusion that using the former method proves to be a more effective technique of COVID-19 detection by CT-scan.

*Keywords-* COVID-19, deep learning, artificial intelligence, machine learning, convolution neural network, transfer learning, gradient weighted class activation mapping

---

### **Optimized Gaussian Process Regression by Bayesian Optimization to Forecast COVID-19 Spread in India and Brazil: A Comparative Study**

Yasminah Alali, Fouzi Harrou\*, Ying Sun

\*Correspondence : [fouzi.harrou1@gmail.com](mailto:fouzi.harrou1@gmail.com)

*Abstract-* (WHO) reported around 45,951 confirmed cases and 817 deaths of COVID-19 in India. This virus has been determined as a global pandemic by WHO in India, and 64,903 confirmed cases and 1,839 deaths in Brazil. Accurate forecast of COVID-19 cases has become a crucial task in the decision-making of hospital managers to optimally manage the available resources and staff. In this study, the Gaussian process regression (GPR) model tuned by Bayesian optimization (BO) was used to forecast the recovered and confirmed COVID-19 cases in two highly impacted countries, India and Brazil. Specifically, the BO algorithm is employed to find the optimal hyperparameters of the GPR model to improve the forecasting quality. We compared the performance of the Optimized GPR with 14 models, including Support vector regression with different kernels, GPR with different kernels, Boosted trees, and Bagged trees. We also applied the BO to the other investigated predictors to maximize their forecasting accuracy. Three statistical criteria are used for the comparison. The daily records of confirmed and recovered cases from Brazil and India are

adopted in this study. Results reveal the high performance of the GPR models compared to the other models.

Keywords - COVID-19, deep learning, artificial intelligence, machine learning, convolution neural network, transfer learning, gradient weighted class activation mapping

---

### **Predicting COVID-19 Spread using Simple Time-Series Statistical Models**

Badriya Khayyat, Fouzi Harrou\*, Ying Sun

\*Correspondence : [fouzi.harrou1@gmail.com](mailto:fouzi.harrou1@gmail.com)

*Abstract- Accurate and timely forecasts of new COVID-19 cases and recoveries would assist in the management of medical resources and bolster public policy formulation during the current pandemic. This study aims to forecast records of confirmed time-series data using simple time series models. Importantly, to predict COVID-19 data of limited size, the performance of statistical time series models, including Linear Regression (LR) and Exponential Smoothing (ES), was investigated. The daily records of confirmed and recovered cases from Saudi Arabia, India, and France were adopted to train and test the investigated models. The forecasting accuracy has been assessed based on three commonly used statistical indicators. Results reveal that the LR model did not forecast COVID-19 time-series data successfully. On the other hand, the ES model showed a promising forecasting performance for both recovered and confirmed times-series data. Furthermore, results showed that ES outperformed the Decision Tree regression and support vector regression with linear kernel.*

Keywords - COVID-19, time series forecasting, data-driven model, exponential smoothing, SVR, Decision Tree.

---

### **Detection of railroad anomalies using machine learning approach**

Ade Chandra Nugraha\*, Santi Sundari, Suhono Harso Supangkat, I Gusti Bagus Baskara Nugraha, Sumarni Sumarni

\*Correspondence : [adechandra.jtk@gmail.com](mailto:adechandra.jtk@gmail.com)

*Abstract - A level crossing is an intersection where a railway line crosses a road or path. The government has made regulation that set level crossings throughout Indonesia, Provisions on traffic and road transport in Law No. 22 of 2009. However, data from PT Kereta Api Indonesia (KAI) shows that during 2020 there was 198 accidents and around 5000 trespasses occurred at level crossings. The surveillance system currently used in level crossings is still conventional, which only relies on supervisory officers and some level crossings monitored by CCTV. Research in the field of video surveillance systems with a computer vision approach has been widely carried out in the past decade. Most researches on video surveillance systems try to replace human functions or traditional systems with video processing algorithms. This paper will review the literature on the application of artificial intelligence for the surveillance system level crossings published from 2015 to 2021. The literature review process consists of analyzing the document to determine the scope of the investigation using intelligent video surveillance systems, frameworks, methods and datasets to detect level crossing violators. In the conclusion of this paper, it will be explained*

*about the challenges and opportunities of research on the object detected violations using intelligent video surveillance system in the future.*

*Keywords - pro-active maintenance, anomaly detection, machine learning, prediction*

---

### ***Image Classification Using TensorFlow GPU***

*Derrick Yeboah\*, Mahamat Saleh Adoum Sanoussi, George K. Agordzo*

*\*Correspondence : [derrick.yeb@gmail.com](mailto:derrick.yeb@gmail.com)*

*Abstract - There are several image classification and a complicated methods that are been overlooked with many articles. This article reviews the latest practices, issues, and options for billing classification. Emphasis is placed on synthesizing important advanced category strategies and targeting strategies that can be used to improve ranking accuracy. Billing sorting is a classic problem in image processing, computer vision, and machine learning. In this article, we study deep learning-based image classification using the TensorFlow GPU. Because the datasets were bridges; CIFAR-10 and MNIST FASHION for the classification module. The results show the efficiency and accuracy of deep learning-based image classification using the TensorFlow GPU. Additionally, some critical issues are mentioned that affect overall performance. However, simple research is needed to identify and reduce uncertainties in the image processing chain to improve classification accuracy.*

*Keywords - Tensorflow GPU, Image Classifications, CNN, Feature Extraction*

---



**8<sup>TH</sup> INTERNATIONAL CONFERENCE ON ICT FOR SMART SOCIETY**  
“Digital Twin For Smart Society”

Sponsored by:



Supported by:



Bandung Institute of Technology, Indonesia

ICISS Secretariat

School of Electrical Engineering and Informatics

Achmad Backrie Building, 3rd Floor. Institut Teknologi Bandung

Jl. Ganesha 10 Bandung 40132 Indonesia

[www.iciss.goesmart.id](http://www.iciss.goesmart.id)