THE IEEE CYBERNETICSCOM 2022

2022 IEEE International Conference on Cybernetics and Computational Intelligence

PROGRAM BOOK

IEEE International Conference on Cybernetics and Computational Intelligence

June, 16-18 2022, in Malang, Indonesia

ORGANIZED BY :

IEEE
INDONESIA SECTION

IEEE
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The Indonesia Section
Systems, Man, and Cybernetics Society Chapter

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CYBERNETICSCOM 2022

CyberneticsCom is the flagship conference of the IEEE Indonesia Section. This scientific conference is often referred to as IEEE CyberneticsCom. This conference is a major international forum for Scientists, Researchers, Engineers, and practitioners interested in the study, analysis, design, modeling, and implementation. Implementation in Cybernetics, Machine Systems, Computational Intelligence, Science and Engineering Systems both theoretically and practically in various fields of application. IEEE CyberneticsCom is an agenda that is not always routinely carried out every year, so it is necessary to make this reputable conference regularly to accommodate researchers, academics, and practitioners in publishing research results.

The last CyberneticsCom has reached its fifth agenda where this event was successfully held in Banda Aceh, Indonesia, in 2019. Previously, this reputable scientific conference had inked gold on the previous year's event, namely: the 4th CyberneticsCom in 2017 in Phuket Thailand, the 3rd CyberneticsCom in 2016 in Makassar, Indonesia, the 2nd CyberneticsCom in 2013 in Yogyakarta Indonesia, and the first CyberneticsCom in Bali Indonesia in 2012.

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Welcome Message from General Chair of CYBERNETICSOM 2022

Greetings from Malang, Indonesia!

On behalf of the IEEE Indonesia Section, we would like to extend our warmest welcome to all keynote speakers, presenters, and participants at the 6th IEEE International Conference on Cybernetics and Computational Intelligence 2022 (IEEE CyberneticsCom 2022). CyberneticsCom is the flagship conference of the IEEE Indonesia Section. This scientific conference is often referred to as IEEE CyberneticsCom. This conference is a major international forum for Scientists, Researchers, Engineers, and practitioners interested in the study, analysis, design, modeling, and implementation. Implementation in Cybernetics, Machine Systems, Computational Intelligence, Science and Engineering Systems theoretically and practically in various fields of application. The 6th IEEE CyberneticsCom 2022 is organized by Institut Teknologi Telkom Purwokerto (ITTP), supported by the IEEE The Indonesia Section Computer Society Chapter (TISCSC) and IEEE SMC Indonesia Chapter and co-host Universitas Brawijaya and Universitas Widyagama Malang. Due to the COVID-19 pandemic, it will be held as a virtual event.

IEEE Indonesia Section has conducted many activities for over 30 years in Indonesia. The IEEE Indonesia section has a good and mutual relationship with ICT organizations, Industries, governments, universities, and the Community in Indonesia. As the six years of CyberneticsCom, this conference shows its sustainability due to the hard work of the conference organizers, well-organized conference, and high-quality papers. We hope that some high-quality conferences will be continued and strengthened shortly. Therefore, the result will benefit and positively impact human beings, especially Indonesian people.

The core purpose of IEEE is to foster technological innovation and excellence for the benefit of humanity. We believe that this conference will bring researchers, academicians, scientists, students, engineers, and practitioners together to participate and present their latest research findings, developments, and applications related to the various aspects of the current state of technology and the outcome of ongoing research in the area of

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Cybernetics, Human-Machine Systems, Systems Science and Engineering, Computational Intelligence, Data Science, and Artificial Intelligence.

Despite the challenges, the 6th IEEE International Conference on Cybernetics and Computational Intelligence 2022 Organizing Committee and volunteers worked very hard to complete the conference program, uphold the quality of conferences, and meet the authors' expectations. IEEE CyberneticsCom 2022 aims to address the current state of technology and the outcome of ongoing research in Cybernetics, Human-Machine Systems, Systems Science and Engineering, Computational Intelligence, Data Science, and Artificial Intelligence.

I hope you all find this conference highly engaging, fruitful, and beneficial for your Fuerteventura. Your support will also make this a memorable and successful event. We wish you to stay safe, healthy, and productive.

We are looking forward to your contributions and participation.

Thank you.
Dr. Arfianto Fahmi, M.T
General Chair

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Program at Glance

Day 1: Thursday, June 16th 2022	
Time	Activity
09.00-09.10	Opening
09.10-09.25	Indonesia Raya
09.25-09.35	Welcoming speech
09.35-09.45	Welcoming speech
09.45-09.55	Welcoming speech
09.55-10.25	Keynote 1
10.25-11.55	Keynote 2
11.05-12.35	Parallel session 1
12.35-13.05	Break (video)
13.05-15.20	Parallel session 2

Day 2 : Friday, June 17th 2022	
Time	Activity
08.00-08.05	Opening
08.05-08.35	Keynote 3
08.35-10.45	Parallel session 3
10.45-10.55	Awarding (best paper & best presenter & best reviewer)
10.55-11.00	Closing ceremony

Day 3 : Saturday, June 18th 2022	
Time	Activity
09:00-10:00	Networking

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Keynote Speaker
Prof. Mario Köppen
(Kyushu Institute of Technology, Japan)

Mario Köppen was born in 1964. He studied physics at the Humboldt-University of Berlin and received his master degree in solid state physics in 1991. Afterwards, he worked as scientific assistant at the Central Institute for Cybernetics and Information Processing in Berlin and changed his main research interests to image processing and neural networks. From 1992 to 2006, he was working with the Fraunhofer Institute for Production Systems and Design Technology. He continued his works on the industrial applications of image processing, pattern recognition, and soft computing, esp. evolutionary computation. During this period, he achieved the doctoral degree at the Technical University Berlin with his thesis works: "Development of an intelligent image processing system by using soft computing" with honors. He has published more than 150 peer-reviewed papers in conference proceedings, journals and books and was active in the organization of various conferences as chair or member of the program committee, incl. the WSC on-line conference series on Soft Computing in Industrial Applications, and the HIS conference series on Hybrid Intelligent Systems. He is founding member of the World Federation of Soft Computing, and also Associate Editor of the Applied Soft Computing journal. In 2006, he became JSPS fellow at the Kyushu Institute of Technology in Japan, and in 2008 Professor at the Network Design and Reserach Center (NDRC) and 2013 Professor at the Graduate School of Creative Informatics of the Kyushu Institute of Technology, where he is conducting now research in the fields of multi-objective and relational optimization, digital convergence and multimodal content management.

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Keynote Speakers
Dr. Jemy V. Confido
(PT. Telkom Indonesia)

• **TELKOM CORPORATE UNIVERSITY, TELKOM**, Bandung, Indonesia, September 2020 –Now Senior General Manager: Leading the corporate university of Telkom Group which includes preparing the organisation transformation to become Indonesia Telecommunication and Digital Research Institute (ITDRI) which functions as digital hub with three pillars: talent development (learning), innovation and research that serves both Telkom Group and the 12 State Owned Enterprise clusters.

• **GROUP CORPORATE TRANSFORMATION, TELKOM,** Jakarta, Indonesia, March 2020 – September 2020 Transformation Program Leader: Led and coordinated digital transformation within Telkom Group which covers product portfolio, business and operating model, organization and people development and also prepared IT B2B service capability across Telkom Group.

• **METRAPLASA, SUBSIDIARY OF TELKOM,** Jakarta, Indonesia, April 2018 – July 2020 Chief Executive Officer: Led and managed the e-commerce company to transform and rebound from deep loss to recover its performance and strengthen the business to also include B2B and O2O by leveraging synergy with Telkom Group and SOEs and partnership with enterprises and MSMEs.

• **BOARD OF COMMISSIONER, PRAMINDO IKAT NUSANTARA (PINS),** Jakarta, Indonesia, April 2016 – July 2018 Member of BOC: Supervised, advised and coached PINS business operation and its senior leaders including the Board of Director members.

• **MARKETING SUB DIRECTORATE, CONSUMER DIRECTORATE, TELKOM**, Jakarta, Indonesia, January 2013 – March 2018 Vice President of Marketing Management (previously Marketing and Sales): Managed overall marketing and sales strategy, which includes market research and analysis, brand strategy, product pricing, sales and channel as well as marketing promotion and activation both offline (conventional) and online (digital).

• **BOARD OF COMMISSIONER, METRA DIGITAL MEDIA (MDM)**, Jakarta, Indonesia, October 2014 – December 2015 Member of BOC and continued as President Commissioner until March 2016: Supervised, advised and coached MDM business operation and its senior leaders including the Board of Director members.

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Keynote Speakers
Assoc. Prof. Mahardhika Pratama
(University of South Australia, Australia)

Assoc. Prof. Mahardhika Pratama is an associate research professor and enterprise fellow in AI (Continuing Level D). Prior to that, He was an assistant professor at School of CSE, Nanyang Technological University, Singapore from 2017. His research interest encompasses continual learning, data stream mining, fuzzy machine learning, intelligent control system where he has excellent publication track record in top publication venues such as AAAI, SIGKDD, CIKM, ICDM, SDM, IEEE TCYB, IEEE TNNLS and IEEE TFS. He has led a special issue on autonomous machine learning (AML) in Information Sciences and a workshop on AML in ICDM 2019. Dr. Pratama currently serves as an associate editor in numerous top journals: IEEE TFS, Information Sciences, Knowledge-based Systems, Evolving Systems, Complexity, Journal of Control and Decision as well as an editor in-chief of International Journal of Business Intelligence and Data Mining. He was a program chair of INNS BDDL 2019 and a local chair of ICBK 2019. During his career, Dr. Pratama has secured up to $3 millions in research funding. He has graduated 7 PhD students to completion in timely fashion and 6 postdoctoral research fellows. Because of his excellent research work, he received IEEE TFS prestigious publication award in 2019 and Amity researcher award in data streams in 2019. Last but not least, this achievement is attained only seven years after Dr. Pratama obtained his PhD from UNSW in 2014.

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CCI-0105 : Technical Session Cybernetics, Computational Intelligence
Parallel Session 1 (Room 1)
Thursday, June 16th 2022
(11:05 – 12:35)

Code Session : CCI-0105
Title Session : Cybernetics, Computational Intelligence

Start	Finish	Papers	Authors
11:20	11:35	A Comparative Analysis of Deep Learning Models for Detecting Malaria Disease through LBP Features	Nona Zarima, Kahlil Muchtar and Akhyar Bintang (Universitas Syiah Kuala, Indonesia); Maulisa Oktiana (Syiah Kuala University, Indonesia); Novi Maulina (Universitas Syiah Kuala, Indonesia)
11:35	11:50	Designing TehNusa Mobile Based Application Using Design Sprint Method	Dinda Maylan Setianti, Daffa Raihan Zaki, Aditya Ammar Pradana and Gita Fadila Fitriana (Institut Teknologi Telkom Purwokerto, Indonesia)
11:50	12:05	Lane Keeping Control Using Nonlinear Model Predictive Control on Constant Speed Autonomous Car	Muhammad Azis Satria (Institut Teknologi Sepuluh Nopember, Indonesia); Katherin Indriawati (Institut Teknologi Sepuluh Nopember Surabaya & Faculty of Industrial Technology, Indonesia); Bambang W (Institut Teknologi 10 Nopember, Indonesia); Akhmad Ibnu Hija (Institut Teknologi Sepuluh Nopember & Engineering Physics Departement, Indonesia); Hendro Nurhadi (Institut Teknologi Sepuluh Nopember (ITS) Surabaya, Indonesia)

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12:05	12:20	Clustering Analysis of Bangla News Articles with TF-IDF & CV Using Mini-Batch KMeans and K-Means	Sakib Al Hasan and Wang Ruiqin (Huzhou University, China); Md Gulzar Hussain (Green University of Bangladesh, Bangladesh & Changzhou University, China)
12:20	12:35	Customer Clustering Based on RFM Features Using K-Means Algorithm	Wafa Essayem (University of Brawijaya & Intelligent System Laboratory, Indonesia); Fitra A. Bachtiar (Brawijaya University, Indonesia); Diah Priharsari (Universitas Brawijaya, Indonesia)

11:20 A Comparative Analysis of Deep Learning Models for Detecting Malaria Disease through LBP Features

Nona Zarima, Kahlil Muchtar and Akhyar Bintang (Universitas Syiah Kuala, Indonesia); Maulisa Oktiana (Syiah Kuala University, Indonesia); Novi Maulina (Universitas Syiah Kuala, Indonesia)

Malaria is a parasitic infection spread by the plasmodium parasite. Malaria continues to be a major threat to world health, with an estimated 200 million cases and over 400,000 fatalities each year. When exposed to this disease, symptoms develop 10-15 days after the parasite enters the body. This disease becomes chronic if it isnot treated medically, and it eventually leads to death. Using spatial information collected from microscopic images, several techniques based on image processing and machine learning have been utilized to diagnosemalaria. Using the Local Binary Pattern (LBP) texture feature as a feature extraction approach, this study contributes to the development of a predictive and high-accuracy deep learning model by testing multiple Deep Learning models and determining which model delivers the best accuracy. To be specific, we tested frequently used baseline methods, namely ResNet34, VGG16, Inception V3, and EfficientNet. The results demonstrate that EfficientNet has a 91 percent outstanding accuracy rate, compared to 87 percent for VGG16, 81 percent for Resnet34, and 77 percent for InceptionV3, respectively.

11:35 Designing TehNusa Mobile Based Application Using Design Sprint Method

Dinda Maylan Setianti, Daffa Raihan Zaki, Aditya Ammar Pradana and Gita Fadila Fitriana (Institut Teknologi Telkom Purwokerto, Indonesia)

Indonesia is a country where most of the population work in the agricultural and plantation sectors. Both sectors are significant for the economy of Indonesia because it contributes to the increase in Gross Domestic Product (GDP). Such as the tea plantation sub-sector, which is one of the export commodities in Indonesia. However, several problems occur to the tea farmers in Indonesia. These problems influence decreasing in tea quality and farmers' welfare in Indonesia. For that reason, TehNusa is created to help solve the issues. TehNusa can be utilized to buy and sell harvested or processed tea. Another hand, TehNusa also has other functions to develop the quality and ability of the community in caring for and managing processed tea. Another side, BUMDes will play a role by managing and developing village prospects and tea farmers to minimize gaps. The design of the TehNusa application is created using the design sprint methodology and for the design validation, we're using the system usability scale methodology. The design of the TehNusa application can be made within 40 working hours, and the test result of design validation gets a conclusion of 81 points or equivalent to grade B. The TehNusa application is rated by users as being able to help make it easier to solve problems. In addition, further research needs to be carried out to determine the implementation of making applications and building business cooperation with BUMDes in Indonesian villages that have skilled farmers and have the potential to become processed tea producers.

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11:50 Lane Keeping Control Using Nonlinear Model Predictive Control on Constant Speed Autonomous Car

Muhammad Azis Satria (Institut Teknologi Sepuluh Nopember, Indonesia); Katherin Indriawati (Institut Teknologi Sepuluh Nopember Surabaya & Faculty of Industrial Technology, Indonesia); Bambang W (Institut Teknologi 10 Nopember, Indonesia); Akhmad Ibnu Hija (Institut Teknologi Sepuluh Nopember & Engineering Physics Departement, Indonesia); Hendro Nurhadi (Institut Teknologi Sepuluh Nopember (ITS) Surabaya, Indonesia)

Lane keeping controller drives vehicle's steering to keep the vehicle driving on the track. This paper discusses lane control on a prototype autonomous car that moves at constant speed, using a nonlinear predictive control (MPC) model which is used to calculate the optimal steering angle based on lateral deviation information. The predictive lateral deviations are obtained from the linear parameter varying (LPV) model while the current lateral deviation value is obtained from the lane detection algorithm which produces a reference trajectory for the car. The lane detection uses image processing towards images captured by the camera. The real time experiment result shows that the proposed controller could keep the prototype to stay on track until the curvature of 0.27 m-1 with the maximum lateral deviation of 8.86 cm.

12:05 Clustering Analysis of Bangla News Articles with TF-IDF & CV Using Mini-Batch KMeans and K-Means

Sakib Al Hasan and Wang Ruiqin (Huzhou University, China); Md Gulzar Hussain (Green University of Bangladesh, Bangladesh & Changzhou University, China)

Document clustering is the compilation of documents relating to textual content into classes or clusters. The primary objective is to group the documents that are internally logical but substantially different from each other. It is a vital method used in the retrieval of information, extraction of information and organization of records. Around 210 million people worldwide speak Bangla as a first or second language. With the passage of time, these computer-assisted approaches were also used in the Bangla language. However, not enough paper has represented the current state of research in Bangla Document Clustering. The ultimate aim of this thesis is to

achieve the objective of testing K-Means clustering and Mini-Batch K-Means clustering algorithms and analysing the performance with silhouette score and homogeneity score of these algorithms for Bangla news text data. The findings shows that for clustering Bangla text news articles TF-IDF improves the clustering performances of both K-Mean and Mini-Batch K-Mean algorithms.

12:20 Customer Clustering Based on RFM Features Using K-Means Algorithm

Wafa Essayem (University of Brawijaya & Intelligent System Laboratory, Indonesia); Fitra A. Bachtiar (Brawijaya University, Indonesia); Diah Priharsari (Universitas Brawijaya, Indonesia)

Offering targeted products and services to customers is the key driver to a successful business. In recent years and with the simplified access and gathering of data, companies are adjusting their marketing strategies to retain and attract new customers. One of the methods organizations adopt, is customer clustering. Customer clustering, as part of Customer Relationship Management, is useful when companies wish to offer services, discounts and targeted advertising campaigns to specific customers based on their preferences. One of the techniques widely used in this task is RFM based clustering using K-Means clustering algorithm. The clusters obtained by the algorithm will then be further analyzed to set marketing strategies. In this research we will cluster customers of a retail store based on RFM features using K-Means clustering algorithm. For the task, we used the available POS data of the store. Clusters obtained were analyzed using Silhouette analysis technique and compared to observations in the retail store. We found that one of the clusters indicated possible customer churn while another showed potential loyal customers. These clusters can be used to set special marketing strategies to retain and win back customers.

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Code Session : HMS-0105
Title Session   : Human Machine System

Start	Finish	Papers	Authors
11:20	11:35	Increase Customer Value Optimization (CVO) Impact on Purchase Intention in Ecommerce	Erwin Halim (Bina Nusantara University & School of Information Systems, Indonesia); Gunaputra Wardhana (Binus University, Indonesia); Agung Sasangko (Bina Nusantara University, Indonesia)
11:35	11:50	Correlation of Relationship Business Model and Business Strategy: Case Study PT Telkom IoT	Sifa Novwidia Agni (University of Indonesia, Indonesia)
11:50	12:05	User Experience Evaluation Using Integration of Remote Usability Testing and Usability Evaluation Questionnaire Method	Ajeng F Rahmawati, Tenia Wahyuningrum and Ariq Cahya Wardhana (Institut Teknologi Telkom Purwokerto, Indonesia); Anindita Septiarini (Universitas Mulawarman, Indonesia); Lasmedi Afuan (Jenderal Soedirman University, Indonesia)
12:05	12:20	User Experience Analysis on e-Wallet Using a Combination of Heuristic Evaluation and UMUX	Havinda Rosita Faradina, Tenia Wahyuningrum and Novian Adi Prasetyo (Institut Teknologi Telkom Purwokerto, Indonesia)
12:20	12:35	Utilizing Topic Modelling in Customer Product Review for Classifying Baby Product	Lay Acheadeth (West Jakarta, Indonesia, NA & Binus University, Cambodia); Nunung Nurul

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			Qomariyah (Bina Nusantara University Jakarta, Indonesia); Misa Xirinda (Bina Nusantara, West Jakarta, Indonesia, Mozambique)

11:20 Increase Customer Value Optimization (CVO) Impact on Purchase Intention in Ecommerce

Erwin Halim (Bina Nusantara University & School of Information Systems, Indonesia); Gunaputra Wardhana (Binus University, Indonesia); Agung Sasangko (Bina Nusantara University, Indonesia)

In general, this research influenced the increasing use of e-commerce as a medium of buying and selling, especially during the COVID-19 pandemic, where social restrictions have prevented many offline stores from operating. Because many offline stores today migrate to online stores without paying attention to these variables, they experience stagnation and difficulties in selling and will even fail in selling online. Because of that, the sellers need to organize Customer Value Optimization (CVO) so that online stores can operate optimally to create customer purchase intention and repurchase. This study uses a systematic literature review for writing and modeling. It complements with a purposive sampling method by collecting questionnaire data, as many as 137 data on 22-24 April 2022 in Indonesia's Jabodetabek area. This study discusses the importance of variables in buying and selling in e-commerce, such as Seller Attribute, Product Attribute, Review, Customer Trust, and Purchase Intention. This research used Structural Equation Modelling (SEM) with Smart-PLS as a statistical tool. A model will approve with six hypotheses found to have a significant impact approved with seven variables. The result shows that one hypothesis is not significant compared with previous research.

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11:35 Correlation of Relationship Business Model and Business Strategy: Case Study PT Telkom IoT

Sifa Novwidia Agni (University of Indonesia, Indonesia)

PT TELKOM is part of the IoT ecosystem that provides IoT services as well as network operation and connection. The success of PT TELKOM's business strategy can be seen in the business model it has. However, the relationship between the business model and business strategy is not yet clearly known. The results of the questionnaire are then processed by methods of analyzing factors and canonical correlations to see the dominating factors of the business model and business strategy and see the relationship between the two variables. Then using the SWOT method to provide strategic recommendations to the company. item X13 at value proportion X23 on the value network and X41 in value architecture is the dominant item reflected in the business dimension of this model. items Y12 on UNFOLD Y21 and Y22 on Coordinate, Y33 on Communicate, Y42 on Control, and Y52 on Recognize and Develop are the dominant items reflected in the business strategy dimension and also show there is a relationship between business model and business strategy with a canonical correlation of 87.886%. The results of matrix analysis I-E, then developed using SWOT analysis, where the results obtained that the company in Quadrant I. namely the strengths owned by the company are better than existing weaknesses, and the company still has wider opportunities or opportunities than the threat to be faced

11:50 User Experience Evaluation Using Integration of Remote Usability Testing and Usability Evaluation Questionnaire Method

Ajeng F Rahmawati, Tenia Wahyuningrum and Ariq Cahya Wardhana (Institut Teknologi Telkom Purwokerto, Indonesia); Anindita Septiarini (Universitas Mulawarman, Indonesia); Lasmedi Afuan (Jenderal Soedirman University, Indonesia)

Innovation Center Innovation System (Sinovi) is a website developed to manage the collection of innovation and HAKI owned by the ITTP academic community. Based on the results of initial observations made by interviewing the Center for Innovation and HAKI, although it has been done twice socialization of website use, there are still complaints and obstacles experienced by users. Based on these problems, the researchers conducted

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research on evaluating the user experience (UX) of the Sinovi website. This study aims to determine the system's performance based on user experience. The UX evaluation process uses moderated remote usability testing methods and user experience questionnaires (UEQ). The study's results using moderated usability testing showed a significant difference in completion rate between the two groups of users, with each group having values of 0.9560 and 0.8235. While the results of time-based efficiency tests showed that the average time-based efficiency between group A and group B has similarities with the values obtained, respectively are 0.1652 and 0.1259. The test results using UEQ show that the Sinovi website has managed to get a positive evaluation. Several categories were successfully obtained, including the "Attractiveness" category with a score of 1,967, the "Perspicuity" category with a score of 1,850, the "Efficiency" category with a score of 2,042, the "Dependability" category with a score of 1,825, and the "Stimulation" category with a score of 1,742. The overall user experience evaluation results show that Sinovi's website is already at a good user experience level but needs to improve to reduce the number of problems.

12:05 User Experience Analysis on e-Wallet Using a Combination of Heuristic Evaluation and UMUX

Havinda Rosita Faradina, Tenia Wahyuningrum and Novian Adi Prasetyo
(Institut Teknologi Telkom Purwokerto, Indonesia)

User satisfaction as a part of usability is important to measure as a recommendation for further design improvements on e-wallets. Usability is the level of ease of users in using the interface on a system. Usability can be measured using expert judgment or user testing. One of the techniques in usability measurement that can be is Heuristic Evaluation (measured by the expert) and Usability Metric for User Experience or as known as UMUX (measured by user). Heuristic Evaluation is an interface evaluation process that aims to measure an interface's usability, efficiency, and effectiveness based on ten heuristic rules. Meanwhile, UMUX is a short-level instrument method or rating level used to collect quantitative user data about the usability of an application. Therefore, the combination of expert judgment and user assessment will provide rich and complementary findings. In this study, we used "CARDS" as the research object. "CARDS" is a digital card application or e-wallet used to pay bills, top-up card balances, online stores,

and Payment Point Online Banks. Educational institutions can use "CARDS" as student and staff/teacher/employee identity cards integrated with digital payment systems, easy and safe. This study aims to improve the quality of service to users of the "CARDS" application by testing the user experience. The result shows that the UMUX score is not equal to 74, so it is necessary to make improvements, with recommendations from experts by the Heuristic Evaluation method based on the lowest assessment score, namely the Consistency and Standards category.

12:20 Utilizing Topic Modelling in Customer Product Review for Classifying Baby Product

Lay Acheadeth (West Jakarta, Indonesia, NA & Binus University, Cambodia); Nunung NurulQomariyah (Bina Nusantara University Jakarta, Indonesia); Misa Xirinda (Bina Nusantara,West Jakarta, Indonesia, Mozambique)

E-commerce is growing at a breakneck pace. As a result, online shopping has increased, which has resulted in an increase in online product reviews. Often, we come across Amazon products with thousands of reviews, and if we look closely we discover that some of them are completely unrelated to the product. In this study, we conducted a research on how product review classification can assist in resolving the issue of comments on incorrect items. The method used in this research consists of 4 steps which are, data acquisition, data pre-processing, topic modelling, and text classification. Where LDA was used as our topic modelling technique, and for text classification we used Support Vector Machine (SVM), Logistic Regression, and Multi-Layer Perceptron (MLP) classifiers. We found out that by combining both topic modelling and text classification, a powerful tool for handling this kind of problem was developed. Adding the topic modelling can improve the model's accuracy performance from 0.61 to 0.78. So, we can conclude that the topic modelling was useful in classifying the product reviews.

SSE-0105: Technical Session System Science and Engineering
Parallel Session 1 (Room 3)
Thursday, June 16th 2022
(11:05 – 12:35)

Code Session : SSE-0105
Title Session   : System Science and Engineering

Start	Finish	Papers	Authors
11:20	11:35	Cybersecurity Maturity Assessment Design Using NIST CSF, CIS CONTROLS v8 and ISO/IEC 27002	Ivan Bashofi (University of Indonesia, Indonesia); Muhammad Salman (Universitas Indonesia, Indonesia)
11:35	11:50	Day Ahead Solar Irradiation Forecasting Based on Extreme Learning Machine	Adelhard Beni Rehiara (University of Papua, Indonesia); Sabar Setia Widayat (Universitas Widya Gama, Indonesia)
11:50	12:05	Optimal Sizing of BESS Considering Economic Dispatch and VRE in Thailand Generation System	Audchara Yimprapai and Surachai Chaitusaney (Chulalongkorn University, Thailand)
12:05	12:20	Evaluation of Decision Matrix, Hash Rate and Attacker Regions Effects in Bitcoin Network Securities	Agus Winarno (University of Indonesia, Indonesia); Novita Angraini (BSSN, Indonesia); Riri Sari (University of Indonesia, Indonesia); Ruki Harwahyu (Universitas Indonesia, Indonesia)
12:20	12:35	LTE Network Resource Management for Live Video Streaming in Dense Area	Borirak Moonphala, Aphirak Jansang, Withawat Tangtrongpairoj, Chaiporn Jaikaeo and Anan Phonphoem (Kasetsart University, Thailand)

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11:20 Cybersecurity Maturity Assessment Design Using NIST CSF, CIS CONTROLS v8 and ISO/IEC 27002

Ivan Bashofi (University of Indonesia, Indonesia); Muhammad Salman (Universitas Indonesia, Indonesia)

Cyberspace was created by the development of Information and Communication Technology (ICT). This makes it easier to access, manage information faster and more accurately, and improve the efficiency of performing activities and achieving business goals. On the other hand, the higher the usage of information technology, the higher the potential for organizational security incident gaps and cybercrime. Addressing this issue requires security standards that are appropriate and meet the requirements for organizations to know the maturity of cybersecurity. XYZ Organization is one of the government instances managing Indonesia's critical infrastructures. Although some international security standards have been implemented, the results of preparing for information security management are not yet optimal. Analysis of the NIST, CIS Controls v8, and ISO27002 standards was performed in this research. In addition, the analysis results are used as resources to create a cybersecurity maturity framework through the three standard approaches that underlie ICT management. The proposed concepts of the 21 integrated cybersecurity categories are expected to become an asset in terms of XYZ organization's ICT management performance

11:35 Day Ahead Solar Irradiation Forecasting Based on Extreme Learning Machine

Adelhard Beni Rehiara (University of Papua, Indonesia); Sabar Setia Widayat (Universitas Widya Gama, Indonesia)

Solar radiation data is very important for humans in meteorology, agriculture and energy. An Extreme Learning Machine (ELM) model is a data-based model developed from a single hidden layer feed-forward neural network (SLFN) which has the superiority in terms of training speed that is better than its predecessor generation. A model for predicting solar radiation in the Manokwari area and its surroundings was built with the ELM algorithm. The model has been used to predict daily solar radiation in the area. The ELM model has been trained using 8016 data solar irradiation and temperature

from NASA. The test results show that the built has fairly high accuracy with MAE values of about 0.6392 in a training time of 4.4375 seconds.

11:50 Optimal Sizing of BESS Considering Economic Dispatch and VRE in Thailand Generation System

Audchara Yimprapai and Surachai Chaitusaney (Chulalongkorn University, Thailand)

The increasing proportion of renewable energy (RE) in a power system causes many problems such as duck curve phenomenon, making its load curve and conventional generator operations change. These issues have become significant concerns. If the difference of the load curve is a huge ramp, the operating costs of the conventional generation will increase. In recent years, the price of battery energy storage system (BESS) has been decreasing continuously. With its fast response characteristic, the BESS is a potential candidate to mitigate the load curve issue. Therefore, this paper proposes an economic dispatch method for minimizing the operating costs of conventional generation integrated with RE generation and the BESS. Besides, the detailed analysis based on Thailand's power generation is provided to achieve the optimal BESS size. According to Power

Development Plan (PDP) 2018, the RE generation comprises photovoltaic (PV) and wind generation while the conventional generation consists of combined-cycle and coal thermal generation. The proposed method was performed using the optimization toolbox in MATLAB programming. The amount of RE generation is swept through 10 to 140 percent of its initial value while the amount of conventional generation is constant. The simulation results show that if the RE generation reaches 90 percent, the BESS is required. To obtain the lowest system operating cost, the optimal size of the BESS under the state of charge (SoC) constraint of 50 percent is 3,463.82 MWh. In summary, this proposed method helps deal with the future growth of VRE generation in Thailand's electrical system.

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12:05 Evaluation of Decision Matrix, Hash Rate and Attacker Regions Effects in Bitcoin Network Securities

Agus Winarno (University of Indonesia, Indonesia); Novita Angraini (BSSN, Indonesia); Riri Sari (University of Indonesia, Indonesia); Ruki Harwahyu (Universitas Indonesia, Indonesia)

Bitcoin is a famously decentralized cryptocurrency. Bitcoin is excellent because it is a digital currency that provides convenience and security in transactions. Transaction security in Bitcoin uses a consensus involving a distributed system, the security of this system generates a hash sequence with a Proof of Work (PoW) mechanism. However, in its implementation, various attacks appear that are used to generate profits from the existing system. Attackers can use various types of methods to get an unfair portion of the mining income. Such attacks are commonly referred to as Mining attacks. Among which the famous is the Selfish Mining attack. In this study, we simulate the effect of changing decision matrix, attacker region, attacker hash rate on selfish miner attacks by using the opensource NS3 platform. The experiment aims to see the effect of using 1%, 10%, and 20% decision matrices with different attacker regions and different attacker hash rates on Bitcoin selfish mining income. The result of this study shows that regional North America and Europe have the advantage in doing selfish mining attacks. This advantage is also supported by increasing the decision matrix from 1%, 10%, 20%. The highest attacker income, when using decision matrix 20% in North America using 16 nodes on 0.3 hash rate with income 129 BTC. For the hash rate, the best result for a selfish mining attack is between 27% to 30% hash rate

12:20 LTE Network Resource Management for Live Video Streaming in Dense Area

Borirak Moonphala, Aphirak Jansang, Withawat Tangtrongpairoj, Chaiporn Jaikaeo and Anan Phonphoem (Kasetsart University, Thailand)

For live video streaming in areas with unexpected events, such as accidents or protests, the network traffic can dramatically increase beyond the network capacity. All the live streams in the same area become broken, or video quality becomes jittering. Therefore, this paper proposed the LTE radio resource management for live video streaming in dense area. The system will

allocate the reserved resource block for priority UE using the concept of prioritization and the Chanel Quality Indicator (CQI) value. The simulation experiment investigated the appropriate reserved block size of priority UE considering the effect on the non-priority UE. The results show that priority UE's throughput and inter packet arrival time meet the required criteria with less impact on the nonpriority UE.

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DSC-0105: Technical Session Data Science
Parallel Session 1 (Room 4)
Thursday, June 16th 2022
(11:05 – 12:35)

Code Session : DSC-0105
Title Session   : Data Science

Start	Finish	Papers	Authors
11:20	11:35	Machine Learning Approaches using Satellite Data for Oil Palm Area Detection in Pekanbaru City, Riau	Arie Wahyu Wijayanto, Natasya Afira and Wahidya Nurkarim (Politeknik Statistika STIS, Indonesia)
11:35	11:50	Lexicon-enhanced hate speech detection on Vietnamese social network data	Tham Nguyen Thi (University of Information Technology, Ho Chi Minh City, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam National University, Ho Chi Minh City, Vietnam)
11:50	12:05	Design of Image Processing Tool Using MATLAB for Freshness Assessment of Beef and Pork	Alice Jade Cabato, Leanza Clarisse Manalus, Arniño Rolusta, Ian Caezar Francisco, Emil Jann Mendoza and Jazha Alaiza Dennice Tejones (Technological Institute of the Philippines-Manila, Philippines); Anna Patricia Valeriano (Technological Institute of the Philippines, Philippines); Rommel Anacan (Technological Institute of the Philippines-Manila, Philippines); Cayetano Hiwatig (Technological Institute of the Philippines, Philippines)
12:05	12:20	Identifying Social Media Conversation Topics Regarding Electric Vehicles in Indonesia Using LDA	Muchamad Taufiq Anwar (Politeknik STMI Jakarta, Indonesia)

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IEEE INDONESIA SECTION
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Institut Teknologi Telkom Purwokerto

Co-host :

12:20	12:35	Drone Flight Logs Sequence Mining	Swardiantara Silalahi (Institut Teknologi Sepuluh Nopember, Indonesia); Tohari Ahmad (Institut Teknologi Sepuluh Nopember (ITS), Indonesia); Hudan Studiawan (Institut Teknologi Sepuluh Nopember, Indonesia)

11:20 Machine Learning Approaches using Satellite Data for Oil Palm Area Detection in Pekanbaru City, Riau

Arie Wahyu Wijayanto, Natasya Afira and Wahidya Nurkarim (Politeknik Statistika STIS, Indonesia)

Palm oil is a commodity that plays an important role in economic activities in Indonesia. Palm oil is able to produce vegetable oil which is much needed by the industrial sector. This study aims to detect oil palm plantation areas using remote sensing satellite imagery data in Pekanbaru City, Riau, Indonesia. The mediumresolution optical satellite images of Sentinel-2 are used with a total sample of 1,750 points classified into 7 target classes. This study compares the performance of the model with the Random Forest, Xtreme Gradient Boosting, and Classification and Regression Tree (CART) methods. In addition, the Grid Search method is used to perform hyperparameter tuning. Our extensive experimental results showed that the Random Forest model gave a superior performance with a promising accuracy of 92.3 percent. The proposed model is also able to detect the estimated area of oil palm plantation of 9,790.51 Ha in Pekanbaru City.

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Co-host :

11:35 Lexicon-enhanced hate speech detection on Vietnamese social network data

Tham Nguyen Thi (University of Information Technology, Ho Chi Minh City, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam National University, Ho Chi Minh City, Vietnam)

This paper applies two lexicon enhancement methods, that are lexica feature extraction and retrofitting to improve the accuracy of hate speech detection problem on Vietnamese social network data. The experiments were conducted on multiple datasets to achieve the statistical significance of the experimental results. The results show that the use of retrofitting lexicon enhancement improves the accuracy of hate speech detection. This paper also introduces a dictionary consisting of hateful words that can be used for lexicon enhancement for hate speech detection on Vietnamese social network data.

11:50 Design of Image Processing Tool Using MATLAB for Freshness Assessment of Beef and Pork

Alice Jade Cabato, Leanza Clarisse Manalus, Arniño Rolusta, Ian Caezar Francisco, Emil Jann Mendoza and Jazha Alaiza Dennice Tejones (Technological Institute of the Philippines-Manila, Philippines); Anna Patricia Valeriano (Technological Institute of the Philippines, Philippines); Rommel Anacan (Technological Institute of the Philippines- Manila, Philippines); Cayetano Hiwatig (Technological Institute of the Philippines, Philippines)

Filipinos, regarding meat consumption, are more than the global average. According to the Organization for Economic Cooperation and Development 2017 study, an ordinary Filipino eat 14.2 kilograms of pork which is two-kilogram above the world's pork consumption yearly while 3 kilos when in terms of beef. In the 2019 forecast, the trend increases to 15.8 kilos for pork and 3.2 kilos for beef. Freshness is the state of being made recently or not having declined on meat or food specifically. Cherry Red is the ideal color for fresh beef, and it should be reddish pink for fresh pork. Color can clearly affect their safety when the consumer eats spoiled meat or even hot meat. Digital image processing is the use of computer algorithms for digital image processing. It is also used to manipulate images. Digital image processing has two main goals: human image enhancement; and autonomous machine

perception, storage, transmission, and representation of image data processing.

12:05 Identifying Social Media Conversation Topics Regarding Electric Vehicles in Indonesia Using LDA

Muchamad Taufiq Anwar (Politeknik STMI Jakarta, Indonesia)

Understanding public perceptions regarding EVs is important so that strategic decisions could be made in developing the EV ecosystem in a country. However, given the large and various aspects of EV adoption, it is very hard to decide which aspects are more important and need to be addressed first. The identification of topics can be facilitated by using topic modeling applied to social media data. This research aims to identify social media conversation topics regarding electric vehicles in Indonesia using Latent Dirichlet Allocation. Tweet search resulted in 11565 tweets which 1746 of them are unique tweets were collected between February 13 to March 9, 2022, using the tweepy library in Python. The LDA modeling resulted in 5 major topics regarding EVs in Indonesia i.e: the ecosystem development (42.9%), the positive impact on the environment (24.1%), the development of the domestic electric vehicle industry (17.5%), the convenience / supporting facilities for electric vehicles (9.7%), and the investment in battery-based electric vehicle production (5.7%). The anecdotal findings and the limitation of this study are discussed.

12:20 Drone Flight Logs Sequence Mining

Swardiantara Silalahi (Institut Teknologi Sepuluh Nopember, Indonesia); Tohari Ahmad (Institut Teknologi Sepuluh Nopember (ITS), Indonesia); Hudan Studiawan (Institut Teknologi Sepuluh Nopember, Indonesia)

Data mining techniques in analyzing log data can discover a useful pattern which then used to infer knowledge. Interesting patterns in log data can help the stakeholder to take action to diagnose a problem or improve the running system. Drone as one IoT device, which consists of sub-system working together, also implements a logging mechanism. While a drone is flying, event-related logs are written into specific log files. These files contain precious information in case of incident happens to the drone. Assuming that

the integrity of the log files is guaranteed, the investigator can find useful patterns and help conclude the incidents. To this end, this paper studies the sequence mining approach to discover some pre-defined incident-related events. As this is an initial study, the main contribution of this paper is the domain adaptation and modeling of the flight logs into a sequence database. After experimenting, we conclude that the modeling procedure is an essential step in conducting sequence mining. Frequency-oriented techniques are not suitable for small sequence databases, as the found patterns tend to have less critical events. Finally, two potential future directions are elaborated

AIT-0105: Technical Session Artificial Intelligence
Parallel Session 1 (Room 5)
Thursday, June 16th 2022
(11:05 – 12:35)

Code Session : AIT-0105
Title Session : Artificial Intelligence

Start	Finish	Papers	Authors
11:20	11:35	Comparative Transfer Learning Techniques for Plate Number Recognition	Rizki Rafiif Amanullah, Rifqi Akmal Saputra, Faisal Dharma Adhinata and Nur Ghaniaviyanto Ramadhan (Institut Teknologi Telkom Purwokerto, Indonesia)
11:35	11:50	IoT and AI-enabled Physical Distance Monitoring Application to Prevent COVID19 Transmission	Mohammad Dwipa Furqan (University of Hasanuddin, Indonesia); Andani Achmad (Hasanuddin University, Indonesia); Wardi Wardi (Universitas Hasanuddin & Jl. Perintis Kemerdekaan Km. 10, Indonesia); Muhammad Niswar (Universitas Hasanuddin, Indonesia)
11:50	12:05	Water Tank Level Control with Proportional Integral Derivative (PID) and Full State Feedback (FSB)	Alfian Ma'arif (Universitas Ahmad Dahlan, Indonesia); Iswanto Iswanto, Is (Universitas Muhammadiyah Yogyakarta, Indonesia); Aninditya Anggari Nuryono, Aan (Mulia University, Indonesia)
12:05	12:20	Deep Learning Approach using Satellite Imagery Data for Poverty Analysis in Banten, Indonesia	Kasiful Aprianto (Directorate Statistical Information System, BPS Statistics Indonesia, Indonesia); Arie Wahyu Wijayanto and Setia Pramana (Politeknik Statistika STIS, Indonesia)

12:20	12:35	Application of Ant Colony Optimization (ACO) Algorithm for Trans Banyumas Route Determination	Abira Armond and Yogo Dwi Prasetyo (Institut Teknologi Telkom Purwokerto, Indonesia); Wahyurini Ediningrum (STKIP Al-Amin Indramayu, Indonesia)

11:20 Comparative Transfer Learning Techniques for Plate Number Recognition

Rizki Rafiif Amanullah, Rifqi Akmal Saputra, Faisal Dharma Adhinata and Nur Ghaniaviyanto Ramadhan (Institut Teknologi Telkom Purwokerto, Indonesia)

Monitoring vehicle activity both on the highway and in certain places such as parking lots needs to be done if there is a specific incident. Unexpected events such as accidents or vehicle theft may occur anytime. Therefore, tracking through number plate recognition has become something important and has become a hot topic with the various methods used. Previous research used machine learning techniques to recognize characters on number plates. The use of this technique has not produced optimal accuracy. Therefore, we propose using transfer learning techniques to achieve better accuracy results. This research evaluated three transfer learning models, namely DenseNet121, MobileNetV2, and NASNetMobile models. The experiment in this research was carried out using the data on number plates in the parking lot. The accuracy calculation counted the number of correctly recognized characters divided by the total characters on the number plate. The experimental results show that the DenseNet121 model produced the best accuracy, 96.42%. Differences in number plate writing style also affected the accuracy results. This research could provide insight into the use of transfer learning techniques in the case of number plate recognition.

11:35 IoT and AI-enabled Physical Distance Monitoring Application to Prevent COVID19 Transmission

Mohammad Dwipa Furqan (University of Hasanuddin, Indonesia); Andani Achmad (Hasanuddin University, Indonesia); Wardi Wardi (Universitas Hasanuddin & Jl. Perintis Kemerdekaan Km. 10, Indonesia); Muhammad Niswar (Universitas Hasanuddin, Indonesia)

During COVID19 pandemic, people are encouraged to practice physical distancing at least 1 meters when interacting with other people to prevent the spread of the COVID19. This study aims to develop a system that can monitor the physical distancing and track physical contact in a room using internet of things (IoT) and artificial intelligent technology. The system consists of microcomputer (Raspberry Pi), webcam, and web application displaying physical contact information. The system uses YOLO algorithms to detect the human object and euclidean distance formula to determine the distance between human objects. We evaluated the performance of YOLOv3 and YOLOv3-tiny and the evaluation result shows that YOLOv3 consumes more CPU resources than YOLOv3-tiny but has better accuracy in detecting human objects. YOLOv3-tiny can process images and detect objects faster than YOLOv3.

11:50 Water Tank Level Control with Proportional Integral Derivative (PID) and Full State Feedback (FSB)

Alfian Ma'arif (Universitas Ahmad Dahlan, Indonesia); Iswanto Iswanto, Is (Universitas Muhammadiyah Yogyakarta, Indonesia); Aninditya Anggari Nuryono, Aan (Mulia University, Indonesia)

This study discusses the control of the liquid level of a tank system using the Proportional Integral Derivative (PID) control and Full State Feedback (FSB) control. Tank systems are widely used in industrial processes and require a controller so that the liquid level follows the needs. Determination of PID controller parameters was sought by using Matlab's PID tuning feature. Meanwhile, the FSB parameters was determined using the trial and error method. The research results based on the Simulink Matlab simulation showed that the PID and FSB controllers could control the liquid level of the tank system and reached the reference value. However, the system's

response with FSB control was better than PID control with faster settling time and smaller overshoot.

12:05 Deep Learning Approach using Satellite Imagery Data for Poverty Analysis in Banten, Indonesia

Kasiful Aprianto (Directorate Statistical Information System, BPS Statistics Indonesia, Indonesia); Arie Wahyu Wijayanto and Setia Pramana (Politeknik Statistika STIS, Indonesia)

Satellite imageries data provides abundant geospatial features of infrastructures, land uses, land covers, and economic activity footprints that are potential for domain-specific tasks. In this study, we investigate the use of satellite imageries data as spatial-based proxy indicators in predicting the percentage of poverty in Banten Province, Indonesia using a deep learning approach. The poverty dataset is taken from the Village Potential Data Survey (PODES) 2018 results published by Statistics Indonesia (BPS) as the assumed ground-truth labels. Our finding reveals a correlation between the night-time light satellite imagery and the percentage of poverty, hence the regression model to predict the percentage of poverty is constructed using convolutional neural networks (CNN) architecture. The correlation between night-time image data and the percentage of poverty in each village is negative 52 percent under log transformation. Our proposed model generates a promising RMSE of 5.3023 which is potentially beneficial to support the construction and monitoring of poverty statistics in Indonesia.

12:20 Application of Ant Colony Optimization (ACO) Algorithm for Trans Banyumas Route Determination

Abira Armond and Yogo Dwi Prasetyo (Institut Teknologi Telkom Purwokerto, Indonesia); Wahyurini Ediningrum (STKIP Al-Amin Indramayu, Indonesia)

The ever-increasing population and high mobility impact the massive number of vehicles that affect the development of public transportation and the determination of effective routes. These factors make it very important to optimize the route because it will impact operational costs and the punctuality of picking up passengers. Determining the optimal route can be

categorized as a Traveling Salesman Problem (TSP). TSP is the activity of a salesman to visit each city exactly once and return to his hometown by minimizing the total cost. This study purposed to determine the optimal Trans Banyumas route by applying the Ant Colony Optimization (ACO) algorithm. ACO is an algorithm inspired by the behavior of ant colonies in searching for food by finding the shortest distance between the nest and the food source. The parameter values used in the ACO algorithm significantly affect the quality of the solution. Based on the test results for the Trans Banyumas corridor 3 using optimal parameters, the ACO algorithm found the shortest route with a total distance of 29.8 km. The determination of new corridor routes using the ACO algorithm was also successfully carried out, corridor 4 with a distance of 30.8 km and corridor 5 about 21.6 km.

CCI-0613: Technical Session Cybernetics, and Computational Intelligence
Parallel Session 2 (Room 1)
Thursday, June 16th 2022
(13:05 – 15:20)

Code Session : CCI-0613
Title Session   : Cybernetics, and Computational Intelligence

Start	Finish	Papers	Authors
13:20	13:35	Training Autoencoders with Noisy Training Sets for Detecting Low-rate Attacks on the Network	Baskoro Adi Pratomo, Ahmad Ibnu Fajar, Royyana Ijtihadie, Abdul Munif, Hudan Studiawan and Bagus Jati Santoso (Institut Teknologi Sepuluh Nopember, Indonesia)
13:35	13:50	An investigation of ML techniques to detect Phishing Websites by complexity reduction	Md. Faiyed Bin Karim (Islamic University of Technology, Bangladesh); Tasnimul Hasan (IUT, Bangladesh); Nushera Tazreen, Safayat Bin Hakim and Samiha Tarannum (Islamic University of Technology, Bangladesh)
13:50	14:05	Channel Estimation for Compound Field Extensive Massive MIMO	Suganya T (Madras Institute of Technology & Anna University, India); Indira Gandhi (Anna University, India)
14:05	14:20	Performance Comparison of AODV, AODV-ETX and Modified AODV-ETX in VANET using NS3	Bayu Ardianto, Hery Nurcahyo and Hasan Muftic (University of Indonesia, Indonesia); Ruki Harwahyu (Universitas Indonesia, Indonesia); Riri Fitri Sari (University of Indonesia, Indonesia)
14:20	14:35	Classifying Portable Executable Malware Using Deep Neural Decision Tree	Rico S. Santos and Enrique Festijo (Technological Institute of the Philippines, Philippines)

14:35	14:50	Algorithm of Caries Classification using Co-Occurrence Matrix and Multilayer Perceptron	Yessi Jusman, Anna Widyaningrum and Sartika Puspita (Universitas Muhammadiyah Yogyakarta, Indonesia)
14:50	15:05	Intent Detection on Indonesian Text Using Convolutional Neural Network	Chiva Olivia Bilah (Gadjah Mada University, Indonesia); Teguh Bharata Adji and Noor Akhmad Setiawan (Universitas Gadjah Mada, Indonesia)
15:05	15:20	An Structural Equation Model for Predicting Determining Factor of Social CRM Adoption in SMEs	Hani Purwanti (Universitas Diponegoro & Sekolah Pascasarjana, Indonesia)
15:20	15:35	Data-Driven Modelling For Tsunami Forecasting Using Computational Intelligence	Michael Siek (Bina Nusantara University, Indonesia)

1:20 Training Autoencoders with Noisy Training Sets for Detecting Low-rate Attacks on the Network

Baskoro Adi Pratomo, Ahmad Ibnu Fajar, Royyana Ijtihadie, Abdul Munif, Hudan Studiawan and Bagus Jati Santoso (Institut Teknologi Sepuluh Nopember, Indonesia)

A Network-based Intrusion Detection System (NIDS) monitors network traffic and analyses it to look for any sign of malicious behaviour. A NIDS may be using of these two methods to look for malicious activities, signaturebased or anomaly-based. A Signature-based NIDS relies on a database of rulesets to determine whether a packet or a flow is malicious. Therefore, it suffers when the database is not updated regularly or when a zero-day attack appears. An Anomaly-based NIDS works by learning the behaviour of normal traffic and looking for anomalous activities. The anomalous activities are then deemed malicious. In doing so, this kind of NIDS does not have to rely on an updated database. It can identify deviation from the normal behaviour by training itself with some training data obtained from the organisation network traffic. The issue is cleaning the network traffic data from a real-world capture is time-consuming. Thus, in this paper, we proposed an anomaly detection method that was trained with network traffic that contains malicious activities. We were looking for evidence of whether

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using Autoencoders is robust to noisy data in the training set. Our experiments show that the detection method can achieve an F2-score of 0.87 for FTP traffic, 0.83 for HTTP traffic, and 0.98 for SMTP traffic. These results were obtained from models that had been trained with a training set which contains 0.3% of malicious traffic.

1:35 An investigation of ML techniques to detect Phishing Websites by complexity reduction

Md. Faiyed Bin Karim (Islamic University of Technology, Bangladesh); Tasnimul Hasan (IUT, Bangladesh); Nushera Tazreen, Safayat Bin Hakim and Samiha Tarannum (Islamic University of Technology, Bangladesh)

In today's digital age, one of the most primary causes for security breach is phishing websites which disguise itself as a legitimate website and tricks gullible users into revealing sensitive information. With the proliferation of highspeed internet and popularization of IT education, there is an increase in unscrupulous actors in the web who are always ready to counterfeit a legitimate website and use it to deceive and manipulate users. Software and non software-based techniques have been used to try to unmask the phishers. Phishing websites have many characteristics in them. Thus, classifying and detecting those is unavoidably time-consuming and complex. Our research analyzed several hybrid machine learning models which includes a bespoke preprocessing step of reducing minimally correlated features and then training with four boosting algorithms and three SVM models for classification. These models have also been trained after hyperparameter tuning. Among the investigated models XGBoost brought the highest accuracy of 97.0455% after the hyperparameter tuning.

1:50 Channel Estimation for Compound Field Extensive Massive MIMO

Suganya T (Madras Institute of Technology & Anna University, India); Indira Gandhi (Anna University, India)

Extensive Massive MIMO (Multiple Input, Multiple Output) has the potential to satisfy the high data rate needs of future 6G. In order to get effective precoding, accurate information about the channel's current condition is

critical. Existing Low pilot overhead estimate approaches strongly depend on attained angular domain channel sparsity based on plane wave front in the FF and polar domain channel sparsity based on spherical wave front in the NF. However FF (FF) as well as NF (NF) schemes for estimating the channel is not enough to find out the combined field Extensive Massive MIMO channel. In practical scenario some scatterers are present in FF region and some are present in NF. An effective combined field approach for predicting the Extensive Massive MIMO channel is proposed in order to overcome this difficulty. Results from simulations reveal that the suggested approach is more efficient than the current one.

2:05 Performance Comparison of AODV, AODV-ETX and Modified AODV-ETX in VANET using NS3

Bayu Ardianto, Hery Nurcahyo and Hasan Muftic (University of Indonesia, Indonesia); Ruki Harwahyu (Universitas Indonesia, Indonesia); Riri Fitri Sari (University of Indonesia, Indonesia)

Vehicular Ad-hoc Networks (VANET) is a solution for road safety, traffic efficiency, and Intelligent Transportation Systems (ITS). VANET is used by autonomous vehicles as an efficient and reliable external vehicle communication. The routing protocol that has a stable and efficient performance is one that affects the quality of vehicle communication. This research simulates and analyzes the performance of VANET routing protocols, namely AODV, AODV-ETX, and Modified AODV-ETX using the NS3 simulator. Our experiment shows that AODV has the best throughput performance, AODV-ETX performs the best MAC/PHY Overhead and Packet Delivery Ratio, in terms of Modified AODV-ETX shows the best goodput performance compared to the others. Overall, the modified AODV-ETX with MRT and ART values 80 seconds provides better performance compared to AODV-ETX.

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2:20 Classifying Portable Executable Malware Using Deep Neural Decision Tree

Rico S. Santos and Enrique Festijo (Technological Institute of the Philippines, Philippines)

Despite the extensive use of malware technologies, malware detection is still a challenge today, especially with the consistent barrage of cyber attacks on a daily basis. Data analysis coupled with machine learning techniques is gaining popularity as one of the approaches being deployed in addressing this issue. This paper proposed a new technique for classifying malware from a large Portable Executable file (PEFile) using a deep neural decision tree. Every node in a hybrid approach represents a neural network that has been trained to identify a single output category using binary classification, as a decision tree. The dataset used in this study includes both benign (7,196) and malicious (16,698) PE files with 14 features extracted from the PEFile headers. The classifier was evaluated using different metrics such as Precision, Recall, Matthew Coefficient Correlation (MCC), Area Under the Curve (AUC) Receiving Operating Characteristic (ROC), and Average Precision. The result shows that binary classifier can distinguish between two classes: (1) malware and (2) benign

2:35 Algorithm of Caries Classification using Co-Occurrence Matrix and Multilayer Perceptron

Yessi Jusman, Anna Widyaningrum and Sartika Puspita (Universitas Muhammadiyah Yogyakarta, Indonesia)

Teeth are one of the organs of the human body that helps digestion by tearing and chewing food before it is channeled by the esophagus into the stomach. One of the diseases that often experienced by Indonesian people is dental caries. Images captured can be obtained with Computed Radiography technology. The purpose of this research is to be able to find out the process of Gray Level Co-occurrence Matrix (GLCM) and Multilayer Perceptron (MLP) methods in Matlab R2018b application to classify dental caries imagery. The algorithm in Matlab R2018b is designed to be able to perform feature extraction using GLCM. The conclusion obtained in this study is that the Gray Level Co-occurrence Matrix (GLCM) and Multilayer Perceptron (MLP) in the Matlab R2018b application can classify dental caries images.

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The best result according to analysis using Matlab analysis is Lavenberg Marquard (trainlm) with hidden layer 10 (Training: 99.20%, Testing: 98.30%). In Backpropagation Bayesian Regularization (trainbr) the best results are found in hidden layer 10 as well (Training: 100%, Testing: 100%)

2:50 Intent Detection on Indonesian Text Using Convolutional Neural Network

Chiva Olivia Bilah (Gadjah Mada University, Indonesia); Teguh Bharata Adji and Noor Akhmad Setiawan (Universitas Gadjah Mada, Indonesia)

Natural Language Processing (NLP) has become the focus of research in recent years. NLP tasks have been implemented in various sectors and fields. The chatbot system is one of the NLP tasks, which functions to communicate with humans using natural language. Many researchers build models to represent the chatbot. To make a chatbot more powerful, the intent of the conversation, a set of sentences representing a specific user's intention when interacting with the chatbot, must be classified. This classification will make the chatbot system more focused, which leads to providing appropriate answers. Humans can simply understand the meaning of different sentences with the same intent. However, a chatbot system will require a complex technique. Therefore, our work uses the CNN (Convolutional Neural Network) for intent detection in Indonesian Language Text using ATIS (Airline Travel Information System) dataset. CNN was selected because it can extract important features from input data, which makes it more efficient than other deep learning algorithms, in terms of memory and complexity. In our work, we also used GloVe (Global Vectors) embedding for generating an optimal intent classification model. The result shows that the GloVe model and CNN produce the best accuracy of 95.84%.

3:05 An Structural Equation Model for Predicting Determining Factor of Social CRM Adoption in SMEs

Hani Purwanti (Universitas Diponegoro & Sekolah Pascasarjana, Indonesia)

The increasing use of social media is challenging the old concept of customer relationship management (CRM). Social CRM strategy is a new model of CRM that applies social technology by presenting a new way to manage

customer relationships. Compared to traditional CRM, social media is an affordable tool for SMEs to compete in the global market. Although the application of social CRM can increase business in SMEs, the implementation of social CRM still requires various conditions, especially for SMEs with limited resources. So for the adoption of social CRM, it is necessary to determine the factors that influence the adoption of social CRM in SMEs. This study aims to predict the adoption of social CRM by proposing a TOEP application model and developing several hypotheses that test the function of technology factors, Organizational factors, Environment factors, and Information Process factors. The proposed hypothesis model was tested using the Structural Equation Model (SEM) method on data taken from SMEs in the Banyumasan area with a sample of 115 SMEs. This study finds that Relative Advantage, Complexity, Compability CRMS, Employee IT/SI Knowledge, Government Support, Information Use, Information Retrieval are the most important factors influencing the adoption of social CRM. This study differs from previous studies because it proposes a new model, namely the TOE adoption model and the information process factor as an additional factor to determine the factors that affect social CRM in SMEs.

3:20 Data-Driven Modelling For Tsunami Forecasting Using Computational Intelligence

Michael Siek (Bina Nusantara University, Indonesia)

Numerous tsunami disasters have occurred in many coastal regions, where most big cities are located. This type of disaster has caused many casualties, infrastructure damages, and economy downturn. Being existence along Circum-Pacific Belt, Indonesia has become a tsunami prone area where the earthquakes frequently happened. The development of accurate and fast early warning system is highly crucial. This paper aimed at developing data-driven model for accurate tsunami forecasting using the principles of computational intelligence. A physically based tsunami model was developed and calibrated for Indian tsunami disaster flushing a city of Banda Aceh occurred in 2004. Several measured data was utilized for building this model, like bathymetry, tidal wave, and tectonic earthquake characteristics. The modelling results were validated against tsunami wave height measured along the coastline and utilized for data requirements in constructing data-driven models using computational intelligence. Time

series data analysis and forecasting with optimal independent variables, windowing size and feasible forecasting horizon were performed to offer the best performance of tsunami forecasting. Three machine learning algorithms based on fully connected neural networks, convolutional neural networks, and recurrent neural networks with LSTM were utilized to train and test tsunami forecasting models using specific evaluation measures. The results indicates that the tsunami forecasts using a fully connected neural network with window size of 15 minutes and horizon of 1 minute outperformed than the others, with RMSE of 0.299. The resulting data-driven model could be an effective and efficient forecasting model in building an accurate and fast tsunami early warning system.

HMS-0612: Technical Session Human Machine System
Parallel Session 2 (Room 2)
Thursday, June 16th 2022
(13:05 – 15:20)

Code Session : HMS-0612
Title Session   : Human Machine System

Start	Finish	Papers	Authors
13:20	13:35	-	-
13:35	13:50	The Impact on Review Credibility and Trust from Review Solicitation on E-commerce	Erwin Halim (Bina Nusantara University & School of Information Systems, Indonesia); Zahran Muzakir (Bina Nusantara University, Indonesia); Marylise Hebrard (Institut Des Usages, France)
13:50	14:05	A Driving Situation Inference for Autopilot Agent Transparency in Collaborative Driving Context	Rinta Kridalukmana, Dania Eridani and Risma Septiana (Diponegoro University, Indonesia)
14:05	14:20	Improved Poisson MAP Algorithm for Better Image Deconvolution	Zohair Al-Ameen (University of Mosul, Iraq); Zainab Khalid Younis (University of Mosul & Computer Science, Iraq)
14:20	14:35	An Integration of End User Computing Satisfaction and Importance Performance Analysis on Website	Anggun Barokhah, Muhammad Luthfi Hamzah, Eki Saputra and Fitriani Muttakin (Universitas Islam Negeri Sultan Syarif Kasim Riau, Indonesia)
14:35	14:50	A LSTM-UNet and Zero Padding technique to detect deforestation in Amazon area	Irham Muhammad Fadhil and Aniati M. Arymurthy (University of Indonesia, Indonesia)
14:50	15:05	Method of EEG Electrode Selection for Motor Imagery Application	Oltfaz Rane, Munawar Riyadi and Teguh Prakoso (Diponegoro University, Indonesia)
15:05	15:20	Modern No Code Software Development Android	Wahyu Nurharjadmo (Universitas Sebelas Maret,

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Co-host :

		Inventory System for Micro, Small and Medium Enterprises	Indonesia); Mutiara Auliya Khadija (Universitas Sebelas Maret, Indonesia & Universitas Gadjah Mada, Indonesia)

1:35 The Impact on Review Credibility and Trust from Review Solicitation on E-commerce

Erwin Halim (Bina Nusantara University & School of Information Systems, Indonesia); Zahran Muzakir (Bina Nusantara University, Indonesia); Marylise Hebrard (Institut Des Usages, France)

It has widely known that Online Customer Reviews have become an integral part of customer decision-making before making online purchases. Sellers and platforms alike develop a strategy to shape reviews profitably under the pretext of increasing sales. Review Solicitation has been used to increase review volume and review valance in the online review platform. Interestingly, while much research is conducted to find the impact of review solicitation on the characteristics of reviews generated, there is not much research done on the perception of customers who have experienced the review solicitation strategy that might pose a problem for parties involved. This study aims to fill the gap of previous studies in finding the answer to what happens to the review credibility and Trust from the customer perspective after review solicitation. The research used Sequential Equation Modeling (SEM) process from 112 data obtained using Purposive sampling with online respondents around the Jabodetabek area in Indonesia in March 2022. There are five variables (Review Solicitation Awareness, Review Solicitation experience, Review Credibility, Trust, and Purchase Intention) with four hypotheses in this study. This study found that customers' Reviews Solicitation Experience significantly influences review credibility. At the same time, customers' Reviews of Solicitation Awareness significantly influence Trust. Then, Trust significantly influences Purchase Intention.

1:50 A Driving Situation Inference for Autopilot Agent Transparency in Collaborative Driving Context

Rinta Kridalukmana, Dania Eridani and Risma Septiana (Diponegoro University, Indonesia)

Overly trust in the autopilot agent has been identified as the primary factor in road incidents involving autonomous cars. As this agent is considered a human driver counterpart in the collaborative driving context, many researchers suggest its transparency to mitigate such an overly trusting mental model. Hence, this paper aims to develop a driving situation inference method as a transparency provider explaining the types of situations the autopilot agent encounters leading to its certain decision. The proposed method is verified using an autonomous driving simulator called Carla. The findings show that the proposed method can generate situations that enable the human driver to calibrate their trust in the autopilot agent.

2:05 Improved Poisson MAP Algorithm for Better Image Deconvolution

Zohair Al-Ameen (University of Mosul, Iraq); Zainab Khalid Younis (University of Mosul & Computer Science, Iraq)

Captured images are usually obtained unclear and blurry. Image deconvolution algorithms are normally applied to get clearer images from their unclear versions. Research related to this field has tremendously grown in the past years due to the increased demand for top-quality images. The Poisson MAP is an iterative algorithm with a simple structure that was proposed for image deconvolution. This algorithm employs numerous iterations to deliver results that have better quality than their originals. This is undesirable because it consumes time and involves a more computational cost that can be avoided. Therefore, this algorithm is modified by utilizing two non-complex acceleration factors so that the desired outcomes are obtained faster by using fewer iterations. The improved algorithm is tested intensively with various real distorted images, as well as it is compared with its original version, and the outcomes are evaluated using two evaluation methods. Finally, the improved algorithm has shown better performances than its original version by providing better-acutance results rapidly.

2:20 An Integration of End User Computing Satisfaction and Importance Performance Analysis on Website

Anggun Barokhah, Muhammad Luthfi Hamzah, Eki Saputra and Fitriani Muttakin (Universitas Islam Negeri Sultan Syarif Kasim Riau, Indonesia)

Media Website "Diskominfotik" Bengkalis is a form of e-learning developed by the Department of Communication, Information and Statistics which plays an important role in the development of Bengkalis district. The services and features provided are in the form of bengkalis news, activity galleries, important announcements, activity videos, public information and activity agendas. This study is based on the fact that users are dissatisfied with the services provided by the Bengkalis Diskominfotik website, such as the lack of updated information that users need. The aim of this study was to measure the level of satisfaction of website users using the EUCS method with five perspectives, namely content, accuracy, format, ease of use, and timeliness and the IPA method to find out the attributes that are important to improve or need to be interpreted in the form of a matrix. The results of this study indicated that all attributes in terms of importance had the category of satisfied and quite satisfied, and the performance attribute was also in the category of satisfied and quite satisfied. namely the variable content, accuracy, ease of use, with the category satisfied, while the format with the category quite satisfied.

2:35 A LSTM-UNet and Zero Padding technique to detect deforestation in Amazon area

Irham Muhammad Fadhil and Aniati M. Arymurthy (University of Indonesia, Indonesia)

The Amazon Rainforest is the largest forest in the world that stores various kinds of biodiversity, both flora and fauna. The protection of the integrity and sustainability of this rainforest is a concern for the entire international community. One form of protection is by mapping the deforestation areas. This paper proposes a Deep Learning method that combines UNet with LSTM and Zero Padding to map deforestation areas. The proposed method

indicates a good accuracy in mapping the deforestation areas, which is 93.35% with an F1-score of 93.82% and a low loss value of 0.1654.

2:50 Method of EEG Electrode Selection for Motor Imagery Application

Oltfaz Rane, Munawar Riyadi and Teguh Prakoso (Diponegoro University, Indonesia)

Brain-computer interface (BCI) technology is commonly used to describe the brain signal activity non-invasively. The development of EEG devices which is used to record brain activity continues to be carried out, both in terms of accuracy, suitability, computation, and cost. However, the complexity arises with increased electrode numbers. In some studies, minimizing the number of electrodes can be a solution to reduce computational time, cost, and the shape of the EEG device, without compromising the level of accuracy. By choosing particular electrodes which are highly related to the activity, the electrode usage can be reduced. This study used correlation coefficient method which is proposed to determine the best electrode pairs. Moreover, the electrodes which have similar features is eliminated. Based on the experimental and test results, it showed that the results were very good, where the average accuracy was increasing by 3% compared to the use of all electrodes, this increasing was followed by a decreasing in computation time with an average decreasing in debugging time by 35%.

3:05 Modern No Code Software Development Android Inventory System for Micro, Small and Medium Enterprises

Wahyu Nurharjadmo (Universitas Sebelas Maret, Indonesia); Mutiara Auliya Khadija (Universitas Sebelas Maret, Indonesia & Universitas Gadjah Mada, Indonesia)

The use of android applications is substantial among the general public, making android applications one of the media used in the trade sector. Entrepreneurs compete in promoting products sold through the application to reach all circles of society. Although many have used applications in product sales, micro, small and medium entrepreneurs still have not used the Android inventory Information System due to the limited capabilities and

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information of micro, small and medium enterprises owners. In this study, there will be an application based on no code that can help small business owners to maintain their inventory products and buyers. Platform no code is a visual software development environment platform where users can drag and drop components such as buttons, drop-down boxes, etc. and connect them without a line of code or less. It is a quick way to develop a definite software or website. The platform based on no code used is AppSheet. AppSheet is an application development platform connected to the google sheet and google cloud designed for all users who want to create applications without having coding knowledge. This research will be made android application based on no code for micro, small and medium enterprises so that business owners can make applications without using coding in inventory issue. The owner can solve manual problem of administrative propose. After the application is made, the business owners can design the application as needed to obtain information from the products sold directly, maintain inventory data to accelerate digital transformation easily.

SSE-0610: Technical Session System Science and Engineering
Parallel Session 2 (Room 3)
Thursday, June 16th 2022
(13:05 – 15:20)

Code Session   : SSE-0610
Title Session   : System Science and Engineering

Start	Finish	Papers	Authors
13:20	13:35	Multiple Waypoint Navigation for Mobile Robot Using Control Lyapunov-Barrier Function (CLBF)	Ridlho Khoirul Fachri, Muhammad Zakiyullah Romdlony and Muhammad Ridho Rosa (Telkom University, Indonesia)
13:35	13:50	Performance Analysis of AWS and GCP Cloud Providers	Erina Fika Noviani (Institut Teknologi Sepuluh November & Surabaya, Indonesia); Bayu Kembara (Sepuluh Nopember Institute of Technology, Indonesia); Dyah Ayu Permata Sari (Institut Teknologi Sepuluh Nopember, Indonesia); Bakti Anugrah Yudha Pratama and Ary Mazharuddin Shiddiqi (Sepuluh Nopember Institute of Technology, Indonesia); Bagus Jati Santoso (Institut Teknologi Sepuluh Nopember, Indonesia)
13:50	14:05	Gas Turbine Anomaly Prediction using Hybrid Convolutional Neural Network with LSTM in Power Plant	Ferdiansyah Zhultriza and Aries Subiantoro (Universitas Indonesia, Indonesia)
14:05	14:20	SCR-Based Power Flow Control for Grid Integration in Home-Scale Photovoltaic System	A. Muh. Aqsha Azhar Mangkona (Hasanuddin University, Indonesia); Faizal Arya Samman

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			(University of Hasanuddin, Indonesia); Syafaruddin Syafaruddin (Universitas Hasanuddin Makassar, Indonesia)
14:20	14:35	EEMD-CNN based Method for Compound Fault Diagnosis of Bearing	Anubhuti Singh (Centre for Advanced Studies Dr A P J Abdul Kalam Technical University Lucknow, India); Arun Kumar (Centre for Advanced Studies Lucknow, India)
14:35	14:50	-	-
14:50	15:05	-	-
15:05	15:20	-	-

1:20 Multiple Waypoint Navigation for Mobile Robot Using Control Lyapunov-Barrier Function (CLBF)

Ridlho Khoirul Fachri, Muhammad Zakiyullah Romdlony and Muhammad Ridho Rosa (Telkom University, Indonesia)

We implemented the Control Lyapunov-Barrier Function (CLBF) method on the Autonomous Mobile Robot (AMR) hardware using the inverse kinematics of four mecanum wheels. The CLBF method is used to obtain stability and safety in the system. The stability of the system is defined when the AMR is able to reach the specified equilibrium point and the safety of the system is defined when the AMR is able to avoid the existing barrier. Waypoint navigation is used to provide several equilibrium points so that the robot can move to the desired coordinate points. In this paper, we do not use a local sensor such as an encoder, but use a global sensor, namely a camera, to read the coordinates of the AMR position. We use two microcontrollers, a microcontroller (A) to receive the coordinates of the x and y positions of the BLOB detection and a microcontroller (B) to send the CLBF output to Matlab which is a linear velocity v_x and v_y. The test was carried out three times with each time testing through three waypoints and one predetermined barrier. This study resulted in the percentage value of the implementation success of 76.47%, this value is the result of a comparison of the path

generated by the simulation with Matlab and the path taken by the AMR real plant.

1:35 Performance Analysis of AWS and GCP Cloud Providers

Erina Fika Noviani (Institut Teknologi Sepuluh November & Surabaya, Indonesia); Bayu Kembara (Sepuluh Nopember Institute of Technology, Indonesia); Dyah Ayu Permata Sari (Institut Teknologi Sepuluh Nopember, Indonesia); Bakti Anugrah Yudha Pratama and Ary Mazharuddin Shiddiqi (Sepuluh Nopember Institute of Technology, Indonesia); Bagus Jati Santoso (Institut Teknologi Sepuluh Nopember, Indonesia)

Cloud servers are currently in high demand due to their low cost and the vast range of service providers. Businesses rely on cloud servers because of their quick response times and ability to meet consumer needs. Users often require references to which service provider suits their requirements. We look at how powerful AWS and GCP are in CPU processing, latency, and throughput using the Golang Framework (Gorilla Mux) and an SQLite database. This research aims to assist users in choosing a cloud provider based on their needs. In this study, we use JMeter to load test the API. Requests sent to the API via the GET method are stored in the SQLite database as parameter query data. In addition, we discovered that success on AWS was more significant than success on GCP.

1:50 Gas Turbine Anomaly Prediction using Hybrid Convolutional Neural Network with LSTM in Power Plant

Ferdiansyah Zhultriza and Aries Subiantoro (Universitas Indonesia, Indonesia)

The fault and anomaly of real-time performance gas turbine data is difficult to predict because of the complexity of feature data and dynamically time-series. In case of real performance gas turbine, the complexity of physical model is hard to interpret. In deep learning, the Convolutional Neural Network (CNN) is used to perform in identification of data with great feature extraction. But, since CNN is poorly accurate for time-series data, the prediction for gas turbine anomaly could be hardly optimized. Another neural network method that can interact with time-series data is Recurrent Neural Network (RNN), especially, the Long Short-Term Memory (LSTM) that can

deal with the vanishing gradient problem in traditional RNN. This paper aims to develop hybrid CNN-LSTM as a proposed method to predict gas turbine anomaly more accurately than single CNN. The accuracy of single CNN method is 81.33%. With the addition of LSTM in the same CNN architecture, the accuracy of hybrid CNNLSTM is 91.79%. The accuracy of model data is significantly increased by adding LSTM layer after convolutional and pooling layer.

2:05 SCR-Based Power Flow Control for Grid Integration in Home-Scale Photovoltaic System

A. Muh. Aqsha Azhar Mangkona (Hasanuddin University, Indonesia); Faizal Arya Samman (University of Hasanuddin, Indonesia); Syafaruddin Syafaruddin (Universitas Hasanuddin Makassar, Indonesia)

This paper presents Silicon Controlled Rectifier (SCR) based power flow control for grid integration in homescale photovoltaic system. Power flow control is used to control the power flow from the grid if the power from solar panel and battery cannot meet the power requirements of the load. To control the power on the grid, a full-wave SCR circuit is designed. Full-wave SCR circuit serves to convert 220 Volt AC from the grid into 36 Volt DC. The effect of the delay angle of the SCR on the full-wave SCR output voltage is shown in this paper. A filter with a combination of an inductor (L) and a capacitor (C) which is assembled into an LCLC filter in parallel with the load aims to smooth out ripples in the output voltage. The circuit is designed and modeled in The PSpice program code, then simulated and analyzed. The simulation and implementation test results show that the voltage can work at the setpoint voltage at 100-ohm and 50-ohm loads. Full-wave SCR circuit can supply up to 1.8kW based on the simulation results.

2:20 EEMD-CNN based Method for Compound Fault Diagnosis of Bearing

Anubhuti Singh (Centre for Advanced Studies Dr A P J Abdul Kalam Technical University Lucknow, India); Arun Kumar (Centre for Advanced Studies Lucknow, India)

After prolonged use of a faulty bearing, cracks are created on more than one parts of the bearing, which is a compound fault condition. This situation is tougher than the single fault condition. This combined faulty bearing creates a complex vibration signal with significant amount of noise, where it becomes very difficult to identify the fault frequencies by signal processing methods. This paper deals with a novel machine learning method for the compound fault diagnosis of Rolling bearing, where compound fault signals are decomposed into Intrinsic Mode Functions (IMF) by Ensemble Empirical Mode Decomposition (EEMD). The proposed method uses Convolution Neural Network (CNN) based technique, which receives the decomposed signals of compound fault signal as input to CNN. These IMFs consists of groups of different frequencies. When these IMFs are given as input to CNN it classifies it effectively into different faults existing on bearing. CNN yields almost 96% accuracy which is better than any other previous performance for compound fault classification.

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Co-host :

DSC-0613: Technical Session Data Science
Parallel Session 2 (Room 4)
Thursday, June 16th 2022
(13:05 – 15:20)

Code Session : DSC-0613
Title Session   : Data Science

Start	Finish	Papers	Authors
13:20	13:35	Forecasting the Automobile and Parts Product Export Values using Time Series Analysis	Jakkaphan Whasphuttisit and Watchareewan Jitsakul (King Mongkut's University of Technology North Bangkok, Thailand)
13:35	13:50	Circle Detection System using Image Moments	Rifqi Fachruddin and Joko Buliali (Institut Teknologi Sepuluh Nopember, Indonesia)
13:50	14:05	Betta Fish Image Classification Using Artificial Neural Networks With Gabor Extraction Features	Satria Hidayat (Universitas Widyagama, Indonesia); Aviv Yuniar Rahman (Universitas Widyagama Malang, Indonesia); I Istiadi (Widyagama University of Malang, Indonesia)
14:05	14:20	Design and Development of Maturity Identifier of Sugarcane thru Phenomics via Image Processing	Alnie Aderes, Harold Combalicer, Jose Rico Garcia, Alyssa Miranda, Hannah Nicole Pedrosa, Arjay Yabut, Rommel Anacan and Josephine Bagay (Technological Institute of the Philippines-Manila, Philippines)
14:20	14:35	Estimating Rice Production using Machine Learning Models on Multitemporal Landsat-8 Satellite Images	Arie Wahyu Wijayanto and Salwa Rizqina Putri (Politeknik Statistika STIS, Indonesia)
14:35	14:50	Image Classification of Starlings Using Artificial Neural Network and Decision Tree	Aviv Yuniar Rahman (Universitas Widyagama Malang, Indonesia)
14:50	15:05	Correlation of Expansive Soil and Road Pavement	Aji Suraji (University of Widyagama Malang, Indonesia); Faqih Rofii (Universitas

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		Conditions Using Data Mining from GIS Portal	Widyagama Malang, Indonesia); Fitri Marisa (Widyagama University of Malang, Indonesia); Agus Tugas Sudjianto (University of Widyagama, Indonesia); Candra Aditya (Universitas Widyagama Malang, Indonesia); Riman Riman (University of Widyagama, Indonesia)
15:05	15:20	Investigating the Key Factors on XYZ Generations' Higher-Order Thinking Skills in ELearning	Erwin Halim (Bina Nusantara University & School of Information Systems, Indonesia); Kevin Kevin (Bina Nusantara University, Indonesia); Marylise Hebrard (Institut Des Usages, France)

1:20 Forecasting the Automobile and Parts Product Export Values using Time Series Analysis

Jakkaphan Whasphuttisit and Watchareewan Jitsakul (King Mongkut's University of Technology North Bangkok, Thailand)

This research aims to study the suitable time series analysis to forecast the automobile and parts product export values over the next 12 months. The time series data source gathers from the Government Open Data of Thailand official website during January 2013 to December 2021, 108 months in total. The experiment starts with creation, comparison, selection, verification, and forecasting. Time series analysis has considered five methods: Trend Analysis, Moving Average, Decomposition, Single Exponential Smoothing, and Double Exponential Smoothing. We use mean absolute present error (MAPE), mean absolute deviation (MAD), and mean squared deviation (MSD) to compare and select the least value. The result showed that Moving Average had the best performance. Then we used the Moving Average to verify and forecast over the next 12 months. However, it was found that the forecast values obtained were constant for the entire 12 months, so the moving average is unused for forecasting. The Moving Average has the least

mean absolute present error (MAPE) at 0.2420. Therefore, we have used Decomposition which is a suitable performance in the second order of forecasting. It is forecast and has a trend value. Moreover, the Decomposition method has the least mean absolute present error (MAPE) at 0.1832.

1:35 Circle Detection System using Image Moments

Rifqi Fachruddin and Joko Buliali (Institut Teknologi Sepuluh Nopember, Indonesia)

The growth of system detection has significant development. Circle detection system is widely used to help people based on their needs, and it also could be used as learning media in educational fields. Especially for students with special needs, the application of circle detection system in Augmented Reality (AR) media would help them a lot. In order to make the study activity more effective and suit with learning material purpose, circle detection system that only detect perfect full circle is needed to minimalized misconception in circle learning material. From the previous method such as Circle Hough Transform (CHT), circle detection face with complex transition from cartesian coordinate into Hough coordinate. The use of image moments would give coordinate of centroid that could use to find the radius by using circle equation. Two groups of datasets would test the new proposed method in detecting circle. Based on experiment, the accuracy of new method was 96.7%. The average time consumption is 0. 405 s which is faster than CHT method with 1.024 s. Circle detection using image moments also more robust towards noise than the previous CHT method.

1:50 Betta Fish Image Classification Using Artificial Neural Networks With Gabor Extraction Features

Satria Hidayat (Universitas Widyagama, Indonesia); Aviv Yuniar Rahman (Universitas Widyagama Malang, Indonesia); I Istiadi (Widyagama University of Malang, Indonesia)

Betta fish also known as battling fish, is a type of freshwater fish that is well known among ornamental fish lovers. For this reason, the analyst proposes Betta Fish Picture Grouping Utilizing Artificial Neural Networks with the Color Gabor feature. The test results have 3 parameters, namely precision,

recall, and accuracy. The level in comparison using a comparator between 50:50. The results obtained starting from the Gabor feature with CMYK precision color have test results reaching 37.94%. Then the recall has a value of 30.40% and accuracy in the existing accuracy reaches 56.71%. From the results of testing the Gabor feature with HSV precision color, reached 38.69%. Then the recall has value of 34.92% and accuracy in the existing accuracy reaches 54.69%. The Gabor feature with RGB precision reaching 39.40% at a 50:50. Then the recall has a value of 32.28% at a 50:50. The level of accuracy in the existing accuracy reaches 58.85% with a ratio of 50:50. From this it can be concluded that the Gabor feature with GRB color has the best accuracy value at a ratio of 50:50. The Gabor feature with RGB color is the best result in betta fish classification using Artificial Neural Networks.

2:05 Design and Development of Maturity Identifier of Sugarcane thru Phenomics via Image Processing

Alnie Aderes, Harold Combalicer, Jose Rico Garcia, Alyssa Miranda, Hannah Nicole Pedrosa, Arjay Yabut, Rommel Anacan and Josephine Bagay (Technological Institute of the Philippines-Manila, Philippines)

Sugarcane is a crop of major importance providing about 65% of the world's sugar. The production of sugarcane dropped by 26.2 percent, but the demand for sugar increased due to a rapidly developing food processing industry and a growing population. Thus, many sugarcane mills needed to produce a maximum weight of the millable canes (thus sugar) with the least possible field losses under the given growing environment. One way to identify the maturity of sugarcane is through its physical characteristics such as its stalk color and node length. The most appropriate method for this approach is image processing. This process has been widely used for identification, classification, grading, and quality evaluation in the agriculture area. The objective of this work is to develop an automated system, which can be capable of detecting the maturity of sugarcanes based on their stalk color by digital image analysis. The prototype is composed of two transceivers communicating with one another. A camera is used to capture sugarcane images and is connected to a microcontroller which processes and sends all the data to the main station. Python is used as the programming language for identification and classification using object detection algorithms, specifically, convolutional neural networks, and pre-trained models in

TensorFlow, which is an open-source artificial intelligence library, uses data flow graphs to build models. The proposed method can be used in maximizing the sugar yield from the sugarcane by identifying if it's matured enough to be harvested since maturity is directly proportional to sugar extracted.

2:20 Estimating Rice Production using Machine Learning Models on Multitemporal Landsat-8 Satellite Images

Arie Wahyu Wijayanto and Salwa Rizqina Putri (Politeknik Statistika STIS, Indonesia)

To enhance sustainable food security, the cost-efficient data collection technology for estimating rice production in a major agriculture nation such as Indonesia is undoubtedly vital to support the existing official data collection. The current official data collection is still facing great challenges in terms of its high cost and laborious nature. This study aims to build machine learning-based models for rice production estimation by utilizing multitemporal Normalized Difference Vegetation Index (NDVI) data obtained from Landsat-8 remote sensing satellite imagery focusing on Ngawi Regency, East Java, Indonesia as a case study are. Our investigation reveals the quarterly changes in vegetation conditions of the rice fields can be captured through the NDVI value. Four different machine learning models are constructed and evaluated to process the satellite data. Support vector regression (SVR) was shown to obtain the best performance from 10-fold cross-validation with the average root mean square error (RMSE) of 6952.89 tons and has a quite high coefficient of determination (R2) score which is up to 0.9. The current estimation results provide an incentive to use satellite imagery data and machine learning models to support agricultural monitoring and decision-making.

2:35 Image Classification of Starlings Using Artificial Neural Network and Decision Tree

Aviv Yuniar Rahman (Universitas Widyagama Malang, Indonesia)

Starlings are well known creatures in Indonesia. Consequently, numerous in Indonesia keep up with and develop starlings. Pretty much every area

Indonesia has various kinds of starlings. The outcomes acquired this correlation from the Artificial Neural Network have brings about surface, shape and shading highlights with the most elevated esteem accuracy arriving at 0.870 few examinations. Then, the most elevated review esteem arrived at 0.600 split proportion 90:10. The most elevated esteem the f-measure arrived 0.865 proportion 10:90. Besides, has the most elevated exactness esteem arriving at 93% correlation of 90:10. The Decision Tree has the most noteworthy worth accuracy arriving at 1,000 on split proportions. The most elevated outcomes on the review came to 1,000. The consequences the f-measure arrive 1,000 and precision esteem arrives 100 percent in proportion of 70:30 up to 90:10. The aftereffects of the tests that have been done show that the Decision Tree can order starling pictures light of 3 element levels. What's more this case can be demonstrated that the Decision Tree more exact during the time spent arranging starling pictures. The strategy this Decision Tree can make it simpler to observe the right precision esteem during the time spent arranging starling species.

2:50 Correlation of Expansive Soil and Road Pavement Conditions Using Data Mining from GIS Portal

Aji Suraji (University of Widyagama Malang, Indonesia); Faqih Rofii (Universitas Widyagama Malang, Indonesia); Fitri Marisa (Widyagama University of Malang, Indonesia); Agus Tugas Sudjianto (University of Widyagama, Indonesia); Candra Aditya (Universitas Widyagama Malang, Indonesia); Riman Riman (University of Widyagama, Indonesia)

Expansive soil has a fairly high shrinkage rate and will affect the strength of the road pavement structure. This paper aims to analyze the condition of expansive soil associated with road pavement damage. The method of collecting road damage data is done by data mining from the GIS portal database owned by Bina Marga. Meanwhile, data on soil conditions was taken from the portal belonging to the Geological Agency. The analytical method used is the statistical approach t-Test - Paired Two Sample for Means. The results of the study show that there is a correlation between expansive soil conditions and road damage. Expansive soil has a significant effect on road damage

3:05 Investigating the Key Factors on XYZ Generations' Higher-Order Thinking Skills in ELearning

Erwin Halim (Bina Nusantara University & School of Information Systems, Indonesia); Kevin Kevin (Bina Nusantara University, Indonesia); Marylise Hebrard (Institut Des Usages, France)

Education development continues to proliferate in Indonesia, so many learning methods are applied, but the number of students with HOTS abilities in Indonesia is minimal. The issues affecting HOTS in Indonesia are (1) Not yet able to adapt, (2) Lack of basic knowledge early on, and (3) Few apply HOTS. The research goals were to examine XYZ generations' HOTS variables in the e-learning concept. This research used Structural Equation Model (SEM) and SmartPLS as statistical tools. With the Purposive sampling method, data was gathered via an online questionnaire from 184 respondents from April 21-28, 2022, consisting of students and lecturers at 20 universities in Indonesia who also came from various regions in Indonesia. The proposed model has six variables: Learning Environment, Learning Motivation, Peer Interaction, Learning Strategy, Learning Style, HOTS in elearning concept, and eight hypotheses. All hypotheses have a significant influence.

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AIT-0612: Technical Session Artificial Intelligence
Parallel Session 2 (Room 5)
Thursday, June 16th 2022
(13:05 – 15:20)

Code Session : AIT-0612
Title Session   : Artificial Intelligence

Start	Finish	Papers	Authors
13:20	13:35	Design and Implementation of IoT-Based Aeroponic Farming System	Riswandi Riswandi (Hasanuddin University, Indonesia); Muhammad Niswar (Universitas Hasanuddin, Indonesia); Zulkifli Tahir (Hasanuddin University, Indonesia); Yung-Wey Chong (Universiti Sains Malaysia, Malaysia)
13:35	13:50	1D-Convnet Model for Detection of Antidepressant Drugs	Gracia Rizka Pasfica, Nur Ghaniaviyanto Ramadhan and Faisal Dharma Adhinata (Institut Teknologi Telkom Purwokerto, Indonesia)
13:50	14:05	Hybrid Whale Optimization Algorithm for Solving Timetabling Problems of ITC 2019	I Gusti Agung Premananda (Institut Teknologi Sepuluh Nopember, Indonesia); Aris Tjahyanto (Sepuluh Nopember Institute of Technology, Indonesia); Ahmad Muklason (Institut Teknologi Sepuluh Nopember, Indonesia)
14:05	14:20	Performance of Information Gain and PCA Feature Selection for Determining Ripen Susu Banana Fruits	Candra Dewi, Endang Arisoesilaningsih, Wayan Firdaus Mahmudy and Solimun Solimun (Universitas Brawijaya, Indonesia)
14:20	14:35	Detector Face Mask using UAV-based CNN Transfer Learning of YOLOv5	Rizqi Alinra, Satryo Utomo, Khairul Anam and Gamma Aditya Rahardi (University of Jember, Indonesia)

14:35	14:50	Machine Learning Algorithms and Datasets for Modern IDS Design	Inam Abdullah Abdulmajeed (University of Kirkuk & College of Computer Science and Information Technology, Iraq)
14:50	15:05	A Hybrid DEMATEL-EDAS Based on Multi-Criteria Decision-Making for A Social Aid Distribution Problem	Irvanizam Irvanizam, Mega Siraturahmi, Aisyah Irwansyah and Puti Nasir (Universitas Syiah Kuala, Indonesia); Zulfan Zulfan (Syiah Kuala University, Indonesia); Nany Salwa (Universitas Syiah Kuala, Indonesia)
15:05	15:20	-	-

1:20 Design and Implementation of IoT-Based Aeroponic Farming System

Riswandi Riswandi (Hasanuddin University, Indonesia); Muhammad Niswar (Universitas Hasanuddin, Indonesia); Zulkifli Tahir (Hasanuddin University, Indonesia); Yung-Wey Chong (Universiti Sains Malaysia, Malaysia)

Urban farming becomes popular and enhanced food security in urban areas. Aeroponic is one of the urban farming methods where plant roots are suspended in the air and are supplied with nutrients by mist spraying. This paper describes an IoT system for monitoring and controlling evapotranspiration in aeroponic environment. The system consists of a microcontroller, single-board computer, sensors, and actuators. The sensors in system collect the data of plant environment parameters including air temperature, humidity, total dissolved solids (TDS), pH, and water temperature. Then, the system calculates the level of evapotranspiration using the BlaneyCriddle method to determine the appropriate actuator action to reduce the level of evapotranspiration in aeroponic using a fuzzy algorithm. The experimental result shows that our IoT system can reduce evapotranspiration, hence, it can improve the plant quality.

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1:35 1D-Convnet Model for Detection of Antidepressant Drugs

Gracia Rizka Pasfica, Nur Ghaniaviyanto Ramadhan and Faisal Dharma Adhinata (Institut Teknologi Telkom Purwokerto, Indonesia)

A drug is a substance or mixture of materials to be used in determining the diagnosis, preventing, reducing, eliminating, curing disease or symptoms of disease, bodily or spiritual injury or disorder in humans or animals, including to beautify the body or parts of the human body. Problems begin to arise when a patient is wrong in consuming the target drug used, which is not by the type of disease suffered. For example, suppose a person suffers from a psychological disorder that requires taking different types of drugs, if it turns out that the type of drug consumed is not by the disease, it is very dangerous. This problem is certainly very dangerous because it can cause death for those who consume it. So, the purpose of this study was to detect the classification of Aptical antidepressants and SSRIs antidepressants using a deep learning model of the 1D-Convolutional Network (1D-Convnet) type. The results obtained using this model are 98.3% with the most influential parameter, namely dropout. The proposed research model also produces higher accuracy than the Naive Bayes supervised learning model.

1:50 Hybrid Whale Optimization Algorithm for Solving Timetabling Problems of ITC 2019

I Gusti Agung Premananda (Institut Teknologi Sepuluh Nopember, Indonesia); Aris Tjahyanto (Sepuluh Nopember Institute of Technology, Indonesia); Ahmad Muklason (Institut Teknologi Sepuluh Nopember, Indonesia)

Timetabling problem at universities is one of the problems that require more attention in operations research. This problem is known as NP-Hard problem, therefore non-deterministic exact algorithm could solve problems within this category within polynomial time. The heuristic approach can produce a fairly good solution within polynomial time but does not guarantee that the solution is optimal. So, there is always a gap in a heuristic algorithm that can be studied to result enhanced algorithm with better performance. There are a lot of timetabling problem domains in the literature that have been well studied in the scientific literature especially in the field of operational research and artificial intelligence. However, there are still few prior studies reported in the literature that focus on solving relatively new timetabling

problem domain of International Timetabling Competition 2019 (ITC 2019). The competition presents real-world datasets with high complexity and large problem sizes. This paper reports our study of developing a novel algorithm called the Hybrid Whale Optimization Algorithm to solve the ITC 2019 problem. The algorithm combines the adapted whale optimization algorithm (WOA) and Late Acceptance Hill Climbing (LAHC) algorithm. The experimental results show that The WOA algorithm successfully improved the average penalty value by 65%. Furthermore, the hybrid WOA improves the WOA algorithm even better, especially on four datasets by 16-43%. Compared to other algorithms reported in the competition, the Hybrid WOA algorithm is ranked 7 out of 13.

2:05 Performance of Information Gain and PCA Feature Selection for Determining Ripen Susu Banana Fruits

Candra Dewi, Endang Arisoesilaningsih, Wayan Firdaus Mahmudy and Solimun Solimun (Universitas Brawijaya, Indonesia)

Susu banana fruits has a uniqueness, where is the difference of slightly ripe and ripe susu banana at the ripen stage is perfectly difficult to distinguish visually because both have almost the same yellow color. Therefore, this study performed identification using a fruit image-based computer vision to replace the human visual. The almost similar characteristics of susu banana at slightly ripe, ripe and riper stage were selected to get a dominant character that has a high influence. The ability of information gain (IG) and principal component analysis (PCA) and combined IG-PCA features selection was evaluated to determine the influence of correlation and probability of each feature on each class. Tests were conducted on clean-peeled and spotted peel susu banana with 3 levels of ripeness at the ripen stage to determine the impact of IG, PCA and combined IG-PCA on classification using extreme learning machines. The test results showed that the use of PCA in the clean-peeled with natural curing (group1) and spotted peel with chemistry curing (group3) was better than IG. In the group1, PCA also outperformed combined IG-PCA, but in the group3 the combined use of IG-PCA was better than IG and PCA. Although the use of feature selection at spotted peel with natural curing (group2) was resulted the lower accuracy, overall, the tests showed that the selected of dominant features in the classification could increase the

recognition accuracy. The proposed method also proved could be used as an alternative in determining the ripen of susu bananas.

2:20 Detector Face Mask using UAV-based CNN Transfer Learning of YOLOv5

Rizqi Alinra, Satryo Utomo, Khairul Anam and Gamma Aditya Rahardi
(University of Jember, Indonesia)

Detection of the use of masks on someone is helpful in health protocols during the covid-19 pandemic. All public services or places require people to wear masks during the pandemic. There are about three types of masks commonly used by the public today: surgical/medical masks, cloth masks, and scuba masks. This research aims to detect masks by monitoring a user using a mask through a camera. also detects the type of mask used by the community. So that it can provide convenience in implementing discipline in carrying out the COVID-19 health protocol using masks. In addition, this research proposes the detection of masks on the face by monitoring using a drone. The detection method used in this research is Transfer Learning CNN. This algorithm is a deep learning method that can classify and detect in digital image processing. The initial step of the research is to collect the types of masks on the market in the form of digital images, followed by the application before being modeled into mathematical calculations, which will later be processed using the Convolutional Neural Network method. This research compares two architectural transfer learning methods in deep learning, namely mobile net V2 with YOLOv5. The system testing process will be carried out by analyzing the recall value, precision, and accuracy. The testing process on drone camera-based devices uses the python programming language. Based on the results of the transfer learning method using YOLOv5, the results of the data training accuracy are 97% in detecting masks.

2:35 Machine Learning Algorithms and Datasets for Modern IDS Design

Inam Abdullah Abdulmajeed (University of Kirkuk & College of Computer Science and Information Technology, Iraq)

Intrusion Detection System (IDS) is a critical component in cyber security to capture and analyze the traffic and then differentiate between benignant and malicious traffic indicating the attack type. This review is aimed to investigate various Machine Learning (ML) algorithms utilized in IDS design; with particular focus on dataset used. The parameters used to compare the performance of each algorithm have been studied also. Dataset choice is exceptionally critical to guarantee that it is matching the IDS requirements. The dataset structure can influence in a great manner the selection of the of ML algorithm. Hence, metric will provide a numerical relation between ML algorithm against specific dataset. This review concluded that researches are liberating themselves from Supervised Learning and moving toward Clustering and other algorithms, which gives the hope that IDS in the future will be able to detect more unknown and zero-day attacks, also the percentage of utilizing hybrid algorithms has increased dramatically. On the other hand, recent ML researchers are depending more and more on modern datasets which contributes as a significant consideration in IDS design although some research articles are still seeing the KDDCup99 and its reduced variant as principal training dataset of IDSs, despite the fact that it is more than 20 years old, while cyber-threats keep rising together with adapting new technologies in the cyber world like cloud computing, IoT, and IPv6.

2:50 A Hybrid DEMATEL-EDAS Based on Multi-Criteria Decision-Making for A Social Aid Distribution Problem

Irvanizam Irvanizam, Mega Siraturahmi, Aisyah Irwansyah and Puti Nasir (Universitas Syiah Kuala, Indonesia); Zulfan Zulfan (Syiah Kuala University, Indonesia); Nany Salwa (Universitas Syiah Kuala, Indonesia)

The office of social affairs has been helping poor or marginalized families through social aid in dealing with poverty. This social aid emphasizes decreasing the poverty rate and economic recovery affected by the COVID19 pandemic. However, the selection process in the previous year evaluated

many families as aid recipient candidates through a conventional process selected by an officer. It would be vulnerable to subjectivity in assessment. Therefore, we attempted to develop a hybrid Multiple Criteria Decision-Making (MCDM) methodology to apply it to this particular decision-making process. This methodology amalgamated the DEMATEL method and the EDAS method with different tasks. Firstly, the DEMATEL method decided the feasible criteria weights automatically based on the proficient decision-maker assessment in estimating a pairwise criteria comparison. Secondly, the EDAS applied the criteria weight values to determine alternatives rank order based on the value of the appraisal score. After comparing with the VIKOR method, the hybrid DEMATEL-EDAS method demonstrated the stability and capability in dealing with the different influence parameters on the final results.

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AIT-1319: Technical Session Artificial Intelligence
Parallel Session 3 (Room 1)
Friday, June 17th 2022
(08:45 – 10:45)

Code Session : AIT-1319
Title Session : Artificial Intelligence

Start	Finish	Papers	Authors
9:00	9:15	Power Allocation Based LSTM-FCN in D2D Underlaying with Multi-Cell Cellular Network	Astri Wulandari and Arfianto Fahmi (Telkom University, Indonesia); Nachwan Mufti Adriansyah (Universitas Telkom, Indonesia)
9:15	9:30	Modified CNN to Maximize Energy Efficiency in D2D Underlying with Multi-Cell Cellular Network	Bayu Setho KusumaSakti and Arfianto Fahmi (Telkom University, Indonesia); Nachwan Mufti Adriansyah (Universitas Telkom, Indonesia); Vinsensius Sigit Widhi Prabowo (Telkom University, Indonesia)
9:30	9:45	Skeletal-based Classification for Human Activity Recognition	Agung Suhendar and Tri Ayuningsih (Telkom Indonesia, Indonesia); Suyanto Suyanto (Telkom University, Indonesia)
9:45	10:00	Voice-Zikr: A Speech Recognition System Implementation for Hands-Free Zikr Based on Deep Learning	Alim Misbullah, Laina Farsiah, Nazaruddin Nazaruddin and Furqan Hermawan (Universitas Syiah Kuala, Indonesia)
10:00	10:15	A study of machine translation for Vietnamese and Korean on the TED Talks 2020 corpus	Binh Van Duong, Kim Chi T. Phan, Chien Nhu Ha and Phat Cao Tran (University of Information Technology, Ho Chi Minh City, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam

			National University, Ho Chi Minh City, Vietnam)
10:15	10:30	Traditional Javanese Membranophone Percussion Play Formalization for Virtual Orchestra Automation	Arry Maulana Syarif and Khafiizh Hastuti (Universitas Dian Nuswantoro, Indonesia); Pulung Nurtantio Andono (Dian Nuswantoro, Indonesia)
10:30	10:45	Hybrid SVD-ARIMA Method for Sales Forecasting with Sparse Data on E-Commerce Products	Vania Putri Minarso (Gadjah Mada University, Indonesia); Teguh Bharata Adji and Noor Akhmad Setiawan (Universitas Gadjah Mada, Indonesia)

9:00 Power Allocation Based LSTM-FCN in D2D Underlaying with Multi-Cell Cellular Network

Astri Wulandari and Arfianto Fahmi (Telkom University, Indonesia); Nachwan Mufti Adriansyah (Universitas Telkom, Indonesia)

Device-to-Device (D2D) communication is one of the key technologies to achieving higher speeds, lower latency, and less energy. It is considered important in 5G. D2D communication refers to direct link communication between two communication devices, meaning that communication can occur without going through the base station. The traditional D2D communication technology still have problems related to the efficiency of the allocation, coordination of interference, and limitations for operating in real-time systems. Power allocation needs to maximize the sum rate and energy efficiency to overcome this problem. This work focuses on designing the Long Short Term Memory with Fully Convolutional Network (LSTM-FCN) algorithm suitable for the power control problem on an D2D underlay communication system with an uplink-side multi-cell scheme. The simulation results show that enhancement of CUE can increase the system's sum rate and energy efficiency, while enhancement of the D2D pair can also increase the sum rate but decrease energy efficiency. Both LSTMFCN, LSTM, and FCN can approximate the performance of the conventional scheme (CA-based algorithm). Besides that, LSTM-FCN get the closest performance to CA in both scenarios above 97% accuracy.

9:15 Modified CNN to Maximize Energy Efficiency in D2D Underlying with Multi-Cell Cellular Network

Bayu Setho KusumaSakti and Arfianto Fahmi (Telkom University, Indonesia); Nachwan Mufti Adriansyah (Universitas Telkom, Indonesia); Vinsensius Sigit Widhi Prabowo (Telkom University, Indonesia)

The usage of Device-to-Device (D2D) underlaying to reuse spectrum has a substantial influence on spectrum efficiency. On the other side, interference issues arise as a result of frequency reused by D2D users. Furthermore, wearable devices or communication devices have limited power sources, such as batteries. As a result, the fundamental problem formulation that must be solved is power allocation, with the goal function being to maximize the energy efficiency of the system. In order to provide optimum power allocation, conventional methods such as Convex Approximation (CA)-based algorithm need to run multiple iterations to solve the nonconvex problem formulation. Therefore, Conventional Neural Network (CNN) as part of Deep Learning (DL) is utilized to approach (CA)-based algorithm for generating power allocation policies to maximize the system's energy efficiency. However, the conventional method of CNN has limitations in accepting arbitrary input size. Accordingly, to the limitation of CNN, this research proposed the combination of CNN with Spatial Pyramid Pooling (SPP) to overcome the limitation on the input size of conventional CNN. Specifically, the inputs of the model are the user's channel state information, and its outputs are power control policies. The simulation results show that both CNN-SPP and CNN can achieve similar performance to the traditional method up to 95% with ultra-low time consumption.

9:30 Skeletal-based Classification for Human Activity Recognition

Agung Suhendar and Tri Ayuningsih (Telkom Indonesia, Indonesia); Suyanto Suyanto (Telkom University, Indonesia)

Human activity recognition (HAR) is critical for determining human interactions and interpersonal relationships. Among the various classification techniques, two things become the main focus of HAR, namely the type of activity and its localization. Most of the tasks in HAR involve identifying a

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human scene from a series of frames in a video, where the subject being monitored is free to perform an activity. For some of the current HAR approaches, 3D sensors are used as input extractors for the skeleton/body pose of the subject being monitored. It is much more precise than using only 2D information obtained from conventional cameras. Of course, the use of 3D sensors is a significant limitation for implementing video-based surveillance systems. In this research, we use the Deep learning OpenPose 3D method as a substitute for 3D sensors that can estimate the 3D frame/pose of the subject's body identified from conventional camera 2D input sources. It is then combined with other machine learning methods for the activity classification process from the obtained 3D framework. Classifiers that can be used include Support Vector Machine (SVM), Neural Network (NN), Long short-term memory (LSTM), and Transformer. Thus, HAR can be applied flexibly in various scopes of supervision without the help of 3D sensors. The experiment results inform that Transformer is the best in accuracy while SVM is in speed.

9:45 Voice-Zikr: A Speech Recognition System Implementation for Hands-Free Zikr Based on Deep Learning

Alim Misbullah, Laina Farsiah, Nazaruddin Nazaruddin and Furqan Hermawan (Universitas Syiah Kuala, Indonesia)

Speech recognition is a branch of pattern recognition that has been widely implemented in products. Some wellknown products that used speech recognition systems include Google Assistant, Apple Siri, and Alexa which have high accuracy to produce output with user expectations. Recently, deep learning is one of the techniques that is often used to build models in speech recognition systems. The technique works to keep information in its hidden layers from audio frames as input features and phones as output labels respectively. Zikr is one of the Muslim worship activities that can be done at any time. Several tools and applications have been created to count the zikr words while repeatedly speaking them. In this research, the speech recognition system is implemented to create an application called voice-zikr that is used to count the zikr words spoken by Muslim people. The speech recognition model is trained using time delay neural networks with 5 hidden layers. The dataset was collected from different ages of speakers who read "Subhanallah", "Alhamdulillah", "Lailahaillallah", and "Allahuakbar". The

model performance can reach 1.04 %WER on recorded audio testing and work perfectly on microphone testing.

10:00 A study of machine translation for Vietnamese and Korean on the TED Talks 2020 corpus

Binh Van Duong, Kim Chi T. Phan, Chien Nhu Ha and Phat Cao Tran (University of Information Technology, Ho Chi Minh City, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam National University, Ho Chi Minh City, Vietnam)

Vietnam has achieved impressive economic growth in the last two decades [1]. It becomes a worth investing country in the area. Consequently, the need of understanding foreign investors from different countries (S. Korea in specific) is an essential issue. Therefore, building an automatic machine translation system with high precision is a necessary solution, especially during the COVID-19 pandemic, where keeping distance is the best way to avoid spreading the virus. As a result, this research presents some experimental results on the TED Talks 2020 dataset for the task Korean - Vietnamese and Vietnamese - Korean machine translation with the purpose of providing an overview of the dataset and a deep learning machine translation model for the problem.

10:15 Traditional Javanese Membranophone Percussion Play Formalization for Virtual Orchestra Automation

Arry Maulana Syarif and Khafiizh Hastuti (Universitas Dian Nuswantoro, Indonesia); Pulung Nurtantio Andono (Dian Nuswantoro, Indonesia)

This research aims to formalize kendhangs play, an instrument that is part of traditional music orchestra from Java called Gamelan. Kendhang play patterns was acquired from experts, and the patterns were used to set rules and implemented into a kendhang play automation system. Considering kendhang is a membranophone and an unpitched instrument, note sequences data from the composition, including the sound of each note from several pitched metallophone instruments, are collected as well to support the evaluation of the play in virtual orchestra mode. The Gamelan virtual

orchestra automation system is designed based on the symbolic representation. The input is a collection of compositions in the form of note sequence data. The system reads beat-by-beat data and calls out sounds. The evaluation was carried out by asking musicians as experts to choose the automation of kendhang play patterns which they thought are correct and comply to the type of accompaniment composition. The results of the evaluation showed that the proposed system could play kendhangs correctly. All compositions selected by experts based on the accuracy of kendhangs play are compositions accompanied by the correct kendhangs pattern.

10:30 Hybrid SVD-ARIMA Method for Sales Forecasting with Sparse Data on E-Commerce Products

Vania Putri Minarso (Gadjah Mada University, Indonesia); Teguh Bharata Adji and Noor Akhmad Setiawan (Universitas Gadjah Mada, Indonesia)

In online business, predictive analytics or forecasting is often used to improve performance effectiveness. One of the forecastings that play an important role in most businesses is sales forecasting. The results of sales forecasting are used to make stock planning and the right decisions for the future. Several previous studies on forecasting preferred to use available methods. Besides, there were also some studies that combined or compared several forecasting methods to produce higher accuracy. However, in the testing process, those studies were still carried out with non-sparse data. Therefore, the Hybrid method between Singular Value Decomposition (SVD) and Autoregressive Integrative Moving Average (ARIMA) is used to do sales forecasting in this study. SVD method is used to predict sparse data. The ARIMA method is then used to forecast sales based on data from the SVD method. The research results on monthly forecasting using sparse data of 40% have an average RMSE and MAE values improvement of 0.308 and 0.352, respectively. For monthly forecasts that use 50% sparse data, the average RMSE and MAE values improvement are 0.279 and 0.28, respectively. For daily forecasting using sparse data of 40%, the average RMSE and MAE values improvement are 0.021 and 0.014, respectively. For daily forecasting using 50% sparse data, the average RMSE and MAE values improvement are 0.017 and 0.009, respectively. The accuracy results show that the Hybrid SVD-ARIMA method can perform forecasts better than the ARIMA method. However, in daily forecasting, the Hybrid SVD-ARIMA method still has a high forecasting error.

AIT-2026: Technical Session Artificial Intelligence
Parallel Session 3 (Room 2)
Friday, June 17th 2022
(08:45 – 10:45)

Code Session : AIT-2026
Title Session : Artificial Intelligence

Start	Finish	Papers	Authors
9:00	9:15	Comparison Of Texture Feature Extraction Method For Covid-19 Detection With Deep Learning	Dionisius Adianto Tirta Nugraha (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia)
9:15	9:30	Capitalization Feature and Learning Rate for Improving NER Based on RNN BiLSTMCRF	Warto Warto (Universitas Islam Negeri Profesor Kiai Haji Saifuddin Zuhri, Indonesia); Muljono Muljono (Dian Nuswantoro University, Indonesia); Purwanto Purwanto (Universitas Dian Nuswantoro, Indonesia); Edi Noersasongko (Faculty of Computer Science, Universitas Dian Nuswantoro, Indonesia)
9:30	9:45	Multi-task Solution for Aspect Category Sentiment Analysis on Vietnamese Datasets	Hoang-Quan Dang and Duc-Duy-Anh Nguyen (University of Information Technology, Ho Chi Minh City, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam National University, Ho Chi Minh City, Vietnam)
9:45	10:00	Indonesian Automatic Speech Recognition Based on End-to-end Deep Learning Model	Anis Sirwan (Telkom Corporate University, Telkom Indonesia, Indonesia); Kurniawan Thama (PT Telkom Indonesia, Indonesia); Suyanto Suyanto (Telkom University, Indonesia)

10:00	10:15	Review of Feature Extraction on Video-Oculography (VOG) and Electro-Oculography (EOG) Signals	Iqbal Kurniawan Asmar Putra (Gadjah Mada University, Indonesia); Sunu Wibirama and Syukron Abu Ishaq Alfarozi (Universitas Gadjah Mada, Indonesia); Muhammad Ainul Fikri (Gadjah Mada University, Indonesia)
10:15	10:30	Comparison of Support Vector Machine and Neural Network Algorithm in Drone Detection System	Risa Farrid Christianti, Hanin Fuadi and Mas Aly Afandi (Institut Teknologi Telkom Purwokerto, Indonesia); Azhari Azhari (UGM, Indonesia); Andi Dharmawan (Universitas Gadjah Mada, Indonesia)
10:30	10:45	Analysis of DNA Sequence Classification Using SVM Model with Hyperparameter Tuning Grid Search CV	Iis Setiawan Mangkunegara and Purwono Purwono (Universitas Harapan Bangsa, Indonesia)

9:00 Comparison Of Texture Feature Extraction Method For Covid-19 Detection With Deep Learning

Dionisius Adianto Tirta Nugraha (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia)

This paper describes research on texture feature extraction for COVID-19 detection. Fractal Dimension Texture Analysis (FDTA) and Gray Level Co-occurrence Matrix (GLCM) were used for feature extraction. A dense neural network is used for classification. Three classes were used for classification to classify Normal, COVID-19, and Other pneumonia. The data entered in the texture feature extraction is a chest x-ray (CXR) image that is grayscaled and resized into 400×400 pixels. Performance analysis of the model uses a confusion matrix. The best performance feature extraction method for detecting COVID-19 is FDTA with an accuracy testing of 62.5%.

9:15 Capitalization Feature and Learning Rate for Improving NER Based on RNN BiLSTMCRF

Warto Warto (Universitas Islam Negeri Profesor Kiai Haji Saifuddin Zuhri, Indonesia); Muljono Muljono (Dian Nuswantoro University, Indonesia); Purwanto Purwanto (Universitas Dian Nuswantoro, Indonesia); Edi Noersasongko (Faculty of Computer Science, Universitas Dian Nuswantoro, Indonesia)

Entity extraction in the natural language processing research field is still a widely researched topic. It can be a data source for the next NLP stage, such as text summarization, sentiment analysis, chatbot, machine translation, information retrieval, opinion mining, speech recognition, etc. Named Entity Recognition (NER) is the task of detecting named entities on the corpus. The detection process of entities can use various features, one of which is capital letters. Capital letters that appear at the beginning of a sentence indicate the name of a person, place, organization, geolocation, etc. The experiment uses the deep learning approach with Recurrent Neural Network Bidirectional Long Short Term Conditional Random Field (RNN-BiLSTM-CRF). Our comparing three optimization algorithms: Stochastic Gradient Descent (SGD), Adaptive Moment Estimation (Adam), and Adadelta, with the CoNLL2003 dataset. The experiment results using capital letter features showed an increase in the value of F1-Score by 2.9 higher compared to test results that did not use capital letter features. The highest F1-score score was 92.82 in testing using Adam's algorithm, with a 0.001 learning rate.

9:30 Multi-task Solution for Aspect Category Sentiment Analysis on Vietnamese Datasets

Hoang-Quan Dang and Duc-Duy-Anh Nguyen (University of Information Technology, Ho Chi Minh City, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam National University, Ho Chi Minh City, Vietnam)

In this article, we solved two tasks in the Vietnamese Aspect-based Sentiment Analysis problem: Aspect Category Detection (ACD) and Sentiment Polarity Classification (SPC). Besides, we proposed end-to-end models to handle the above tasks simultaneously for two domains (Restaurant and Hotel) in the VLSP 2018 Aspect-based Sentiment Analysis dataset using PhoBERT as Pre-

trained language models for Vietnamese in two ways: Multitask and Multi-task with Multi-branch approach. Both models give very good results when applied preprocessing. Specifically, the Multi-task model achieves state-of-the-art (SOTA) results in the Hotel domain of the VLSP 2018 ABSA dataset, with the F1-score being 82.55% for ACD and 77.32% for ACD with SPC. For the Restaurant domain, our Multi-task model also achieved SOTA in the ACD with SPC task by an F1-score of 71.55% and 83.29% for the ACD.

9:45 Indonesian Automatic Speech Recognition Based on End-to-end Deep Learning Model

Anis Sirwan (Telkom Corporate University, Telkom Indonesia, Indonesia); Kurniawan Thama (PT Telkom Indonesia, Indonesia); Suyanto Suyanto (Telkom University, Indonesia)

The Indonesian language is different from English in phonetics. It is challenging to develop AI technology, machine learning, and deep learning with various algorithms to select the appropriate methods and algorithms for Indonesian speech recognition needs. Much research on speech recognition has been performed for highresource languages, such as English. Unfortunately, those models cannot be directly used for the Indonesian language. To create an excellent speech recognition model, we need a high-quality and quantity dataset of the Indonesian language. But, such a dataset is not available at the moment. Hence, in this research, we start collecting such a dataset. Next, the developed dataset is used to train an end-to-end deep learning-based speech recognition model. The evaluation shows that the developed model achieves a word error rate of 14.172%, better than two previous models: Mozilla DeepSpeech (23.10%) and Kaituoxu Speech-Transformer (22.00%).

10:00 Review of Feature Extraction on Video-Oculography (VOG) and Electro-Oculography (EOG) Signals

Iqbal Kurniawan Asmar Putra (Gadjah Mada University, Indonesia); Sunu Wibirama and Syukron Abu Ishaq Alfarozi (Universitas Gadjah Mada, Indonesia); Muhammad Ainul Fikri (Gadjah Mada University, Indonesia)

Eye tracking is used to observe where users are looking, how long they are looking, and what order they are looking. Eye tracking has been widely used in various fields such as helping people with disabilities by using Electro-Oculography (EOG) and analyzing eye movements signal in vestibular patients by using VideoOculography (VOG). The human eye has a cornea and retina that are located between the front and back of the human eye. Eye movement signal analysis is a necessary step prior to eye movement classification. Selecting a model and tuning the feature extraction algorithm on eye movements are tasks that researchers continue to optimize. However, there are very few studies investigating various feature extraction methods in VOG and EOG signals. To solve this research gap, this paper systematically describes feature extraction that is suitable for use in VOG and EOG signal analysis. Three main factors are important to be considered when choosing a feature extraction method: (1) classification, (2) filters and amplifiers, and (3) dataset characteristics. The results of this literature review can be used as a reference for developing feature extraction algorithms for EOG and VOG applications.

10:15 Comparison of Support Vector Machine and Neural Network Algorithm in Drone Detection System

Risa Farrid Christianti, Hanin Fuadi and Mas Aly Afandi (Institut Teknologi Telkom Purwokerto, Indonesia); Azhari Azhari (UGM, Indonesia); Andi Dharmawan (Universitas Gadjah Mada, Indonesia)

With the increase in the number of drones, it is possible to have the danger of using drones illegally. It is crucial to detect adverse events or conditions so that security operators can obtain that information and situational identification of drones. This paper proposes two methods of classifying acoustic sensor data in a UAV detection system, using Support Vector Machine and Neural Network, that will be compared. This research shows that the accuracy achieved in predicting acoustic sensor data is 82.27% in the

SVM method. The accuracy achieved is 90.58% for the NN method under the same input conditions and amount of training data. This comparation needs to do to choose the best accuracy in a public safety environment

10:30 Analysis of DNA Sequence Classification Using SVM Model with Hyperparameter Tuning Grid Search CV

Iis Setiawan Mangkunegara and Purwono Purwono (Universitas Harapan Bangsa, Indonesia)

Viruses and bacteria are constantly evolving in the world. Early identification of pathogens is one way that can be used to spread the spread of disease to drug design. DNA sequence classification is an essential aspect of computational biology. Pathogen identification was carried out by comparing data between sequenced genomes with NCBI data. Machine learning technology can classify DNA whose nature is unclear, and the sequence is considered long and challenging to find. The SVM classification model is proposed in this study. The resulting accuracy is still considered not optimal, so optimization is needed. In contrast to previous studies, we used the grid search cv optimization technique on the SVM classification model. Kernel polynomial with 2 degrees is the best parameter recommendation from the grid search cv technique. The accuracy before the optimization is 77%, while after optimization, it is 90%. This shows an increase in accuracy of 14% after applying the grid search cv method to DNA sequence classification using the SVM model

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AIT-2733: Technical Session Artificial Intelligence
Parallel Session 3 (Room 3)
Friday, June 17th 2022
(08:45 – 10:45)

Code Session : AIT-2733
Title Session   : Artificial Intelligence

Start	Finish	Papers	Authors
9:00	9:15	Design Science Research Methodology and Its Application to Developing a New Timetabling Algorithm	I Gusti Agung Premananda (Institut Teknologi Sepuluh Nopember, Indonesia); Aris Tjahyanto (Sepuluh Nopember Institute of Technology, Indonesia); Ahmad Muklason (Institut Teknologi Sepuluh Nopember, Indonesia)
9:15	9:30	Fuzzy Logic Control Strategy for Axial Flux Permanent Magnet Synchronous Generator in WHM 1.5KW	Demas Yangindrajat (Institut Teknologi Sepuluh Nopember & ITS, Indonesia); Harus Guntur (ITS, Indonesia)
9:30	9:45	An Ensemble Voting Method of Pre-Trained Deep Learning Models for Skin Disease Identification	Kien Trang and An Hoang Nguyen (International University, Vietnam); Long TonThat (International University HCMC, Vietnam); Hung Ngoc Do (International University, Vietnam); Bao Quoc Vuong (University of Brest, France & International University, VNUHCM, Vietnam)
9:45	10:00	Expert System Integrated with Medical Record for Infectious Diseases using Certainty Factor	I Istiadi and Emma Sulistiarini (Widyagama University of Malang, Indonesia); Rudy Joegijantoro (Widyagama Husada School of Health, Indonesia); Kuncahyo Setyo Nugroho

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			(Brawijaya University, Indonesia); Ismail Akbar (State Islamic University Maulana Malik Ibrahim, Indonesia); Affi Nizar Suksmawati (Gadjah Mada University, Indonesia)
10:00	10:15	COVID-19 Disease Classification by Cough Records Analysis using Machine Learning	Kien Trang and An Hoang Nguyen (International University, Vietnam); Long TonThat (International University HCMC, Vietnam); Hung Ngoc Do (International University, Vietnam); Bao Quoc Vuong (University of Brest, France & International University, VNUHCM, Vietnam)
10:15	10:30	Epileptic Seizure Detection Using Machine Learning and Deep Learning Method	Ade Eviyanti (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia); Ahmad Saikhu and Chastine Fatichah (Institut Teknologi Sepuluh Nopember, Indonesia)
10:30	10:45	USK-COFFEE Dataset: A Multi-class Green Arabica Coffee Bean Dataset for Deep Learning	Alifya Febriana (University of Syiah Kuala, Indonesia); Kahlil Muchtar and Rahmad Dawood (Universitas Syiah Kuala, Indonesia); Chih-Yang Lin (Yuan Ze University, Taiwan)

9:00 Design Science Research Methodology and Its Application to Developing a New Timetabling Algorithm

I Gusti Agung Premananda (Institut Teknologi Sepuluh Nopember, Indonesia); Aris Tjahyanto (Sepuluh Nopember Institute of Technology, Indonesia); Ahmad Muklason (Institut Teknologi Sepuluh Nopember, Indonesia)

Natural science research is the most common and widely used research methodology. Various fields such as physics, biology, social and behavioral

apply this research methodology. However, not all research is suitable for using the natural science research methodology in computer fields such as information technology, computer science, and information systems. Research that aims to solve problems by developing an artefact is more suitable for using the design science research methodology. Unfortunately, there are still many researchers who do not understand or even do not know this methodology. In this paper, we discuss the design science research methodology framework to reintroduce this methodology. In addition, this paper will also illustrate how to apply the design science research methodology to develop algorithms for timetabling problems.

9:15 Fuzzy Logic Control Strategy for Axial Flux Permanent Magnet Synchronous Generator in WHM 1.5KW

Demas Yangindrajat (Institut Teknologi Sepuluh Nopember & ITS, Indonesia); Harus Guntur (ITS, Indonesia)

This study presents the uses of fuzzy control for AFPMSG which is implemented on a Wheel Hub Motor. The use of Fuzzy aims to stabilize the voltage used for charging batteries in electric vehicles. Electric vehicles today have a shortage in mileage. This research optimizes the WHM function for driving and also to charging with AFPMSG Fuzzy control. AFPMSG was made on the WHM stator and magnets on the WHM cover. The type of generator used is without a core on the coil. The generator has been simulated using MATLAB and FEM. The simulation results show a maximum voltage of 24 Volts at a speed of 1000 RPM. The system used for fuzzy input is the speed and distance of the motor. The resulting output is a voltage. Fuzzy control is used for the stability of the charging system in electric vehicles. The research is presented in the form of simulations and field tests.

9:30 An Ensemble Voting Method of Pre-Trained Deep Learning Models for Skin Disease Identification

Kien Trang and An Hoang Nguyen (International University, Vietnam); Long TonThat (International University HCMC, Vietnam); Hung Ngoc Do (International University, Vietnam); Bao Quoc Vuong (University of Brest, France & International University, VNUHCM, Vietnam)

Millions of confirmed cancer cases have been reported worldwide as a result of the development of skin disease. One of the most essential stages in preventing disease development is early diagnosis and treatment.

Nevertheless, due to similarities in appearance, location, color, and size, diagnosing skin lesions is a challenging feat which requires high standard human resources in the medical system. To address this problem, a machinebased skin disease diagnosis is introduced as a first step to aid in patient classification. Recently, deep learning in medical imaging is becoming a cutting-edge research trend in a variety of applications. In this research, an ensemble network from the pre-trained models ResNet50, MobileNetV3, and EfficientNet is proposed to classify skin diseases. Thanks to the major voting step, the advantages of distinct models are combined to improve the diagnosis of the classification process. The observations and results are based on the experiments performed with the HAM10000 dataset, which includes 7 different forms of skin disease. In comparison to the initial pretrained models, the proposed model has a 98.3% average accuracy and other assessment metrics indicate improved results.

9:45 Expert System Integrated with Medical Record for Infectious Diseases using Certainty Factor

I Istiadi and Emma Sulistiarini (Widyagama University of Malang, Indonesia); Rudy Joegijantoro (Widyagama Husada School of Health, Indonesia); Kuncahyo Setyo Nugroho (Brawijaya University, Indonesia); Ismail Akbar (State Islamic University Maulana Malik Ibrahim, Indonesia); Affi Nizar Suksmawati (Gadjah Mada University, Indonesia)

Humans with weak immune systems are very susceptible to infectious diseases. So that humans who have been infected with infectious diseases are very likely to have the risk of early mortality if not appropriately handled. The diagnosis and treatment of infectious diseases also consider the patient's disease history data. This study tries to integrate the expert system with the health care system. System integration is carried out to optimize the database of disease examination history. So that physicians can use the examination history data as consideration for disease diagnosis and expert systems can be used to acquire new knowledge. Disease diagnosis in expert systems is carried out using the Certainty Factor (CF) method. Testing on 35 patient medical record data obtained a system accuracy value of 80%.

10:00 COVID-19 Disease Classification by Cough Records Analysis using Machine Learning

Kien Trang and An Hoang Nguyen (International University, Vietnam); Long TonThat (International University HCMC, Vietnam); Hung Ngoc Do (International University, Vietnam); Bao Quoc Vuong (University of Brest, France & International University, VNUHCM, Vietnam)

The rapid spreading rate of the Coronavirus disease 2019 (COVID-19) has resulted in more than 6.2 million deceased cases. Furthermore, the patients of the latest Omicron variation carry light to almost no symptoms of the disease themselves. Thus, the requirement for a new diagnosis method besides Reverse TranscriptionPolymerase Chain Reaction (RT-PCR) becomes the most important step to successfully detect infected cases. In this research, the application of the KNN, Ensemble and SincNet models are implemented as the main models for classification diagnosis based on cough sound records of infected patients. After pre-processing steps for removing silence ranges in the audio scripts, the cough sounds are augmented, subsequently separated into single cough samples, then generated 3 testing scenarios for dealing with the imbalanced problem between the sample classes. Afterward, MelFrequency information and MelSprectrogram are extracted as main features for analysis in order to distinguish patients with COVID-19 disease and healthy cases. The AICV115M dataset consisting of two classes COVID-19 and NonCOVID-19 is implemented for performance evaluation. The recorded highest accuracy on the models KNN, Ensemble and SincNet are 92.49\%, 90.1\% and 85.15\%, respectively

10:15 Epileptic Seizure Detection Using Machine Learning and Deep Learning Method

Ade Eviyanti (Institut Teknologi Sepuluh Nopember Surabaya, Indonesia); Ahmad Saikhu and Chastine Fatichah (Institut Teknologi Sepuluh Nopember, Indonesia)

Seizures are a common symptom of epilepsy, a nervous system disease. Epilepsy can be detected with an Electroencephalogram (EEG) signal that records brain nerve activity. Visual observations cannot be done on a routine basis because the EEG signal has a large volume and high dimensions, so a method for dimension reduction is needed to maintain signal information.

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This study compares the performance of Machine Learning and Deep Learning models to detect epileptic seizures to get the best performing model. The feature extraction process using Discrete Wavelet Transform (DWT) is implemented through two complementary filters, namely Low-Pass Filter and High-Pass Filter, taking feature values, namely maximum, minimum, standard deviation, mean, median, and energy. Furthermore, feature selection uses correlation variables, namely removing uncorrelated variables using threshold variations. The improvement of this study is to use six features, namely the maximum, minimum, standard deviation, mean, median, and energy values, as input values in the classification process. Non-seizure signals and epileptic seizures were classified using Machine Learning: Support Vector Machine (SVM), K-Nearest Neighbor (K-NN), Random Forest (RF), Decision Tree (DT), and Deep Learning: Long Short-Term Memory (LSTM). The trials used three variations of datasets, namely dataset 1: 96 signals, dataset 2: 134 signals, and dataset 3: 182 signals. Nine different classification experiments were conducted using four performance evaluation indicator. Based on the test results, the model with the best performance is the SVM method with 100% accuracy, 100% precision, 100% recall, and 100% f1-

10:30 USK-COFFEE Dataset: A Multi-class Green Arabica Coffee Bean Dataset for Deep Learning

Alifya Febriana (University of Syiah Kuala, Indonesia); Kahlil Muchtar and Rahmad Dawood (Universitas Syiah Kuala, Indonesia); Chih-Yang Lin (Yuan Ze University, Taiwan)

Coffee is one of the plantation commodities that plays a big role in the world economy. According to the classification of coffee, each type of coffee has various shapes and textures. Traditional human visual sorting of coffee beans is time-consuming, labor-intensive, and may result in low-quality coffee due to work stress and exhaustion. The contribution of this paper is twofold. First, a new dataset, called USK-Coffee, which contains a total of 8.000 images and is divided into 4 classes, is created and made publicly available. To the best of our knowledge, the USK-Coffee dataset is currently the most comprehensive green coffee bean dataset. Second, this study aims to offer a lightweight and understandable intelligent coffee bean sort accurately system that uses deep learning (DL) to assist farmers in sorting green bean arabica by variety. To be specific, this paper presents a baseline for classification performance on the dataset using the benchmark deep learning models,

MobileNetV2, and ResNet-18. These models achieved an average classification accuracy of 81.31% and 81.12%, respectively. The dataset is available at: http://comvis.unsyiah.ac.id/usk-coffee/

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AIT-3444: Technical Session Artificial Intelligence
Parallel Session 3 (Room 4)
Friday, June 17th 2022
(08:45 – 10:45)

Code Session : AIT-3444
Title Session : Artificial Intelligence

Start	Finish	Papers	Authors
9:00	9:15	Classifying The Swallow Nest Quality Using Support Vector Machine Based on Computer Vision	Anindita Septiarini and Hamdani Hamdani (Universitas Mulawarman, Indonesia); Tenia Wahyuningrum (Institut Teknologi Telkom Purwokerto, Indonesia)
9:15	9:30	Hyperparameter Optimization on CNN Using Hyperband on Tomato Leaf Disease Classification	Ardiansyah K Alkaff and Budi Prasetiyo (Universitas Negeri Semarang, Indonesia)
9:30	9:45	Intrusion Detection using Dense Neural Network in Network System	Aman Doherey and Akansha Singh (Centre for Advanced Studies, Lucknow, India); Arun Kumar (Centre for Advanced Studies Lucknow, India)
9:45	10:00	Cataract Detection using Deep Learning Model on Digital Camera Images	Raghavendra Ramkewal Chaudhary (Centre for Advanced Studies, Lucknow, India); Arun Kumar (Centre for Advanced Studies Lucknow, India)
10:00	10:15	On-tree Mature Coconut Fruit Detection based on Deep Learning using UAV images	Jilbert M Novelero and Jennifer C. Dela Cruz (Mapua University, Philippines)
10:15	10:30	Credit card fraud detection system using machine learning technique	Ayushi Maurya (CENTRE FOR ADVANCED STUDIES, Lucknow, India); Arun Kumar (Centre for Advanced Studies Lucknow, India)

10:30	10:45	Aspect-based Sentiment Analysis for Improving Online Learning Program based on Student Feedback	Yaya Heryadi, Bambang Wijanarko and Dina Fitria Murad, Dfm (Bina Nusantara University, Indonesia); Cuk Tho (University of Bina Nusantara, Indonesia); Kiyota Hashimoto (Prince of Songkhla University, Thailand)

9:00 Classifying The Swallow Nest Quality Using Support Vector Machine Based on Computer Vision

Anindita Septiarini and Hamdani Hamdani (Universitas Mulawarman, Indonesia); Tenia Wahyuningrum (Institut Teknologi Telkom Purwokerto, Indonesia)

Swallow Nest is a valuable export commodity, particularly in Indonesia. It is produced when a swallow's saliva hardens and is frequently encountered in high-rise buildings. Swallow nests can be utilized to treat various ailments in the medical sector. The price of a swallow nest varies according to its quality, which is commonly classified into three grades: quality 1 (Q1), quality 2 (Q2), and quality 3. (Q3). Q1 is of the highest quality, while Q3 is of the lowest. Each grade has a different physical appearance. Currently, many people lack knowledge regarding the grade of a swallow nest. Therefore, a method is needed to automatically classify the quality of swallow nests based on computer vision. The proposed method consists of several main processes, including image acquisition, ROI detection, pre-processing, segmentation, feature extraction, and classification. The feature extraction was applied based on shapes, followed by the Support Vector Machine (SVM) implementation in the classification process. This process was performed with cross-validation using the k-fold values of 5. The performance evaluation was done using three parameters: precision, recall, and accuracy, by achieving the value of 90.6%, 89.3%, and 89.3%, respectively.

9:15 Hyperparameter Optimization on CNN Using Hyperband on Tomato Leaf Disease Classification

Ardiansyah K Alkaff and Budi Prasetiyo (Universitas Negeri Semarang, Indonesia)

Convolutional Neural Network (CNN) has been successfully applied to image classification, one of which is plant or leaf disease. However, choosing the optimal architecture and hyperparameters is a challenge in its implementation. The purpose of this study was to optimize the Convolutional Neural Network (CNN) hyperparameter on the classification of tomato leaf diseases. In this research, optimization of hyperparameter Convolutional Neural Network (CNN) using Hyperband on Tomato Leaf Disease Detection dataset. The dataset consists of 10,000 training data and 1,000 testing data with 10 classes. In the training data, the distribution of the dataset is 80% for training data and 20% for data validation. This study uses the Keras-Tuner library which aims to optimize two hyperparameters, namely the number of dense neurons and the learning rate. The best hyperparameter value resulting from hyperparameter optimization is 128 for the number of dense neurons and 0.001 for the learning rate. The proposed method succeeded in achieving an accuracy value of 95.69% in the training phase and 88.50% in the validation phase. These results were obtained from model training of 50 epochs. In addition, the model testing obtained an accuracy value of 88.60%. Previous research focused on the application and development of algorithms for the classification of tomato leaf diseases. Therefore, hyperparameter optimization on Convolutional Neural Network (CNN) using Hyperband can be an alternative in choosing the optimal architecture and hyperparameters.

9:30 Intrusion Detection using Dense Neural Network in Network System

Aman Doherey and Akansha Singh (Centre for Advanced Studies, Lucknow, India); Arun Kumar (Centre for Advanced Studies Lucknow, India)

An Network Intrusion Detection System can be perceived as a device, either software or hardware which is utilized to screen the organization for suspicious action or policy violation. In this era of digitization where everyone is using computers for all types of communications- personal, political, financial, etc., it becomes necessary to ensure that the medium of the

communication is secure or not. Because nowadays every small scale enterprise, big companies, even personal households are having their own server. The new technologies are based on the concept of networking. So, an intrusion in such networks can cause bid risks like data breach financial risk or malfunctioning of the devices connected in that network. It might be possible for small networks to be checked manually because the total connection in such networks is less, but when it comes to the big networks where a lot of connections are sending and receiving requests, it is near to impossible for someone to check all the connections manually. In this paper dense neural network are used for detecting the network intrusion and NSL-KDD dataset are used to test the model. The proposed model achieved 98.29% accuracy.

9:45 Cataract Detection using Deep Learning Model on Digital Camera Images

Raghavendra Ramkewal Chaudhary (Centre for Advanced Studies, Lucknow, India); Arun Kumar (Centre for Advanced Studies Lucknow, India)

Cataracts are one of the most prevalent visual diseases that people get as they gets older. A cataract is a fog that forms on the lenses of our eyes. The main symptoms of this illness include dim view, colorless, and difficulties in watching a daylight. Slit lamps and fundus cameras are routinely used to detect cataracts, although they are both expensive and require domain knowledge. As a result, the shortage of skilled ophthalmologists may cause cataract identification to be delayed, necessitating medical treatment. Consequently, early detection and prohibition of cataracts might assist to reduce the frequency of occurrence of blindness. Hence the goal of this study is to utilize Convolutional Neural Networks (CNN) to diagnose cataract pathology using a publicly available Digital Camera Image dataset. The CNN cycle takes a considerable amount of time and expense. As a result, optimization will take place. It can increase accuracy while also reducing processing time. In this study the proposed model consist of three Convolution layers, three pooling layers, one flatten layer, and two dense layers with an ADAM optimizer. The proposed CNN model can detect cataracts with a testing accuracy of 0.9925 with a loss of 0.0475, and a training accuracy of 0.9980 with loss of 0.0038, for the selected Digital Camera Images Dataset.

10:00 On-tree Mature Coconut Fruit Detection based on Deep Learning using UAV images

Jilbert M Novelero and Jennifer C. Dela Cruz (Mapua University, Philippines)

Coconut harvesting in the Philippines is considered one of the most dangerous agricultural jobs because it is typically done by climbing the tree. Due to the height and structure of the tree, harvesting the so-called tree of life may pose fatal injuries or even death to the pickers. This paper presents an approach to leveraging Unmanned Aerial Vehicles (UAVs) to detect the mature on-tree coconut fruits. The proposed method would help set up the vision of the autonomous robots to be employed for coconut harvesting. The model used a Deep Learning algorithm, specifically the YOLOv5 Neural Network, to train, validate and test the custom dataset for coconut fruits and finally detect on-tree coconut fruits in real-time. The dataset was composed of 840 images, where a DJI Mini SE drone captured all images and real-time detection scenarios. On the other hand, Python 3 Google Compute Engine backend (Tesla K80 GPU) in Google Collab was used to process the images and implement the algorithm. The investigation confirmed that the YOLOv5 model could instantaneously detect the on-tree mature coconut fruits. With an accuracy of 88.4%, the proposed approach will be of great value in eliminating the risks of harvesting coconuts in the future. The model can also be used for coconut crop yield estimation as the system mainly detects the visible mature fruits on the coconut tree.

10:15 Credit card fraud detection system using machine learning technique

Ayushi Maurya (CENTRE FOR ADVANCED STUDIES, Lucknow, India); Arun Kumar (Centre for Advanced Studies Lucknow, India)

Over the years, with the development of e-commerce, people are mostly making online transactions, and the risk of getting scammed has also increased. This in turn forces the financial institutions to improve continuously and upgrade their model. Machine Learning techniques were used to detect fraud in credit card transactions, but working with real-time data can be tough for machine learning to handle. Thus, we implement blockchain techniques with machine learning to improve the efficiency and accuracy of the model. In the proposed model, Ethereum dataset has been

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used to check the fraudulent transaction and secure it with the help of machine learning algorithms. Out of all the classifiers XGBoost has attained the highest accuracy of 99.21% for the stated dataset.

10:30 Aspect-based Sentiment Analysis for Improving Online Learning Program based on Student Feedback

Yaya Heryadi, Bambang Wijanarko and Dina Fitria Murad, Dfm (Bina Nusantara University, Indonesia); Cuk Tho (University of Bina Nusantara, Indonesia); Kiyota Hashimoto (Prince of Songkhla University, Thailand)

This paper presents an empiric results of aspect-based sentiment analysis in education to extract and classify opinions, sentiments, evaluations, attitudes, and emotions from newly graduates of an online learning program. As part of continuous education monitoring system, the sentiment analysis process produces valuable input to leverage service quality of online learning program. In this study, the aspect-based sentiment analysis is implemented to analyze a set of feedbacks from 162 newly graduate from Binus Online Program majoring in Accounting, Management, Information System, and Computer Science. The important qualitative results of this study are confirmation that the main benefits of online learning from student perspective are mainly: the knowledge they gained from the program, learning guidance, reliable student team to work on thesis, quality of education support system, and learning happiness.

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Comparative Transfer Learning Techniques for Plate Number Recognition

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Abstract— Monitoring vehicle activity both on the highway and in certain places such as parking lots needs to be done if there is a specific incident. Unexpected events such as accidents or vehicle theft may occur anytime. Therefore, tracking through number plate recognition has become something important and has become a hot topic with the various methods used. Previous research used machine learning techniques to recognize characters on number plates. The use of this technique has not produced optimal accuracy. Therefore, we propose using transfer learning techniques to achieve better accuracy results. This research evaluated three transfer learning models, namely DenseNet121, MobileNetV2, and NASNetMobile models. The experiment in this research was carried out using the data on number plates in the parking lot. The accuracy calculation counted the number of correctly recognized characters divided by the total characters on the number plate. The experimental results show that the DenseNet121 model produced the best accuracy, 96.42%. Differences in number plate writing style also affected the accuracy results. This research could provide insight into the use of transfer learning techniques in the case of number plate recognition.

Keywords — DenseNet121, MobileNetV2, NASNetMobile, Number plate recognition

I. INTRODUCTION

The vehicle number plate is one of the identities of motorized vehicles. The number plate material is metal or plastic with the identity number mounted on the front and back of the vehicle. The vehicle's identity is the main clue when an incident occurs on the road, such as an accident or traffic violation. The authorities will identify the vehicle number plate to see the driver's identity data when something happens on the road [1]. The authorities' identification process carried out manually requires the authorities to be at the case scene. Currently, many Closed-Circuit Television (CCTV) cameras are installed on the roads that monitor activity on the road [2]. This CCTV camera can be used for automatic number plate recognition that utilizes Artificial Intelligence technology.

Research on vehicle number plate recognition is beneficial for developing smart cities, such as smart transportation systems, missing vehicle searches, traffic monitoring, city management, and toll entry payments. Several previous studies did the number plate recognition using machine learning methods [3][4][5] and deep learning [6][7]. Machine learning techniques have not yet achieved maximum accuracy for plate number recognition. Research by Gunawan et al. [8] used the K-NN method to identify Indonesian vehicle number plates. The results showed that not all characters were detected, with an average accuracy of 92.86%. Then, the use of the Random Forest method also has not produced optimal accuracy, which is 90.9% [9]. Other researchers use transfer learning methods to detect number plates [10]. This research resulted in 99% accuracy in the training validation process. However, an evaluation has not been carried out using the vehicle plate character matching one by one. Therefore, we propose a deep learning approach to improve the accuracy of the results. The proposed research aims to obtain a more accurate vehicle number plate recognition.

The feature extraction and classification stages are the vehicle number plate recognition that affects the accuracy value. For character recognition, both numbers and letters, there are 36 classes with ten numeric characters and 26 letter characters. To distinguish these classes, a method that can classify them is needed. One of the powerful techniques for classifying many classes is the transfer learning technique [11]. Previous studies compared DenseNet121 and NASNetMobile transfer learning models for COVID-19 detection using Chest X-ray images [12]. The results showed that the accuracy values were not much different. Similarly, research by Agarwal et al. [13] also detected COVID-19 using the DenseNet121, MobileNetV2, and NASNetMobile methods. The research results are also not too much different in the value of accuracy. Therefore, the proposed research used DenseNet121, MobileNetV2, and NASNetMobile model transfer learning techniques. This model is also used because the three models are not too large in the number of parameters. We hope that the results of this research can provide insight into the transfer learning method for vehicle plate character recognition.

II. PROPOSED METHOD

The character recognition system on motorized vehicle license plates starts from the character training stages of letters and numbers. The character dataset was pre-processed first to adjust to the size of the training process using transfer learning techniques [14]. Then, to increase the diversity of

the data, we also used data augmentation. The dataset that had been pre-processed was divided into training data and testing data. The next stage was feature extraction using DenseNet121, MobileNetV2, or NASNetMobile. The result of feature extraction was a model used to match the features with the vehicle's character. Then, the vehicle number plate data was obtained from the image at the testing stage. The image data obtained was searched for the number plate area. The detected number plate was segmented using a bounding box. The segmentation results were used for matching with the feature extraction model. The final result was the character on the vehicle plate. Figure 1 shows the stages of the vehicle plate number recognition.
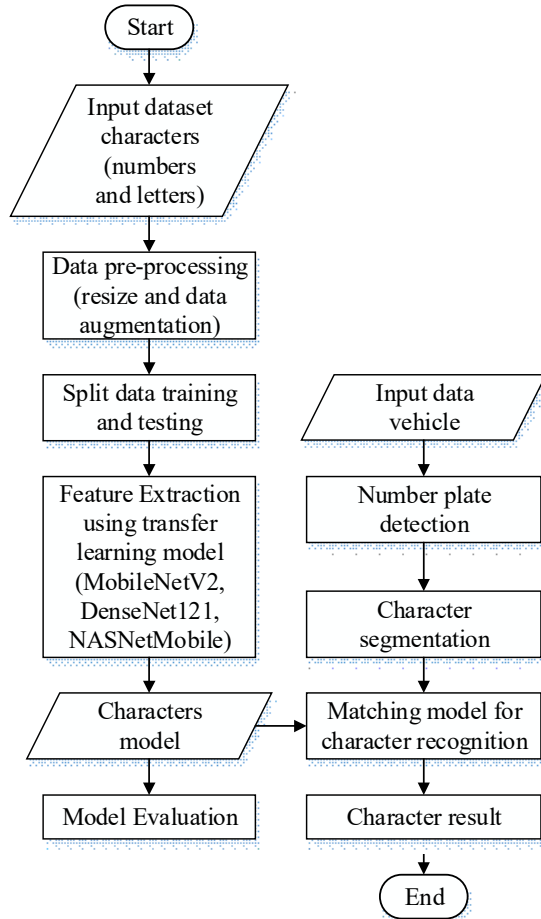

Fig. 1. Stages of vehicle plate number recognition

A. Dataset

The character dataset used in this research was obtained from Kaggle [15]. There were 36 characters with ten numeric characters and 26 letter characters. The data used was in black and white, with the character color being white and the background black. The total data used in this research were 37,623 data. Figure 2 shows an example of the data used in this research. Then, for the testing data, we used motor vehicle image data. The image was shot perpendicular to the vehicle object. We used the image of Indonesian vehicle plates in the parking lot.

Fig. 2. Example of the dataset used in this research

B. Data pre-processing

Before being used for the feature extraction stage, the dataset was carried out in a pre-processing stage to adjust to the transfer learning model. The pre-processing stage was done by resizing to 224 x 224 to fit the pre-trained transfer learning model. Then, we also used data augmentation to add diversity to the data used in the feature extraction stage. We used the ImageDataGenerator library [16], provided by the Python programming language for data augmentation.

C. Feature extraction

Traditional feature extraction cannot automatically determine what features are present in an object. When the number of available features is large, the feature extraction method used must also have many parameters to extract these features. Therefore, deep learning provides a breakthrough by automatically extracting features on image objects. The popularity of deep learning continues to grow as large amounts of data become available, namely ImageNet [17]. However, the use of large amounts of data is challenging to obtain. Therefore, there is an alternative called transfer learning [18]. Transfer learning is a training method in which the model has been previously trained, and the results can be used for other case datasets. Many transfer learning models, including MobileNetV2, NASNetMobile, and DenseNet121. MobileNetV2

1) MobileNetV2: is a development model of MobileNetV1. In the image classification experiment using ImageNet, MobileNetV2 shows better accuracy results than MobileNetV1 with fewer parameters [19]. In MobileNetV2, there are two types of blocks, namely, the residual block with stride one and stride two. The two blocks are arranged to form the MobileNetV2 architecture. Figure 3 shows the architecture of MobileNetV2.
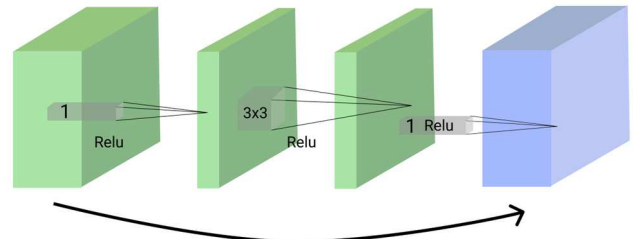

Fig. 3. MobileNetV2 architecture that skips connection

2) NASNet: is a model based on research by finding the best block architecture in a small dataset, then copying the best-found architecture for use in a larger dataset, namely ImageNet.
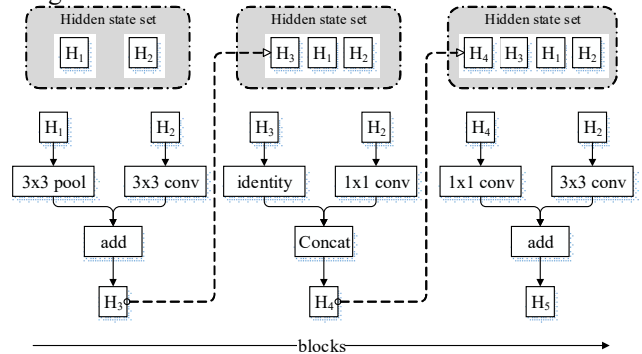

Fig. 4. NASNet search space

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NASNetMobile is a smaller NASNet architecture with the same number of parameters as MobileNet but with better accuracy performance [20]. Figure 4 shows the NASNet search space. The NASNet architecture consists of 2 main blocks: normal cells and reduction cells. The correct layer arrangement for the two cells is searched using a recurrent neural network.

3) DenseNet121: is an architectural model with unique characteristics called dense blocks where in this block, each layer is directly connected to all layers. A layer takes input from the output of all previous layers and provides output for all layers, allowing the network to be leaner. It is different from the traditional convolution layer, where a layer takes input from the previous layer and provides output for the next layer [21]. Figure 5 shows the layers in the DenseNet201 model.
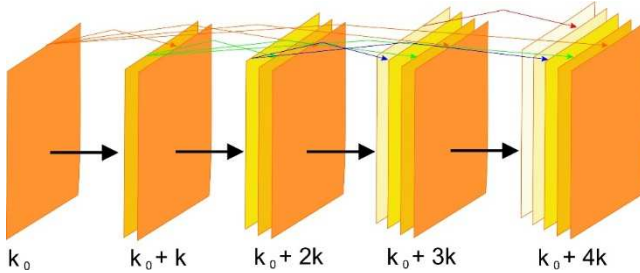

Fig. 5 DenseNet201 layer structure

D. System Evaluation

The evaluation of the system in this research was done using the image of a vehicle with a number plate. The vehicle image detects the position of the number plate. Then, the detected number plate was executed, not a segmentation process to divide each character on the number plate. The character on the license plate was matched with the feature extraction results of the MobileNetV2, NASNetMobile, or DenseNet121 models. Evaluation was done by counting the correct number of characters divided by the number on the license plate. We used 15 number plate data, so the final accuracy was obtained from the average accuracy of each number plate.

III. RESULT AND DISCUSSION

This section discusses the results of making a number plate recognition system using transfer learning. In this research, the program was created using the Python programming language version 3. The discussion was divided into two stages: the training and testing stages.

A. Training stage

The training stage is the stage of model formation for vehicle number plate recognition. The configuration of the transfer learning method in this research used transfer learning in the feature extraction section or the base model. The classification layer uses Dense and Dropout layers. This research used a Dropout value of 0.5. Then in the loss function, we used categorical crossentropy with the Adam optimizer. We used the EarlyStopping function to stop the training process so that the resulting graph did not look overfitting. Figure 6 shows a graph of the training results. In both models' graphs generated from the training process

using MobileNetV2, DenseNet121, and NASNetMobile overfitting did not occur. The training and validation accuracy graphs from epoch five seem to be parallel. Similarly, the training and validation loss graphs were also parallel.
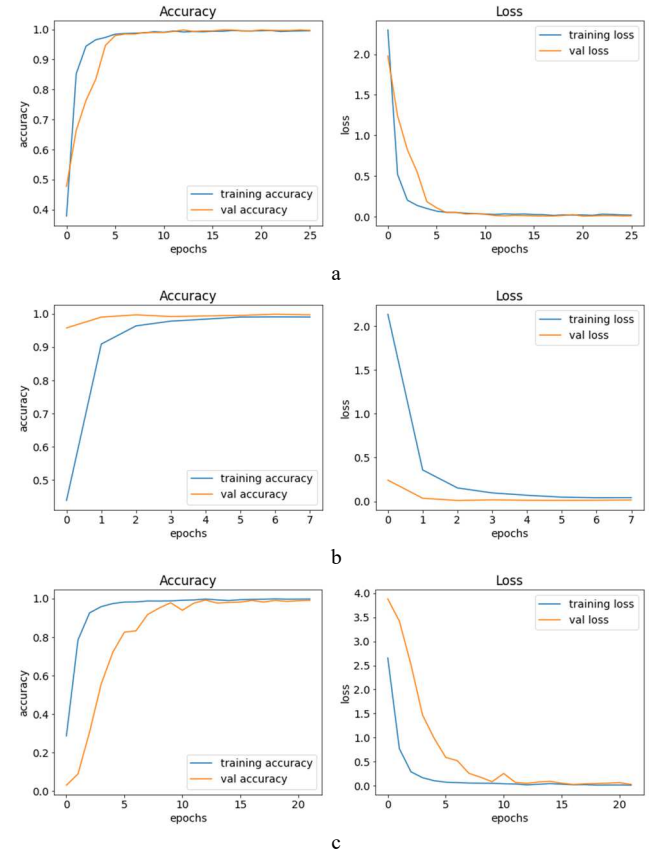

Fig. 6. Training result on accuracy and loss values, a) MobileNetV2, b) DenseNet121, c) NASNetMobile

The EarlyStopping function that we used monitored the validation loss value with a value of 5 so that if there was no better change of 5 epochs, the training process would be stopped. Table 1 shows the results of training using the three models. The DenseNet121 model had the fastest training process because it only had up to 10 epochs. Meanwhile, the NASNetMobile model reached the 22nd epoch. Then the MobileNetV2 model reached the 26th epoch. When compared to the validation loss values of the three models, the results of the MobileNetV2 model were the best. We saved these three models for testing using license plate testing data.

TABLE I. RESULT OF VALIDATION LOSS TRAINING PROCESS

Epoch	Validation loss		
	MobileNetV2	DenseNet121	NASNetMobile
2	1.2397	0.0359	3.4199
4	0.5494	0.0175	1.4670
6	0.1066	**0.0116**	0.5874
8	0.0499	0.0162	0.2547
10	0.0339	0.0144	0.0813
12	0.0115	-	0.0674
14	0.0127	-	0.0757
16	0.0079	-	0.0510
18	0.0060	-	**0.0373**
20	0.0230	-	0.0513
22	**0.0050**	-	0.0449
24	0.0109	-	-
26	0.0069	-	-

B. Testing stage

In the testing phase, we used data taken in the parking lot. The testing data consisted of 15 number plates, both car and motorcycle license plates in Indonesia. The detected number plates were matched using the three training models. Table 2 shows the results of the number plate recognition accuracy. The percentage was obtained by counting the correct characters divided by the number of characters on the license plate. Then, the average accuracy is obtained from the average accuracy in each model.

TABLE II.   RESULT OF PLATE NUMBER RECOGNITION

No	Image	Model					
		MobileNetV2	%	DenseNet121	%	NASNetMobile	%
1	R 1374 JR	R1374JR	100	R1374JR	100	R1374JR	100
2	AE 1922 PQ	AE1922PO	87.5	AE1922P0	87.5	AE1922PQ	100
3	H 1143 WF	H1143WF	100	H1143NF	85.7	H1143WF	100
4	D 1297 ACW	D1297ACW	100	D1297ACN	87.5	D1297ACH	87.5
5	K 1536 VD	K1536VO	85.7	K1536VD	100	K7536VD	85.7
6	B 1991 J0	81991J8	71.4	B1991J6	85.7	81991J0	85.7
7	BP 1087 FZ	BP1O87FZ	87.5	BP1087FZ	100	BP1087FZ	100
8	R 2699 RH	R2699RH	100	R2699RH	100	R2699RH	100
9	B 1539 KFH	81539KFH	87.5	B1539KFH	100	B1539KFH	100
10	AB 4252 IZ	A84252IZ	87.5	AB4252IZ	100	AB4252IZ	100
11	B 457 UTY	B457UTY	100	B457UTY	100	6457UTY	85.7
12	B 9320 VUA	B9320VUA	100	B9320VUA	100	B9320VUA	100
13	B 1690 BAC	B1690BAC	100	B1690BAC	100	B1690BAC	100
14	B 1820 UZN	B1820UZN	100	B1820UZN	100	61820UZN	87.5
15	B 1611 MB	816T7MB	87.5	B1611MB	100	B1611MB	100
Average Accuracy (%)			92.97		96.42		95.47

Table 2 shows that the DenseNet121 model produced the best average accuracy than the MobileNetV2 and NASNetMobile models. Several characters were detected incorrectly, for example, the letter D with O, and B with the number 8. When viewed in general, the characters have almost the same shape. The dataset used was also in black and white. No color stood out from each character, resulting in errors when matching. However, overall, the accuracy produced by the DenseNet121 model was better than the use of machine learning techniques [8][9]. This accuracy result is also due to the influence of the number of parameters on the DenseNet121 model than on the MobileNetV2 and NASNetMobile models. Future research can add datasets with various writing styles to increase the accuracy of results.

IV. CONCLUSION

Vehicle number plates need to be identified when unexpected events occur on the streets. Many CCTV cameras have been installed on the road and in the parking lot to monitor driving activities. Previous research used machine learning techniques to perform number plate recognition. The use of machine learning has not yet produced optimal accuracy. This research used three transfer learning techniques for number plate recognition. The results showed that the DenseNet121 model yielded an accuracy of 96.42%. This research still has shortcomings in recognizing the number plates with a variety of character models. Therefore, it is recommended that future research increase the diversity of data to increase accuracy.

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