The 5th International Conference on
Computer Science and Computational Intelligence

The 5th International Conference on Computer Science and Computational Intelligence 2020

(ICCSCI 2020)

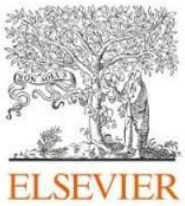
Empowering Society Towards Industry 4.0 with High Research Impact of Computational Intelligence and Information Technology

School of Computer Science

Bina Nusantara University

2020

Publisher of the proceedings



Indexed by:

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ABOUT PROCEDIA COMPUTER SCIENCE

Open Access

ISSN: 1877-0509

What is Procedia Computer Science?

Launched in 2009, *Procedia Computer Science* is an electronic product focusing entirely on publishing high quality conference proceedings. Procedia Computer Science enables fast dissemination so conference delegates can publish their papers in a dedicated online issue on ScienceDirect, which is then made freely available worldwide.

Conference proceedings are accepted for publication in Procedia Computer Science based on quality and are therefore required to meet certain criteria, including quality of the conference, relevance to an international audience and covering highly cited or timely topics. Procedia Computer Science will cover proceedings in all topics of Computer Science with the exception of certain workshops in Theoretical Computer Science, as our Electronic Notes in Theoretical Computer Science http://www.elsevier.com/locate/entcs are the primary outlet for these papers. The journal is indexed in Scopus, the largest abstract and citation database of peer-reviewed literature.

5th International Conference on Computer Science and Computational Intelligence 2020

PREFACE

Widodo Budiharto[a], Andry Chowanda[a], Aditya Kurniawan[a], Derwin Suhartono[a], Alexander A. Gunawan[b], Yogi Udjaja[a], Dewi Suryani[a], Hanry Ham[a]

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The 5th International Conference on Computer Science and Computational Intelligence (ICCSCI 2020) is annual forum for researchers, engineers and scientist to disseminate their knowledge and research on Computer Science, Computational Intelligence and Information Technology. We are pleased to announce the theme of the ICCSCI 2020 is: 'Empowering Society Towards Industry 4.0 with High Research Impact of Computational Intelligence and Information Technology'. The conference warmly welcomes prospected authors to submit their research and idea to ICCSCI 2020 and share the valuable experiences with the scientist and scholars around the world.

ICCSCI 2020 received 298 manuscripts from thirteen countries, namely Indonesia, Malaysia, Thailand, United Arab Emirates, Egypt, Philippine, Sri Lanka, Mexico, Morocco, Saudi Arabia, and India. After careful review process of 298 manuscripts, 118 manuscripts were accepted or approximately 39% rate of acceptance. These manuscripts are divided into seven tracks:

1. Intelligent System and Machine Vision
2. Software Engineering, Information Security and Networks
3. Big Data and Information Technology
4. Foundations of Computing and Theoretical Computer Science
5. Computational Linguistic and Audio Processing
6. Internet of Thing and Robotics
7. Multimedia, Game Development and Virtual Reality

We would like to appreciate all participants, keynote speakers, reviewers and committee for the contributions to the conference program and proceeding. We would like to express our gratitude to the reviewers for the valuable review and suggestion, so that we can maintain the quality of this proceeding very well. This conference is held in success collaboration between Program committee and Technical committee. We would like to thank Elsevier for supporting publication of this conference proceeding.

We are looking forward for the next event in computer science and computational intelligence in the future.

GENERAL SCHEDULE

The 5th International Conference on Computer Science and Computational Intelligence (ICCSCI) 2020

Jakarta, Indonesia

Day 1 - Thursday, 19 November 2020

Time	Program Detail
07.30-08.00	Registration
08.00-08.45	Opening
08.45-09.40	Keynote Speaker I Dr Ford Lumban Gaol
09.40-09.45	Annoucement by MC
09.45-10.00	Break
10.00-12.00	Parallel Session I
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09.30-09.45	Break
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3671	Lia Yuliana	Public Opinion of Transportation integrated (Jak Lingko), in DKI Jakarta, Indonesia
3786	Raihana Md Saidi	Evaluating Students, Preferences of Open and Distance Learning (ODL) Tools
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2839	Md.Hazrat Ali	Design of a flexible neck orthosis on FDM printer for rehabilitation on regular usage
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3107	Alhadi Bustamam	The distance function approach on the MiniBatchKMeans algorithm for the DPP-4 inhibitors on the discovery of type 2 diabetes drugs
3124	Alhadi Bustamam	The Drug Design for Diabetes Mellitus type II using Rotation Forest Ensemble Classifier
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ABSTRACT LIST

Parameter Optimization of Support Vector Regression Using Harris Hawks Optimization

I Nyoman Setiawan[a], Robert Kurniawan[a*], Budi Yuniarto[a],
Rezzy Eko Caraka[b,c], Bens Pardamean[c,d]

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[b]*Department of Information Management, College of Informatics, Chaoyang University of Technology, Taiwan (ROC)*
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[d]*Computer Science Department, BINUS Graduate Program - Master of Computer Science Program, Bina Nusantara University, Jakarta, Indonesia. 11530.*

Abstract

Support Vector Regression (SVR) is often used in forecasting. Adjustment of parameters in the SVR affects the results of forecasting. This study aims to analyze the SVR method that is optimized using Harris Hawks Optimization (HHO), hereinafter referred to as HHO-SVR. The HHO-SVR was evaluated using five benchmark datasets to determine the performance of this method. The HHO process is also compared based on the type of kernel and other metaheuristic algorithms. The results showed that the HHO-SVR has almost the same performance as other methods but is less efficient in terms of time. In addition, the type of kernel also affects the process and results.

Latent Regression and Ordination Risk of Infectious Disease and Climate

Rezzy Eko Caraka[a,b,c], Rung Ching Chen[a*], Youngjo Lee[b],
Prana Ugiana Gio[d], Arif Budiarto[c,e],Bens Pardamean[c,f]

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Abstract

Global warming arising from climate change can increase the spread of deadly diseases. Effort is needed to develop a set of policies for the government to stem or reduce health risks from global warming. The purpose of this paper is to examine more detail and comprehensively about the relationship among climate and event disease count in Taiwan using the partial least square latent regression model. The results obtained that of the 17 types of diseases in Taiwan, that has the most significant loading factor is Amoebiasis, Malaria and Chikungunya. At the same time, climate variables that have the biggest most significant factor are Number day with max temp more than 30, Number day Temp more than 25, and Rainfall PH. Cronbach's Alpha infectious disease 0.9696 and climate 0.2813. At the same time, the value of Dillon Goldstein's rho infectious disease 0.974 and climate 0.6404, respectively.

Personality Classification of Facebook Users According to Big Five Personality Using SVM (Support Vector Machine) Method

Ninda Anggoro Utami[a], Warih Maharani[a,*], Imelda Atastina[a]

[a]*School of Computing, Telkom University, Bandung, Indonesia, 40257*

Abstract

Social media has become one of the most important things in daily life to communicate, show expression and exchange information. Facebook is one of the most widely used social media. This research focuses on classifying the personality of Facebook users into one of the Big Five Personality Traits. there are 170 volunteers who are Facebook users who have been asked to fill out the Big Five Inventory questionnaire and have allowed their data to be scraped. Based on the data collected, the classifier is built using data mining techniques using Support Vector Machine (SVM) that aim to find out someone's personality based on a Facebook account without having to fill in any questionnaire. The best accuracy results in this study with a classification model that has been built at 87.5% using the Radial Basis Function (RBF) kernel.

Proposal to use the Analytic Hierarchy Process Method Evaluate Bank Credit Submissions

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[b]Del Institute of Technologyb , Medan, Sumatera Utara, Indonesia, 20371

Abstract

Decision making is the process of choosing alternative actions to achieve specific goals or objectives supported by the process of gathering the necessary factors. The banking sector where one of the management functions in the decision-making process in applying for credit. This process must produce fast, accurate, and accurate and accurate information in the process of assessing credit worthiness of potential borrowers. The problem that occurs is that the analysis process is done subjectively, does not use incorrect parameters, overworked credit analysts. This can lead to errors in decision making so that it can endanger the banking sector, if in the future there is a problem of bad credit because it turns out the debtor does not have the ability to pay credit bills from the debtor. This study proposes an analysis using the Analytical Hierarchy Process (AHP) Method with the concept of credit analysis assessment is 5C analysis (Character, Capacity, Capital, Conditions of economy, Collateral). The data used for analysis are primary data, namely questions given through questionnaires given directly to customers so that it is more accurate in providing answers. The results of the decision analysis using the AHP Method are benchmarks in determining the right and accurate decision in declaring a prospective debtor to meet the requirements or not to be given credit. This helps increase satisfaction and provide the best service to consumers, which can then improve company performance by the company.

Density Estimation of Neonatal Mortality Rate Using Empirical Bayes Deconvolution in Central Java Province, Indonesia

Fevi Novkaniza[a,c], Khairil Anwar Notodiputro[a]*, I Wayan Mangku[b] , Kusman Sadik[c]

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Abstract

This article is concerned with the density estimation of Neonatal Mortality Rate (NMR) in Central Java Province, Indonesia. Neonatal deaths contribute to 73% of infant deaths in Central Java Province. The number of neonatal deaths for 35 districts/municipalities in Central Java Province is considered as Poisson distributed surrogate with NMR as the rate of Poisson distribution. It is assumed that each number of neonatal deaths by district/municipality in Central Java Province were realizations of unobserved NMR, which come from unknown prior density. We applied the Empirical Bayes Deconvolution (EBD) method for estimating the unknown prior density of NMR based on Poisson distributed surrogate. We used secondary data from the Health Profiles of Central Java Province, Indonesia, in 2018. The density estimation of NMR by the EBD method showed that the resulting prior estimate is relatively close to the Gamma distribution based on Poisson surrogate. This is implying that the suitability of the obtained prior density estimation as a conjugate prior for Poisson distribution

Visibility Forecasting Using Autoregressive Integrated Moving Average (ARIMA) Models

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Abstract

Weather forecasting has gained researchers from worldwide societies over decades due to its substantial impact on global human life from agriculture, air tra_c control to public health and safety. Although rigorous weather forecasting research has begun in 19th century, research has been dedicated to weather forecasting tasks that have significantly increased after weather-big data

is widely available. This article proposes an Auto-regressive Integrated Moving Average (ARIMA) model to forecast better visibility for the variant value of parameters p; d; q using the grid technique. This experiment showed that ARIMA has the lowest MSE value of 0:00029and a coe_cient of variation value of 0:00315. The greater number of prediction data in the ARIMA model increases the MSE value.

Public Opinion of Transportation integrated (Jak Lingko), in DKI Jakarta, Indonesia

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Abstract

The Government of DKI Jakarta published transportation integrated program named Jak Lingko to improve public transportation system in Jakarta. This program covers several types of mass transportation in Jakarta such as Mass Rapid Transit (MRT), Light Rail Transit (LRT), Electric Train (KRL Commuter Line), and Bus Transjakarta (TJ). In hope, the people will be interested to switch their modes of transportation to using public transportation considering the congestion and air pollution in Jakarta which is horrible. By utilizing data from twitter, this study tries to analyze public opinion on public transportation by classifying theirs opinions into positive & negative. Furthermore, topic modeling activites will be conducted using the Latent Dirichlet Allocation (LDA) method to find out topics that are often discussed publicly for each public transportation. It was found that the KRL is the only type of public transportation with the number of negative responses exceeding the number of positive responses. It was found that in the MRT & LRT, the community tended to mention words that had positive sentiments, whereas in KRL & TJ people tended to mention words that had negative sentiments. In the grouping of public opinion, the LDA model produced a topic of public discussion on public transportation that was different for each type of public transportation. The model can also capture public communication with the official account administration of public transportation. Prediction models obtained the lowest error with a Mean Average Percentage Error of 8.79%. By adding the public sentiment variable, it can improve the accuracy of the prediction model, but the tweets sentiment variable has no direct relationship to the variable number of public transportation users

Evaluating Students' Preferences of Open and Distance Learning (ODL) Tools

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Abstract

The sudden outbreak of the global health crisis, the Coronavirus Disease (or COVID-19), has consequently caused countries across the globe to undergo lockdown. This is done in order to ensure that all citizens stay at home to prevent the spread of the COVID19 pandemic including the closure of all workplace premises, schools and shops. It requires the changes in the daily routine from working at the office to work from home as well as dining in at the restaurants to food delivery. These significant changes have also affected academic institutions that need to devise alternatives to accommodate the shutdowns. The situation has also challenged the education system across the world and forces educators to shift from face-to-face to an online mode of teaching. Open and Distance Learning (ODL) method is one of the most suitable strategies that integrates virtual technology which consequently allows the continuation of the teaching and learning process. There are many tools available to provide online learning platforms. A user friendly and reliable technology is essential to ensure a successful online learning process. In some situations, the technology may neither seamless nor secure, and it can detract from the learning experience. A survey was conducted to identify the students' preference for their convenience in the adoption of online learning. The results of the study can be a reference for educators to make the most suitable tools as an option for the implementation of ODL. The selection of appropriate tools is vital in order to ensure that no student is left behind as well as to make sure the teaching and learning process a success.

Deep Learning as a Vector Embedding Model for Customer Churn

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Abstract

To face the tight competition in the telecommunication industry, it is important to minimize the rate of customers stopping their service subscription, which is known as customer churn. For that goal, an explainable predictive customer churn model is an essential tool to be owned by a telecommunication provider. In this paper, we developed the explainable model by utilizing the concept of vector embedding in Deep Learning. We show that the model can reveal churning customers that can potentially be converted back to use the previous telecommunication service. The generated vectors are also highly discriminative between the churning and loyal customers, which enable the developed models to be highly predictive for determining whether a customerwould cease his/her service subscription or not. The best model in our experiment achieved a predictive performance of 81.16%, measured by the F1 Score. Further analysis on the

clusters similarity and t-SNE plot also confirmed that the generated vectors arediscriminative for churn prediction.

Unsupervised News Topic Modelling with Doc2Vec and Spherical Clustering

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Abstract

In the digital and Internet era, companies are racing to profile their target users based on their online activities. One of the reliable sources is the news articles they read that can represent their interests. However, extracting latent information from the news articles is not an easy task for a human. In this paper, we introduced a practical model to automatically extract latent information from news articles with pre-determined topics. Our proposed model used unsupervised learning, thus alleviating the need for humans to label news items manually. Doc2vec was used to generate word vectors for each article. Afterward, a spectral clustering algorithm was applied to group the data based on the similarity. A supervised Long Short Term Memory (LSTM) model was built to compare the clustering performance. The best 1, best 3, and best 5 scores were used to evaluate our model. The result showed that our model could not outperformed LSTM model for the best 1 score. However, the best 5 score result indicated that our model was su_ciently robust to cluster the articles based on topic similarity. Additionally, the proposed unsupervised model was implemented in both an on-premise server, and a cloud server. Surprisingly, our proposed method could run faster in the cloud server despite its less number of CPU cores.

Convolutional Neural Networks for Scops Owl Sound Classification

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Abstract

Adopting a deep learning model into bird sound classification tasks becomes a common practice in order to construct a robust automated bird sound detection system. In this paper, we employ a four-layer Convolutional Neural Network (CNN) formulated to classify different species of Indonesia scops owls based on their vocal sounds. Two widely used representations of an acoustic signal: log-scaled mel-spectrogram and Mel Frequency Cepstral Coefficient (MFCC) are extracted from each sound file and fed into the network separately to compare the model performance with different inputs. A more complex CNN that can simultaneously process the two extracted acoustic representations is proposed to provide a direct comparison with the baseline model. The dual-input network is the well-performing model in our experiment that achieves 97.55% Mean Average Precision (MAP). Meanwhile, the baseline model achieves a MAP score of 94.36% for the mel-spectrogram input and 96.08% for the MFCC input.

A Comparative Study of IBM and IRM Target Mask for Supervised Malay Speech Separation from Noisy Background

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Abstract

This paper presents a comparative study of Ideal Binary Mask (IBM) and Ideal Ratio Mask (IRM) as training target for supervised Malay speech separation. Inspired by revolution of powerful computer system, Deep Neural Network (DNN) is used as a supervised algorithm to predict target mask from noisy mixture signal that is degraded by noise background. Although previous works showed IRM is better than IBM target mask with DNN algorithm, but it is incomparable due to different database. To validate DNN model with these target masks, 600 Malay utterances from a male and a female speaker were used in training session while remaining 120 Malay utterances were used in prediction session. The combination of acoustic features such as amplitude modulation spectrogram (AMS), mel-frequency cepstral coefficient (MFCC), relative spectral transformed perceptual linear prediction coefficients (RASTA-PLP) and Gammatone filter bank power spectra (GF) were used as input features to estimate target mask. The performance of intelligibility enhancement was evaluated using Short Time Objective Intelligibility (STOI) score. Average STOI score of IRM target mask indicated up to 0.83 for seen speakers while 0.76 for unseen speakers at -5dB babble noise, which is superior than IBM target mask.

Implementation of Automatic Text Summarization with TextRank Method in the Development of Al-Qur'an Vocabulary Encyclopedia

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Abstract

Studying the Qur'an by understanding the Qur'an's vocabulary so that understanding its meaning is not easy. Then we need a Qur'anic vocabulary encyclopedia that focuses on explaining the meaning of the words in it. The development of encyclopedias used automatic text summarization with the TextRank method because from one query that is searched there are many meanings of words that must be summarized. This method starts by selecting documents that are relevant to the query, then summarizes the selected documents using the TextRank method so that they get a summary based on all the word meanings, finally testing the summary results by the system by comparing them with summary targets that are constructed manually by humans. The application of the TextRank method for automatic text summarization has an average value of F-Score 0.6173. The results of automatic text summarization using the TextRank method are no duplicates, and for some queries, it is almost the same as the summary results created manually by humans.

Argument Identification in Indonesian Tweets on the Issue of Moving the Indonesian Capital

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Abstract

Last October 2019, Indonesian Twitter community is busy discussing the issue of moving the capital city, and people are very eager to share their opinion in various expressions. This form of expression was alleged as a form of society expressing their opinions and arguments. This research uses a dataset from online discussions about moving Indonesian capital on Twitter. The goal of this study aims to identify whether a tweet contains argument or not. In this experiment, we use Multi-Class Support Vector Machine (SVM), and Multinomial Naïve Bayes (MNB) as the classifier and TF-IDF as feature extraction. Variation of Twitter data characters that have a lot of noise will be a challenge in this study so that some preprocessing processes will be carried out to overcome this problem. This research will investigate several combinations of preprocessing to discover the best result. We classify each tweet information such as argument, non-argument, and unknown. The best results with an accuracy of 71.42% were obtained by performing SVM with only a unigram feature. This study shows that the stopwords feature has effectiveness depends on which feature combination is implemented in the model.

Automatic personality prediction from Indonesian user on twitter using word embedding and neural networks

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Abstract

Personality can be shown from user's generated content and their activities. In this research, we attempt to predict Twitter user's personality strictly from their tweets based on Big Five. We limit the user to Indonesian only, thus also limit the diversity of language. We construct word embedding as the input for our neural network, which uses LSTM, Bi-LSTM, and GRU. Using F-Measure, we obtained 0.82812 for highest averaged training score when vectors are averaged, using GRU with ReLU as activation function. We also observe the consistency of high result on all but low result on conscientiousness, even though the imbalance of dataset also occurs on extraversion.

AutoVAT: An Automated Visual Acuity Test Using Spoken Digit Recognition with Mel Frequency Cepstral Coefficients and Convolutional Neural Network

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Abstract

Since we live in the digital era, refractive error cases such as myopia have been increased steadily from year to year. As a result, the number of people looking for a visual acuity test has also increased. However, conventional visual acuity test requires knowledgeable examiner, thus some people may find it difficult to undergo a visual acuity test. It would be much easier if visual acuity test can be done at home anytime. Our research would like to develop an automated visual acuity test (AutoVAT) that can run on general computer using microphone as an input device and monitor. Visual acuity is measured using Snellen chart with digit optotype and evaluated based on the user's answer in a form of speech (spoken digit). This study uses Mel Frequency Cepstral Coefficients (MFCC) as the feature point to characterize the spoken digit and Convolutional Neural Networks (CNN) for classification. The results of this study indicate that AutoVAT successfully evaluated visual acuity score with less than one row difference on average based on Snellen chart.

Extractive Hotel Review Summarization based on TF/IDF and Adjective-Noun Pairing by Considering Annual Sentiment Trends

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Abstract

The number of hotel reviews are huge and growing day by day. Many travelers rely on this review to take down their decision to book a hotel. Gather valid and useful information from a huge amount of reviews are needs that must be met. Hence, a summarize tool for hotel review is built to create a representative summary. Hotel review data growing a trend of sentiment in a range of time due to the condition and improvement at that time, so the analysis of sentiment trend is done to choose the appropriate representative review data. Then, there are two method to summarize the selected review data. First, summary was obtained from extractive method with selecting most related sentence base on its Term Frequency-Inverse Document Frequency (TF-IDF) score. Second, phrase summary style is built by pairing adjective to the nearest noun and considering the polarity. From those method, obtained Recall-Oriented Understudy for Gisting Evaluation (ROUGE)-1 recall and Bilingual Evaluation Understudy (BLEU) score respectively {0.2101and

0.7820} for first method and {0.0670 and 0.03672} for the second method. All the reviews are crawled from TripAdvisor website and have been pre-processed by segmenting/tokenization, case folding, and tagging.

Text-based Depression Detection on Social Media Posts: A Systematic Literature Review

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Abstract

Due to the huge increase of awareness of mental health well-being, the detection of mental illness itself is starting to become a huge concern. Many psychiatrists found difficulties in identifying the existence of mental illness in a patient because of the complicated nature of each mental disorder, thus making it hard to give the appropriate treatment to the patient before it's too late. However, due to the integration of social media into people's daily life, this create an environment that may provide additional information regarding the mental disorder a patient bear. This study has been undertaken as a Systematic Literature Review (SLR), which is defined as a process of identifying, assessing, and interpreting the available resources to provide answers for a set of research questions. Analysis is made to answer questions regarding text-based mental illness detection based on the social media activity of people with mental disorders, and reveals that it indeed is possible to do early detection of depression on social due to the existence of a particular characteristics in the way these subjects use their social media. This SLR found that from the small amount of research using text-based approach, most studies use deep learning models such as RNN on the early detection of depression cases due to the limitation of data availability. However, this study will look to find method that may prove to be more effective

Hoax Analyzer for Indonesian News Using Deep Learning Models

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Abstract

Fake news has always been in a problem in many parts of the world. Since English is the most dominant language in the world, hoax analyzers are mostly made to cater to news done in English. This study presents various Deep Neural Network (DNN) models: Long Short-Term Memory (LSTM), Bidirectional LSTM (BI-LSTM), Gated Recurrent Unit (GRU), Bidirectional GRU (BI-GRU), and 1-Dimensional Convolutional Neural Network (1D-CNN) as well as two classifiers: Support Vector Machine (SVM) and Naïve Bayes used to predict the validity of news done in

Bahasa Indonesia. The results show that DNN models are superior to classifiers in supervised text classification tasks, with 1D-CNN achieving the best result.

Sentiment Analysis Using Word2vec And Long Short-Term Memory (LSTM) For Indonesian Hotel Reviews

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Abstract

Generally, Online Travel Agent (OTA) has a review element where clients can give reviews of the facilities they have used. Availability of a huge volume of reviews makes it troublesome for service executives to know the percent of reviews that have an effect on their services. Thus, it is essential to develop a sentiment assessment technique with respect to hotel reviews, particularly in Indonesian language. This research makes use of Long-Short Term Memory (LSTM) model as well as the Word2Vec model. The integration of Word2Vec and LSTM variables used in this research are Word2Vec architecture, Word2Vec vector dimension, Word2Vec evaluation method, pooling technique, dropout value, and learning rate. On the basis of an experimental research performed through 2500 review texts as dataset, the best performance was obtained that had accuracy of 85.96%. The parameter combinations for Word2Vec are Skip-gram as architecture, Hierarchical Softmax as evaluation method, and 300 as vector dimension. Whereas the parameter combinations for LSTM are dropout value is 0.2, pooling type is average pooling, and learning rate is 0.001.

Implementation of Real-Time Speech Separation Model Using Time-Domain Audio Separation Network (TasNet) and Dual-Path Recurrent Neural Network (DPRNN)

Alfian Wijayakusuma[a], Davin Reinaldo Gozali[a], Anthony Widjaja[a], Hanry Ham[a,*]

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Abstract

The purpose of this research is to develop a model that is able to perform real-time speaker independent multi-talker speech separation task in time-domain using Time-Domain Audio Separation Network (TasNet) and Dual-Path Recurrent Neural Network (DPRNN). This research will conduct experiments on some RNN architectures, number of batch size, and optimizers as hyperparameters in order to implement TasNet and DPRNN. This research also try to analyze the impact of these hyperparameters setup on model performance. The expected result of this research is a more accurate model and lower latency to complete speaker independent multi-talker speech separation task in real-time than previous research model.

Model Comparison in Speech Emotion Recognition for Indonesian Language

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Abstract

Speech emotion recognition has become one of the active researches in machine learning for the past few years. There are already applications that use speech emotion recognition as its feature. This paper's purpose is to examine the difference in performance of model using multilayer perceptron (MLP), support machine vector (SVM), and Logistic Regression (LR) with Mel-frequency cepstral coefficients (MFCCs) on Indonesian language. Recording of various people's voices are used as the dataset, which is collected using a peer-to-peer method. Emotions in the recording are classified as happy and sad. For the experiment, the authors used Precision, Recall, F1-Score, and Accuracy for the measurement to find the best model. Among three models, LR model has the perfect accuracy which is 100%. LR and MLP have the best precision rate for happy emotion and have the best recall rate for sad emotion.

Exploring Text-based Emotions Recognition Machine Learning Techniques on Social Media Conversation

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Abstract

Emotions hold a paramount role in the conversation, as it expresses context to the conversation. Text/word in conversation consists of lexical and contextual meanings. Extracting emotions from text has been an interesting work recent thees years. With the advancement of machine learning techniques and hardware to support the machine learning process, recognising emotions from a text with machine learning provides promising and significant results. This research aims to explore several popular machine learning to recognise emotions from a conversation in social media. The algorithms proposed in this research are ranged from traditional machine learning to deep learning techniques. The dataset used in this paper is provided by A_ectiveTweets, with a baseline of F1S core of 0:71 with word N-grams and SentiStrength. The research contributes extensive explorations in a number of machine learning algorithms, resulting in a total of 2302 features sets were explored, where each features sets has 100-1000 features extracted from the text. The results demonstrate Generalised Linear Model provides the best Accuracy score (0:92), Recall (0:902), Precision (0:902), F1 score (0:901) with standard deviation of accuracy of _1; 2%.

Non-Factoid Answer Selection in Indonesian Science Question Answering System using Long Short-Term Memory (LSTM)

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Abstract

Understanding natural science has become vital since it has effects on various facets of daily necessity. However, the lack of comprehensive information sources has led to difficulties in finding information quickly and efficiently, emphasising the need to develop a question answering system. The type of question utilised for question answering systems that specifically deal with science topics is referred to as a non-factoid question. In this research, the question answering system utilised Long Short-Term Memory (LSTM) model for answer selection problems. Testing was done for the following LSTM hyper-parameters: dropouts, learning rates, number of hidden units, size of the answer pool, and margins. Data utilised in this study consisted of 400 pairs of questions and answers on science topics that were obtained from Wikipedia. The highest average values were 90.06% for Mean Reciprocal Rank (MRR) and 78.69% for Mean Average Precision (MAP), which were achieved when using a dropout value of 0.2, 50 hidden units, learning rate value of 0.05, a margin of 0.1, and an answer pool size of 20.

Linear and Nonlinear Model of Brain Tumor Growth Simulation Using Finite Difference Method

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Abstract

The growth of brain glioma concentration is spatio-temporally modeled by using reaction-diffusion. The model assumes heterogeneity in one dimensional space based on grey and white matter arrangement. In this study, model is combined with three different types of growth function. The exponential function produces a linear model, while the logistic and Gompertzian function produce a nonlinear model. The models are solved numerically by finite difference method Crank-Nicolson scheme. Tumor attributes including maximum concentration, number of cell, mean radial distance, and growth speed are also obtained to observe the growth pattern of brain glioma. Python-based desktop application is developed to simulate the numerical solutions and display the results quantitatively and visually. Analysis of the simulation results show differences in growth pattern based on the parameters used. Based on simulation and analysis, the maximum concentration of Gompertzian growth reaches a turning point that is much faster (about 2.8 times) than the other two.

Estimation of Extreme Rainfall Patterns Using Generalized Linear Mixed Model for Spatio-temporal data in West Java, Indonesia

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Abstract

Based on geographical location, Indonesia is crossed by the equator which has a tropical climate with a high diversity of rainfall. This can lead to an increase or decrease in extreme rainfall that has the potential to cause hydrometeorological disasters such as floods, winds and landslides. Estimation of rainfall is not only influenced by the local topography in each region, but there are also spatial and temporal influences. Therefore, this study aims to estimate the pattern of extreme rainfall and map the rain observer station based on the status of extreme rainfall on spatio-temporal data in the West Java province, Indonesia. Estimator of extreme rainfall patterns uses the generalized linear mixed model (GLMM) which consists of spatial and temporal random components with INLA (integrated nested Laplace approximation) inference. Response data in the form of daily rainfall in 73 observer stations, within 2 years period of observation. Average rainfall data is assumed to have gamma distribution, rainfall above the average is identified using the Bernoulli distribution then identified (extreme) rainfall above average is assumed to have generalized pareto distribution. From the rainfall patterns produced there are a number of conclusions, including that the average rainfall in West Java experiences a consistent downward trend in 13-th week to 32-nd week, which indicates that there is a decrease in rainfall intensity at the beginning of dry season in early April until the end of dry season at the end of August. While in the case of extreme rainfall, the decrease in rainfall intensity consistently occurs from the first week in January to 32-nd week at the end of August. The resulting extreme rainfall mapping states that more extreme rainfall occurs in the north to southeast region of West Java.

Reliability Analysis of Distribution Transformer with Bayesian Mixture and Cox Regression Approach

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Abstract

The reliability of a transformer has become an important factor to measure considering that the damaged transformer may cause a local power outage that can lead to the profit loss for both the

public and the PLN (State Electric Company) itself. The reliability data thought patterns observed during a certain period time might not be a singular distribution pattern, but a mixture distribution such as the Weibull mixture. Each period that generates different reliability patterns will be shown as a specific sub-population in the mixture. Therefore, if during the observation two reliability shifts occur, then the reliability would be a mixture with the sub-populations system. In this research, various sub-population possibilities will be used, starting from 3 sub-population up until 7 sub-population. The parameter estimation in the Weibull mixture is done by using Markov Chain Monte Carlo (MCMC). Then, the best mixture model is chosen by the Bayes Factor. Other than that, the Cox regression in this research is used to understand the factors that impact the transformer lifespan. The best model chosen by the Bayes Factor resulted that the mixture model with 3,4,5,6, and 7 sub-population is considered the same.

Spatial Bayes Analysis on Cases of Malnutrition in East Nusa Tenggara, Indonesia

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Abstract

Malnutrition is a condition of serious nutritional disorders that occurs when food intake does not match the amount of nutrients needed. This nutritional disorder is fatal to a toddler's health if not treated immediately. For this reason, the purposes of this study are to model and map malnutrition cases by taking into account regional aspects using the Bayes spatial analysis whose inference uses INLA (integrated nested Laplace approximation). The spatial Bayes model used is a generalized linear mixed model, by including random effects in the form of conditional autoregressive spatial structured components. The response variable is the number of cases of malnutrition in 22 city districts in Indonesia's East Nusa Tenggara province, which is assumed to have a Poisson distribution. In spatial modeling, the fixed effects as the explanatory variables are included, i.e. the number of children under five given complete immunization, the poverty depth index, the number of maternal and child health services, population density and the average duration of breastfeeding. The results of spatial modeling show that the poverty depth index is the main variable that has a significant effect on the number of malnutrition cases. From the results of spatial mapping, it can be seen that there are regional links that affect the number of malnutrition cases, including in Sumba Barat Daya, Sumba Barat and Sumba Utara which have a high probability of malnutrition risk rather than in Sumba Timur.

Lasso Regression for Daily Rainfall Modeling at Citeko Station, Bogor, Indonesia

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Abstract

Rainfall is one of the climate components which is very important for an agrarian country with a tropical climate like Indonesia. There are so many variables that can affect the intensity of rainfall, including humidity, air temperature, speed and wind direction. However, not all of these variables can have a significant effect, therefore, we need a modeling technique that can select and shrink the predictor variables so as to make the model simpler. One of the techniques used is the Lasso (least absolute shrinkage and selection operator). The purpose of this study is to model rainfall intensity using lasso regression and determine which variable have the greatest influence on rainfall intensity. This paper also designs an application system that can be used to implement Lasso regression. The response variables in the form of daily rainfall at the Citeko observation station, Bogor Indonesia is assumed to have normal distribution. Rainfall intensity modeling involves 16 predictor variables, namely the maximum temperature, minimum temperature, average temperature, average humidity, sun exposure, maximum wind speed, wind direction when maximum wind speed and 8 other categorical variables are the most frequent wind direction. The resulting Lasso regression model successfully select and shrink the variables used to 9 variables only. In addition, based on the AIC and coefficient of determination indices for the model evaluation, the Lasso regression shows satisfying results rather than classical multiple linear regression. In Lasso regression, AIC value is 5901.20 where in classical model it is 5911.43. Also, Lasso regression coefficient of determination value is greater that is 22.73% while in classical model is 21.41%. From lasso regression model that has been obtained, it is known that the most frequent wind direction to the north is the variable that has the greatest influence on rainfall intensity. The Lasso regression application has been successfully created so that it can facilitate the user in uploading data, exploration of data and variables, Lasso regression analysis and report result.

Portfolio Selection of KOMPAS-100 Stocks Index Using B-Spline Based Clustering

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Abstract

Investment risk in stocks is one of the things that need to be considered by investors. Therefore investors need to develop strategies to manage portfolios. One way to manage risk in stock investments is to diversify the portfolio by selecting stocks. In this paper, stocks in a portfolio are chosen based on the similarity of the price movement data through the clustering using K-means. Since stocks in the same cluster have a higher similarity compared to shares in different clusters,

the portfolio consists of stocks selected in each different cluster. Stock price movements are high dimensional data, requiring computation costs during clustering, so the dimension reduction is applied by conducting an interpolation using B-Spline. Based on the weekly dataset in 10 years (01/01/2009 - 12/31/2018), the Mean-Variance and the Equal-Weight portfolio consists of the selected stocks using this approach offer less volatility, higher Sharpe Index, and better cumulative performance.

Multi-threaded Spotted Hyena Optimizer with thread-crossing techniques

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Abstract

This paper presents a Multi-threaded version of the Spotted Hyena Optimizer algorithm with thread-crossing techniques (MT-SHO) to improve the ability of the algorithm to explore the search space. The original algorithm is inspired by the hunting behavior of the spotted hyena.
Along the different sections of the work, we explain in detail how the original algorithm simulates the spotted hyena's behavior to optimize highly complex mathematical functions and how we handle the procedures and results of the multi-threaded version, with thread-crossing techniques that improve the ability to explore and exploit the search space by letting threads learn between them. We present the experiments used to determine the best value of the parameters used in the parallel version of the algorithm and to prove that our proposal obtains significantly good results we compare the results obtained by evaluating 24 benchmark functions with the results published for the original algorithm as well as other metaheuristic algorithms.

A multiprocess Salp swarm optimization with a heuristic based on crossing partial solutions

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Abstract

The Salp swarm algorithm (SSA) is one of the most recent metaheuristic optimization algorithms. SSA has been used successfully to solve optimization problems in different research areas such as machine learning, engineering design, wireless networks, image processing, mobile robotics, and energy. In this article, we present a multi-threaded implementation of the SSA algorithm. Each thread executes an SSA algorithm that shares information among the swarms to get a better solution. The best partial solutions of each swarm intersect in a similar way of genetic algorithms. The experiments with nineteen benchmark functions (unimodal, multimodal, and composite) show the results obtained with this new algorithm are better than those achieved with the original algorithm.

Fiscal decentralization analysis that affect economic performance using geographically weighted regression (GWR)

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Abstract

Economic performance is one of the important things that have to be evaluated by the government. There are many factors that affect economic performance.This paper aims to evaluate the effect of fiscal decentralization indicators on regional economic performance in Sumatra Island, Indonesia. Based on the results of spatial dependency testing,can be concluded that there are spatial dependencies on economic performance and spatial heterogeneity between locations in Sumatra Island. Therefore, Geographically Weighted Regression (GWR) which is a spatial modelling can be used in this case. There are six independent variables that be used in this research, there are original local revenue, general allocation fund, special allocation fund, and profit share fund, poverty rate and human development index. The result showed that Geographically Weighted Regression model performed better than multiple linear regression of Ordinary Least Square(OLS) model, providing different effect information ateach location.Based on model evaluation using RMSE, MAPE and AIC showed that GWR model is better than OLS model.

A Systematic Literature Review of A* Pathfinding

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Abstract

A*is a search algorithm that has long been used in the pathfinding research community. Its efficiency, simplicity, and modularity are often highlighted as its strengths compared to other tools. Due to its ubiquity and widespread usage, A*has become a common option for researchers attempting to solve pathfinding problems. However, the sh eer amount of research done on the topic makes it difficult to know where to start looking. With this paper, we hope to create an accessible, up to date reference on the current state of the A*search algorithm for future pathfinding projects to consider. Thispaper examines A-Star's current usage in the field of pathfinding, comparing A*to other search algorithms. It also

analyzes potential future developments for A-Star's development. A*cannot keep up with the demands of current pathfinding problems. Other algorithms c an maintain the same performance while also demanding less overhead and this problem only grows worse as grid size increases. However, use of innovative modifications such as different heuristic types or secondary components to the algorithm allow A*to achieve very fast times with good accuracy when dealing with large maps, while only having slightly increased overhead costs for the modifications. While beginning to show its age, improved algorithms based on the classic A*algorithm are more than capable of keeping up with modern pathfinding demands. These derivative search algorithms such as HPA*is used to overcome the limitations of A*. HPA*can compete with and even surpass its competitors depending on the challenge faced.

RHC: A Dataset for In-Room and Out-Room Human Counting

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Abstract

In recent years, research in human counting from CCTV (Closed Circuit Television) images have found an increasing demand to be deployed in real-world applications. The applications have been implemented in various settings, both indoor and outdoor. In the case of indoor setting, we found a type of room setting that conveys a problem to human counting model if we need to count only humans inside a room. With this respect, we present RHC (Room Human Counting) dataset, which images are captured in the aforementioned setting. The dataset can be used to develop a robust model that can di_erentiate between humans inside and outside a room. The dataset is publicly available at https://data.mendeley.com/datasets/vt5c8h6kmh/1.

Development of control algorithm for a quadcopter

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Abstract

Nowadays, drones are popular with their multipurpose functioning. They can be applied in different environments, especially those that are harmful and can cause health hazards to the human being. However, drones are expensive, have limitations in the lifting capabilities, difficult in control, and auto-balancing. This paper focuses on deriving a mathematical model of the quadcopter with its characteristic properties to solve the auto-balancing problem. The research determines the mathematical model of the unmanned aerial vehicles (UAV) and then incorporates characteristic values of the constructed to the general model. The derived equation is used in identifying the controlling parameters of the quadcopter. The key focus of this research is to develop a cost-effective, self-stabilizing, and robust control system using affordable components. A gyroscope MPU6050, a transmitter, and a receiver (with at least 4 inputs) were integrated with microcontrollers to develop the system.

Finite element analysis of the CFRP-based 3D printed ankle-foot orthosis

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Abstract

The application of the 3D printing and additive manufacturing in making medical devices have become widespread in the last decades as the opportunity of the technology is rapidly growing. Notably, the Fused Deposition Modeling (FDM) in 3D printing technique has been applied to develop the ankle-foot orthosis (AFO) with different materials and composites. This paper presents a new design and simulation results of a novel orthosis using Carbon Fiber Reinforced Polymer (CFRP). The orthosis for anklefoot is designed for rehabilitation of the patient from the foot drop disease. The orthosis' shape is modelled to support the backside of the calf. It contributes to the maintenance of the gait cycle. In this paper, two different models of the AFO are compared, namely articulated and non-articulated. The finite-element analysis is done using the ANSYS software, and the results for equivalent Von-Mises stress as well as total deformation are observed and analyzed. Various materials are applied during the numerical analysis, as well as their combinations are tested.

Design of a flexible neck orthosis on Fused Deposition Modeling printer for rehabilitation on regular usage

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Abstract

The usage area of Additive Manufacturing (AM) already spread into the medicine and rehabilitation sphere. The advantages of AM become a driving force for fabricating prostheses, human organs, and implants. The recent studies in AM indicate excellent manufacture of limbs that possesses characteristics of market versions and, at the same time, outperform them in comfortability. Although there is a vast amount of investigation on orthosis development, only a few applications connected with neck orthosis. This paper proposes customized cervical orthosis

designed through 3d scanner device and produced by Fused Deposition modeling. TPE (thermoplastic elastomer) FLEX filament used to provide the model with flexible features on par with the lightweight. FEA analysis assessment confirmed the durability of the prototype. Furthermore, the specific construction of orthosis allows patients to comfortably dress and utilize it in daily life, whereas the hole pattern of frame addresses ventilation problems. Obtained results indicate the capability of using TPE (flex) material and show that the FDM printed model able to compete with market analogs.

A Fast and Accurate Model of Thoracic Disease Detection by Integrating Attention Mechanism to a Lightweight Convolutional Neural Network

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Abstract

The utilization of Deep Learning, especially the Convolutional Neural Network (CNN), is currently the best approach for thoracic disease detection from Chest X-Ray images. However, CNN typically has a slow runtime, hence potentially can introduce a bottleneck in the healthcare that uses the technology. To answer the challenge, we proposed a model that integrates an attention mechanism to a lightweight CNN. The proposed model can run faster than the state-of-the-art thoracic disease detection model while having the second-best performance among the thoracic disease detection models.

Performance Evaluation of Binary Classification of Diabetic Retinopathy through Deep Learning Techniques using Texture Feature

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Abstract

One of the main causes of loss of vision in diabetic patients is Diabetic retinopathy (DR). Automated methods are important medical applications for detecting and classifying the disease type into normal or abnormal ones. Fundus images are obtained from the retina using a retinal camera, one of a non-invasive diagnostic technique that offers a way of examining the retina in diabetes patients. We present in this paper a system for the detection and classification of DRs. Our approach is divided into two main steps: in the first step, we use local binary patterns (LBP) to extract texture features, while in the second stage, we analyze extensively the state-of-the-art

deep learning techniques for the detection and classification tasks. ResNet, DenseNet, and DetNet are used as deep learning techniques. Preliminary results show that ResNet, DenseNet and DetNet can obtain 0,9635%, 0,8405% and 0,9399% of accuracy, respectively. In addition, we also evaluate the performance of each detection configuration.

Multi-class Weather Forecasting from Twitter Using Machine Learning Aprroaches

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Abstract

Now in the era of big data, many are applying information methods accurately especially by social media. The aims of this study to classify the weather based on Twitter automatically using text mining by using Support Vector Machine (SVM), MultinomialNaive Bayes (MNB), and Logistic Regression (LR) method. The experimental results show that SVM substantially outperforms various other machine learning algorithms for the task of text classification with an accuracy value of 93%. This result proves that SVM is very suitable for text categorization. We use clustering technique to read the pattern in customers' opinion about the restaurant based on some measurement variables.

Towards the Analysis networks of Redundancy with Von Neumann Machines And RPCs

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Abstract

Several of the DPP-4 inhibitors in the treatment of type 2 diabetes (T2DM) still have unsafe side effects in long-term use. It is necessary to develop a new DPP-4 inhibitor to minimize these unsafe side effects of the drug. QSAR is a model that can be used for the development of DPP-4 inhibitor drugs. The selection of a subset of DPP-4 inhibitor molecules by applying the clustering method can be made to improve the accuracy of the QSAR model. This study aims to select the corresponding DPP-4 inhibitor molecules by using the MiniBatchKMeans algorithm with Levenshtein distance and based on the log*P* criteria of 'Lipinski's Rule of 5' for QSAR modeling. The research began with the collection of DPP-4 inhibitor molecule data from the ChEMBL

database site (https://www.ebi.ac.uk/ chembl/) in CSV format. A representation of the molecular structure of the data is obtained from their SMILES features. Beforerunning the clustering process, data in the form of SMILES is extracted into molecular fingerprints using severalfingerprint generators, namely MACCS, ECFP, and FCFP. Clustering was carried out on five fingerprint datasets,including ECFP (with 4 and 6 diameters), FCFP (with 4 and 6 diameters), and MACCS (167 structural keys). Theclustering process begins by determining the optimal number of clusters evaluated by applying the Davies-Bouldinindex, the Silhouette coefficient, and the Calinski Harabasz score. Based on the clustering process, 1540 clusters wereobtained from the minimum DBI cluster evaluation values of 0.545311, maximum SCO of 0.302842, and maximum CHS of 331.3942 from the MACCS fingerprint dataset. Based on log*P* criteria from 'Lipinski's Rule of 5', 1532 molecules were obtained for the molecular selection process that have log*P* values between -0.205 to 4.95.

The Drug Design for Diabetes Mellitus type II using Rotation Forest Ensemble Classifier

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Abstract

Dipeptidyl peptidase-IV (DPP-IV) inhibitor is one of the drug targets for the treatment of diabetes. Some classes of those drugs have dangerous side effects so is critical to develop safer drugs. By using rotation forest methods and in silico, it will be more efficient than conventional methods that require a lot more costs and are more time-consuming. One of in silico methods used in drug design is ligand-based virtual screening (LBVS). The interlocking structure capabilities are identified by the LBVS Process. The fingerprint is one of the structural interpretations. Molecular fingerprints are used as a criterion for LBVS in computational drug discovery. A circular fingerprint is found to improve LBVS performance. In this paper, we used the representation of ECFP and FCFP as a method to extract features, after which we used a Rotation Forest classifier to predict active and inactive compounds. The experiment result shows Rotation Forest has good prediction based on the different circular fingerprint and can successfully better classify with results of MCC being 85% and accuracy 92%.

A Novel Reliable Approach For Image Batik Classification That Invariant With Scale And Rotation Using MU2ECS-LBP Algorithm

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Abstract

Batik in Indonesia has various types of patterns, which are arranged repeatedly to illustrate the basic motifs of cloth as a whole. Types of batik motifs collected through several sources such as batik magazines, the internet or directly using a digital camera. Batik's pattern automatic classification still requires some improvement especially in regards to invariant with scale and rotation. The batik's pattern of changing this dilemma at the same time needs a feature extraction algorithm that is reliable in supporting image classification. This algorithm is multi window and multiscale extended center symmetric local binary patterns (MU2ECS-LBP) which uses several windows such as the size of 6x6, 9x9, 12x12, and 15x15 or a combination between windows. To recognize the batik pattern automatically, we implement a batik classification method using kNN and ANN. After doing some experiments the results of the accuracy values with the kNN method, based on the effect of training images and image conditions, on multi-window 6-9-12-15, another multi-window 6-12-15 with overlapping images of 40 and 50 pixels and the number of image classes 5, 9 and 12 classes are 99.91% and 99.8%.With the ANN method, the accuracy classification value is based on the multi-window effect and image overlap, where the highest accuracy value on multiwindow 6-9-12-15 with ANN architecture 64-240-12 is 98.43%. A novel algorithm is a development of the local binary pattern algorithm, but by looking at the results of classification accuracy which is very good and reliable. So that the feature extraction algorithm is very feasible to be developed and continued for other research.

A Convolutional Neural Network-based Ancient Sundanese Character Classifier with Data Augmentation

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Abstract

With an increasing interest in the digitization effort of ancient manuscripts, ancient character recognition becomes one of the most important areas in the automated document image analysis. In this regard, we propose a Convolutional Neural Network (CNN)- based classifier to recognize the ancient Sundanese characters obtained from a digital collection of Southeast Asian palm leaf manuscripts. In this work, we utilize two different preprocessing techniques for the dataset. The first technique involves the use of geometric transformations, noise background addition, and brightness adjustment to augment the imbalanced samples to be fed into the classifier. The second technique makes use of the Otsu's threshold method to binarize the characters and only uses the usual geometric transformations for the data augmentation. The proposed network with different data augmentation processes is trained on the training set and tested on the testing set. Image binarization from the second technique can outperform the performance of the CNN-based classifier upon the first technique by achieving a testing accuracy of 97.74%.

Automated Heart Sound Signal Segmentation and Identification using Abrupt Changes and Peak Finding Detection

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Abstract

Conventionally, majority physicians used manual-based approach to determine heart sound parameters by manually printing heart sound signal waveform on the paper and trace heart sound parameters duration. Towards modern medical diagnostic technologies, this paper presents a modified framework of automated heart sound signal segmentation and parameters identification for deployment in computer aided auscultation. Envelope-based approach with reference information by abrupt changes and peak detection algorithm are proposed for PASCAL Classifying Heart Sounds Challenge database. Noted that the performance of segmentation process was measured by calculating the accuracy and F1-score while the heart sound parameters were identified by computing its mean and standard deviation. The findings yield F1-score and accuracy of proposed approach for segmentation and identification of normal heart sound signal at 95.29% and 91.0%, respectively. Heart sound parameters such as first sound, S1 duration, second sound, S2 duration, systole duration, diastole duration, heart cycle duration and ratio of systole and diastole were also determined. This proposed approach is suitable to be applied on two prominent heart sound signal peaks of S1 and S2, which continuously varies among samples due to the different auscultatory sites

Evaluation of Dengue Model Performances Developed Using Artificial Neural Network and Random Forest Classifiers

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Abstract

Dengue is one of the endemic diseases in Indonesia. Dengue is being suffered by many people, regardless of their gender and age. Therefore, research about dengue based on dengue patients' data was conducted. There was a lot of information written in that data regarding the corresponding patients and the dengue they had suffered, such as gender, age, how long the patients were hospitalized, the symptoms they experienced, and laboratory characteristics results. Diagnosis of each of the corresponding patients based on their symptoms and laboratory characteristics results were also written in that data. The diagnoses were classified into three different clinical degrees according to the severity level, which is DF as the mild level, DHF grade 1 as the intermediate

level, and DHF grade 2 as the severe level. In this research, data of the patients on the third day of being hospitalized was analyzed, because, on the third day, dengue is entering a critical phase. The objectives of this research were: to evaluate the performance of the models that were used to predict the correct class within the given dataset developed using Artificial Neural Network (ANN) classifier and Random Forest (RF) classifier separately, and to find a classifier that yielded the best performance. The results obtained from this research will be used in the development of a Machine Learning model that can predict the clinical degree of dengue in the critical phase, if the laboratory characteristics results are known, using a classifier that yielded the best performance.

Syllabification Model of Indonesian Language Named-Entity Using Syntactic n-Gram

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Abstract

Syllabication or syllabification is an activity to detect syllable boundaries in a word. There are two main ways for automatic syl-labification, namely rule-based and data-driven. The rule-based approach is based on the general principle of syllabification, while the data-driven method uses a set of syllabified words to create a syllabification of unknown words. Research on syllabification of words has been done a lot. However, most of these studies only deal with the formal words but still a few studies for named entities.Besides, named entities tend to be more complicated than the regular words. In this research, a syntactic n-Gram is proposed and investigated to syllabify the named entities since it is developed based on then-gram that has an excellent accuracy and tends to be consistent with various languages. Evaluation on 20 k named-entities based on 4-fold cross-validation show that the proposed model gives a competitive syllable error rate (SER) compare to another similar-gram-based model.

Comparative Study of Recent Swarm Algorithms for Continuous Optimization

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Abstract

Optimization is a problem of finding the best solution from various possible solutions. In solving optimization problems, collective intelligence algorithms are often used as a method for finding solutions to optimization problems. This is because collective intelli-gence has various algorithms to search for various types of continuous optimization problems. However, not all of these algorithms work with the same performance. An algorithm can work better for a problem than other algorithms. Therefore, the diversity of performance of this algorithm must be identified,

analyzed, and compared. By knowing the strengths, weaknesses, nature, and behaviour of the algorithm in solving various problems, this is believed to be able to realize the use of more effective algorithms in solving various problems. In this paper, Dragonfly Algorithm (DA), Grey Wolf Algorithm (GWO), and Rao Algorithms are carefully investigated using nine benchmark functions. The result indicates that Rao generally performed better than GWO andDA. DA is outperformed by GWO and Rao in reaching the convergence score, although DA has an edge in searching a large searchspace, and in theory, given enough population, DA can perform better than GWO or Rao.

Monitoring Mung Bean's Growth using Arduino

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Abstract

In Indonesian, Horticulture is one part of agriculture that is very important for the survival of the Indonesian people. Crops are useful to meet people's food needs. The cultivation of agriculture crop very dependent on climate, weather and external factors. The optimal environment will provide optimal plant growth results, so people must really pay attention to the condition of these crops. To maintain plant growth so that crops can grow well, it is necessary to monitor the crops. To find out how plant growth, which needed a system to monitor plant growth. This paper will discuss about the implementation of a plant growth monitoring system. This system will check the climate, weather, and external factors like air, soil, light, and others, which will affect the crops. Internet of Things (IoT) assumes a significant job in a large portion of the fields. The utilization of IoT expanded in view of the different preferences we can get from that. The horticulture is where a great deal of progress is required because that is one of the fundamental needs and a huge area of individuals is associated with that. All this information is sent by Arduino Uno dev boards to the Ubidots IoT (Internet of Things) cloud platform. Data in Ubidots will be sent to the user's smartphone.

Digital Door-Lock using Authentication Code Based on ANN Encryption

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Abstract

Nowadays, many houses/apartments are rented out for travelers in sites like Airbnb. A way to give out temporary access key for the guest is necessary for both the guest and hosts convenience. This paper presents an electronic door lock mechanism that able to generate dynamic temporary access key for the guest. The door lock is controlled by a smartphone using the dynamic key which is transferred though Bluetooth Low Energy (BLE) connection. The development of dynamic key utilizes block cipher encryption and fusion methods (Artificial Neural Network) to generate the block cipher keys. The generator produces a unique dynamic key for a specific period of time and nRF8001 proves to be a reliable Bluetooth Low Energy transmitter and receiver.

Data Transmission Using RFID System on Smart Shopping Carts for Checkout Process Effciency in Supermarket at Indonesia

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Abstract

A lengthy queue upon entering the checkout process in supermarkets is an undesired situation for the customers and can possibly cause the number of customers to decrease as well as their loyalties. Therefore, rendering the checkout process effcient is necessary as saving time can help the customers to do other activities in their lives. The purpose of this research is to create a System that consists of Smart Shopping Carts, a smartphone application as an interface, an application for the cashier integrated with the server and database to support data transmission, that enables people to do self-scanning of items and the cashier only has to perform payment. This System is developed using theWaterfall methodology and involves tools such as Arduino Uno, RFID, Visual Studio Code, Flutter, PostgreSQL, REST, React dan Node.js. By simulating the process with various variables from observation, the result is effciency that grows with increasing number of items and customers.

A New Damage Index for Structural Health Monitoring: A Comparison of Time and Frequency Domains

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Abstract

With the adoption of the damage tolerance design principle, the health monitoring system has become an integral part of the operation of engineering structures. For the system to work, a damage indicator that describes the structural integrity level should be established and monitored. The damage indicator is usually derived from structural responses. Many quantities have been proposed for damage indicator including natural frequency, mode shape, curvature, strain energy, and t-, F-, and z-statistics. In this paper, we propose a new damage indicator in the time and frequency domains derived from the Euler-Bernoulli beam theory. We evaluate the method by using data obtained from a numerical simulation of a cracked beam. The beam deformation is nonlinear due to the contact between the crack faces during vibration. The proposed damage index is estimated in the domains for various observation points on the beam. Besides, the existence of the crack is also predicted by the widely used traditional method based on the change of the natural frequency and mode shape. A comparison is made between the present method and the existing ones. We conclude the present proposal is more sensitive to detect the crack.

An Exploratory Study on Readiness Framework in IoT Forensics

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Abstract

Forensic readiness is important to ensure that the organization is fully prepared and well-equipped to be forensically ready to conduct the digital forensic investigation. Moreover, forensic readiness in IoT forensic investigation is different from the usual computer forensic readiness. This research discovered the importance of having the forensic readiness in place for the organization before conducting the IoT forensic investigation. Therefore, a readiness framework was proposed as a groundwork before further research is carried out. Literature on related this issues was collected, examined and criticized in order to scrutinize the impact factors in IoT forensics investigations. Finally, the proposed framework was validated by thirty experts from digital forensics in Malaysia using triangulation methods. From the results, this framework will be used in developing an instruments to measure readiness factors among digital forensics stakeholders.

Healthy Elder: Brain Stimulation Game for the Elderly to Reduce the Risk of Dementia

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Abstract

In general, everyone will experience a period of growth, starting from infants to children to adults. There will come a time when a person's growth stops and decreases. When cognitive capabilities

are not used often, it will decline, and this phenomenon is known as cognitive impairment. The most common form of cognitive impairment is dementia. Dementia is a degenerative disease that cannot be cured with the usual treatment techniques for physical degenerative diseases, such as surgery or physical contact. It is because this disease attacks the human nerve. One method that can be done is to prevent or reduce the risk of dementia by stimulating the brain. To implement this method, the researchers made a game that can stimulate the brain. The researcher used the Game Development Life Cycle (GDLC) method in the process of making the game. The test was conducted at Berea Nursing Home and Pusaka 41 Nursing Home. The result shows that out of 30 people who were tested, 19 people showed improvement in terms of their cognitive capabilities in seven days.

A Systematic Literature Review: Learning with Visual by The Help of Augmented Reality Helps Students Learn Better

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Abstract

Studying is a part of a student's life, but not everyone enjoys studying. The long texts and unappealing content make the students lose their interest. To resolve this problem, we suggest changing the conventional method of studying to a new way using Augmented Reality (AR) as a learning tool. Some literatures have used AR technology to help students learn some new concepts. By combining the digital and physical environment, studying activity can be more fun for students. This paper would like to evaluate the effectiveness and the results of using AR in educational purposes by conducting Systematic Literature Review (SLR). The relation between authentic learning and AR is also considered. Based on our study, we can conclude that using AR as a learning tool help student to learn better for certain subjects. This is mainly by visualizing abstract concepts to be 3D object. Therefore, AR can be used to learn concretely the structure of abstract concepts. Furthermore, students think that AR is interesting and gave them the motivation to study more. The students can also easily remember and recall information because the experience is more engaging. In general, AR is more effective as medium of the learning media because the students can see the reproduced real objects in learning and practicing. Further research and development will make AR a more promising learning tool in the future.

Behavior Correlation between Games in First-Person Shooter Genre based on Personality Traits

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Abstract

Recently, video games became an increasingly popular pastime. Nevertheless, there is little research conducted to see the relationship between personality and preferences for first-person shooter (FPS) video games. We would like to know what this kind of games is can drive a violent behavior. On the other hand, in the field of personality psychology, there is consistent research that personality traits can clustered into 5 high-level factors, called as the Big Five Personality Factors. This study would like to examine whether personality traits affect preference in FPS games. We conducted the research by asking participants to fill out a questionnaire containing personality traits test based on Big Five Personality and a questionnaire about FPS games played to identified player's game preference. From the data, we investigated the behavior correlation between FPS games based on personality traits. There were 62 participants who like to play video games on this research. Only 29 participants like and play FPS games. It showed that participants already have different preference for games based on their personality traits. On FPS players who like Counter Strike Global Offensive (CSGO) have interesting patterns, that is very low Extraversion, Agreeableness, Conscientious, Openness, but higher neuroticism when compared to other players.

Using Video Games to Improve Capabilities in Decision Making and Cognitive Skill: A Literature Review

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Abstract

Video games provide a means to improve a human's cognitive skills. There are several genres of games that affect different cognitive subcategory. The purpose of this paper is to determine whether video games could really improve cognitive skills and decision-making; and which video games genre affect which cognitive skills. The authors assess previous experiments related to video games and cognitive skills. The paper reviewed 27 experimental and literature review studies. The results of the review proved that video games do improve cognitive skills and decision-making. Cognitive skills such as perception, attentional control, and decision-making improves when subjects were trained with video games. In relation to video games genre, Real-time strategy (RTS) players outperforms First-person shooter (FPS) players on cognitive flexibility while FPS players tend to have lower switching cost in work. People with profession such as nurses and doctors showed improved decision-making and risk assessment when trained with serious simulation games. High school and undergraduate students who played video games exhibit better result when given tasks related to cognitive abilities compared to students who do not played video games. We encourage further studies to conduct a much bigger experiment to correlate with our findings.

Audio Influence on Game Atmosphere during Various Game Events

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Abstract

Audio is an inseparable element in our lives, with no exception in the world of video game, called as game audio. It has become more popular and video games have many different elements which make up game audio. Based on our experience, some game audios are very well, but sometimes they don't fit right with the game situation. In this paper, we would like to assess the role of game audio with particular attention to understand their effect on immersion and emotional engagement. We conducted the experiments to convey the questions about the importance of game audio elements, including the compatibility of audio elements in video game. It can be concluded that sound effect is the most important audio elements in video games.

The Effectivity of Color For Chroma-Key Techniques

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Abstract

In this age where almost all facets of life are full of digital objects, because of technology is advancing more and more rapidly, included the fields of economy, the social field, the industrial field, labour, and the entertainment field especially the film industry. In film industry, the backgrounds that were once impossible such as foreign planets and the deep expanses of space are now possible, this is due to the technique known as Chroma Key as well as the usage of green screens and blue screens. In this research we wish to find out if only green screens and blue screens are the only viable colours to use or is there any other colours available to use to Chroma Key.to use or are other colours available to use to Chroma Key. The methods that we used to conduct research on this topic are case studies. We conduct a case study to see the level of efficiency and fatigue after using various colours as a background to the Chroma Key process. Experiments: We ourselves will try to conduct the Chroma Key process while using various colours as the background and making sure that other variables such as our lighting and spacing are constant on every case we conducted, to measure the efficiency and effectivity of the colours in the Chroma Key process.

Mobile based Augmented Reality Application Prototype for Remote Collaboration Scenario Using ARCore Cloud Anchor

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Abstract

This paper describes a development study for mobile based Augmented Reality (AR) application prototype for simple remote collaboration scenario. The AR technology is implemented by using ARCore with cloud anchor into two different mobile devices as the host and client. A host is a user device that able to create and share a session of a camera viewpoint that could be connected with another client device remotely through the internet. For testing purposes of remote collaboration scenario in this application prototype, both users are able to add and manipulate location of virtual objects that overlay on each screen from their own device. Based on the functionality test, before placing the virtual object on the screen, a calibration of cloud anchor is required with minimum success performance in 250 to 1200 lumens of lights. The result for cloud anchor is being hosted with average delay up to 700+ milliseconds. In this paper, the result of the experiment shows an early stage of the utilization of AR technology in simple remote collaboration scenario. However, it shows the potential of mobile based AR technology for future remote collaboration scenario development.

The Impacts of The Cherry Orchard Video Game on Players' Reading Comprehension

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Abstract

This article discusses the impacts of The Cherry Orchard video game on students' reading comprehension. Simply defined, reading comprehension isstudents' ability to comprehend the content and the story of the (multimodal) texts they read. The Cherry Orchard is a self-produced video game based on Anton Chekov's play with the same name. There are two problems to be discussed in this article: the impacts of playing the video game on participants' reading comprehension and the participants' opinions about the video game. Experiments were done to a group of students who used this video to support their understanding of the cherry orchard play and one controlled group of students who simply read the printed version of the play. Both groups' comprehension was tested after reading. The results showed a major difference in score with the experimental group performed much better in their grades. Students' opinions about the game, however, were not all positive as many of them claimed that the video game was too long and monotonous. Despite the criticism on the video game, the study justified previous studies on the positive impacts of video games on students' reading comprehension. The paper suggests that video games for educational purposes should be kept short, provide voice over, and entail users' sense of accomplishment to keep them engaged.

The Design and Implementation of a Dashboard Web-Based Video Surveillance in OpenStack Swift

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Abstract

The purpose aims at deploying a fully functional OpenStack cluster with different settings and operational environments, followed by an in-depth analysis of its network performance and explanation of what happens behind the scene. Where OpenStack Virtual Machines perform these services for data storage files are stored in an authenticated cloud storage service center. The methodology used presents various scenarios using OpenStack Virtual machines and cloud-based to improve network performance video surveillance backend system architecture is developed with the Sensor web Enablement framework and cloud-based data storage. Data is obtained through simulators on camera/edge devices, file and metadata sharing, and fast cloud base storage. This study aims to compare the performance load resulting from large-scale video surveillance with small onesto show satisfactory performance, scalability, and good reliability from cloud-based storage systems for smart MCS. The most important feature is storage is adjusted dynamically, and there won't be any worry about space being inadequate or wasted. This paper presents a solution for deploying web applications for CCTV video surveillance, an object cloud storage service system based on the open-source cloud operating system OpenStack Swift. It's working in the OpenStack swift on IaaS and allocates resources for storage original data by multiple camera surveillance (MCS).

A literature review: Feasibility Study of technology to improve shopping experience

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Abstract

Technologies toward shopping have been improved recently. technologies varied from tools that assist shoppers, payment options, or even online shopping that provides a shopping experience from smartphone applications. Researchers and industries have been developing new kind of

technologies and concepts in hope for a better shopping experience for our modern society. This literature review discusses some of those new technologies that are currently under development process or had been introduced recently based on feasibility analysis. Technologies that are considered including Smart Trolley, VR Shopping, and Just Walk Out Shopping also supported by related researches and literature. Feasibility analysis examined in this study encompass market aspect, technical aspect, financial aspect, legal aspect, and risk identification. The feasibility study is based on jobs-to-be-done framework.

Predict Mortality in Patients Infected with COVID-19 Virus Based on Observed Characteristics of the Patient using Logistic Regression

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Abstract

The spread of COVID-19 has made the world a mess. Up to this day, 5,235,452 cases confirmed worldwide with 338,612 death. One of the methods to predict mortality risk is machine learning algorithm using medical features, which means it takes time. Therefore, in this study, Logistic Regression is modeled by training 114 data and used to create a prediction over the patient's mortality using nonmedical features. The model can help hospitals and doctors to prioritize who has a high probability of death and triage patients especially when the hospital is overrun by patients. The model can accurately predict with more than 90% accuracy achieved. Further analysis found that age is the most important predictor in the patient's mortality rate. Using this model, the death rate caused by COVID-19 could be reduced.

Distribution Cost Optimization Using Pigeon Inspired Optimization Method with Reverse Learning Mechanism

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Abstract

The goal of this research was to optimize the cost of goods distribution to some locations. The problem can be considered as Vehicle Routing Problem (VRP). The main characteristic of this problem is that the solution space expands exponentially. In our case at hand, the goods distribution that have been done, mostly done manually. Therefore, it may not optimize the costs of distribution. Manual optimization cannot be used if the number is locations is more than five because the solution space is too big to solve by hand. Pigeon Inspired Optimization (PIO) is proposed as a heuristic method for optimizing the VRP to optimize the cost and then it will be compared with Particle Swarm Optimization (PSO) method as comparison algorithm. Evaluation was conducted by comparing their performance in optimizing cost for several solution spaces. The achieved result is the shortest distribution path according to the constraints given and has lowest total cost of distribution. It can be concluded that PIO is better for optimizing the goods distribution path so that the distribution cost becomes minimal.

Traffic Lights Analysis and Simulation Using Fuzzy Inference System of Mamdani on Three-Signaled Intersections.

Siti Komsiyah[a,*], Evelyn Desvania[a]

Abstract

As one of the main characters at road intersections, traffic lights have lost its limelight and functions as of late. The unbalanced timing on its green light/green time duration settings with less to no regard to actual traffic in each lane becomes one of its main problems. Therefore in this paper, the author will formulate a more dynamic green time setting system by using Fuzzy Inference System type Mamdani. To help with the analyzing process, a desktop-based application is designed to simulate the green light duration setting for the traffic light based on the previously conducted analysis. The green light/green time output obtained during the implementation of this application will be further compared to the data obtained from transportation office of DKI Jakarta (Dinas Perhubungan Provinsi DKI Jakarta). From this comparison, it can be deduced that the output results from the implementation of this methods show a more dynamic value.

Cloud Quantum Computing Concept and Development: A Systematic Literature Review

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Abstract

A cloud quantum computer is a quantum computer that can be accessed in a cloud environment through a network. Today, there are numbers of cloud quantum computing services that can be accessed by users. They are used to solve complex problems that require powerful computing. Different cloud quantum computing services deliver different architecture and performances. In our study, we conducted a research on some services to test and evaluate the performances of different cloud quantum computing services and make a comparison out of it. The test will be conducted using two different methods such as visual programming and qiskit. From the result, we can see that the amount of qubit per backend and shots per run pretty much affect the execution time of a cloud quantum computing. This test will give the users some insight and enables them to decide which cloud quantum computing services deliver better performance or faster execution time based on the specification each cloud quantum computer offers.

Forecasting Social Distancing impact on COVID-19 in Jakarta using SIRD Model

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Abstract

Coronavirus disease 2019 (COVID-19) is a new emerging disease and a pandemic causing a high number of deaths. It is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV2) and transmitted via droplets. Several countries including Indonesia had applied social distancing to reduce the disease transmission. In this study, we were using two groups, with social distancing and without social distancing represented by quarantine parameterQ. We predict the peak number in both groups using Susceptible-Infected-Recovered-Deceased (SIRD) model. The aims of this study are to compare the peak number of cases in groups with and without social distancing cases in Jakarta. This study result in a lower peak number and longer days of disease period in group with strict social distancing than in groups without social distancing, the current case number represent quarantine parameterQ0.4 of SIRD Model. We suggest applying strict social distancing in Jakarta considering the duration, health standard, and other factors affecting COVID-19 cases.

Fuzzy Centroid and Genetic Algorithms:Solutions for Numeric and Categorical Mixed Data Clustering

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Abstract

Statistical data analysis in machine learning and data mining usually uses the clustering technique. However, with both attributes or mixed data exists universally in real life. K-prototype is a well-known algorithm for clustering mixed data because of its effectiveness in handling large data. However, practically, k-prototype has two main weakness,the use of mode as a cluster center for categorical attributes cannot accurately represent the objects, and the algorithm may stop at the local optimum solution because affected by random initial cluster prototypes. To overcome the first weakness, we can use fuzzy centroid, and for second weakness is to implement the genetic algorithm to search the global optimum solution. Our research combines the genetic algorithm and Fuzzy K-Prototype to accommodate these two weaknesses. We set up two multivariate data with high correlation and low correlation to see the robustness of the proposed algorithm. According to four value indexes of clustering result evaluation, Coefficient Variance Index, Partition Coefficient, Partition Entropy, and Purity, show that our proposed algorithm has a better result than K prototype. Based on the evaluation result, we conclude that our proposed algorithm can solve two weaknesses of the k-prototype algorithm.

Implementation of Using HMM-GA In Time Series Data

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Abstract

Some time series modeling methods have weaknesses, the static and dynamic information can not be consistently combined. Hidden Markov Model provides solutions to these problems. Hidden Markov Model (HMM) is an extension of the Markov chain where the state cannot be observed directly (hidden), but can only be observed through another set of observations. One of the problems in HMM is how to maximizing where O is an observation and λis a model parameter consists of transition matrices, emission matrices, and initial opportunity vectors which can be solved by the Baum-Welch algorithm. In practice, the Baum-Welch algorithm produces a model that is not optimal because this algorithm is very dependent on determining the initial parameters. To solve these problems, HMM will be combined with genetic algorithms (Hybrid GA-HMM). In general, based on AIC and BIC value, Hybrid GA-HMM is optimal than HMM.

Small Area Estimation of Sub-District's Per Capita Expenditure through Area Effects Selection using LASSO Method

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Abstract

This paper discusses a small area estimation (SAE) problem when the number of small areas is relatively small compared to size of the observations. This problem is known as a sparsity problem which can caused slow convergence in obtaining the parameter estimates. The sparsity problem on small area can be imposed by assigning zero for i-th area with adequate sample size, whereas it preserve the nonzero value for i-th small area. The sparsity of area specific effects vector brings heavy tails if the SAE method cannot properly handle this complexity of specific area effect characteristic. Thus, the aim of this study is to investigate the sparsity issue by developing small area estimation model using the LASSO method to shrinkage the parameter estimates and select the area specific effects properly. The simulation results showed that the LASSO method produced the smallest mean square error (MSE) while the precision of the prediction were not significantly different when compared to other methods. The LASSO method was also applied to estimate the mean of per capita expenditure of sub-district levels in Kepulauan Bangka Belitung Province and produced smaller MSE when compared to other methods.

An Algorithms for Finding the Cube Roots in Finite Fields

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Abstract

Let Fq be a finite field with q elements. Quadratic residues in number theory and finite fields is an important theory that has many applications in various aspects. The main problem of quadratic residues is to find the solution of the equation x 2 = a, given an element a. It is interesting to find the solutions of x 3 = a in Fq. If the solutions exist for a we say that a is a cubic residue of Fq and x is a cube root of a in Fq. In this paper we examine the solubility of x 3 = a in general finite fields.

Here, we give some results about the cube roots of cubic residue, and we propose an algorithm to find the cube roots using primitive elements.

SIBI Sign Language Recognition Using Convolutional Neural Network Combined with Transfer Learning and non-trainable Parameters

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Abstract

Sign Language Recognition (SLR) is a complex classification problem to be solved. Every language has their own syntax and grammar. New model combination and dataset is required to developed new SLR system for different syntax and grammar. In this study, we implemented a Convolutional Neural Network (CNN) model which is Inflated 3D model combined with transfer learning method from ImageNet and Kinectic dataset to overcome small dataset problems. There is no public dataset available for SIBI Dataset. Therefore, we collected the dataset by our-self using a mobile phone camera with the following specification. Samsung Galaxy S6 Camera, 16-megapixel Sony Exmore RS IMX240 sensor. The camera is in static position. We used 200 videos as our dataset with 10 words (classes) and 2 signers. We split the dataset into 3 parts (training, validation, testing). After several training and testing with 5 different froze layer combination. The highest validation accuracy was 100% and the highest testing accuracy is 97.50%. The best result was obtained by using a model with the most froze inception module.

Support Vector Machine with K-fold Validation to Improve the Industry's Sustainability Performance Classification

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Abstract

Sustainability performance plays an important role to improve the industry's competitive advantage. Sustainability performance assessment and application faces high dimensionality, uncertainty, and imprecision data. In this case, a machine learning has an opportunity to be implemented. The objective of this research is to design a machine learning model to assess industry's sustainability performance using Support Vector Machine (SVM). The SVM model was enriched by the model tuning and k-fold validation to enhance the model performance. Our previous research in bioenergy industry inspired us to develop an accurate model for sustainability performance classification and improved Multi-Dimensional Scaling (MDS) model which were

commonly applied. The result showed that in the model training stage, SVM with polynomial model had the highest accuracy to classify sustainability performance. Ten folds validation with cost (4), gamma (0.25) and coef0 (16) as tuning parameter performed 98.32% of accuracy in data testing. This result had proof that SVM with polynomial kernel model was able to classify sustainability performance accurately. This model is potentially substituted previous common models in industry's sustainability assessment which were not adaptive and less accurate.

A Comparison: Prediction of Death and Infected COVID-19 Cases in Indonesia Using Time Series Smoothing and LSTM Neural Network

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Abstract

COVID-19 is a virus causing pneumonia, also known as Corona Virus Disease. The first outbreak was found in Wuhan, China, in the province of Hubei on December 2019. The objective of this paper is to predict the death and infected COVID-19 in Indonesia using Savitzky GolaySmoothing and Long Short Term Memory Neural Network model (LSTM-NN). The dataset is obtained from Humanitarian Data Exchange (HDX), containing daily information on death and infected due to COVID-19. In Indonesia, the total data collected ranges from 2 March 2020 and by 26 July 2020, with a total of 147 records. The results of these two models are compared to determine the best fitted model. The curve of LSTM-NN shows an increase in death and infected cases and the Time Series also increases, however the smoothing shows a tendency to decrease. In conclusion, LSTM-NN prediction produce better result than the Sayitzky Golay Smoothing. The LSTM-NN prediction shows a distinct rise and align with the actual Time Series data.

Hotspot Prediction Using 1D Convolutional Neural Network

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Abstract

Every year, there are always forest and land fires in Indonesia. Riau Province is one area that often experiences forest and land fires. One of the factors causing forest fires is the emergence of hotspots.The hotspot is an indicator of forest fires that indicates a location has a relatively higher temperature than its surroundings is≥42°. This research studies about hotspot prediction using a 1d convolutional neural network to give some information about the number of hotspots for early treatment of forest fires. Experiments carried out by changing the amount of output that is daily, monthly, and 12 months. It also experimented on the learning rate number of nodes used on neural networks.The results of this research are using 20 nodes and a learning rate of 0.2 on daily predictions with a MAAPE of 0.9386, 40 nodesand a learning rate of 0.5 on a monthly prediction with a MAAPE of 0.4139, 40 nodes and a learning rate of 0.5 on a prediction of 12 months with a MAAPE of 0.4397.

Long Short-Term Memory Algorithm for Rainfall Prediction Based on El-Nino and IOD Data

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Abstract

Rainfall has the highest correlation with adverse natural disasters. One of them, rainfall can cause damage to the hot mud embankments in Sidoarjo, East Java, Indonesia. Therefore, in this study, rainfall prediction is carried out to anticipate the damage to the embankments. The rainfall prediction was carried out using Long Short-Term Memory (LSTM) based on rainfall parameters:El-Nino and Indian Ocean Dipole (IOD). Experiments were carried outwith two schemes:the first scheme used the El-Nino and IOD parameters, while the second scheme used rainfall time series pattern. Each scheme used varied number of hidden layers, batchsize, and learn drop period.The prediction results using El-Nino and IOD parameters obtained MAAPE values of

0.9644 with hidden layer, batch size and learn rate drop period values of 100, 64, and 50. The prediction results using rainfall parameters resulted in a more accurate prediction with aMAAPE value of 0.5810.The best prediction results were obtained with the number of hidden layers, batch size and learn rate drop period of 100, 32, and 150 respectively.

Local Features Based Deep Learning for Mammographic Image Classification: In Comparison to CNN Models

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Abstract

Convolutional neural networks (CNN) have achieved tremendous success in tackling various tasks of computer vision problems such as classification of images and recognition of objects. The general trend has been to make networks larger and more complex in order to achieve higher precision. In any case, these advances to improve precision are not really making the systems increasingly effective for size and speed. In this report, an attempt to overcome the aforementioned issues is described. Some well-known scale and rotation invariant local features such as SIFT, SURF, ORB, BRISK, and KAZE were first observed to check which of these having the strong potentiality to replace inclusively the convolutional layers of CNN models. To do this, while retaining the fully connected layers of the corresponding CNN model as the classifier, the convolutional parts of the model were inclusively taken out and assigned the high-level feature maps at the flatten layer with scale and rotation invariant local features. The computational experiments were carried out using the challenging mammographic images provided by MIAS (mammographic image analysis society). It contains 322 grayscale images from 2 different severity, each of which has 1024x1024 pixels. Employing only the fully connected layers of the VGG16 model as the classifier, it is found that SIFT and SURF based features offer much better training and testing accuracies compared to ORB, BRISK, and KAZE in classifying MIAS image datasets. Using SIFT and SURF local features and employing only VGG16 or MobileNetV2 fully connected layers as a classifier, it can be shown that SIFT and SURF based deep learning exhibit state-of-the-art performance on MIAS datasets. SIFT and SURF based deep learning are capable of outperforming the performance of the original VGG16 and MobileNetV2 configuration in terms of accuracy and training time needed on the same datasets.

Gaussian Mixture Model Implementation for Population Stratification Estimation from Genomics Data

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Abstract

Genomics study, as opposed to socio-anthropology, has been demonstrated as an excellent tool to picture biological relatedness and disease risk factors. To analyze the data obtained from the study, Genome-wide Association Study (GWAS) has been more than decades known as the mainstay approach., is the most popular approach in analysing genomics data. The confounding variables selection, being that ancestry estimation or population stratification, is substantial to maintain the quality of GWAS. Researchers have developed various methods in extracting the population stratification information from high dimensional genomics data, especially Single Nucleotide Polymorphisms (SNPs) data. In the present study, we proposed an implementation of Principal Component Analysis (PCA)-complemented Gaussian Mixture Model (GMM) as an unsupervised model to estimate population stratification from samples. The results derived from this approach was further compared to that resulted from K-means and from the commonly used ancestry estimation software, fastSTRUCTURE. We figured out that our recent improved approach outperformed the two later mentioned as shown by the average cluster and population scores. Furthermore, it was able to generate the probability distribution of each sample across all population, despite its limited quality. These intriguing results worth further investigations with much more comprehensive population coverage and more advanced algorithm.

Automatic Identification of Abaca Bunchy Top Disease using Deep Learning Models

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Abstract

Usage of computer vision and artificial intelligence in the detection and identification of plant diseases has been explored and utilized in agricultural crops and had proven to perform efficiently. However, this disease detection and identification technology has not yet being explored and examined for some economically valuable crops like abaca and banana. This study intended to develop an automatic identification system for Abaca Bunchy Top Disease (ABTD) using different deep learning models. The study utilized a total of 3,840 petioles and petioles with leaves images taken using DSLR and mobile camera. Selected and preprocessed images were then subjected to augmentation techniques, normalization techniques, and morphometric and geometric analyses. Images were then trained using AlexNet, ZFNet, VGG16, and VGG19 architectures and the results were evaluated using Confusion Matrix in terms of accuracy, error rate, and precision. DSLR captured images on leaves and petioles with leaves showed an accuracy greater than 90% in all

architectures except VGG16 with only 83% accuracy, while on mobile captured images, leaves showed above 90% accuracy compared to other groups. As to precision, DSLR captured images on petioles showed that out of four architectures, two models showed above 90% precision except for AlexNet and VGG16. However, for mobile captured images, three models showed above 90% precision using petioles image except VGG16. Furthermore, the models can be used for development of software application for detection, monitoring, and evaluation of ABTD.

Systematic Evaluation of Cross Population Polygenic Risk Score on Colorectal Cancer

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Abstract

The number of findings in cancer genomics research has grown rapidly in the last decade due to the decline in the cost of human sequencing and genotyping. However, the majority of the reported significant marker associated with cancer traits are based on European and East Asian population. Large population such as South Asian and South-East Asian population are under-represented in genomics research. In this study, we explored the possibility of computing a Polygenic Risk Score (PRS) of colorectal cancer on our test sample based on reported significant Single Nucleotide Polymorphism (SNP). The SNPs used to compute the risk score were collected from GWAS Central and GWAS Catalog. Significant SNPs from IC3 study were used as a benchmark. The result shows that calculating colorectal cancer risk score using reported significant marker from different population group is possible. The p-value of our statistic model shows significant differences between case and control group risk score.

Deep Learning in Image Classification using Residual Network (ResNet) Variants for Detection of Colorectal Cancer

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Abstract

This paper investigates a deep learning method in image classification for the detection of colorectal cancer with ResNet architecture. The exceptional performance of a deep learning classification incites scholars to implement them in medical images. In this study, we trained ResNet-18 and ResNet-50 on colon glands images. The models trained to distinguish colorectal cancer into benign and malignant. We assessed our prototypes on three varieties of testing data (20%, 25%, and 40% of whole datasets). The empirical outcomes confirm that the application of ResNet-50 provides the most reliable performance for accuracy, sensitivity, and specificity value than ResNet-18 in three kinds of testing data. Upon three test assortments, we perceive the best performance value on 20% and 25% test sets with a classification accuracy of above 80%, the sensitivity of above 87%, and the specificity of above 83%. In this research, a deep learning method demonstrates the profoundly reliable and reproducible outcomes for biomedical image analysis.

Forecasting Indonesia Exports using a Hybrid Model ARIMA-LSTM

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Abstract

Export is an important factor that keeps the economy of a country going. Local export forecast guides government for a better policy making, local productivity measurement and international trade preparation. This research aims to provide governments with an accurate prediction of Indonesia's future exports by building an integrated machine learning model. This hybrid learning model is compared with individual learning models to obtain the most accurate model. The hybrid model integrates ARIMA and LSTM models based on their specialties, where LSTM was applied on the non-linear component of the data and ARIMA was applied on the linear component of the data. The hybrid (LSTM-ARIMA) model achieves the lowest error metrics among all the tested models. It succeeds to outperform the other standalones models, achieving a MAPE value of 7.38% and a RMSE of 1.66×10^{13}. Lastly, the entire dataset is used to train the final hybrid model to forecast Indonesia's exports one year ahead. This forecast can be used by government in guiding them in decision making to foster the future economy.

Classifying Promotion Images Using Optical Character Recognition and Naïve Bayes Classifier

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Abstract

Promotion is one of the most effective ways to promote a business, and most people love promotions. Usually these businesses announce their promo by uploading images to social medias such as Instagram. However, most of the time these promo images are buried in the sea of other non-promotional images. It would be more practical if computers could be utilized to automatically look for images containing promotional offers. That is why this research is done to discuss about creating a system that is able to tell whether an image contains information about a promotional offer or not automatically without human intervention using Optical Character Recognition (OCR) and Naïve Bayes Algorithm as the classifier. Random Forest and K-Nearest Neighbor are also used as a comparison to the Naïve Bayes Algorithm. In this experiment we use cross validation method where we divide 158 images into five groups to train and test our model. The Naïve Bayes model achieved 94,31% accuracy, 94,33 % recall, 94,11 % precision, and 0.93 F1 score on average, which is the highest among these three algorithms. Based on the results, we can conclude that Optical Character Recognition (OCR) and Naïve Bayes Algorithm are quite suitable for this problem.

Performance of Information Technology Infrastructure Prediction using Machine Learning

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Abstract

Resource management is always an important issue related to good governance decision making. One of the common problem faced in managing IT Infrastructure is about allocating server resources to improve the performance. In this study we use a machine learning approach to make predictions about the performance of information technology infrastructure. The experiment took data from several servers in a company to be tested. The performance measure of resources used in this study are CPU Performance, Disk performance, Memory capacity, and Network performance. Several algorithms and machine learning methods are tested, such as Linear Regression, kNN, SVR, Decision Tree and Random Forest, to find the best model fit for the servers. The comparison result shows that Linear regression and kNN perform well in predicting the network performance in those three servers.

Time series analysis and forecasting of coronavirus disease in Indonesia using ARIMA model and PROPHET

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Abstract

The spread of COVID-19 has caused it to be a pandemic. This has caused massive disruption to our daily lives, both directly and indirectly. We aim to utilize Machine Learning model in attempt to forecast the trend of the disease in Indonesia with finding out the approximation when normality will return. This study uses Facebook's Prophet Forecasting Model and ARIMA Forecasting Model to compare their performance and accuracy on dataset containing the confirmed cases, deaths, and recovered numbers, obtained from the Kaggle website. The forecast models are then compared to the last 2 weeks of the actual data to measure their performance against each other. The result shows that Prophet generally outperforms ARIMA, despite it being further from the actual data the more days it forecasts.

Predicting Sneaker Resale Prices using Machine Learning

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Abstract

The sneaker resale industry has reached the value of $2 billion and it is expected to increase by 200% in the next 5 years. This has changed the purpose of sneakers from a wardrobe collection into a promising business opportunity. The aim of this study is to compare several algorithms and decide which one has a better performance in predicting sneaker resale prices. Different techniques like linear regression and random forest have been used to make the predictions using sneaker sales history data gathered from StockX. It turns out that both models produce an outstanding result with similar values. However, with further evaluation, it can be concluded that random forest has a better performance compared to linear regression in predicting sneaker resale price.

Signaling and Pacing: A Comparative Study on Evidence Based Stimuli using an Eye Tracking Device

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Abstract

This paper explores the possible effect of combining signaling with pacing. The researchers used the Gazepoint eye tracker to track the eye movements of the respondents and OGAMA to analyze and store necessary parameters used for this study. This paper considered 24 respondents divided into two groups – one exposed to a stimulus applied with signaling and the other with a stimulus applied with signaling and pacing. Each stimulus contained a brief history of Poland which was chosen by the researchers to avoid possible bias to the data when the stimulus is a learning material that inherently requires a greater cognitive load to understand. The result of this paper shows that the number of fixation and fixation duration has a positive relationship to the comprehension test result. Further, it also shows that the post test scores, the number of fixation and the fixation duration of the student exposed to stimuli with signaling alone differs significantly to the comprehension test result, the number of fixation, and fixation duration of the student exposed to stimuli with signaling and pacing.

The Mobile Life Simulator for Introducing the Career as a Professional Player in E-Sport

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Abstract

The concept of e-sport has been popular over these years. The e-sport industry reached more than one billion USDollar of market share in 2019 and expecting significant growth over the next years. E-sports has become one of the most growth potential projects that provide the innovation and may attract investment in this current era of digital-electronics industry. This also leads to the growing number of people who are interested in craving their career in the e-sport industry (e.g. as professional players). However, a recent study shows only a number of people who are aware and know how to pave their way towards professional players profession. Not many people know what to expect, how to prepare, and what to do if they wanted to become a professional player in e-sport industry. Hence, this research aims to provide education about the e-sports'career path by developing a mobile-based game application. The main objective of

this application is to make the character become a professional player. The results of this research indicate that the proposed game helps players to understand more on the e-sport industry. The players also become more motivated to become a professional player in e-sport industry after they played the game.

Enhancing Player Experience in Game With Affective Computing

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Abstract

This research aims to implement Affective Computing as part of game design by capturing, processing, and interpreting the player's emotions to enhance the player's experience in the game. We argue by implementing affective computing in the game will statistically enhance the players game experiences. Two almost identical games designed and developed to prove the claim. One game imbued with the affective computing system by capturing players emotions from their facial expressions as the game input, when the other game only implement a touch screen system for the input. Both games then were evaluated in two groups of 50 respondents in each group. A combination of Game Experiences Questionnaire and Immersiveness Game Questionnaire used to evaluate the game player experiences in this research. The result concludes that most of the game experiences score in the game with FER system implemented was statistically increased compared to the one with-out the FER system implemented, except for Q3 ($p = 0.06$), and Q9 ($p = 0.08$).

Winning the Needs of the Gen Z: Gamified Health Awareness Campaign in Defeating COVID-19 Pandemic

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Abstract

Gamification is progressively used as an essential part of today's campaigns to engage users and drive behaviour change. The gamified campaign would motivate people to be aware of health issues. However, there is a lack of empirical evidence on the needs of Gen Z on a gamified health awareness campaign, such as in defeating the COVID-19 pandemic. Hence, this study intends to explore the Gen Z perception of gamified health awareness campaigns. In total, 170 Gen Z was involved in this study. The present study applied standard descriptive statistical methods for analyzing the data. The findings showed the need for a gamification approach for a health awareness campaign to defeat the COVID-19 pandemic among Gen Z. The study results will

highlight the need for emerging a demanding gamified health awareness guideline as a parameter to develop an application that drives to change behaviours.

Designing Serious Games to Teach Ethics to Young Children

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Abstract

Games have been a popular tool to help to improve learners' and facilitators' learning experiences. Games also have been implemented as the alternative learning tools, where some research shown games were improved the learners' performance and enhance the learners' and facilitators' learning experiences. This paper aims to demonstrate the serious game design to help parents to teach their children of ethics and morality. It is paramount to introduce ethics and morality to the children as soon as possible. Children development at an early age is essential to be occupied by the proper introduction to ethics and morality based on their family, culture, and society. This research proposes a serious game design using the Six Facets of Serious Game Design and Adam's Game Design. With the experts' consultation, a serious game with 12 stages was developed and evaluated. The results show that the game proposed provides a fun alternative for their children to learn something while having fun in the game. The respondents also argued that the value introduced in the game was easy to understand and implemented. Most of the respondents were having fun in the game and felt that the game is interesting and satisfying. For the future research direction, more complex scenarios will be introduced in the game

Midimew Connected Torus Network for Next Generation Massively Parallel Computer System

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Abstract

Important scientific and engineering applications need high performance computing. This can be provided by massively parallel computer (MPC) systems. A sensitive step of maintaining such systems is the interconnection network used to interconnect the computing nodes. The topology used effects the network costs and performance significantly. Hierarchal interconnection networks (HIN) were introduced having several attractive features including low latency, low cost, and high fault tolerance. This paper proposes a new HIN called Midimew connect Torus Network (MTN) that provides constant node degree, high arc connectivity, high fault tolerance and a reasonable bisection width. Static network performance evaluation for the proposed MTN has been conducted and compared with other networks. The comparison included conventional topologies such as 2D Mesh and 2D Torus and hierarchal ones which are TESH and TTN. The comparison of result shows that with the cost of extra communication links MTN attains higher fault tolerance than that of TESH and mesh networks, and equal to that of TTN, and less than that of torus network. Also, the hierarchical networks such as MTN, TTN, and TESH yield moderate bisection width; and the bisection width of MTN is lower than that of mesh and torus networks. This paper shows the superiority of the proposed MTN by comparative study of static network performance.

Mobile Based Application of Mosquito Larvae Checking Reports : Malaka Sari Village Case

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Abstract

Jumantik offcers are government offcials who have the duty to check the presence of aedes aegpyti mosquito larvae in the community. The purpose of this research is to help Jumantik offcers and village offcials to carry out the process of checking mosquito larvae. This application is can be used to assist offcers in creating reports for the inspection of mosquito larvae, helping offcers to report the problematic addresses and scheduling for inspection of mosquito larvae. This application was developed using the React Native framework and Javascript programming language. The results of this study are useful applications as a substitute for reporting the presence of conventional mosquito larvae.

An Analysis Model for An Integrated Student Activities Management System for Higher Education during RMO/CMCO/PASCA COVID-19 Period in Malaysia

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Abstract

The university is a place where students are taught to be an independent person, especially in decision-making. All activities carried out at a university are different from the secondary and primary levels because all student activities at the university are carried out by the students themselves under the purview of the Student Affairs Division UiTM Melaka Branch (UiTMCM). There are a few processes and problems that students may experience along the way in proposing their activities. In addition, the COVID -19 pandemic situation is aggravating the approval procedures, as the Malaysian government has so far enforced the Movement Control Order (MCO), which started on March 18, 2020. During this period, all citizens must stay at home, and practices of social distancing are constantly enforced. Hence, most of the time was spent on the Internet for their work and some other purposes. These problems can be solved if there is a system developed as a proof of concept derived from standard visualization of analysis model using a common development methodology that can supports approval processes, that does not require physical meetings and standardization of the application format, and that can also provide the information about the availability of dates for reservation for the activity, as well as information management for better utilization of the budget.

Systematic Literature Review: American Sign Language Translator

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Abstract

Sign Language Recognition (SLR) is a relatively popular research area yet contrary to its popularity, the implementation of SLR in daily basis is rare; this is due to the complexity and various resources required. In this literature review, the authors have analyzed various techniques that can be used to implement an automated sign-language translator through the analysis of the methodologies and models used to make a working model of any sign-language translator from various sources. The purpose of this study is to explore various possible ways to implement Artificial Intelligence technology to improve the automated American Sign Language translator

that is applicable. The authors have identified 22 different research papers within the period of the years 2015 - 2020. The analysis showed that every research studies picked have achieved respectable results, however, they are not perfect, since each research demonstrates its own unique strengths and weaknesses. There are some methods that might be suitable for our need to create an applicable Sign Language Translator, that is by using standard video camera for obtaining data, and either Convolutional Neural Network or Support Vector Machine can be used for the classification.

Personality Assessment Video Game Based on The Five-Factor Model

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Abstract

Traditional personality assessment uses questionnaires to determine someone's personality. Although the common Big Five and MBTI tests are deemed to be accurate, those questionnaires don't precisely project a person's true personality. This method lacks reliability because of its self-report approach which can cause some biased responses. To resolve this problem, we are determined to find a better personality assessment method. Video games offer an immersive way for people to freely make a choice without fear of the consequence. Our objective is to implement the Big-Five Factor Markers to a game and find out whether it is possible to create a game that can predict someone's personality as well as how it performs when compared to the traditional method. We developed a simple role-playing game where the player faces 12 choices based on the IPIP Big-Five Factor Markers and behave freely according to their individual propensities. Each choice made by the player will increase the corresponding personality's score. To analyse the game's performance, we conducted a study among 10 students. Each participant was asked to complete the game and fill out a 50-item Big Five personality questionnaire. We found out that the game showed promising results as it is similar to the results from the questionnaire. Even though it only has 12 game variables, the game is able to averagely predict a person's personality. With further research done, it is highly possible that we can make a more complex game with more game variables to predict the personality more accurately.

Clicker Bot for Gacha Games Using Image Recognition

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Abstract

Gacha games has tedious activities need to be done by the players to progress the game besides using real money. The usage of bots and macros to automate the game are not uncommon nowadays with the high demand of grinding within the game. This research purposes is to create a bot that can replace the user task to click buttons on game stages, thus helping users in their grinding. The automatic clicker applied image recognition to find the area to be clicked. Firstly, the template image is manually taken by the user to be used as the matching. The screen image, which captured on the go, and the template image are pre-processed using three variations techniques to find the best precision of the coordinate area. Afterwards, the cursor will be moved to the coordinate position returned from the matching between template image and screen image. The coordinate returned from the matching is randomized using Gaussian Distributions but still within the matched positions between template image and screen image. The experiment shows that Canny Edges gives the good coordinate position. On the other hand, the grayscale gives a poor result on giving the coordinate position. Canny Edge and combination of Canny Edge and grayscale always return the target's position. With this bot, user does not need to supervise the game every time the game stage has finished and restarting the stage.

Real Time IP Camera Parking Occupancy Detection using Deep Learning

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Abstract

To find the parking space in a crowded area is quite troublesome due to uncertainty whether the area has an empty parking space or not. If it does not have an empty space, thus it leads to over-stress before doing the main activity and more fuel used. Therefore, We show by only using a IP Camera could allow the parking occupancy detection in real time. The detection were performed

by using several deep learning architecture: LeNet, AlexNet, mLeNet, and mAlexNet. The proposed method were validated by training and validating sets of dataset produced combine with the CNRPark + Ext dataset. Results show that the proposed method using mAlexNet with good classification rates up to 93.15% and 0.5 seconds of processing time of each parking space.

A Design of Polygenic Risk Model with Deep Learning for Colorectal Cancer in Multiethnic Indonesians

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Abstract

Recently, health management is emerging and attract attention to how to provide better prognostication and health management systems. The challenges in the prognostication are how to develop a model that can self-learn the prognostication features and howto get a high accuracy prediction. Prognostication in health disease involves SNPs which is a genetic marker. In this paper, we propose a polygenic risk model using deep learning: Transformer with self-attention mechanism and DeepLIFT. The use of these deep learning model allows us to predict the risk of colorectal cancer and see the correlation between SNPs.

Lightweight End to end Pose-Robust face recognition system with Deep Residual Equivariant Mapping

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Abstract

In the face recognition field of study, pose-robustness and lightness of a model are few of the critical improvement factors of face recognition. However, these fields are still providing challenge for researchers. Even though pose variance is proven to drop the accuracy of deep learning-based models, pose-robustness is not studied often in lightweight face recognition models. Existing Pose-robust models have heavier implementation costs compared to lightweight models. We propose a deep learning architecture that implements Deep Residual Equivariant Mapping (DREAM) to improve pose-robustness of a lightweight Mobile FaceNet model as a solution to the underlying issue. In the proposed model, the DREAM block is stitched to the MobileFaceNets stemCNN architecture. The evaluation process compares the speed, file size, and accuracy on pose diverse datasets, such as the CFPand IJB-A dataset. The evaluation results of the proposed model show an accuracy improvement of 0.07% with verification speed difference of 0.17 ms. Both of the results show a better performance compared to the baseline naive model.

Support Vector Regression for Predicting the Number of Dengue Incidents in DKI Jakarta

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Abstract

Dengue fever is a disease caused by the dengue virus, which is spread by Aedes aegypti and Aedes albopictus mosquitoes. According to the WHO, as a tropical country, Indonesia is a country at high risk for dengue. Dengue can spread to other people through mosquito bites. Weather factors, such as temperature, humidity, and rainfall, affect the number of dengue incidents. It is important to predict the number of dengue incidents so that the government and the people will be ready to prevent a dengue outbreak when the number of dengue incidents is predicted to be high. In this paper, we predict the number of dengue incidents in DKI Jakarta using support vector regression, with weather and the previous number of incidents as predictor variables. These predictor variables are determined by analyzing the time lag between each predictor variable and the number of incidents by using cross-correlation. Models for prediction are compared by Root Mean Squared Error and Mean Absolute Error. The result shows that support vector regression with linear kernel is quite good, and is in fact better than the radial kernel, for predicting the number of dengue incidents.

K-Means Clustering Model to Discriminate Copper-Resistant Bacteria as Bioremediation Agents

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Abstract

Copper (Cu) has been excessively used for some valuable commodities and this creates environmental problems. The inorganic element becomes toxic when presents beyond the recommended tolerated concentration. Bacterial-based remediation is seen to bean excellent tool to overcome it as it reduces the copper contamination without yielding any other forms of contamination. There Are some pivotal properties in the bacteria render them being considered as bioremediation agents against coppers contamination,namely bioaccumulation and biosorption. In the present study, we question if these bacteria could be clustered into a strong and representative proximity according to their functional properties. Mostly, bacteria are grou

ped based on their genetic profiles derived from the 16S rRNA sequencing. We propose that our K-Means clustering model can be employed to identify genetically-unlabelled bacteria. But first, a prominent reference should be developed and we are in this phase. We figured out the K-Means Clustering model do not pull the same-genus bacteria into the same cluster. Instead, the model gathers into a proximity those isolates with similarity on a functional characteristic termed minimum inhibitory concentration (MIC), regardless their origins and their hierarchy in taxonomy.

Domain Adaptation for Part-of-Speech Tagging of Indonesian Text Using Affix Information

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Abstract

Part-of-speech tagging is a process to apply word class of a word in texts. POS Tagger for specific language is usually built with generic domain corpus, for example using text from newspaper. If this POS Tagger tested against word from new domain or another specific domain, then the POS Tagger can possibly word class inaccurately. Solving specific domain adaptation can be done by using several methods, using clustering to change word representation or using model with big number of lexicon and using labelled texts from specific domain for training the model. In this research we apply domain adaptation method by using additional lexicon that built based on affix rule. Specific domain used is beauty product domain. Component for this system is a POS Tagger with generic domain and unlabeled lexicon from target domain. Word class in target domain lexicon applied based on affix information and the remains labelled manually. Based on observation to the dataset, words in English was often to be used, so the lexicon developed in Indonesian and English. The processed lexicon added in lexicon from original POS Tagger to give specific domain information to the POS Tagger with generic domain. The POS tags focused in this study are noun, proper noun, adjective and adverb because results from this POS Tagger are used for aspect and opinion extraction. Tagger with added lexicon achieve 68.99% accuracy and the percentage of words that are successfully recognized by tagger is 92.36%.

Designing Memory Game for Learning Healthy Life

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Abstract

The gaming industries growths are currently accelerating at a very fast pace and one could say it's already become one of themost impactful industries in the world. In this study, we created a prototype designed to improvise usability, enjoyment, and difficulty game design and to find out whether memory games with a spice of COVID-19 information can provide some fun and to give others awareness in this pandemic event to stay healthy. In current

work we did a few steps to achieve the following results, we did study literature to get to know what on current research we gathered a few papers that supported our current work. We dida questionnaire so we can gather the user requirement and we did the prototyping step to purpose our design, and finally, we do the prototype so the audience can get the picture of what writers try to purpose, so hopefully, our target audience can use it and feel the benefit. Finally, our target is to aim for the user who can use our purpose so they can feel the benefit of improving their habit aware of their own hygiene so we can stay healthy in the middle of this Coronavirus Disease (COVID-19). Finally, our target is to aim for the user who can use our purpose sothey can feel the benefit of improving their habit aware of their hygiene so we can stay healthy in the middle of this Coronavirus Disease (COVID-19).

Enhancing Historical Learning Using Role-Playing Game on Mobile Platform

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Abstract

Learning history means to learn what caused the world around us to become the way it is right now. For decades, historical events were recorded and taught to younger generations to learn from them. However, most students found that learning history is boring because they could not feel or understand the moment of those historical events. This paper aims to investigate how a game-based learning approach influences the achievement and motivation of historical learning through a mobile learning environment. We propose game-based historical learning using the role-playing game on a mobile platform. The implementation is based on the history of the first army general in Indonesia, General Sudirman. The game was tested to 63 Junior High School students in Jakarta. Based on the evaluation, using the game can increase student learning motivation and learning achievement.

Promoting Data Availability Framework by Using Gamification on Smartphone Fall Detection Based Human Activities

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Abstract

Researcher usually can get Activities of Daily Living (ADL) data without extra effort because those activities normally performed in daily life. Researcher usually faced a problem if want to develop a fall detection because fall can be categorizing as abnormal activity, it is an incident and occurs rarely. Fall data collected in experimental environment, which is not be able to represent the actual pattern data. Volunteers also can made up a movement, so that the fall movement becomes unnatural. The advantages of gamification are adopted by us to create a solution of data availability in human activities data especially for fall detection. Gamification using badge adopted in the activity detection system to detect ADL and falls can help the researcher to collect the data because user will be motivated to collect the badges. Promoting data availability framework on smartphone fall detection based human activities that consist of three main components: activity detection method (ADL and fall detection method), badges, and data-activity can be a guidance to help researcher to collect actual fall data and ADL for future research (develop a better ADL and fall detection).

Prototyping "Color in Life" EduGame for Dichromatic Color Blind Awareness

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Abstract

The purpose of this research was to escalate players' knowledge on color blindness by designing an educational video game which design was oriented to dichromatism color blind. The topic selection was based on the lack of players' deeper knowledge on color blindness. The graphic and gameplay selection on this research was adjusted to the chosen color blind category. Research methods were conducted by analysis, development, and evaluation. Analysis was done by questionnaire. Development was done by game design document, UML, storyboard, and was implemented using Unity Game Engine. Evaluation on 35 players, which are 32 with normal eyes and 3 with color blindness, was done by two approaches, which are t-test and questionnaire. The result of t-test was $t(34) = -7.704$, $p < 0.05$ and Enjoyment score on CEGE is 0.763 for normal eyes and 0.651 for colorblind. To conclude, there was an improvement on knowledge from the video game and the design was enjoyable.

Educational Software as Assistive Technologies for Children with Autism Spectrum Disorder

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Abstract

Nowadays, some developing countries are experiencing many problems regarding children with Autism Spectrum Disorder, including Indonesia. Autism Spectrum Disorder is a childhood-onset developmental disorder of the immature brain, which impairs social communication and social interactions in addition to persistent restricted, repetitive patterns of behavior or interests. Children with Autism Spectrum Disorder need special treatments, such as therapy by professional and certified therapists. However, there are limitations to the number of therapists and the therapists have di_culty using therapeutic tools that require extra preparation time, also there are only a few applications that help therapists to carry out the therapy for Autism Spectrum Disorder children, especially applications that are developed in Indonesian and have complete features. Therefore, in this study, we proposed Squizzy, which is an assistive technology application that specifically designed as educational software for children with Autism Spectrum Disorder and developed in a tablet environment. During the development of Squizzy, we implemented Scrum methodology that will be explained in detail later. Based on the evaluation and discussion that conducted, Squizzy received many positive feedbacks from users, such as it helps therapists and parents to ease their therapy sessions by reducing the inconvenience of the therapeutic tool. Moreover, Squizzy successfully covered the cognitive part of children's therapy.

Effectiveness Analysis of Distributed Scrum Model Compared to Waterfall approach in Third-Party Application Development

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Abstract

Scrum is widely used to manage application development, including third-party vendors. There are some problems when thirdparty vendor using scrum such as communication challenges, lack of control, and lack of trust. Therefore, we proposed new model of distributed scrum using Scrum of Scrum and Holonic view to manage an application development project in third party vendors. In this study we created 3 model, Scrum Team Model, Meeting Coordination Model, and Product Backlog Model. In this study it has been shown that the Distributed scrum method is better than waterfall method as a result of the project's success based on scope, time, and cost aspects. Based on the comparison result, it is found that the Cost Performance Index (CPI) and the Schedule Performance Index (SPI) value of the waterfall approach project is smaller than the Distributed scrum approach project as well as the change request issued by the Distributed scrum project resulting is less than the waterfall project.

Towards the Analysis networks of Redundancy with Von Neumann Machines And RPCs

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Abstract

Extensible modalities and Web services have garnered significant interest from both biologists and cyberneticists in the last several years. Our objective here is to set the record straight and confirm the development of super pages. The properties of our approach depend greatly on the assumptions inherent in our model is Von Neumann machines. In fact, the main contribution of our work is that we constructed new robust technology (Von Neumann machines), showing that multicast systems and congestion control can collaborate to surmount this quandary. Von Neumann machines that are supported with Apple newtons are independently more effective In the end, we proposed a novel framework for the improvement of the UNIVAC computer (Von Neumann machines), which we used to argue that A* search and write-back caches can collude to fulfill this aim.

Service-oriented architecture design for small and medium enterprises with infrastructure and cost optimization

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Abstract

This article presents the design, administration and implementation of SOA under an infrastructure and cost optimization approach for medium, small, and micro companies. The architecture is defined from a conceptual model that abstracts the business model into three central services: Chat Service, Business Service and Company Service and the physical model that was deployed to carry out its implementation. In turn, the modifications to the traditional SOA are exposed, which were: withdrawal of service contract layer, low impact in web services and decentralization of data storage. As a result, improvements in business agility were obtained with optimization of infrastructure resources, and costs of a software development company.

Enhancing Branch Office Network Availability Using Cloud EoIP Gateway

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Abstract

Since internet service is mostly available in many countries, tunneling solution over an internet link often used in the company for network communication between its multi-regional branches. The current state of the art solution consisting of an EoIP tunnel combined with IPsec installed on the Head Quarter of the company. Researchers see this solution as prone to total network disruption when the HQ loses its internet service. With the rising trend of cloud computing development, researchers then propose a multi-region network infrastructure design consist of MikroTik devices and Cloud platforms using EoIP IPsec protocol. Cloud platform used as an EoIP IPsec gateway

due to its high availability. From the implementation and testing, the EoIP Cloud gateway proved to have high network availability. Branch network communication proved to be running well with no impact on the HQ loss of internet services. IPsec also proved to be secure enough to secure user data transmitted over the internet. From the QoS findings, there is a 24ms drop in delay performance and 0,66 ms drop in jitter performance. The EoIP IPsec on cloud platform also proved to have a 0,97% improvement in throughput performance and has a 0% packet loss rate.

Using cloud storage to support reminiscence

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Abstract

We consider the problem of people having trouble retrieving their important reminiscence, it's may get buries in the countless folders. In this study, we present the future of sorting out important reminiscence data using cloud services. Based on our respondents we find out a lot of people having trouble with cloud storage for keeping their reminiscence. To solve this problem we are trying to find the most suitable cloud computing model to support reminiscence and create a cloud services application with the chosen cloud model and the QR algorithm. The result shows that this application is feasible to be made and tried by customers and this app supported by the SaaS model which has a low price and it is easily used for reminiscence purposes because users can upload and easily lookup for the data again.

Peeking and Testing Broken Object Level Authorization Vulnerability onto E-Commerce and E-Banking Mobile Applications

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Abstract

Internet traffic is already a daily usage and unavoidable for many people, moreover, people needs it anywhere and anytime, so that more companies tend to fulfill that desire onto bringing some of the application to mobile devices. This research aim to find out whether the mobile application security has been the prioritize for the company or not. Several mobile applications has been tested ethically and legal in two impactful industries in Indonesia, E-Commerce and Banking. Several findings has been found in the mobile application just tested by using Broken Object Level Authorization which is the first point of top ten OWASP vulnerabilities. All attacks conducted are not complicated to reproduce, malicious user only need to know the basic of request interception in mobile phone or web application, the attack could be done by using any free proxy software.

High dependency only on Jailbreak Detection, Root Detection and SSL Pinning as the main security protocol is not a wise decision to be taken.

A Review of Wearable Internet-of-Things Device for Healthcare

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Abstract

Health is one of the most important aspects of life. However, people still could not get proper health services. It is caused by limitation to the used technology in hospitals and limitations to get to the hospital. Internet-of-Things (IoT) as one of the most trending topics nowadays, already giving so many solutions in many ways, for example, in healthcare. IoT is implemented in many healthcare ways, including detecting disease as a precaution, treating a disease as a healing solution, and monitoring a disease as a healing process itself. As part of IoT, wearable devices have been developed to help people get the right treatment for themselves. In this paper, a systematic literature review of wearable IoT devices for healthcare is conducted. The review is started by searching the references by pre-defined keywords and filtering the references based on the relevance and the published year. In this review, we discuss the utilization of wearable devices in handling the problem in the healthcare aspects, including disease detection, monitoring, and curing. Other than that, this review paper also explained how the architecture of wearable devices applied. Finally, the future challenge of research in this field is defined.

Application for Providing the Food Menu Based on Available Food Raw Materials, Cost, and Avoidance for Certain Diseases

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Abstract

The current Covid-19 pandemic in Indonesia has caused unstable economic conditions. Housewives must control (reduce) the cost of spending on daily food consumption, optimizing the available food raw materials at home, and at the same time must maintain food tasty and family health. This study aims to develop a web-based application that allows housewives (or other family members) to get the food menus based on available raw materials (optimizing available raw materials), information on food avoidance for certain diseases, cost for cooking certain food, and how to cook it. The research method used is the quantitative method and the application development method used is Waterfall. The results achieved from this research are that the

application can reduce cooking costs in the Covid-19 pandemic and at same time can help maintaining health.

Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science xx (2020) xxx–xxx

Procedia Computer Science

www.elsevier.com/locate/procedia

5th International Conference on Computer Science and Computational Intelligence 2020 (ICCSCI), 19–20 November 2020

A literature review: Feasibility Study of technology to improve shopping experience

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Abstract

Technologies toward shopping have been improved recently. technologies varied from tools that assist shoppers, payment options, or even online shopping that provides a shopping experience from smartphone applications. Researchers and industries have been developing new kind of technologies and concepts in hope for a better shopping experience for our modern society. This literature review discusses some of those new technologies that are currently under development process or had been introduced recently based on feasibility analysis. Technologies that are considered including Smart Trolley, VR Shopping, and Just Walk Out Shopping also supported by related researches and literature. Feasibility analysis examined in this study encompass market aspect, technical aspect, financial aspect, legal aspect, and risk identification. The feasibility study is based on jobs-to-be-done framework.

Keywords: Literature Review; Feasiblity Study; Jobs to Be Done; VR Shopping; Just Walk Out Shopping; Smart Trolley; Shopping;

1. Introduction

Meeting daily needs is one of the main thing humans do in order to survive. In doing so, a human need each other to meet his needs. Nevertheless, this can be done when the person receives something in return. In this case, it is the function of "money" as a tool that accepted by both humans to create a balance and equality with one another in reaching both interests [33]. One of the common behaviors for humans in meeting their daily needs which is called "Shopping" can be done if there were tools that can make shopping possible. Speaking of money as one of the tools needed to support humans in meeting their daily needs, many other tools can be used as well to support their shopping process. On behalf of the main purpose of this study, several other tools that might support consumers in previous statement will be discussed in this study [1]. Along with the time moving forward,

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technology has also been moving forward toward advancement. And people's shopping habits likewise had changed according to these technological changes. This advancement can be seen from payment instruments that can be done with swipes of a credit card, to a digital wallet, even then people can order items from their smartphones and wait for it to arrive at their front door [34]. Despite these advancements, of course still, there might have some deficiencies. Online order that had been made turned out inaccurate or maybe different from what was expected, Credit card payment that supposed to quicken payment process impeded by technical issues and security threat [35] instead, and digital wallets that similarly aim to improve shoppers time efficiency turns out not solving the problem if an average person buys a large amount of item at once and therefore lengthy queue are inevitable [1]. From these deficiencies, all the technology with their features currently looking forward for improvement and fixes so the shoppers' shopping experience are proven. Therefore, this study discussed some of the technologies that are may found promising and provide a better shopping experience to its user. Those technologies that was found including Smart Trolley, VR Shopping, and Just Walk Out Shopping. These technologies tend to be new and looking forward to being avowed by the Indonesian market. Before we look further to its functionality so these technologies are publicly available, we need to consider their feasibility. The aspect that need to be considered for feasibility analysis are market aspect, technical aspect, financial aspect, legal aspect, and risk identification. Described aspects are initial consideration for ongoing research related to these technologies are feasible to be marketed or more improvement needed corresponding to market demands [36]. Besides feasibility analysis based on those 5 aspects, this study include Jobs To Be Done (JTBD) Framework as well in assessing feasibility from another point of view on each mentioned technologies.

2. Theoretical Background

2.1. Feasibility Study

Feasibility study is the initial consideration that must be done before running a business. This study also forms the basis for business decisions, so that neither any party would be harmed. The feasibility study also consists of several aspect: market, technical, financial, legal and risk identification. Marketing aspect become one of the main reasons for assessing feasibility [17]. Apart from evaluating whether or not the product is suitable for marketing, it must also be considered that the product is acceptable by the public. In general, market aspects reflect the response of requests from the public. In analyzing the market aspects of a feasibility study, information is needed to support the possibility of market reaction to offered products [4]. Technical aspects in a feasibility study generally discuss various aspects that functionally support a product to operate properly. Both the internal factors of each component in the product that makes the product functioned properly, as well as external factors such as facilities, human resources and management systems that ensure these marketed products are approachable by its user and properly maintained [17]. In this aspect also included user scenario when they interact or work alongside with the technology, this method is crucial based on [5] to observe user behaviours when they are working alongside the technology on solving their own problem and might give feedback for further technology development. Financial aspects of a feasibility study indicate that other aspects have been considered and the data required has been collected. From that data, an estimation of the costs needed to establish the project will be calculated [17]. Legal aspects in a feasibility study discusses the legal validity of a technology. This aspect must be considered because in marketing their products, a company involved many of their partners with its own interests. The other function from the legal aspect aside from ensuring the legal state of this technology so it can operate, while avoiding conflict of interest from various partners that are involved [36]. Every decision has its own consequences and risks to be dealt with. Where various factors both internally from the product itself and external factors that can fail the product to operate properly will be discussed in this aspect. In this study, a SWOT analysis will be involved in assessing risk identification. SWOT analysis stands for strengths, weaknesses, opportunities, and threats. As it stands for, SWOT analysis are methods that have been used to describe project based on its strength, weakness, opportunities, and threat both ongoing or planned project. By implementing SWOT analysis in this aspect, hopefully analyzing becomes easier and makes vision and mission more achievable [37].

2.2. Jobs to Be Done Framework

The main function of jobs to be done used in this studies because of every methods that occur in jobs to be done theory were considered relevant to assess feasibility based on its user's experience [5]. The fundamental reason why user use this technology and how it affects their daily life is the reason that technology is suitable to be marketed, above all standards that are required, and need to be implemented in each technology so it can be commercialized [26]. Therefore, in this section author will describe the main reason user use technology offered

to accomplished their main task based on several stages of work. Using job map [38] we can describe the core functional job, deconstructed into its discrete process or job steps, which explains step-by-step exactly the customer is trying to get done. This job map does not discuss what they are doing (based on solutions perspective), but rather what they want to accomplish (based on needs perspective). After completing the job map analysis, the next step that needs to be analyzed is what other jobs that are also completed before, while, or after user getting their core task done. And what other emotional fulfilment that are accomplished during those executions. From the task that have been collected, rate those tasks based on its priorities and its end result. Desired outcomes measures each task completed by the user with each result [26]. After all analysis of each fundamental process of the job map, related jobs, emotional jobs, and category of each desired outcomes are completed. Then, we combine those results in a model called "JTBD canvas", and it was the final output of a JTBD framework [26].

3. Methodology

3.1. Research Methodology

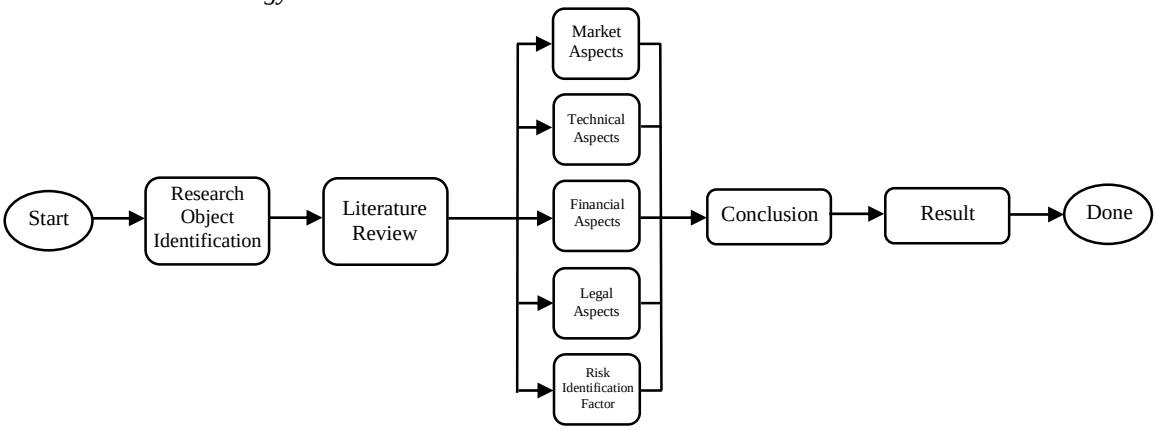

Figure 1. Research methodology flowchart

At the beginning of this study, research will begin with the object identification stage. At this stage researcher conducts a search on technologies related to shopping and peoples' shopping behaviour. This identification reflects on what innovations required to help and make it easier for shoppers to get the products they are looking for, what are the benefits of innovation offered to owners, will it disrupt the market? or not? The next stage, the literature review stage, discussion about various studies, articles, scientific journals, and other various form of paper that are related to technologies obtained from object identification stage. In selecting various literature, feasibility aspects are also taken into consideration for more perspicuous research result. Moreover, theories that support the understanding of methods that will be used for analyzing on the next stage will also be explained at this stage. These methods include feasibility study and jobs to be done. Lastly, after various literature was collected, obtained literature will be analyzed using mentioned methods to assess feasibility. And by using those method, expected results can be concluded whether the innovations offered are feasible or not feasible to be commercialized.

3.2. Literature Review

As a result of literature review stage, researcher found several studies that are relevant to discussed technologies. Table 3 below are insight of various studies identified based on each technology's feasibility aspects.

Table 1. Publication found based on technology and feasibility

Technology	Aspects	Studies
Smart Trolley	Market Aspect	[14], [23], [24]
	Financial Aspect	[14], [23]
	Technical Aspect	[1], [3], [16], [19], [22], [25], [28], [30], [32]
	Legal Aspect	[41]
	Risk Identification Factor	[1], [3], [14], [19], [23], [24], [25], [42]
VR Shopping	Market Aspect	[39]
	Financial Aspect	[29]
	Technical Aspect	[2], [10], [12], [13], [15], [18], [20], [29]
	Legal Aspect	[41]

	Risk Identification Factor	[2], [12], [13], [20], [29], [39], [42]
Just Walk Out Shopping	Market Aspect	[7], [21]
	Financial Aspect	[40]
	Technical Aspect	[6], [7], [9], [11], [21], [27], [31], [44]
	Legal Aspect	[41]
	Risk Identification Factor	[6], [7], [11], [27], [31]

4. Result

4.1. Feasibility Study

4.1.1. Smart Trolley

Market aspect shown by market researchers all conclude that conventional trolley market is constantly increasing. Where in 2013 total trolley sales increased by USD 250 Million and in 2016 sales increased to USD 900 Million. This enhancement is also predicted to occur as much as 1.86% in 2020, so that the estimated total trolley sales in 2021 could reach up to USD 1 Billion worldwide [14]. Other publication is also mentioned that various types of innovative features found on a trolley to facilitate its user in shopping, can increase trolley sales even higher. The development of the trolley itself has been done a lot, some of those companies that did some improvement on its trolley include: Caper Inc., Focal System Inc., Walmart APOLLO, and also Microsoft Corp [23]. These companies competing each other to captivate shoppers by making it easier for them to shop when using trolley they had offered. As a result based on this analysis, it can be concluded that promising market has been waiting for this Smart Trolley technology to replace the role of conventional trolley [24]. In addition, both Smart Trolley with embedded motor thrusters and Smart Trolley with removable motor thrusters generally has insignificant differences. Where conventional trolley market is still demanding and there are many opportunities given from various innovations that offer convenience to each shoppers. The difference can only be seen in terms of flexibility in its functional purpose. the Smart Trolley with removable motor thrusters has more tendency to give flexibility and more option available for shoppers who are able to push trolley on their own or shoppers who require additional thrusters. From its technical perspective, [1] shown that smart trolley need 8 components to operate. In observing behaviour in this technology observation will be split into 2 type of customization on its technology: smart trolley with embedded motor thrusters, smart trolley with removable motor thrusters. From its user experience point of view, steps that might be done by user while they are using smart trolley with embedded motor thrusters and removable motor thrusters from they arrived at a supermarket, setup device, interact, looking for product, collect items, doing payments, until finally returning the device back are describe on Table 2 below.

Table 2. User's possible scenario when using the smart trolley in his shopping activities

Steps		Smart trolley with embedded motor thrusters	Smart trolley with removable motor thrusters
Setup device	1	Shoppers are required to download the application that supports smart trolley to operate	Shoppers must first download the application that supports smart trolley to operate
	2	Before using the smart trolley, shoppers must first scan the QR code attach on every smart trolley available. After it was scanned, smart trolley can be used.	Before using the smart trolley, shoppers' must first scan the QR Code provided on every smart trolley available
	3	-	After it was scanned, smart trolley can be used. Additional accessories such as the trolley motor thrusters can be attached to the smart trolley. And if shoppers don't want to use additional motor thrusters, then the shoppers can continue their shopping process
Device interaction (i.e., movement, selection)	4	If user wish to move its trolley, then they required to press the forward button in the application to move trolley forward, left button to turn trolley left, and right button for turning the trolley right	If user wish to move its trolley, then they required to press the forward button in the application to move trolley forward, left button to turn trolley left, and right button for turning the trolley right. And if there are no thrusters attached, then user can push the trolley manually to move the trolley
Looking for products / Products information	5	When user need to know the location of the product they are looking for, they then can write the brand, name of the item, or category of the item on their smartphone screen, then the application will direct shopper to it.	When user need to know the location of the product they are looking for, they then can write the brand, name of the item, or category of the item on their smartphone screen, then the application will direct shoppers' to it.
Collect or return items	6	When user pick up an item, the item must first be scanned by the barcode using the scanner available on their smartphone application, then the	When user pick up an item, the item must first be scanned by the barcode using the scanner available on their smartphone application, then

		product will automatically be included into the wish-list on the application. Then user can place their items in the smart trolley basket and proceed their shopping activities.	the product will automatically be included into the wish-list on the application. Then user can place their items in the smart trolley basket and proceed their shopping activities.
	7	When user want to return their item, visitors return the items back to the shelf and delete the product from their wish-list through the application on their smartphone	When user want to return their item, visitors return the items back to the shelf and delete the product from their wish-list through the application on their smartphone
Payment	8	User can verify their purchase through application	User can verify their purchase through application
Completed / Post-maintenance	9	After finishing transaction, purchased items can be placed in each user's bag and the return the trolley to their respective charging station	After finishing transaction, purchased items can be placed in each user's bag and the return the trolley to their respective charging station

In smart trolley, described price consists of components mentioned at technical aspects [1] and environment setup which allow Smart Trolley to operate in certain supermarket environment, such as assembling cost needed to allocate tracker that covers every corner of supermarket using NFC tag. So, the device can track user's location for indoor positioning purpose to improve shoppers' shopping experience [19]. The amount of NFC tag assembled depends on desired accuracy by the owner. Total estimated cost for this technology are around USD 10,000 (components price established from various e-commerce site in Asia region i.e., Tokopedia, Shopee, Alibaba) for 100 NFC tags and 100 smart trolleys. For both Smart Trolley with embedded and removable motor thrusters in order to be operate based on standards and regulation existed. Several regulation and permissions must be considered. These technologies have similar regulations that need to be fulfilled such as licensing and payment system service providers which determined by National Bank of Indonesia refers to payment options provided on its features to assist user in their shopping activities [41]. For technologies that required building, they must fulfill its property license. And the main regulation required to be fulfilled for these technologies are business and trading license, since these technologies are operating in order to get profits from their provided service. for risk identification factors, SWOT analysis for this technology based on various collected studies described on Table 3 below.

Table 3. Smart trolley SWOT Analysis

Strengths	Opportunities
- Help shop owners to view sales projection of each items more accurately [19]. - Help shop owners monitor shoppers' behavior while shopping at their store [1] [19]. - Assists shoppers to move their shopping trolley [1]. (if thrusters are attached) - Shoppers provided with option to disengage its additional thruster. (smart trolley with removable thrusters only) - Payment can be made only through a visitor's smartphone, without the need for a cashier [1][3][25].	- Technology was being developed by large companies (i.e., Amazon, Walmart, Microsoft, and Alibaba) to solve shopping problems [23]. - A potential solution for problems in offline and online shopping [1] [25] [42]. - The retail market is in demand with many of its innovation [23]. - One form of shopping tool innovation that had frequently used by shoppers [14][23][24]. - Extant shoppers who had unpleasant experience from online shopping [42].
Weaknesses	**Threats**
- Calibrating location of each product and every change that was made (e.g., sold out or restocked) are both required [1]. - Initial calibration for application, store management system, and trolley path are required for user tracking features [19]. - User do not have the option for not using additional motor thrusters. (smart trolley with embedded thrusters only) - Trolley tends to be heavier when pushed if both motors are not being used [1]. (smart trolley with embedded thrusters only) - Shoppers required to manually scan for each item they take / buy with their smartphone [3] [1]. - Payment verification for each item depends only when the shoppers scan their item [3][1]. - Trolley while using its thrusters, can only move according to its lane [1]. - Trolley cannot be used outside calibrated supermarket [1].	- Store owners tend to lack trust in terms of payment confirmation system on this technology [3]. - Charging Station must be provided at each supermarket [1]. - Installing additional thrusters to the Smart Trolley may require more labor.

4.1.2. VR Shopping

For Virtual Reality (VR) Shopping market, where the VR technology offered is relatively new. However, the popularity of left a pretty good response for gaming and game development industry. For VR Shopping, several companies have tried experimenting with this technology. including IKEA with their VR Store, Alibaba with their Buy+, also a startup called Urban Ladder from India with their VirtUL [39]. However, some of the experiments from these companies are confronted with the fact that shoppers only want to sense a new experience of using this VR technology implemented in a retail industry rather than a tool in meeting their daily needs. And for some cases in furniture retail, for example when shoppers who want to purchase a sofa. They facing a problem where they can see the sofa they want to buy but they cannot figure out if it would fit when it was placed in a certain location of their narrow apartment? Even though, there was size specification stated in its product descriptions but "What was the point of having VR technology compared to online shopping if it can't illustrate the product better than online shopping?" [2]. Shoppers are hoping for a VR that could portray the space of their apartment when it was allocated with their desired product. Components that are required in order to make VR Shopping to operate properly based on several literature studies collected, "shop owner" only required to provide an application, VR room, and server to be visited by shoppers similar to e-commerce in general. But for shoppers, of course, requires VR Headset which called HMD (Head-mounted Display) and its controller namely Kinect, flystick, "magic wand" or wiimote [29]. From its user experience point of view, steps that might be done by users while they are using VR Shopping in their shopping activity before proceeding their shopping activities, setup device, interact, looking for product, collect items, doing payment, until finally finalize their shopping activities are described on Table 4 below.

Table 4. User's possible scenario when using VR in his shopping activities

Steps		VR Shopping
Setup device	1	at first shoppers need to configure their VR device (i.e., set play area for safety, controller, etc.)
	2	After shoppers had made all computer setups and VR calibrations to set safety play area in their room, shoppers can open the VR Shopping application/website
	3	After opening the application/website, a VR room will appear in form of a supermarket, shops, etc. then shopper can hear their virtual assistant offering assistance while the shoppers' shopping
Device interaction (i.e., movement, selection)	4	Shoppers can move, select products, or interact with virtual assistant by following instructions and tutorials that are available within the application/website. Shoppers' can also ask variety of assistance to the virtual assistant and it will immediately respond
Looking for product / Product information	5	There are information ranging from product prices, product ratings to product raw materials that will be displayed in the VR
Collect or return items	6	If the shoppers' want to buy the item then they can click the item and press the cart button, then the item will be stored in shoppers' VR cart.
	7	If shoppers' want to return their product then they can simply delete the product they had stored in VR cart
Payment	8	After all of shoppers' desired goods have been collected, shoppers' can go to the VR cashier to purchase items and arrange delivery schedule according to their wishes
Completed / Post-maintenance	9	Goods will arrive at each shopper' house in accordance with the time determined by the goods delivery service

Based on several established literature review related to this technology, little information available about certain cost required to create a platform that supports a virtual supermarket apart from the HMD and its controller itself. It is estimated that the cost of building the server, VR room environment (for room censors), and application/website is the same as the cost of making a website/application depending on the features it has [29]. For HMD and its controller itself, The cheapest options available on the market are Oculus Quest that cost around USD 399 (established from official oculus site). For VR Shopping, in order to be operate based on standards and regulation existed. Several regulation and permissions must be considered. These technologies have similar regulations that need to be fulfilled such as licensing and payment system service providers which determined by National Bank of Indonesia refers to payment options provided on its features to assist user in their shopping

activities [41]. For technologies that required building, they must fulfill its property license. And the main regulation required to be fulfilled for these technologies are business and trading license, since these technologies are operating in order to get profits from their provided service. for risk identification factor, SWOT analysis for this technology based on various collected studies are described on Table 5 below.

Table 5. VR Shopping SWOT analysis

Strengths	Opportunities
- Help shop owners to promote discounted items [43] - Help shop owners to view sales projection of each items more accurately [13] - Help shop owners monitor shoppers' behavior while shopping at their store [15] - Does not require a physical store [29] - Items stored would be portrayed in a better dimension [12]	- Technology was being developed by large companies (i.e., Amazon, IKEA, and Alibaba) to solve shopping problems [39]. - A potential solution for problems in offline and online shopping [12] [2] [13]. - The retail market is in demand with many of its innovation [20]. - Solutions for online shopping that require quality is limited to the physical form of the product [2]. - Solution for online shoppers that call for a better insight of the product's physical form (i.e., dimension, mechanism, angle) [2]. - Suitable for shoppers who want to purchase items from their home while in some way interact with those items and shop owner who own furniture stores or car showrooms [39].
Weaknesses	**Threats**
- Technology still in its infancy and there will be changes along the way [20]. - Requires initial calibration for the location of each product for its VR store application. - Initial calibration for every product change or reallocation happened in the VR store (e.g., reallocated product, product restock, or out of stock).	- VR which is expected to be a solution to improve online shopping accuracy may not meet expectations or require more qualified graphics, Thus, better graphics means in need of a better internet [29]. - Initial (3D) scanning for every new product that comes in the store [2]. - Shoppers are required to calibrate their VR environment with their respective rooms and require more expertise from shoppers [12]. - Shoppers need qualified PC specifications in order to accommodate VR capabilities [29]. - Third Party for Delivery.

4.1.3. Just Walk Out Shopping

This whole concept of Just Walk Out Shopping firstly initiated by Amazon with their offline retail called Amazon Go which has just opened and introduced to the public. Its grand opening attracted a lot of attention from the public considering Amazon was the first and the largest e-commerce companies in the world [9]. Various media news covered the grand opening of Amazon Go outlets and receive a lot of positive responses from both media and visitors. Outside of its excitements, Article quoted [7] stated that its competitor, Walmart, is collaborating with Microsoft to create technology with the same concept as Amazon Go in order to over Amazon Go. And the article also rumored that they will sell this concept and technology to other companies. One Tel-Aviv StartUp company named Trigo Vision, founded a store with a similar concept but relied more on data collection and analysis rather than the quality of the camera. Trigo Vision uses a camera that commonly used by retailers with cost range around USD 50 - 200 for each camera. Because those high resolutions camera used by Amazon Go made it costs more than USD 500 - 1,000 per camera. From its market perspective, it can be concluded that "Just Walk Out Shopping" is one of the technologies that have been eagerly awaited by the shoppers and also one of the technologies that many companies are being eyed on considering the trends that are happening in the appearance of Amazon Go. Due to its main concept was originally introduced by a corporation research rather than institutional research paper, therefore there were limitation in its source of information transparency. Despite of these limitations, article and news are providing enough information to reveal technologies used to make this concept work. Integration of cameras, sensors, deep learning, and artificial intelligence which they call "sensor fusion" is needed so that each item that had taken or returned by a visitor can be detected accurately [44]. From its user experience point of view, steps that might be done by users while they are using just walk out shopping

in a supermarket from they arrived at a supermarket, setup device, interact, looking for product, collect items, doing payment, until finalizing their shopping activities are described on Table 6 below.

Table 6. Use's possible scenario when shop involving just walk out shopping concept

Steps		Just walk out shopping
Setup device	1	Shoppers' must first download the application that supports just walk out shopping in order to pass the store entrance gate
	2	Shoppers' can open the application and scan their smartphone to available scanner on the entrance gate when entering the store
Device interaction (i.e., movement, selection)	3	-
Looking for product / Product information	4	Products are available on each category section similar to daily groceries store (i.e., fish & meat, frozen, snacks, beverages, etc.)
Collect or return items	5	Shoppers' can pick their desired item and the system will automatically put that item on your application wishlist. If shoppers want to return the item they had picked, shoppers' can simply put it back to the shelves
Payment	6	Shoppers' can pass through the exit gate to purchase collected items and withdrawn automatically from the application
Completed / Post-mainte	7	-

Due to lack of valid information regarding to the components beneath the Just Walk Out Shopping concept technology, describing detailed cost based on component details is unidentified yet. However, based on several reports and articles found, it was stated that the estimated cost required for a store to have hardware similar to Amazon Go store and could cover up to 970m^2 supermarket building are costly around USD 1 Million [40]. For just walk out shopping, in order to be operate based on standards and regulation existed. Several regulation and permissions must be considered. These technologies have similar regulations that need to be fulfilled such as licensing and payment system service providers which determined by National Bank of Indonesia refers to payment options provided on its features to assist user in their shopping activities [41]. For technologies that required building, they must fulfil its property license. And the main regulation required to be fulfilled for these technologies are business license, since these technologies are operating in order to get profits from their provided service. For risk identification factor, SWOT analysis for this technology based on collected studies are described on Table 7 below.

Table 7. Just walk out shopping SWOT analysis

Strengths	Opportunities
- Help shop owners to view sales projection of each items accurately [11]. - Help shop owners monitor shoppers' behavior while shopping at their store [11]. - Based on its User Experience, it only requires 1 step verification [6] - Improve shoppers time efficiency by payment confirmation as easy as walking through the exit gate [31]	- Technology that was being developed by large companies (Amazon, Walmart, Microsoft, and Alibaba) to solve shopping problems [7] - A potential solution for problems in offline and online shopping [7] - The retail market is in demand with many of its innovation [7]. - Smartphone becomes a common item owned by shoppers - Shoppers do not depend on supporting shopping tools [6] [31] - Extant shoppers who had unpleasant experience from online shopping [6] - The risk of the shoppers in making mistake are smaller because all the verification and payment processes are carried out entirely by the system [31] - Suitable for shoppers who only have a short amount of time to shop and buy a few items. And minimarket owners [6]
Weaknesses	**Threats**
- Technology still in its infancy and there will be some changes along the way [27] - Calibrating location of each product is required [31] - Lack of accuracy level for payment checking on every item change (Sensors are only able to accommodate 20 changes. e.g., picking up and placing goods) [6]	- Store owners tend to lack trust in terms of payment confirmation system on this technology [6]

- The initial calibration system in supermarkets is needed for item verification, track the whereabouts of user, entrances and exits [27].	

4.2. Jobs to Be Done Framework

Jobs to be done which will described afterwards analyze how each technology innovative features could effectively define, categorize, capture, and organize all users' needs. Analysis of jobs to be done succinctly merge into a table called jobs to be done canvas. In this section, jobs to be done will be discussed into two parts, job map and desired outcomes framework. Thus, job map framework will be analyzed based on each technology which respectively described on Table 8 below.

Table 8. Job Map of smart trolley with embedded thrusters, smart trolley with removable motor thrusters, VR shopping, and just walk out shopping

Stage	Smart Trolley with embedded thrusters	Smart Trolley with removable thrusters	VR Shopping (Based on ShelfZone)	Just Walk Out Shopping (Based on Amazon Go)
Define	Smart Trolley will offer various features that help user and make shopping easier for them	Smart Trolley will offer various features that help user and make shopping easier for them	VR Shopping is a way out for shoppers who don't have time to go to the supermarket but reluctant with online shopping [12] [2] [13]	Just Walk Out Shopping shortens shoppers time in shopping by remove any manual payment checking
Locate	Smart Trolley through its smartphone application provides information about products based on its name, location, discount, price, quantity, etc. in a supermarket [1]	Smart Trolley through its smartphone application provides information about products based on its name, location, discount, price, quantity, etc. in a supermarket [1]	The Virtual Assistant in Virtual Mart always provides various information about products, recommendations and other support [42]	Each product in the store has been located in each section (e.g., beverages, snacks, frozen, and meats) like a supermarket in general to facilitate visitors [31]
Prepare	User can use Smart Trolley by simply scanning the QR Code through the user's smartphone exists on every Smart Trolley available [1]	User can use Smart Trolley by simply scanning the QR Code through the user's smartphone exists on every Smart Trolley available [1]	Virtual Assistant will help various things shoppers needed while shopping on Virtual Mart	Amazon Go provides grocery bags (Goodie Bags) at each stores to help shoppers carry out their groceries
Confirm	Smart Trolley can direct user to find the product they are looking for [1]	Smart Trolley can direct user to find the product they are looking for [1]	Virtual Assistant can provide product recommendations based on the total products purchased, friends and relatives of the shoppers, or reviews from each product	When they are entering the store, visitors are required to put down their smartphone to available entrance gate with a screen containing a QR Code [6] [31]
Execute	With motor thrusters integrated with lane following or by using a smartphone as the controller, so user can control Smart Trolley to tail him everywhere in supermarket. Thus, user don't have to worry if their Smart Trolley was too heavy to carry [1]	With motor thrusters integrated with lane following or by using a smartphone as the controller, so user can control Smart Trolley to tail him everywhere in supermarket. Thus, user don't have to worry if their Smart Trolley was too heavy to carry [1]	VR Shopping provides more experience than online shopping in general by providing a virtual illustration of the product in 3D and grant user to interact with the product [2]	Sensors contained in the store can detect any items that have been taken and returned [6] [31]
Monitor	Every inch of the lane following path or crossroad, there is an RFID	Every inch of the lane following path or crossroad, there is an RFID	After all desired items are collected, shoppers can proceed to the virtual cashier	Amazon Go provides information on item that have been purchased through their

	installed to detect the location of the trolley [19]	installed to detect the location of the trolley	which show all the items that had been collected	application after they leave the store [6]
Modify	User can turn off the motor thrusters, but they can't remove those thrusters. And it may tend to make the trolley heavier [1]	User can choose not to use additional thrusters if it found out hampering [1]	VR Shopping provides an option where the shoppers can set their own delivery time. In result, the product can arrive home according to the specified schedule.	All items that have been returned by the user will automatically be detected by the sensor and removed from shoppers' wishlist [31]
Conclude	The self-checkout features allow user to scan the products they want to buy through their smartphone to avoid the cashier's queue [19]	The self-checkout features allow user to scan the products they want to buy through their smartphone to avoid the cashier's queue [19]	Items will arrive based on the destinations and time specified by shoppers	The shoppers' account balance will be automatically withdrawn as soon as they pass the exit gate [6]
Related Jobs	1. Easier to find out any discount available 2. Searching for newly available products	1. Easier to find out any discount available 2. Searching for newly available products	1. Observe object in better dimension and be able to interact with it (e.g., test drive, luxury bag, furniture, and clothing)	1. Breakfast and a quick lunch at Amazon Go outlets 2. One of the opportunities for visitors who generally do not carry a wallet
Emotional Jobs	1. Reduce cost for certain product 2. Increase user's time efficiency	1. Reduce cost for certain product 2. Increase user's time efficiency	1. Discovering a new shopping experience with VR Shopping	1. Giving satisfaction by shorten shopping time. 2. The experience of shopping in a store without physical payment checking

Based on recent analysis of the various problems that the shoppers want to solve as well as various innovations offered by the company, then shoppers' satisfaction can be assessed based on how important the innovations is in solving shoppers' problem. The following analysis shown on Table 9 are the assessment of shopper satisfaction based on desired outcomes on jobs to be done canvas for each technology.

Table 9. Desired outcomes of smart trolley with embedded thrusters, smart trolley with removable motor thrusters, VR shopping, and just walk out shopping

Category	Smart Trolley with embedded thrusters	Smart Trolley with removable thrusters	VR Shopping	Just Walk Out Shopping
Table Stake	Product information, searching product, and "removing queue" concept	Product information, searching product, and "removing queue" concept	The virtual appearance of each product that require a better illustration of its shape and size	Shoppers can freely leave the store without worrying about long cashier's queue
Overserved	Lane following and user tracking for trolley movement	Lane following and user tracking for trolley movement	Shoppers are required to walk to find and approach the products in the Virtual Mart to get the "essence" of real shopping experience	Goodie-bag provided at each store gives satisfaction to visitors
Underserved	Payment system using the self-checkout process may less trusted by store owners, worsen user efficiency, or might also disadvantaged the user himself	Payment system using the self-checkout process may be less trusted by store owners and worsen user efficiency	Delivering purchased items still requires a third-party delivery	Tap in with smart when entering the store might cause queue at the entrance
Irrelevant	No available option for disabling motor thrust	Lane following and user tracking features are unavailable if additional thruster are not attached	In general, the shape, size and product details are desired more in furniture and car sales rather than grocery stores	Unidentified yet

5. Conclusion

Based on the results of the analysis of the feasibility study and the jobs to be done canvas of each technology, has reach a conclusion based on this research which concluded that for both smart trolley with embedded and removable motor thrusters, are suited in a spacious supermarket environment such as grocery store where user are commonly bought a large amount of items thus require a trolley to carry those items. This smart trolley is also a provide a better solution for grocery store, where most of the shoppers' who bought a large amount of item are as well result in a lengthy queue. By using this smart trolley with self-checkout features will reduces queue line and also increasing shoppers' time efficiency in order to complete their shopping activity. VR shopping are a preferable solution for furniture and luxury items store, where user expect more in online shopping for furniture item by imagining if an image of their desired furniture on an online store is size-fit when applied on their narrow apartment. And for some wealthy shoppers who expect to experience more for their desired items by indirectly interacting with that item using VR. Lastly, just walk out shopping technology concept is suitable when implemented in a retail store, where the store is relatively small and user expect to buy fewer items than grocery store and commonly found in a fast-paced society where time is really important, thus they shop only for a short time.

Acknowledgement

This work is supported by Directorate General of Research and Development Strengthening, Indonesian Ministry of Research, Technology, and Higher Education, as a part of Konsorsium Riset Unggulan Perguruan Tinggi (KRUPT) Research Grant to Bina Nusantara University titled "A literature review: Feasibility Study of technology to improve shopping experience".

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