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Universitas Ciputra Surabaya
Email: david.sundoro@ciputra.ac.id
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Institut Informatika Indonesia Surabaya
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Edwin Meinardi Trianto, S.Kom., M.Kom.
Institut Informatika Indonesia Surabaya
Email: edwin@ikado.ac.id
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Email: gunawan@istts.ac.id
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Universitas Kristen Petra Surabaya
Email: resmana@petra.ac.id
[SINTA ID: 27072] [SCOPUS ID: 57141791400] [GOOGLE SCHOLAR ID: uKjxL-4AAAAJ]

Timothy John Pattiasina, S.T., M.Kom.
Institut Informatika Indonesia Surabaya
Email: temmy@ikado.ac.id
[SINTA ID: 5974935] [SCOPUS ID: 57202505132] [GOOGLE SCHOLAR ID: -YTkIdUAAAAJ]

Titasari Rahmawati, S.Pd., M.Kom.
Institut Informatika Indonesia Surabaya
Email: tita@ikado.ac.id
[SINTA ID: 6114398] [GOOGLE SCHOLAR: DM0ZJ_0AAAAJ]

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The Implementation of A* Algorithm for Developing Non-Player Characteristics of Enemy in A Video Game Adopted from Javanese Folklore "Golden Orange"

Subari[1], Nira Radita[2*], Bimo Prakoso[3]

[1,2,3]Informatics, Sekolah Tinggi Informatika & Komputer Indonesia, Malang, East Java, Indonesia
Email: [1]subari@stiki.ac.id, [2*]niraradita@stiki.ac.id, [3]bimo.prakoso@gmail.com

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Abstract

Video games are a means of entertainment for everyone, from children to adults. The genre of games now is also very diverse, ranging from adventure, puzzles to storytelling, and even many folk stories have been made into video games by several developers in Indonesia. Starting from folk tales with horror themes such as kuntilanak, legends such as cucumber man, to folk tales that rarely sound like golden oranges. The folklore video game of buah jeruk emas is a video game that tells of a king who gets a whisper from the gods to get golden oranges. The king then held a competition to get the golden orange fruit. The player must be able to take the golden orange fruit from the enemy in the form of a Non-Playable Character (NPC) who will chase the player. In making NPCs, algorithms are used to help play video games. Therefore, the author wants to apply the A * algorithm in the game of golden oranges so that npc can catch up to players according to the planned system. The main method used is A * and then the addition of the FSM method for other methods. The golden orange fruit is a video game using the A * algorithm and the FSM method After testing it can be concluded that it is enough to make the game run. With the results according to the planned system.

Keywords: A*, FSM, Video Game, golden orange fruit.

I. INTRODUCTION

The golden orange fruit folklore game is a video game that tells a king who gets a whisper from the God to get golden oranges. The king then held a contest to get the golden oranges [1]. The player must be able to take the golden orange fruit from the enemy in the form of a Non-Playable Character (NPC) who will chase the player.

In making NPCs, algorithms are used to help in running video games. These algorithms are very diverse, starting from the simplest algorithms to algorithms that use Artificial Intelligence (AI) which means that artificial intelligence is created and then inserted into a system so that it can behave like humans [2] [3]. The examples of algorithms used are A* (A-star) and Finite State Machine (FSM) [4].

Finite state machine (FSM) is a control system design methodology that describes the behavior or working principle of the system using the following three things: state, event and action. This state transition is generally also accompanied by actions performed by the system when responding to inputs that occur. The taken actions can be simple actions or involve a series of relatively complex processes [5]. FSM in this golden orange game is used for decision making on enemy NPC characters driven by artificial intelligence. This method aims at supporting NPC characters so that the movements and actions of the enemy can run without user intervention from the game [6].

In addition to the FSM method, this study also uses the A* method for the pathfinding algorithm. A* itself is one of the most popular methods and pathfinding algorithms that have the best performance. The A* algorithm checks the feasibility of the costs required to reach a node from another node. This algorithm is a Best First Search algorithm that combines Uniform Cost Search and Greedy Best-First Search [7].

The FSM and A* algorithms have previously been applied in a study entitled "An intelligent agent of finite-state machine in the educational game "Flora Be Explorer" but their usage is only for chasing players [8], so this research is expected to improve the use of the Finite State Machine algorithm (FSM) and the A* algorithm that can make the actions and rate of enemy NPCs more diverse and efficient [9] [10].

The Implementation of A* Algorithm for Developing Non-Player Characteristics of Enemy in A Video Game Adopted from Javanese Folklore "Golden Orange"

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Rancang Bangun Website Mempawah Mangrove Park Menggunakan Metode Rational Unified Process (RUP)

Yudi[1*], Ilhamsyah[2], Renny Puspita Sari[3]

[1,2,3]Program Studi Sistem Informasi, Universitas Tanjungpura, Pontianak, Kalimantan Barat
Email: [1*]eynyster@student.untan.ac.id, [2]ilhamsyah@sisfo.untan.ac.id, [3]rennysari@sisfo.untan.ac.id

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Abstrak

Mempawah Mangrove Park (MMP) adalah taman wisata hutan bakau yang ada di Desa Pasir, Kecamatan Mempawah Hilir, Kabupaten Mempawah. Namun tempat wisata tersebut belum memiliki situs web. Meskipun informasi tentang tempat wisata masih dapat diakses melalui media sosial, keberadaan situs web dapat memperluas jangkauan informasi kepada calon pengunjung yang lebih luas. Calon pengunjung juga akan mendapatkan kemudahan untuk mengetahui detail, jam operasional, dan fasilitas yang tersedia. Oleh sebab itu, sebagai bagian dari penelitian ini, sebuah situs web dibangun untuk mendukung *Mempawah Mangrove Park* (MMP) dalam memperkenalkan dan menyajikan informasi mengenai MMP. Situs web dibangun dengan menerapkan metode pengembangan perangkat lunak *Rational Unified Process* (RUP). RUP adalah metode pengembangan perangkat lunak iterasi dan inkremental yang meningkatkan efisiensi dan efektivitas pengembangan. Sehingga jika perubahan kebutuhan fungsional, RUP mampu untuk beradaptasi dengan perubahan tersebut. Situs web yang dibangun juga menggunakan metode *Black-Box* untuk menguji fungsionalitasnya. Pengukuran parameter tampilan dan aplikasi menggunakan skala *Likert* dengan melibatkan 30 responden. Hasil pengujian menunjukkan bahwa 75,21% dari responden memberikan penilaian positif berdasarkan skala *Likert*. Nilai ini mengindikasikan bahwa kualitas situs web masuk dalam kategori 'Baik', sesuai dengan parameter yang diukur dalam pengujian fungsionalitas.

Kata Kunci: *Mempawah Mangrove Park, Rational Unified Process* (RUP), Situs Web, Tempat Wisata.

Design and Development of Mempawah Mangrove Park Website Using Rational Unified Process (RUP) Method

Abstract

Mempawah Mangrove Park (MMP) is a mangrove forest tourist park located in Pasir Village, Mempawah Hilir Sub-District, Mempawah Regency. However, the tourist spot does not yet have a website. Although information about the tourist spot can still be accessed through social media, the presence of a website can expand the reach of information to a wider audience. Prospective visitors will also find it easier to learn about details, operating hours, and available facilities. Therefore, as part of this research, a website was built to support Mempawah Mangrove Park (MMP) in introducing and presenting information about MMP. The website was built by applying the Rational Unified Process (RUP) software development method. RUP is an iterative and incremental software development method that improves the efficiency and effectiveness of development. Thus, if there are changes in functional requirements, RUP is able to adapt to these changes. The website built was tested using the Black-Box method to test its functionality. The display parameters of the application were measured using a Likert scale involving 30 respondents. The test results show that 75.21% of the respondents gave a positive assessment based on the Likert scale. This value indicates that the quality of the website falls into the 'Good' category, according to the parameters measured in the functionality test.

Keywords: *Mempawah Mangrove Park, Rational Unified Process (RUP), Website, Tourist Destination.*

Rancang Bangun Website Mempawah Mangrove Park Menggunakan Metode Rational Unified Process (RUP)

Yudi, Ilhamsyah, Renny Puspita Sari

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Optimisasi Monitoring Tugas Akhir Mahasiswa dengan Integrasi Formasi Metode Agile Framework Scrum dan Notifikasi WhatsApp di Institut Teknologi Garut

Ridwan Setiawan[1*], Deni Heryanto[2], Faizal Rifaldy[3]

[1,2,3]Program Studi Teknik Informatika, Institut Teknologi Garut, Garut, Jawa Barat
Email: [1*]ridwan.setiawan@itg.ac.id, [2]deni.heryanto@itg.ac.id, [3]1806095@itg.ac.id

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Abstrak

Lama waktu penyelesaian tugas akhir atau skripsi menjadi salah satu hal yang penting dalam proses penyelesaian studi mahasiswa, di mana beberapa penyebab keterlambatan penyelesaian skripsi dipengaruhi beberapa hal yang di antaranya proses pengerjaan oleh mahasiswa diakhirkan, kurangnya intensitas bimbingan, kurangnya motivasi penyelesaian, dan aktivitas monitoring. Tujuan penelitian ini adalah mengembangkan sistem monitoring tugas akhir dengan menerapkan API *WhastApp* sebagai notifikasi kepada mahasiswa untuk memberikan peringatan kepada mahasiswa yang memiliki progres lambat. Metode yang digunakan dalam perancangan perangkat lunak menggunakan *Agile* dengan *framework Scrum* dengan pemodelan sistem menggunakan *Use Case Diagram* dan skenario *Use Case* dengan bahasa pemrograman menggunakan PHP dan MySQL sebagai DBMS. Hasil penelitian menunjukkan mahasiswa, dosen, dan koordinator skripsi dapat melihat progres melalui *dashboard* dan notifikasi melalui *WhatsApp*. Penelitian ini dilaksanakan pada Institut Teknologi Garut dengan studi kasus yang diambil pada salah satu jurusan yaitu Ilmu Komputer. Sistem yang dibangun dapat memantau progres tugas akhir mahasiswa, memberikan notifikasi kepada mahasiswa yang tidak melakukan bimbingan dalam waktu tertentu, memberikan peringatan, dan motivasi kepada mahasiswa sehingga mendorong komunikasi dan keterlibatan yang lebih baik di antara mahasiswa dan pembimbing dalam penyelesaian tugas akhir, sedangkan penerapan *Framework Scrum* pada pembangunan sistem terjadi keterlambatan penyelesaian dari estimasi meski masih dalam status wajar.

Kata Kunci: *Agile Scrum Framework*, Monitoring Tugas Akhir, *Product Backlog*, Sistem Notifikasi, *Scrum*.

Optimization of Student Under Graduate Thesis Monitoring with the Integration of Agile Framework Scrum Method and WhatsApp Notification at Garut Institute of Technology

Abstract

The duration of completing an undergraduate thesis is a critical aspect of the student's academic journey. Several factors contribute to delays in thesis completion, including students procrastinating, insufficient intensity of guidance, lack of motivation to complete the work, and inadequate monitoring activities. The objective of this research is to develop a final project monitoring system by implementing the WhatsApp API as a notification tool for students, providing alerts to those with slow progress. The software design method employed in this research uses Agile with the Scrum framework, with system modeling using Use Case Diagrams and Use Case scenarios, and programming languages including PHP and MySQL as the DBMS. The results indicate that students, lecturers, and thesis coordinators can monitor progress through a dashboard and receive notifications via WhatsApp. This research was conducted at the Garut Institute of Technology, with a case study taken from the Computer Science department. The developed system can monitor students' thesis progress, send notifications to students who do not receive guidance within a certain timeframe, and provide warnings and motivation to encourage better communication and engagement between students and supervisors in the completion of their theses. Although there was a delay in the system development from the estimated completion time due to the implementation of the Scrum framework, it remained within a reasonable range.

Keywords: *Agile Scrum Framework, Product Backlog, Notification System, Scrum, Under Graduate Thesis Monitoring.*

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Optimisasi Monitoring Tugas Akhir Mahasiswa Dengan Integrasi Formasi Metode Agile Framework Scrum dan Notifikasi WhatsApp di Institut Teknologi Garut

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Abstract views: 1, PDF downloads: 0

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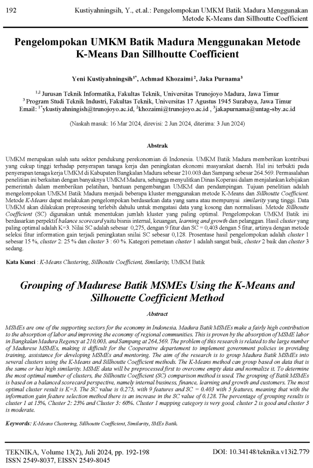

Pengelompokan UMKM Batik Madura Menggunakan Metode K-Means Dan Sillhoutte Coefficient

Yeni Kustiyahningsih[1*], Achmad Khozaimi[2], Jaka Purnama[3]

[1,2] Jurusan Teknik Informatika, Fakultas Teknik, Universitas Trunojoyo Madura, Jawa Timur
[3] Program Studi Teknik Industri, Fakultas Teknik, Universitas 17 Agustus 1945 Surabaya, Jawa Timur
Email: [1*]ykustiyahningish@trunojoyo.ac.id, [2]khozaimi@trunojoyo.ac.id , [3]jakapurnama@untag-sby.ac.id

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Abstrak

UMKM merupakan salah satu sektor pendukung perekonomian di Indonesia. UMKM Batik Madura memberikan kontribusi yang cukup tinggi terhadap penyerapan tanaga kerja dan peningkatan ekonomi masyarakat daerah. Hal ini terbukti pada penyerapan tenaga kerja UMKM di Kabupaten Bangkalan Madura sebesar 210.003 dan Sampang sebesar 264.569. Permasalahan penelitian ini berkaitan dengan banyaknya UMKM Madura, sehingga menyulitkan Dinas Koperasi dalam menjalankan kebijakan pemerintah dalam memberikan pelatihan, bantuan pengembangan UMKM dan pendampingan. Tujuan penelitian adalah mengelompokan UMKM Batik Madura menjadi beberapa kluster menggunakan metode K-Means dan *Sillhoutte Coefficient*. Metode *K-Means* dapat melakukan pengelompokan berdasarkan data yang sama atau mempunyai *similarity* yang tinggi. Data UMKM akan dilakukan preprosesing terlebih dahulu untuk mengatasi data yang kosong dan normalisasi. Metode *Sillhoutte Coefficient* (SC) digunakan untuk menentukan jumlah kluster yang paling optimal. Pengelompokan UMKM Batik ini berdasarkan perpektif *balance scorecard* yaitu bisnis internal, keuangan, *learning and growth* dan pelanggan. Hasil *cluster* yang paling optimal adalah K=3. Nilai SC adalah sebesar 0,275, dengan 9 fitur dan SC = 0,403 dengan 5 fitur, artinya dengan metode seleksi fitur information gain terjadi peningkatan snilai SC sebesar 0,128. Prosentase hasil pengelompokan adalah *cluster* 1 sebesar 15 %, *cluster* 2: 25 % dan *cluster* 3 : 60 %. Kategori pemetaan *cluster* 1 adalah sangat baik, *cluster* 2 baik dan *cluster* 3 sedang.

Kata Kunci : *K-Means Clustering, Sillhoutte Coefficient, Similarity,* UMKM Batik

Grouping of Madurese Batik MSMEs Using the K-Means and Silhouette Coefficient Method

Abstract

MSMEs are one of the supporting sectors for the economy in Indonesia. Madura Batik MSMEs make a fairly high contribution to the absorption of labor and improving the economy of regional communities. This is proven by the absorption of MSME labor in Bangkalan Madura Regency at 210,003, and Sampang at 264,569. The problem of this research is related to the large number of Madurese MSMEs, making it difficult for the Cooperative departement to implement government policies in providing training, assistance for developing MSMEs and mentoring. The aim of the research is to group Madura Batik MSMEs into several clusters using the K-Means and Sillhoutte Coefficient methods. The K-Means method can group based on data that is the same or has high similarity. MSME data will be preprocessed first to overcome empty data and normalize it. To determine the most optimal number of clusters, the Sillhoutte Coefficient (SC) comparison method is used. The grouping of Batik MSMEs is based on a balanced scorecard perspective, namely internal business, finance, learning and growth and customers. The most optimal cluster result is K=3. The SC value is 0.275, with 9 features and SC = 0.403 with 5 features, meaning that with the information gain feature selection method there is an increase in the SC value of 0.128. The percentage of grouping results is cluster 1 at 15%, Cluster 2: 25% and Cluster 3: 60%. Cluster 1 mapping category is very good, cluster 2 is good and cluster 3 is moderate.

Keywords: *K-Means Clustering, Sillhoutte Coefficient, Similarity, SMEs Batik.*

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Pengelompokan UMKM Batik Madura Menggunakan Metode K-Means dan Sillhoutte Coefficient

Yeni Kustiyahningsih, Achmad Khozaimi, Jaka Purnama

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Smart Door Lock Using Face Recognition Access Based on Internet Of Things (IoT)

Farrel Laogi Murjitama[1], Hafidz Nur Raihan[2], Rangga Prasetya Adiwijaya[3], Desi Fitriani Ramadan[4], Bagas Imanuel Pasaribu[5], Bintang A. Silalahi[6], Nada Nadiefah Tasman[7], Syafira Audri Dwijayanti[8], Ummu Putri Salsabila Panjaitan[9], Yudhi S. Purwanto[10]

[1,2,3,4,5,6,7,8]Informatics Engineering, Faculty of Telematics Energy, Institut Teknologi PLN, Jakarta Barat, DKI Jakarta, Indonesia
[9,10]Electrical Engineering, Faculty of Electricity and Renewable Energy, Institut Teknologi PLN, Jakarta Barat, DKI Jakarta, Indonesia
[9]Information System, Faculty of Telematics Energy, Institut Teknologi PLN, Jakarta Barat, DKI Jakarta, Indonesia

E-mail: [1]farrel2231096@itpln.ac.id

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Abstract

Security is one of the basic things that humans need. In relation to a house or room, the forms of security is on the door lock. Various types of door locks have been created, ranging from conventional ones with physical keys, to modern types. This modern type of door lock is also diverse with various ranges in terms of security, some are using a series of codes (keypad), some are card readers, fingerprint sensors, to the use of face recognition technology. Several door lock technologies with face recognition have also been created, but they are still expensive. The other problem is that those devices are not equipped with some fail-safe mechanisms, in case there are troubles with the devices. This smart door lock is made using face recognition technology based on the Internet of Things. This lock is equipped with an ESP32-cam camera integrated in the ESP8266MOD module that can recognize faces that have been registered in the database on the website. In addition, the door is also equipped with a push button to open the door from the inside, and a button as a backup if there is a malfunction of the face recognition feature. The device test indicates no apparent issues and operates smoothly. The accuracy test for the camera yields positive outcomes, reaching up to 100% in normal lighting conditions, and dropping to around 61-80% in blur condition. Accuracy is further compromised, potentially dropping in dim light that the images are only reached 40-60% for clear images and 20% in blurry images.

Keywords: Smart Door Lock, ESP32cam, ESP8266MOD, Push Button, Keypad

I. INTRODUCTION

Information technology that supports the industrial revolution 4.0, is fast, efficient and reliable. Based on the observations of experts, the rapid progress of information technology at this time is very fast and almost complete in all circles and all fields. The use of information systems to support organizational performance is increasingly necessary because information is an important resource in modern management. Driven by the sophistication of information technology now, this helps the development of increasingly sophisticated information systems such as websites or mobile [1].

In the current era, almost all fields have used information technology, for instance, in the field of public services. Public security and order is the reason in the National Police Chief Regulation No. 23 of 2010 [2], which states that Kamtibmas is a condition for one of the prerequisites in a dynamic society for the implementation of the national development process. Security and order is very important in the continuity of social activities, because if it is not controlled it will result in conditions that are not conducive to the community itself and even the outside community. Lonely places, and lack of security can be a source of criminal acts or actions that are contrary to the ethics and norms of society, such as: theft, robbery, robbery, even persecution. In this case, it will encourage the development of security aspects in society in order to prevent noise or acts of bad behavior in the surrounding environment [3].

The importance of security has become a common concern for everyone, given many cases of rampant theft. The National Police cracked down on 58,208 people who were reported for theft with aggravation. The motives varied from stealing in

The Smart Door Lock Using Face Recognition Access Based on Internet Of Things (IoT)

Farrel Laogi Murjitama, Hafidz Nur Raihan, Rangga Prasetya Adiwijaya, Desi Fitriani Ramadan, Bagas Imanuel Pasaribu, Bintang A. Silalahi, Nada Nadiefah Tasman, Syafira Audri Dwijayanti, Ummu Putri Salsabila Panjaitan, Yudhi S. Purwanto

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204 Putra, R.A., et.al.: Implementation of Classification Algorithm for Sentiment Analysis: Measuring App User Satisfaction

Implementation of Classification Algorithm for Sentiment Analysis: Measuring App User Satisfaction

Rizki Aulia Putra[a#], Rice Novita[b], Tengku Khairil Ahsyar[c], Zarnelly[d]

[1,2,3]Information System Study Program, Faculty of Science and Technology, Universitas Islam Negeri Sultan Syarif Kasim Riau, Pekanbaru, Indonesia
Email: [a#]12050313356@students.uin-suska.ac.id, [b]rice.novita@uin-suska.ac.id, [c]tengkukhairil@uin-suska.ac.id, [d]zarnelly@uin-suska.ac.id

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Abstract

Google Play Store is the official app store for Android devices from Google that offers rating and review features. This feature on the platform is a source of data for sentiment analysis in research on app user satisfaction. The purpose of this study is to provide an overview of app user satisfaction and evaluate the accuracy of the algorithms used. The algorithms compared include Support Vector Machine (SVM), namely linear, rbf, sigmoid, and polynomial kernels with Naive Bayes Classifier (NBC). The key variables analyzed include perceived usefulness, perceived ease of use, zelia-bility, responsiveness, and website design. The results showed that the SVM algorithm with a linear kernel achieved the highest accuracy of 95.28% compared to the NBC algorithm of 91.43%. For other accuracy results, rbf kernel 94.35%, sigmoid kernel 95.19% and polynomial kernel 93.31%. In addition, the results of sentiment analysis on application user satis-faction revealed that 75% of users were dissatisfied, with the service indicator having the highest number of negative sen-timents. These findings suggest that sentiment analysis can be an effective tool for companies to measure and improve user satisfaction. In addition, these results can also be a useful reference for new users in assessing apps before using them.

Keywords: Google Play Store, Naive Bayes, Sentiment Analysis, Support Vector Machine, User Satisfaction.

I. INTRODUCTION

Improvements in technology have led to a notable surge in Internet usage, resulting in the emergence of novel routines like social networking and e-commerce-based online purchasing [1]. Transactions now feel more customized, flexible, and convenient because to the growth of e-commerce [2]. Every year, the value of e-commerce transactions in Indonesia rises. Delivery services, acting as a middleman between buyers and sellers, are crucial to getting items to final customers. Because of this, there is a greater demand for dependable delivery services as well as an increase in public interest in online purchasing [3].

J&T Express, a leading company in the expedition sector operating in Indonesia [4], recorded a 40% increase in shipment volumes over 2023, with an average of 2.5 million packages shipped daily [5]. According to the Top Brand Award 2023, J&T Express was named the best brand in the courier service category with 35.5%, marking a significant increase from the previous year. According to one of Indonesia's online survey platforms Populix, J&T Express is the favorite courier service among both Generation Z and Millennials for their online shopping needs.

To stay competitive and retain customers, innovations are constantly being made. PT Global Jet Express launched a smartphone app in 2015, allowing customers to track packages, find courier locations, and schedule pickups [6]. The J&T Express app continues to be popular with over a million downloads. According to data from app sensortower.com, the number of downloads in Indonesia for all platforms from December 2015 to December 2023 reached 50 million to 100 million downloads, with more than one million active users according to similar web [6].

The J&T Express app received a low rating of 2.2 on the Play Store and 2.0 on the App Store, with many 1-star reviews continuing to drop. Comments indicate disappointment with delivery accuracy, poor service, including delays, breakdowns, and a tracking feature that doesn't work properly despite being updated [7]. J&T Express app user satisfaction is key to maintaining and increasing the company's market share. In order to ensure customer satisfaction, J&T Express needs to deeply understand the level of user satisfaction [8]. Sentiment analysis of app comments is becoming an important tool in

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Putri, G.R., et.al.: Perbandingan Algoritma Naïve Bayes dan TextBlob Untuk Mendapatkan Analisis Sentimen Masyarakat Pada Sosial Media 213

Perbandingan Algoritma Naïve Bayes dan TextBlob Untuk Mendapatkan Analisis Sentimen Masyarakat Pada Sosial Media

Giesta Rahguna Putri[1*], Muhammad Akbar Maulana[2], Samsul Bahri[3]

[1,2,3]Program Studi Informatika, Institut Teknologi Tangerang Selatan, Tangerang Selatan
Email: [1*]giestarp12@gmail.com, [2]makbar513@gmail.com, [3]sambahrie@gmail.com

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Abstrak

Media sosial *Twitter* adalah platform yang populer di Indonesia untuk berkomunikasi dan mendapatkan informasi dengan cepat. Hal ini memungkinkan masyarakat dengan mudah mengungkapkan opini dan sentimen mereka. Penelitian ini berfokus pada perbandingan algoritma *TextBlob* dan *Naïve Bayes* dalam menganalisis sentimen masyarakat. Temuan menunjukkan bahwa *TextBlob* mengklasifikasikan sebagian besar *tweet* sebagai positif, sementara *Naïve Bayes* menunjukkan kecenderungan yang serupa dengan akurasi sebesar 78,18%. Dari analisis *TextBlob*, sekitar 50,98% komentar menunjukkan sentimen positif, 16,01% negatif, dan 33,33% netral. Dengan menggunakan kedua algoritma ini, penelitian berhasil mengidentifikasi sentimen masyarakat dengan akurasi yang baik, menunjukkan distribusi yang jelas antara sentimen positif, netral, dan negatif.

Kata Kunci: Analisis Sentimen, *Twitter*, *TextBlob*, *Naïve Bayes*.

Comparison of Naïve Bayes and TextBlob Algorithms for Analyzing Public Sentiment on Social Media

Abstract

Social media platform Twitter is popular in Indonesia for quick communication and information retrieval. It allows people to easily express their opinions and sentiments. This research focuses on comparing the TextBlob and Naïve Bayes algorithms in analyzing public sentiment. The findings show that TextBlob classifies most tweets as positive, while Naïve Bayes shows a similar trend with an accuracy of 78.18%. From the TextBlob analysis, about 50.98% of comments show positive sentiment, 16.01% negative, and 33.33% neutral. By using these two algorithms, the research successfully identified public sentiment with good accuracy, showing a clear distribution between positive, neutral, and negative sentiments.

***Keywords:** Analysis of Sentiment, Twitter, TextBlob, Naïve Bayes.*

I. PENDAHULUAN

Dalam konteks politik, pemilihan presiden merupakan peristiwa yang sangat penting bagi sebuah negara. Seiring dengan perkembangan teknologi informasi dan media sosial, pendapat serta sentimen masyarakat terhadap calon presiden dapat dengan cepat tersebar dan berdampak besar pada proses pemilihan tersebut. Oleh karena itu, analisis sentimen masyarakat terhadap calon presiden menjadi suatu hal yang krusial untuk dipahami [1].

Dalam era digital, data teks dari berbagai platform media sosial seperti *Twitter*, *Facebook*, dan forum-forum *online* menjadi sumber informasi yang kaya akan pendapat dan sentimen masyarakat [2]. Melalui teknik analisis sentimen, kita dapat menggali dan memahami opini serta sikap masyarakat dengan lebih efisien dan tepat. Namun, masih terdapat kebutuhan akan pemahaman yang lebih dalam tentang cara masyarakat merespons berbagai isu atau topik tertentu di media sosial. Dalam penelitian ini opini masyarakat menjadi masalah dalam melihat sejauh mana sentimen masyarakat

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Perbandingan Algoritma Naïve Bayes dan TextBlob Untuk Mendapatkan Analisis Sentimen Masyarakat Pada Sosial Media

Giesta Rahguna Putri, Muhammad Akbar Maulana, Samsul Bahri

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Setiadi, W.K., et.al.: Comparison of Extreme Learning Machine Methods and Support Vector Regression for Predicting Bank Share Prices in Indonesia 219

Comparison of Extreme Learning Machine Methods and Support Vector Regression for Predicting Bank Share Prices in Indonesia

Williem Kevin Setiadi[1], Vincentius Riandaru Prasetyo[2*], Fitri Dwi Kartikasari[3]

[1,2,3]Informatics Department, Universitas Surabaya, Surabaya, East Java, Indonesia
Email: [1]s160420056@student.ubaya.ac.id, [2*]vincent@staff.ubaya.ac.id, [3]fitri_dk@staff.ubaya.ac.id

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Abstract

Investing is the practice of postponing current consumption to obtain more significant value in the future. One profitable form of investment is stock investment, where investors buy company shares to benefit from appreciation in share value or dividend payments. Before investing in shares, investors need to pay attention to movements in the Composite Stock Price Index (IHSG), which reflects the performance of the Indonesian stock market. The Indonesian Stock Exchange (BEI) recorded around 740 companies listed in 2021. The BEI also compiled the LQ45 list of 45 stocks with the largest market capitalization, including the four largest banks in Indonesia. However, investing in bank shares only sometimes produces profits due to share price fluctuations. Stock price analysis and price movement predictions are important steps before investing. Extreme Learning Machine (ELM) and Support Vector Regression (SVR) methods are techniques used to predict time series data. This research compares the performance of the two methods in predicting stock prices of the big 4 Indonesian banks. The dataset used in this research comes from the Yahoo Finance site, which was taken since the market crash recovery period due to the Covid-19 pandemic. Based on the evaluation conducted, both the ELM and SVR methods are effective for predicting the share prices of the big four Indonesian banks. The average MAPE for the ELM method is 8.5% and SVR is 2.64%. However, when considering computing time, the ELM method is more efficient with an average computing time of 0.006 seconds, than the SVR method with an average computing time of 0.694 seconds.

Keywords: Extreme Learning Machine, Support Vector Regression, Stocks Prediction, Banking Indonesia, MAPE.

I. INTRODUCTION

Investment is an activity carried out to postpone current consumption to generate higher value in the future. Investment is an activity carried out to postpone current consumption, with the hope that the investment value in the future will be higher than the current value. Investment also involves taking risks for better results or profits [1]. There are various kinds of investments; one of the most profitable is stock investment. Stock investment is buying company shares as part of ownership to make a profit. This involves buying and selling shares in the capital markets to profit from appreciation in share value or dividend payments. Stock investment is studied as a strategy to gain wealth gradually [2].

Before buying or selling shares, investors or traders must pay attention to movements in the Composite Stock Price Index (IHSG). IHSG is the leading stock market indicator on the Indonesia Stock Exchange (BEI). IHSG reflects the average performance of share prices from various industrial sectors listed on the IDX. IHSG is often used as a benchmark to measure the performance of the Indonesian stock market as a whole. Changes in the IHSG value usually reflect market sentiment and economic and political factors that influence stock price movements in Indonesia [3]. In 2021, BEI noted that there will be around 740 companies registered and listed on the stock exchange. However, this figure may change from time to time due to the addition or reduction of companies conducting an initial public offering (IPO) or being removed from the trading list for various reasons, including mergers, acquisitions, or bankruptcy [4].

IDX has also published and grouped a list of shares with high liquidity and market capitalization into LQ45 [5]. LQ45 is a list of 45 stocks that have the largest market capitalization, including the big 4 Indonesian banks, namely BCA (BBCA), BRI (BBRI), Mandiri (BMRI), and BNI (BBNI) [6]. Investors who want to invest in banking issuers also cannot be careless in purchasing shares without carrying out an analysis because of the high level of liquidity and fluctuations in the share prices of the Big Four banks. Even though investing in Big Four banking with a large market capitalization does not mean that you will always make a profit, there is the possibility of a loss due to needing to be corrected in taking a position to buy

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Comparison of Extreme Learning Machine Methods and Support Vector Regression for Predicting Bank Share Prices in Indonesia

Williem Kevin Setiadi, Vincentius Riandaru Prasetyo, Fitri Dwi Kartikasari

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226 Siswantoro, J., et.al.: Facial Expression Recognition to Detect Student Engagement in Online Lectures

Facial Expression Recognition to Detect Student Engagement in Online Lectures

Joko Siswantoro[1*], Januar Rahmadiarto[2], Mohammad Farid Naufal[3]

[1,2,3]Department of Informatics, University of Surabaya, Surabaya, East Java, Indonesia
Email: [1*]joko_siswantoro@staff.ubaya.ac.id, [2]s160418042@student.ubaya.ac.id, [3]faridnaufal@staff.ubaya.ac.id

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Abstract

In synchronous online lectures, the lecturers often provide the lecture material directly through video conference technology. On the other hand, there are many students who do not pay attention to the lecturers when they are participating in online lectures. As a consequence, in this research, an application was developed to assist lecturers in gathering data regarding the degree to which students who participate in online lectures pay attention to the presented information. The application employed a convolutional neural network (CNN) model to recognize each student's facial expressions and place them into one of two classes: either engaged or disengaged. The captured student facial image was preprocessed to facilitate the classification process. The preprocessing stage consisted of image conversion to gray scale, face detection using the Haar-Cascade Classifier model, and a median filter to reduce noise. In the process of designing a CNN model, three different hyperparameter tuning scenarios were implemented. These tuning scenarios aimed to obtain the best possible CNN model by determining which CNN model hyperparameters were the most optimal. The results of the experiments indicate that the CNN model from the second scenario has the highest level of accuracy in terms of recognizing facial expressions, coming in at 86%. The results of this research have been tested to measure the level of student participation in online lectures. The trial results show that the proposed application can help lecturers evaluate student engagement during online lectures.

Keywords: Facial Expression Recognition, Convolutional Neural Network, Student Engagement, Online Lectures.

I. INTRODUCTION

Online lectures are learning processes using virtual classrooms on the Internet [1], [2]. Online lectures have become indispensable in various educational institutions since the Covid-19 pandemic [3]. But after the Covid-19 pandemic passed, online lectures still have an important role in education [4]. Two popular methods are used in conducting online lectures, namely synchronous and asynchronous. In the synchronous method, lectures are delivered directly by lecturers to students through video conferencing applications. In addition, lecturers and students can also meet face-to-face and communicate directly in virtual classrooms. Students can also work together virtually at the same time. In the asynchronous method, lecturers usually provide learning videos or written learning materials in files uploaded to the learning site so that students can access and study at a specified time. Communication between lecturers and students is usually done by sending messages through discussion boards available on learning sites [5].

The effectiveness of online lectures is still very low compared to offline face-to-face lectures. This is the impact of low student engagement in the respective online lectures. Students are only present in the virtual classroom but then do other activities unrelated to the lecture and do not pay attention to the lecture's material [6]. On the other hand, lecturers need to evaluate student engagement in a lecture activity because student engagement is one important aspect of determining student success in a lecture, especially online lectures [7].

In online lectures, it is difficult for lecturers to see student engagement directly, even though students are asked to turn on the camera when explaining synchronous online lecture material. This can happen because the lecturer focuses more on the materials delivered. Therefore, an application is needed to assist lecturers in evaluating student engagement during synchronous online lectures. Some methods that can be used to develop such applications are recording brain and heart signals [8], measuring heart rate [9], using context-performance [10], and facial expression recognition [11]. Due to the ease of obtaining and using digital cameras, facial expression recognition is the most widely used method to detect student engagement in lectures [12].

Several researchers have developed various methods to recognize participants' facial expressions in both online and

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Facial Expression Recognition to Detect Student Engagement in Online Lectures

Joko Siswantoro, Januar Rahmadiarto, Mohammad Farid Naufal

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Ferdinand, K., et.al.: Innovative Approach of 2D Platformer Mobile Game Development "Super Journey" 233

Innovative Approach of 2D Platformer Mobile Game Development "Super Journey"

Kelvin Ferdinand[1], Kevin Jonathan JM[2*], Darius Andana Haris[3]

[1,2,3]Informatics Engineering Study Program, Universitas Tarumanagara, DKI Jakarta, Indonesia
Email: [1]kelvinferdinand1@gmail.com, [2*]kevinjonathanjm88@gmail.com, [3]dariush@fti.untar.ac.id

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Abstract

This study investigates the design and development process of "Super Journey", a 2D platformer mobile game aimed at enhancing user engagement and satisfaction through innovative game mechanics and design. Utilizing the Agile methodology, the development stages included conceptualization, design, implementation using the Unity game engine, and iterative testing and evaluation based on user feedback. This development process involved crafting a detailed game design document, creating initial sketches and prototypes, and integrating graphical elements, animations, and game mechanics. The game features 3 levels with simple controls, visually appealing pixel art, and progressively challenging levels. A survey conducted with 20 participants revealed high overall satisfaction (4.15 out of 5), with particular praise for level design (4.25) and game mechanics (4.2). Feedback indicated areas for improvement, such as balancing difficulty levels and incorporating more diverse obstacles and enemies. The findings underscore the importance of agile, user-centered design in game development and provide insights for future iterations to further enhance the gaming experience. "Super Journey" exemplifies the effective integration of classic platformer elements with modern innovations, highlighting its potential in the competitive mobile gaming market. The results of this research are expected to serve as a reference and inspiration for other game developers to create superior products by combining innovative technology and thoughtful design.

Keywords: 2D Platformer, Agile, Game Development, Unity

I. INTRODUCTION

In this digital era, the development of technology and mobile devices has impacted significantly on various aspects of life, including entertainment [1]. One form of entertainment that is popular and continues to evolve is mobile games [2]. The flexibility and high accessibility offered by mobile games allow users to play anywhere and anytime [3].

Based on data obtained from Statista.com, the number of smartphone mobile network subscriptions worldwide from 2016 to 2023 continues to increase and is expected to continue until 2028 as shown in Figure 1 [4]. This data also indirectly reflects the growing number of smartphone users worldwide. The increasing number of smartphone users is driving the growth of the mobile games industry significantly and is becoming one of the most lucrative sectors in the entertainment industry.

The development of the "Super Journey" mobile game is based on trends and mobile game user's preferences at present. Platformer 2D remains one of the most popular game types, both old and new players, cause of the simple mechanics but challenge [5]. Through "Super Journey", we want to combine classic elements from the platformer game with modern innovation to create a unique and interesting playing experience. We're confident that a combination of the intuitive mechanics of the game, creative level design, and interesting graphics will result in not only a fun game but also a challenging intellectual.

The main aim of this research is to explore how innovation in the design and development of games can improve the quality and attraction of Platformer 2D games on mobile devices. Previous research has shown that innovative level design and engaging game mechanics are essential for player retention and satisfaction [6]. However, most of these studies are still limited to analyzing game mechanics and level design without integrating user feedback directly into the development process. Sutopo highlighted the importance of intuitive mechanics and creative-level design in increasing player engagement [7]. On the other side, research by Vlahovic et al. found that high graphical quality and smooth user interaction significantly contribute to the overall play experience and player satisfaction [8].

Several popular games in this genre, one of which is "Super Mario Run" have successfully combined classic and modern

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Innovative Approach of 2D Platformer Mobile Game Development "Super Journey"

Kelvin Ferdinand, Kevin Jonathan JM, Darius Andana Haris

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PDF

Saputra, I.A., et.al.: Forecasting Model of Export and Import Value of Oil and Gas Using Gated Recurrent Unit Method 239

Forecasting Model of Export and Import Value of Oil and Gas Using Gated Recurrent Unit Method

Ilham Adji Saputra[1], Anik Vega Vitianingsih[2*], Yudi Kristyawan[3], Anastasia Lidya Maukar[4], Jack Febrian Rusdi[5]

[1,2,3]Informatics Department, Universitas Dr. Soetomo, Surabaya, Indonesia
[4]Industrial Engineering Department, President University, Bekasi, Indonesia
[5]Informatics Department, Sekolah Tinggi Teknologi Bandung, Bandung, Indonesia
Email: [1]ilhamadjisptr@gmail.com, [2*]vega@unitomo.ac.id, [3]yudi.kristyawan@unitomo.ac.id,
[4]almaukar@president.ac.id[5], jack@sttbandung.ac.id[5]

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Abstract

Indonesia's natural resources are abundant, including oil and gas. It is one of the countries active in international trade, including exports and imports. Oil and gas exports are a significant source of income for the country, encouraging economic growth. Oil and gas imports are very important to meet domestic energy needs, which continue to increase in demand. Increasing oil and gas imports can increase the trade balance, which can affect the country's economic stability if the value of imports exceeds the value of exports. Forecasting is a solution to overcome these problems by forecasting the value of oil and gas exports and imports. The gated recurrent unit (GRU) method is used for forecasting in this study because it has a simple computation and fairly high accuracy. The dataset used is monthly time series data from 1993 to 2023 from the website of the Badan Pusat Statistik (BPS). The MAPE results on the GRU model forecast the value of oil and gas exports and imports at 12.19% and 14.30%, respectively. The best average forecasting of export and import values obtained a MAPE of 13.38%.

Keywords: Forecasting Model, Oil and Gas Import Export Value, Deep Learning, Gated Recurrent Unit Model

I. INTRODUCTION

Information technology is not a difficult thing to get nowadays because it has entered all lines of life and provides many conveniences can also be felt in the economic field [1]. Technological developments that continue to impact the economic field positively encourage economic growth. The country's economic growth can increase national development and positively impact other fields [2]. Economic growth in a country can be obtained by conducting international trade, namely exports and imports. Exports are activities selling commodities in the country to other countries, while imports buy commodities from different countries for domestic needs [3]. International trade activities consist of export and import activities, which are generally categorized based on commodities with oil and gas and non-oil and gas (gas) [4]. Oil and gas have become an energy source that is needed by the community because many sectors used by humans use oil and gas [5]. The high market demand for oil and gas commodities makes the government a policy maker, using forecasting of future export and import values to reduce the value of imports and increase the value of exports to maintain the country's economic stability. Forecasting is the science of making predictions on data, either estimates in the present or for the future, based on future events using past time series data [6]. Forecasting is done using data obtained within a certain period in a good sequence in the form of annual, monthly, weekly, daily, and hourly, referred to as a time-series dataset [7]. Forecasting helps minimize uncertain future risks. Forecasting is expected to provide positive results for the organization [8].

Indonesia is a country that has abundant natural resources, one of which is petroleum and natural gas (oil and gas) [5]. Oil and gas are essential commodities for meeting domestic energy needs and are a source of state revenue [9]. Oil and gas exports significantly contribute to state revenue and drive the country's economic growth [10]. Oil and gas imports are significant in fulfilling domestic energy needs. However, the increase in oil and gas imports can increase the trade balance deficit if the export value exceeds the export value, affecting the country's economic stability [5]. Therefore, a forecasting approach to the value of oil and gas exports and imports can greatly assist the government and oil and gas export and import industry players

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Forecasting Model of Export and Import Value of Oil and Gas Using Gated Recurrent Unit Method

Ilham Adji Saputra, Anik Vega Vitianingsih, Yudi Kristyawan, Anastasia Lidya Maukar, Jack Febrian Rusdi

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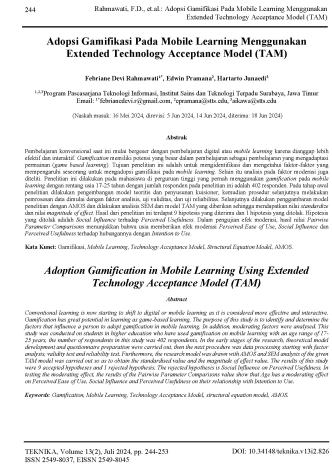

244 Rahmawati, F.D., et.al.: Adopsi Gamifikasi Pada Mobile Learning Menggunakan Extended Technology Acceptance Model (TAM)

Adopsi Gamifikasi Pada Mobile Learning Menggunakan Extended Technology Acceptance Model (TAM)

Febriane Devi Rahmawati[1*], Edwin Pramana[2], Hartarto Junaedi[3]

[1,2,3]Program Pascasarjana Teknologi Informasi, Institut Sains dan Teknologi Terpadu Surabaya, Jawa Timur
Email: [1*]febrianedevi.r@gmail.com, [2]epramana@stts.edu, [3]aksara@stts.edu

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Abstrak

Pembelajaran konvensional saat ini mulai bergeser dengan pembelajaran digital atau *mobile learning* karena dianggap lebih efektif dan interaktif. *Gamification* memiliki potensi yang besar dalam pembelajaran sebagai pembelajaran yang mengadaptasi permainan (*game based learning*). Tujuan penelitian ini adalah untuk mengidentifikasi dan mengetahui faktor-faktor yang mempengaruhi seseorang untuk mengadopsi gamifikasi pada *mobile learning*. Selain itu analisis pada faktor moderasi juga dilakukan. Penelitian ini dilakukan pada mahasiswa yang pernah menggunakan gamifikasi pada *mobile learning* dengan rentang usia 17-25 tahun dengan jumlah responden pada penelitian awal ini adalah 402 responden. Pada tahap awal penelitian dilakukan pengembangan model hipotesis dan persiapan kuisioner, kemudian proses selanjutnya melakukan pengumpulan data dimulai dengan faktor analisis, uji validitas, dan uji reliabilitas. Selanjutnya dilakukan pengaplikasian model penelitian dengan AMOS dan dilakukan analisis SEM dari model TAM yang diberikan sehingga menghasilkan nilai *standardize* dan nilai magnitude *of effect*. Hasil dari penelitian ini terdapat 9 hipotesis yang diterima dan 1 hipotesis yang ditolak. Hipotesis yang ditolak adalah *Social Influence* terhadap *Perceived Usefulness*. Dalam penggunan efek moderasi, hasil nilai *Pairwise Parameter Comparisons* menunjukkan bahwa usia memberikan efek moderasi *Perceived Ease of Use*, *Social Influence* dan *Perceived Usefulness* terhadap hubungannya dengan *Intention to Use*.

Kata Kunci: Gamifikasi, *Mobile Learning*, *Technology Acceptance Model*, *Structural Equation Model*, AMOS.

Adoption Gamification in Mobile Learning Using Extended Technology Acceptance Model (TAM)

Abstract

Conventional learning is now starting to shift to digital or mobile learning as it is considered more effective and interactive. Gamification has great potential in learning as game-based learning. The purpose of this study is to identify and determine the factors that influence a person to adopt gamification in mobile learning. In addition, moderating factors were analyzed. This study was conducted on students in higher education who have used gamification on mobile learning with an age range of 17-25 years; the number of respondents in this study was 402 respondents. In the early stages of the research, theoretical model development and questionnaire preparation were carried out, then the next procedure was data processing starting with factor analysis, validity test and reliability test. Furthermore, the research model was drawn with AMOS and SEM analysis of the given TAM model was carried out so as to obtain the standardized value and the magnitude of effect value. The results of this study were 9 accepted hypotheses and 1 rejected hypothesis. The rejected hypothesis is Social Influence on Perceived Usefulness. In setting the moderating effects, the results of the Pairwise Parameter Comparisons value show that age has a moderating effect on Perceived Ease of Use, Social Influence and Perceived Usefulness on their relationship with Intention to Use.

Keywords: Gamification, Mobile Learning, Technology Acceptance Model, structural equation model, AMOS.

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Adopsi Gamifikasi Pada Mobile Learning Menggunakan Extended Technology Acceptance Model (TAM)

Febriane Devi Rahmawati, Edwin Pramana, Hartarto Junaedi

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254 Lievianto, K.V., et al.: The Design of 3D Virtual Reality Animation of Javan Rhino for Educational Media of Endangered Animals in Indonesia

The Design of 3D Virtual Reality Animation of Javan Rhino for Educational Media of Endangered Animals in Indonesia

Kent Vin Lievianto[1], Yana Erlyana[2]

[1,2]Visual Communication Design Department, Universitas Bunda Mulia, DKI Jakarta, Indonesia
Email: [1]kentvinlievianto@gmail.com, [2]erlyana@bundamulia.ac.id

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Abstract

Indonesia is one of the largest archipelagic countries in the world. Indonesia has very rich biodiversity but is facing serious threats. Many endemic species are threatened with extinction due to factors such as climate change, habitat loss, illegal trade and poaching. This research highlights the urgent need for education about endangered animals, with a focus on the Javan Rhinoceros (Rhinoceros Sondaicus) which is categorized as Critically Endangered by the International Union for Conservation of Nature (IUCN). This research was created for Animalium, a research facility under the National Research and Innovation Agency (BRIN), which still lacks interactive Virtual Reality media for education. The main aim of this research is to design a 3D VR animation about the Javan Rhino to increase education and awareness about its conservation. Interviews with educators at Animalium revealed the need for such a medium to prevent damage to physical replicas and to engage visitors, especially children, in a more immersive and interactive learning experience. Observations showed that there were no 3D VR-based educational tools in the facility. The implementation of VR technology has the potential to significantly increase visitor engagement and experiences regarding the conservation of endangered species, in line with Sustainable Development Goals (SDGs) related to terrestrial ecosystems. This research highlights the potential of VR to provide immersive and interactive educational experiences, increase public awareness, and support wildlife conservation efforts, especially the Javan Rhino. The result of this design is an Unreal Engine project file that can be used in Animalium to create an immersive and interactive educational experience, increase public awareness, and support wildlife conservation efforts, especially the Javan Rhino

Keywords: Virtual Reality, Javan Rhino, 3D Animation, Interactive Education, Indonesian Biodiversity.

I. INTRODUCTION

Indonesia, as one of the largest archipelagic countries in the world, has a very rich biodiversity, unfortunately this natural wealth is currently facing serious threats. Many animal species endemic to Indonesia are at risk of extinction due to a number of factors such as climate change, habitat loss, illegal trade and poaching. This is an urgent and alarming problem that requires serious attention and innovative solutions [1]. Based on data from the International Union for Conservation of Nature (IUCN), there are 1,217 endangered animal species in Indonesia as of October 4, 2022, equivalent to 2.94% of the world's total of 41,308 endangered animal species [2].

In Indonesia, one of the endangered animals is the Javan rhino or with the Latin name Rhinoceros sondaicus [3]. The Javan rhino has been red-listed as Critically Endangered since 2019 by the International Union for Conservation of Nature and Natural Resources (IUCN), an international organization dedicated to the conservation of natural resources. The Javan rhino, or Rhinoceros sondaicus, is one of the wildlife species that is a priority species for urgent conservation [4]. The Javan rhino is one of two rhino species whose habitat is only in Indonesia, with the current population distribution limited to the southwestern peninsula of Java Island, in the Ujung Kulon National Park (TNUK) area and this one-horned rhino is also one of the least populated large mammals in the world so, this is of particular concern to the government, in this case, the Directorate General of Natural Resources and Ecosystem Conservation (KSDAE), Ministry of Environment and Forestry, Ujung Kulon National Park (TNUK), partners, and experts [4].

Therefore, there is a need for education about endangered animals in Indonesia, especially about mammals in Indonesia, namely the Javan rhino. The initial resolution in this design was made for Animalium, which is one of the research facilities owned by the National Research and Innovation Agency (BRIN) in the form of an educational tourist spot about wild animals that are researched by researchers, also cared for and displayed to visitors as learning materials. Then this design is made for Animalium which aims to provide a new and interactive in-depth educational experience about the

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The Design of 3D Virtual Reality Animation of Javan Rhino for Educational Media of Endangered Animals in Indonesia

Kent Vin Lievianto, Yana Erlyana

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Perbaikan Akurasi Random Forest Dengan ANOVA Dan SMOTE Pada Klasifikasi Data Stunting

Ari Ahmad Dhani[1], Taghfirul Azhima Yoga Siswa[2]*, Wawan Joko Pranoto[3]

[1,2,3]Program Studi Teknik Informatika, Universitas Muhammadiyah, Kalimantan Timur
Email: [1]2011102441090@umkt.ac.id, [2]*ayy758@umkt.ac.id, [3]wjp357@umkt.ac.id

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Abstrak

Stunting terus menjadi isu kesehatan masyarakat yang kritis di Indonesia, khususnya di Kota Samarinda yang mencatat prevalensi sebesar 25,3% pada tahun 2022, menjadi yang tertinggi kedua di Provinsi Kalimantan Timur. Di tengah prioritas nasional untuk riset 2020-2024, penggunaan data rumah tangga untuk klasifikasi *stunting* memperlihatkan potensi yang signifikan namun tetap menghadapi tantangan dalam menangani data berdimensi tinggi dan ketidakseimbangan kelas. Penelitian ini bertujuan untuk meningkatkan akurasi klasifikasi *stunting* dengan mengintegrasikan *ANOVA feature selection* dan *SMOTE* untuk menyeimbangkan kelas. Data yang digunakan dalam penelitian ini bersumber dari Dinas Kesehatan Kota Samarinda, meliputi 20 Puskesmas dengan 21 atribut, dan total 150.466 record. Teknik validasi yang diterapkan adalah *cross-validation* k = 10. Hasil menunjukkan peningkatan akurasi dari 98,83% menjadi 99,27% roki sebesar 0,04% setelah penerapan seleksi fitur *ANOVA*. Fitur *ZS TB/U*, *ZS BB/U*, dan *BB/U* diidentifikasi sebagai yang paling berpengaruh. Peningkatan ini menunjukkan efektivitas integrasi metode dalam mengatasi masalah *stunting* pada dataset yang kompleks dan tidak seimbang, ini dihasilkan dapat mendukung kebijakan dan intervensi kesehatan lebih lanjut di kawasan tersebut.

Kata kunci: Klasifikasi, *Random Forest*, *ANOVA*, *SMOTE*, *High Dimensional*

Improving the Accuracy of Random Forest with ANOVA and SMOTE on Stunting Data Classification

Abstract

Stunting continues to be a critical public health issue in Indonesia, particularly in Samarinda City, which recorded a prevalence of 25.3% in 2022, the second highest in East Kalimantan Province. Amidst the national research priorities for 2020-2024, the use of data mining for stunting classification shows significant potential but still faces challenges in handling high-dimensional data and class imbalance. This study aims to improve stunting classification accuracy using the Random Forest (RF) method integrated with ANOVA feature selection and SMOTE technique for class balancing. The data used in this study were sourced from the Samarinda City Health Office, encompassing 20 health centers with 21 attributes and a total of 150,466 records. The validation technique used is cross-validation k = 10. The results show an accuracy increase from 98.83% to 99.27%, an increase of 0.44%, after applying ANOVA feature selection. The features ZS TB/U, ZS BB/U, and BB/U were identified as the most influential. This increase demonstrates the effectiveness of the method integration in addressing the stunting problem in complex and imbalanced datasets and is expected to support further health policies and interventions in the area.

Keywords: *Classification, Random Forest, ANOVA, SMOTE, High Dimensional*

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Perbaikan Akurasi Random Forest Dengan ANOVA Dan SMOTE Pada Klasifikasi Data Stunting

Ari Ahmad Dhani, Taghfirul Azhima Yoga Siswa, Wawan Joko Pranoto

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Syaputra, R., et.al.: Model Optimasi SVM Dengan PSO-GA dan SMOTE Dalam Menangani High Dimensional dan Imbalance Data Banjir 273

Model Optimasi SVM Dengan PSO-GA dan SMOTE Dalam Menangani High Dimensional dan Imbalance Data Banjir

Raenald Syaputra[1], Taghfirul Azhima Yoga Siswa[2*], Wawan Joko Pranoto[3]

[1,2,3]Program Studi Teknik Informatika, Universitas Muhammadiyah Kalimantan Timur, Samarinda, Kalimantan Timur

Email: [1]2011102441040@umkt.ac.id, [2*]ay758@umkt.ac.id, [3]wjp337@umkt.ac.id

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Abstrak

Banjir merupakan salah satu bencana alam yang sering terjadi di Indonesia, termasuk di Kota Samarinda dengan 18-33 titik desa terdampak dari tahun 2018-2021. Penggunaan *machine learning* dalam mengklasifikasi bencana banjir sangat penting untuk memprediksi kejadian di masa mendatang. Beberapa penelitian sebelumnya terkait klasifikasi data banjir dalam 3 tahun terakhir telah dilakukan. Namun, dari beberapa penelitian tersebut memunculkan masalah terkait dengan *dataset high dimensional* yang dapat menurunkan performa model klasifikasi dan menyebabkan *overfitting*. Selain itu, masalah lain juga muncul dalam fail imbalance data yang menyebabkan bias terhadap kelas mayoritas dan representasi yang tidak akurat. Oleh karena itu, permasalahan dataset *high dimensional* dan *imbalance data* merupakan tantangan spesifik yang harus diatasi dalam klasifikasi data banjir Kota Samarinda. Penelitian ini bertujuan mengidentifikasi fitur-fitur yang diperoleh dari seleksi fitur *Genetic Algorithm* (GA) yang memiliki pengaruh terhadap akurasi klasifikasi data banjir Kota Samarinda menggunakan algoritma *Support Vector Machine* (SVM), serta meningkatkan akurasi klasifikasi data banjir di Kota Samarinda dengan menginplementasikan algoritma SVM yang dikombinasikan dengan metode *Synthetic Minority Oversampling Technique* (SMOTE) untuk *oversampling*, seleksi fitur dengan GA dan optimasi menggunakan *Particle Swarm Optimization* (PSO). Teknik validasi yang digunakan adalah *10-fold cross* validation dan evaluasi performa menggunakan *confusion matrix*. Data yang digunakan berasal dari BPBD (Badan Penanggulangan Bencana Daerah) dan BMKG (Badan Meteorologi, Klimatologi, dan Geofisika) Kota Samarinda pada tahun 2021-2023 terdiri dari 11 fitur dan 1.095 record. Hasil penelitian menunjukkan bahwa fitur-fitur penting yang terpilih melalui GA adalah temperatur maksimum, kecepatan angin maksimum, arah angin maksimum, arah angin terbanyak, lamanya penyinaran matahari dan kecepatan angin rata-rata. Dengan kombinasi metode SVM, SMOTE, GA dan PSO, akurasi klasifikasi data banjir mencapai 82,28%. Namun, penelitian ini juga menghadapi tantangan seperti keterbatasan hasil dengan penelitian lain terkait penggunaan SMOTE dan variasi hasil akibat karakteristik dataset serta metode pembagian data yang berbeda. Hasil penelitian ini dapat digunakan oleh pemerintah daerah dan badan penanggulangan bencana daerah Kota Samarinda untuk memprediksi kejadian banjir dengan lebih akurat, serta merancang solusi pencegahan yang lebih efektif. Penerapan hasil penelitian ini dapat meningkatkan efektivitas dalam mitigasi bencana banjir Kota Samarinda.

Kata Kunci: Klasifikasi Banjir, SVM, SMOTE, GA, PSO

SVM Optimization Model with PSO-GA and SMOTE in Handling High Dimensional and Imbalanced Flood Data

Abstract

Flooding is one of the natural disasters that frequently occurs in Indonesia, including in Samarinda City, with 18-33 affected village points from 2018-2021. The use of machine learning in classifying flood disasters is crucial for predicting future events. Several studies related to flood data classification in the past three years have been conducted. However, these studies have highlighted issues related to high-dimensional datasets that can decrease the performance of classification models and cause overfitting. Additionally, problems related to data imbalance can lead to bias towards the majority class and inaccurate representation. Therefore, the issues of high-dimensional datasets and data imbalance are specific challenges that must be addressed in the classification of flood data in Samarinda City. This study aims to identify important features selected by GA that influence the accuracy of flood data classification in Samarinda City using the SVM algorithm, as well as to improve the

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Model Optimasi SVM Dengan PSO-GA dan SMOTE Dalam Menangani High Dimensional dan Imbalance Data Banjir

Raenald Syaputra, Taghfirul Azhima Yoga Siswa, Wawan Joko Pranoto

273-282

Abstract views: 0, PDF downloads: 0

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Hiu, N., et.al.: Redesigning User Interface of DatascripMall Mobile Apps Using User Centered Design Method 283

Redesigning User Interface of Datascripmall Mobile Apps Using User Centered Design Method

Nicholas Hiu[1*], Yana Erlyana[2]

[1,2]Visual Communication Design Department, Universitas Bunda Mulia, DKI Jakarta, Indonesia
Email: [1*]nicholashiu8@gmail.com, [2]yerlyana@bundamulia.ac.id

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Abstract

The rapid growth of the e-commerce industry, driven by technological advancements and increased internet access, has intensified competition for attracting and retaining customers. In Indonesia, the shift from desktop computers to smartphones has made mobile commerce (m-commerce) increasingly dominant. PT Datascrip, a leading Indonesian company, launched Datascripmall, a B2C and B2B e-commerce marketplace, in August 2020. Despite initial success, a decline in mobile app users indicated a need for an improved user interface (UI) and user experience (UX). This research underscores the urgent need to redesign the Datascripmall mobile app's UI using the User-Centered Design (UCD) methodology, focusing on user needs and preferences. The study employed questionnaires to identify the need for clearer explanations and a more consistent interface. Adding smart features and shortcuts for experienced users was found to boost efficiency and satisfaction. Interviews with the Datascripmall manager confirmed the necessity of a UI/UX redesign to enhance mobile app user numbers. The UCD process involved understanding the context of use, specifying user requirements, designing solutions, and evaluating them against those requirements. The study highlights the benefits of a redesigned UI/UX, enhancing the user experience with greater intuitiveness and engagement. Both qualitative and quantitative data support recommendations for creating a user-friendly interface and increasing overall user engagement. The result of this redesign is a prototype framework developed using Figma, which encompasses page structure, features, and content, providing a comprehensive view of the Datascripmall application UI design. This redesign aims to enhance user satisfaction and increase user numbers, leading to a more comfortable and engaging shopping experience.

Keywords: E-Commerce, M-Commerce, User Interface, User Experience, User Centered Design

I. INTRODUCTION

The rapid expansion of e-commerce, driven by technological advancements and increased internet accessibility, has intensified competition to attract and retain customers [1]. Digital marketing plays a pivotal role by leveraging technology and online platforms to promote products, engage customers, and foster strong relationships. Modern smartphones, being cost-effective, flexible, and widely accessible, significantly influence user behavior [2]. This trend is especially pronounced in Indonesia, where a notable shift from desktops to smartphones underscores the evolution of connected media [3].

The global surge in mobile phone users has propelled the wireless mobile industry, making it the fastest-growing segment in telecommunications, with substantial implications for mobile commerce (m-commerce) [4]. M-commerce facilitates business transactions via mobile devices, enhancing user accessibility by enabling transactions without geographical constraints [5]. Despite its promising potential, challenges persist in ensuring a seamless user experience [6].

PT Datascrip, established in 1993, has grown into a leading information firm, launching Datascripmall, a B2C and B2B e-commerce platform, in August 2020. Despite initial success, declining mobile app usage and customer feedback underscore the necessity for improved user interface (UI) and user experience (UX) [7]. High-quality UI/UX design is crucial for enhancing user satisfaction and customer retention [8].

Observational methods identified significant usability issues within the Datascripmall mobile app [9]. Users frequently encountered navigation complexities that hindered browsing and transactions. These challenges were exacerbated by inconsistent visual elements and a lack of intuitive design features, leading to user frustration and decreased engagement.

A user questionnaire among Datascripmall customers revealed widespread dissatisfaction with the current UI/UX [9]. Key issues included difficulty finding products, cumbersome checkout processes, and the absence of

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Redesigning User Interface of Datascripmall Mobile Apps Using User Centered Design Method

Nicholas Hiu, Yana Erlyana

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Azzumzumi, A.D., et.al.: Klasifikasi Penyakit Paru-Paru Berdasarkan Peningkatan Kualitas Kontras dan EfficientNet Menggunakan Gambar X-Ray 293

Klasifikasi Penyakit Paru-Paru Berdasarkan Peningkatan Kualitas Kontras dan EfficientNet Menggunakan Gambar X-Ray

Asfa Dhevi Azzumzumi[1*], Muhammad Hanafi[1], Windha Mega Pradnya Dhuhita[1]

[1]Program Studi Informatika, Universitas Amikom Yogyakarta, DI Yogyakarta
Email: [1*]asfa.as@students.amikom.ac.id, [1]hanafi@amikom.ac.id, [1]windha@amikom.ac.id

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Abstrak

COVID-19 dan penyakit paru-paru telah menjadi faktor utama penyebab kematian manusia di seluruh dunia. Kematian pasien dipengaruhi oleh keterlambatan deteksi dini. Sebagian besar profesional medis menggunakan gambar untuk mengidentifikasi kondisi paru-paru. Namun, para ahli yang dapat me-diagnosis dengan gambar sangat terbatas. Diagnosis gambar meradiagnosa menggunakan pengibatan manusia secara konvensional. Klasifikasi penyakit paru-paru sangat bervariasi. Masalah yang disebabkan di atas menunjukkan bahwa deteksi penyakit paru-paru dengan *Artificial Intelligence* (AI) yang efektif telah ditangkan. Namun, sebagian besar hasil penyakit paru-paru telah didiagnosis. Ilagi pasien, masalah ini menjadi masalah besar. Bertujuan untuk meningkatkan klasifikasi penyakit paru-paru dengan deteksi kesalahan yang tinggi, kami menggunakan beberapa teknik *pre-processing* gambar dan menerapkan model pembelajaran mendalam dalam *EfficientNet*. Model *Pre-processing* termasuk augmentasi, peningkatan *white balance*, dan peningkatan kontras. Berdasarkan penelitian sebelumnya, masyoritas proses analisa gambar medis mengalami kualitas gambar yang rendah. Berdasarkan laporan eksperimen, model yang kami usulkan memiliki hasil yang signifikan dalam mengatangi kesalahan deteksi pada klasifikasi penyakit paru-paru. Dimana hasil F1 score-nya 0,97, recallnya 0,98, presisinya 0,96, dan akurasinya 0,97. Kami menpertimbangkan untuk menggunakan model yang kami usulkan dalam klasifikasi *multi-class*. Kami mengevaluasi model yang kami usulkan menggunakan *evaluation metric* dan *AUC Curve*.

Kata Kunci: Penyakit Paru-paru, *CLAHE, EfficientNet, Covid-19, White Balance*

Advanced Lung Diseases Classification Based on Contrast Enhancement and EfficientNet Using X-Ray Images

Abstract

COVID-19 and other lung illnesses have become a prominent factor because of the death toll of humans worldwide. The patient's death was being affected by late, early detection. The majority of medical professionals use visual material to identify lung conditions. Experts in medical imaging are scarce, nevertheless. When using conventional human eyesight, image diagnostics is used for diagnosis. The classification of lung disorders is highly variable. The aforementioned issue indicates that effective artificial intelligence (AI) lung disease detection has been established. Nonetheless, a significant majority of lung disease results are misdiagnosed. For patients, this issue becomes a major issue. In order to address the issue of high error detection when classifying lung disorders, we utilized multiple image pre-processing techniques and implemented a deep learning model within EfficientNet. The pre-processing model, which includes contrast, white balance, and augmentation. Previous studies have shown that the majority of medical imaging procedures result in images with poor quality. The experiment report indicates that our suggested model greatly reduced the number of false positives for lung illness classification. The results showed that the F1-score was 0.97, recall was 0.98, precision was 0.96, and accuracy was 0.97. We take into account using our suggested methodology for multi-class categorization. We evaluated our proposed model using evaluation metric and AUC Curve.

Keywords: *Lung Disease, CLAHE, EfficientNet, Covid-19, White Balance*

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Klasifikasi Penyakit Paru-Paru Berdasarkan Peningkatan Kualitas Kontras dan EfficientNet Menggunakan Gambar X-Ray

Asfa Dhevi Azzumzumi, Muhammad Hanafi, Windha Mega Pradnya Dhuhita

293-300

Abstract views: 0, PDF downloads: 0

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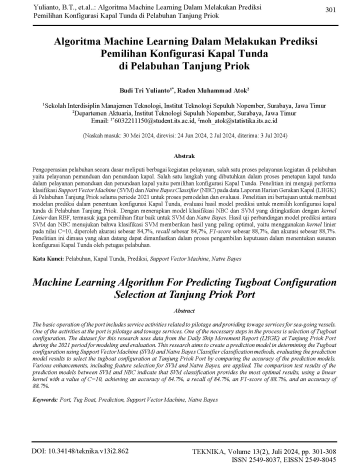

Yulianto, B.T., et.al.: Algoritma Machine Learning Dalam Melakukan Prediksi Pemilihan Konfigurasi Kapal Tunda di Pelabuhan Tanjung Priok 301

Algoritma Machine Learning Dalam Melakukan Prediksi Pemilihan Konfigurasi Kapal Tunda di Pelabuhan Tanjung Priok

Budi Tri Yulianto[1*], Raden Muhammad Atok[2]

[1]Sekolah Interdisiplin Manajemen Teknologi, Institut Teknologi Sepuluh Nopember, Surabaya, Jawa Timur
[2]Departemen Aktuaria, Institut Teknologi Sepuluh Nopember, Surabaya, Jawa Timur
Email: [1*]6032211150@student.its.ac.id, [2]moh_atok@statistika.its.ac.id

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Abstrak

Pengoperasian pelabuhan secara dasar meliputi berbagai kegiatan pelayanan, salah satu proses pelayanan kegiatan di pelabuhan yaitu pelayanan penundaan dan penundaan kapal. Salah satu langkah yang dilbutuhkan dalam proses penetapan kapal tunda dalam pelayanan penundaan dan penundaan kapal yaitu pemilihan konfigurasi Kapal Tunda. Penelitian ini mengaji performa klasifikasi *Support Vector Machine* (SVM) dan *Naive Bayes Classifier* (NBC) pada data Laporan Harian Gerakan Kapal (LHGK) di Pelabuhan Tanjung Priok selama periode 2021 untuk proses pemodelan dan evaluasi. Penelitian ini bertujuan untuk membuat modelan prediksi dalam penentuan konfigurasi Kapal Tunda, evaluasi hasil model prediksi untuk memilih konfigurasi kapal tunda di Pelabuhan Tanjung Priok. Dengan menerapkan model klasifikasi NBC dan SVM yang dilinglakkan dengan *kernel Linier* dan RBF, termasuk juga pemilihan fitur baik untuk SVM dan *Naive Bayes*. Hasil uji perbandingan model prediksi antara SVM dan NBC menujukan bahwa klasifikasi SVM memberikan hasil yang paling optimal, yaitu menggunakan *kernel* linier pada nilai C=10, dipersoleh akurasi sebesar 94,7%, *recall* sebesar 94,7%, *F1-score* sebesar 88,7%, dan akurasi sebesar 88,7%. Penelitian ini dimana yang akan datang dapat ditambahkan dalam proses pengambilan keputusan dalam menentukan susunan konfigurasi Kapal Tunda oleh petugas pelabuhan.

Kata Kunci: Pelabuhan, Kapal Tunda, Prediksi, *Support Vector Machine, Naive Bayes*

Machine Learning Algorithm For Predicting Tugboat Configuration Selection at Tanjung Priok Port

Abstract

The basic operation of the port includes service activities related to pilotage and providing towage services for sea-going vessels. One of the activities at the port is pilotage and towage services. One of the necessary steps in the process is selection of Tugboat configuration. The dataset for this research was data from the Daily Ship Movement Report (LHGK) at Tanjung Priok Port during the 2021 period for modeling and evaluation. This research aims to create a prediction model in determining the Tugboat configuration using Support Vector Machine (SVM) and Naive Bayes Classifier classification methods, evaluating the prediction model results to select the tugboat configuration at Tanjung Priok Port by comparing the accuracy of the prediction models. Various enhancements, including feature selection for SVM and Naive Bayes, are applied. The comparison test results of the prediction models between SVM and NBC indicate that SVM classification provides the most optimal results, using a linear kernel with a value of C=10, achieving an accuracy of 94.7%, a recall of 94.7%, an F1-score of 88.7%, and an accuracy of 88.7%.

Keywords: *Port, Tug Boat, Prediction, Support Vector Machine, Naive Bayes*

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Algoritma Machine Learning Dalam Melakukan Prediksi Pemilihan Konfigurasi Kapal Tunda di Pelabuhan Tanjung Priok

Budi Tri Yulianto, Raden Muhammad Atok

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PDF

Liliana, et.al.: Exploration of Software as a Service (SaaS) as a Project Management Tools 309

Exploration of Software as a Service (SaaS) as a Project Management Tools

Liliana[a1], Daniel Soesanto[2], Bambang Prijambodo[3], Jasti Ohanna[4]

[1]Information System Department, Faculty of Engineering, Universitas Surabaya, Surabaya, East Java, Indonesia
Email: [a1]lilis@staff.ubaya.ac.id

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Abstract

Companies increasingly adopt software as a Service (SaaS) as a project management tool. SaaS offers greater flexibility, availability, and accessibility than traditional information system software. In this study, SaaS is used as the basis for creating project management applications, including recording work plans, the progress of each user's performance, and meeting documentation. The stages of the literature study are carried out by looking at journals and books. The trial was carried out using black-box testing. Verification trials are carried out by involving a team of programmers to see the flow of the system algorithm. Validation trials are carried out by asking various users involved in project implementation to try the system and asking users to fill out questionnaires related to the ease of use of project management features. The two stages of the trial showed good results, as evidenced by 77.8% of users stating that the SaaS concept really helped them with the flexibility of system installation with a short waiting time. Meanwhile, 74.6% of users stated that the features provided and their configuration could help them in project management. The research results show that SaaS has great potential to help companies to manage projects effectively. In future research, various factors in different project management can be explored deeper, so that SaaS becomes more configurable and used by a wider variety of users.

Keywords: *SaaS, Project Management, Information Technology, Multi-Tenancy, Project Management Tools.*

I. INTRODUCTION

Organizations face a digital revolution that presents opportunities and threats [1]. One way to defend yourself in business competition is to digitize the system [2], [3]. These technical solutions can be developed in-house or purchased from companies specializing in the required area. Along with technological developments, another solution that can be done is to adopt software as a Service (SaaS) [4]. SaaS provides software that is hosted on servers and accessed via the Internet for small and large enterprises [5], [6]. This offers greater flexibility, accessibility, and financing than traditional project management software [7].

Project management is essential in business development, especially for coordinating resources, time, and costs to achieve the desired project objectives [8]. Issues in project management have ongoing challenges [9]. Various tools have been developed to overcome project management problems, such as work delays, over-financing, documentation, and other monitoring processes [10]. Financing and mastery of technology in developing these tools is one of the problems faced by various companies [11], tiny companies with limited budgets [12].

Several other studies have also been developed related to project management in various aspects of the industry. In 2017, there were at least six studies related to project management. Jesse et. al. is one of the researchers from 2017 and found that project management must be equipped with proper control, both from the internal project team and externally [13]. The external party referred to in Jesse et.al's research al., related to policies and regulations issued by the government. This internal and external control is to ensure the project can run well. Idelanse et. al. in the same year also conducted research on the adoption of project management in the health sector [14]. This study intends to find out the responses, risks, and even injection that may occur when project management is implemented in the health sector. The results obtained were unexpected, because it turned out that all parties in the health sector that were studied received well the project management. But was implemented, because they felt it could really help work in the health sector. Furthermore, research conducted by Marco et. al. perfecting what Jesse has done, with the addition that project management can be successful if it pays attention to four factors, namely innovation from business models, stakeholder management, economic competitive advantage, as well as government

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Exploration of Software as a Service (SaaS) as a Project Management Tools

Liliana, Daniel Soesanto, Bambang Prijambodo, Jasti Ohanna

309-317

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318 Zebua, A.D.C., et.al.: Classification of Lung Cancer with Convolutional Neural Network Method Using ResNet Architecture

Classification of Lung Cancer with Convolutional Neural Network Method Using ResNet Architecture

Aldrich Deril Christian Zebua[a1], Dedy Yehezkiel Marbun[2], Felix Thedora[3], Mawaddah Harahap[4]

[1,2,3,4]Informatics Engineering Department, Universitas Prima Indonesia, Medan, North Sumatra, Indonesia
Email: [a1]aldrichderilchristianzebua@gmail.com, [2]dedymarbun573@gmail.com, [3]felixthedora16@gmail.com, [4]mawaddah@unprimdn.ac.id

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Abstrak

Lung cancer has become one of the most frightening specters in the world of health, leading many people to death each year. Therefore, the classification of lung cancer types is very important to determine the appropriate treatment steps. Considering that lung cancer treatment in the early stages is far more effective and efficient, accurate classification is the key to improving survival rates. This research focuses on the classification of three common lung cancer types: Adenocarcinoma, Large Cell Carcinoma, and Squamous Cell Carcinoma. To achieve optimal results, this study utilizes the ResNet architecture, a deep neural network model that has demonstrated its capabilities in various fields. Before being used on the model, the dataset containing lung X-ray images of patients undergoes preprocessing. At this stage, each image is resized to 256x256 pixels to ensure uniformity and compatibility with the model. Furthermore, this research trains various ResNet models, ranging from ResNet50, ResNet101, to ResNet152, which is the model with the most parameters. By comparing the performance of each model, this study finds that all trained ResNet models are capable of producing good accuracy in classifying lung cancer types. Among these models, ResNet152 demonstrates the most superior performance with an accuracy of 89%. This result suggests that the ResNet architecture has great potential to be used as an aid in classifying lung cancer types with a high level of accuracy. This research makes a significant contribution to the effort to improve the diagnosis and treatment of lung cancer, paving the way for a brighter future for lung cancer patients.

Kata Kunci: Computer Vision, Convolutional Neural Network, ResNet, Image Classification, Lung Cancer

I. INTRODUCTION

According to WHO, lung cancer is one of the diseases with the highest mortality rates each year [1]. Lung cancer often does not show early symptoms, hence the need for early diagnosis and treatment [2]. Regular medical checkups and the use of cutting-edge medical technology are vital in improving the chances of survival and quality of life for patients. Important steps such as raising awareness of risk factors, providing effective treatment, and developing more advanced diagnostic technologies are priorities in addressing the major challenges posed by lung cancer.

Several studies on lung cancer detection in CT scan images using the CNN method, one of which is Ozkan et al. [3] which discusses the classification of lung and colon cancer using Convolutional Neural Network by analyzing the condition and function of organ tissue. Pujar et. al. [4] detected lung cancer nodules in CT scan images using Mask R-CNN. Most existing studies simply categorize tumors as benign or malignant [5], [6], [7]. This study overcomes these limitations by exploiting the full potential of the ResNet architecture within a Convolutional Neural Network (CNN) framework. This study used convolutional neural networks (CNN) to classify three types of lung cancer: adenocarcinoma, large cell carcinoma, and squamous cell carcinoma. Accurate classification of these specific cancers has the potential to significantly improve lung cancer management and patient outcomes. By achieving accurate classification of these specific cancers, this research has the potential to significantly improve lung cancer management and patient outcomes.

The utilization of computer vision in image detection has become increasingly popular nowadays [5]. Convolutional Neural Network (CNN) has become one of the computer vision methods that can be used to detect and recognize objects in an image [6]. CNN has proven to be effective in detecting lung diseases through CT Scan images [7], [8], [9], [10]. ResNet, including ResNet50, ResNet 101, and ResNet152, is one of the well-known CNN architectures that excel in CT Scan detection due to its ability to train Deep Neural Network (DNN) deeply and address the vanishing

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Classification of Lung Cancer with Convolutional Neural Network Method Using ResNet Architecture

Aldrich Deril Christian Zebua, Dedy Yehezkiel Marbun, Felix Thedora, Mawaddah Harahap

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Comparison of Extreme Learning Machine Methods and Support Vector Regression for Predicting Bank Share Prices in Indonesia

Williem Kevin Setiadi[1], Vincentius Riandaru Prasetyo[2*], Fitri Dwi Kartikasari[3]

[1,2,3]Informatics Department, Universitas Surabaya, Surabaya, East Java, Indonesia
Email: [1]s160420056@student.ubaya.ac.id, [2*]vincent@staff.ubaya.ac.id, [3]fitri_dk@staff.ubaya.ac.id

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Abstract

Investing is the practice of postponing current consumption to obtain more significant value in the future. One profitable form of investment is stock investment, where investors buy company shares to benefit from appreciation in share value or dividend payments. Before investing in shares, investors need to pay attention to movements in the Composite Stock Price Index (IHSG), which reflects the performance of the Indonesian stock market. The Indonesian Stock Exchange (BEI) recorded around 740 companies listed in 2021. The BEI also compiled the LQ45 list of 45 stocks with the largest market capitalization, including the four largest banks in Indonesia. However, investing in bank shares only sometimes produces profits due to share price fluctuations. Stock price analysis and price movement predictions are important steps before investing. Extreme Learning Machine (ELM) and Support Vector Regression (SVR) methods are techniques used to predict time series data. This research compares the performance of the two methods in predicting stock prices of the big 4 Indonesian banks. The dataset used in this research comes from the Yahoo Finance site, which was taken since the market crash recovery period due to the Covid-19 pandemic. Based on the evaluation conducted, both the ELM and SVR methods are effective for predicting the share prices of the big four Indonesian banks. The average MAPE for the ELM method is 8.5% and SVR is 2.64%. However, when considering computing time, the ELM method is more efficient with an average computing time of 0.006 seconds, than the SVR method with an average computing time of 0.694 seconds.

Keywords: Extreme Learning Machine, Support Vector Regression, Stocks Prediction, Banking Indonesia, MAPE.

I. INTRODUCTION

Investment is an activity carried out to postpone current consumption to generate higher value in the future. Investment is an activity carried out to postpone current consumption, with the hope that the investment value in the future will be higher than the current value. Investment also involves taking risks for better results or profits [1]. There are various kinds of investments; one of the most profitable is stock investment. Stock investment is buying company shares as part of ownership to make a profit. This involves buying and selling shares in the capital markets to profit from appreciation in share value or dividend payments. Stock investment is studied as a strategy to gain wealth gradually [2].

Before buying or selling shares, investors or traders must pay attention to movements in the Composite Stock Price Index (IHSG). IHSG is the leading stock market indicator on the Indonesia Stock Exchange (BEI). IHSG reflects the average performance of share prices from various industrial sectors listed on the IDX. IHSG is often used as a benchmark to measure the performance of the Indonesian stock market as a whole. Changes in the IHSG value usually reflect market sentiment and economic and political factors that influence stock price movements in Indonesia [3]. In 2021, BEI noted that there will be around 740 companies registered and listed on the stock exchange. However, this figure may change from time to time due to the addition or reduction of companies conducting an initial public offering (IPO) or being removed from the trading list for various reasons, including mergers, acquisitions, or bankruptcy [4].

IDX has also published and grouped a list of shares with high liquidity and market capitalization into LQ45 [5]. LQ45 is a list of 45 stocks that have the largest market capitalization, including the big 4 Indonesian banks, namely BCA (BBCA), BRI (BBRI), Mandiri (BMRI), and BNI (BBNI) [6]. Investors who want to invest in banking issuers also cannot be careless in purchasing shares without carrying out an analysis because of the high level of liquidity and fluctuations in the share prices of the Big Four banks. Even though investing in Big Four banking with a large market capitalization does not mean that you will always make a profit, there is the possibility of a loss due to needing to be corrected in taking a position to buy

shares, which is a resistance area. Resistance is an area where the price has reached that price several times but has not been penetrated. So, stock price movements will experience a decline over the next few days [7].

Based on these problems, analyzing the share price movements within a certain period is necessary depending on how long the investor will invest. Time series data can be used to model patterns in stock prices so that they can be used to predict stock price movements. Methods that can be used to make good predictions on time series data are Extreme Learning Machine (ELM) and Support Vector Regression (SVR) [8] [9]. Therefore, this research aims to compare the two methods in predicting share prices for Indonesia's big four banks. Comparisons are not only made on the accuracy of the resulting prediction model, but also the computing time required to produce the prediction output.

II. RELATED WORKS

Research comparing several methods for predicting stock prices has been carried out before. Research conducted by Fitri and Riana [10] compared linear regression, random forest regression, and multilayer perceptron methods, where the data used was historical stock prices by taking data samples on three issuers from the Indonesian capital market. Testing was carried out with two data models: partitioning, validated with cross-validation, and data modeling with cross-validation without partitioning. In this research, the linear regression prediction model was able to produce relatively low error prediction values with the lowest RMSE value of 0.010 and the highest RMSE of 0.012, the lowest MAPE of 1.2%, and the highest of 1.9%, the lowest MAE of 0.006 and the highest of 0.009, and The highest R2 value was 99.8%, and the lowest was 99.6%.

Another research by Ramadhan and Pamuji [11] compared linear regression and neural network methods to predict the LQ45 share price of PT Bank Mandiri Sekuritas (BMRI). By using four attributes, namely open, high, and low values as predictors and close as a class, this research focuses on determining accuracy values, namely Root Mean Squared Error (RMSE), by optimizing parameter values. Based on the results of the tests, the Neural Network method has a lower error rate with an RMSE value of 0.034 compared to the Linear Regression method with an RMSE value of 0.052.

In contrast to previous research, Laksono et al. [12] compared linear and polynomial regression methods to predict BCA Bank share prices. The data used is 1252 BCA Bank share data for five years. The MAPE value calculation is used for prediction testing. This research shows that both methods are good criteria because the MAPE value is less than 10%, and the polynomial regression method gets a better score than the linear regression method. The test results for the Linear Regression method get a MAPE value = 6.55%, while the Polynomial Regression method gets a MAPE value = 6.54%.

Research on BMRI share price predictions was also carried out by Pratama and Banowosari [13]. To determine the best method, this research compared the Extreme Gradient Boosting (XGBOOST) and Long Short-Term Memory (LSTM) methods. After testing, the results obtained from the XGBoost method were obtained, namely a Coefficient of Determination (R2) value of 89.09%, which indicated that the prediction results were good and the Mean Absolute Percentage Error (MAPE) was 3.21%. Meanwhile, the LSTM method's R2 value is 98.44%, and MAPE is 1.77%, indicating a low error percentage.

Different from the research discussed previously, this research compares the ELM and SVR methods in predicting share prices for the big 4 Indonesian banks. The stock price dataset was taken from the Yahoo Finance site. This site was chosen because several researchers have used it in their research related to stock predictions [14]. Apart from that, the data displayed on Yahoo Finance is also real data that describes current stock movements [15]. The evaluation was carried out by comparing the Mean Absolute Percentage Error (MAPE) values resulting from the two prediction models of the ELM and SVR methods.

III. RESEARCH METHODS

This research is divided into several stages, including dataset collection, preprocessing, training process, evaluation. The flow of these stages can be seen in Figure 1.

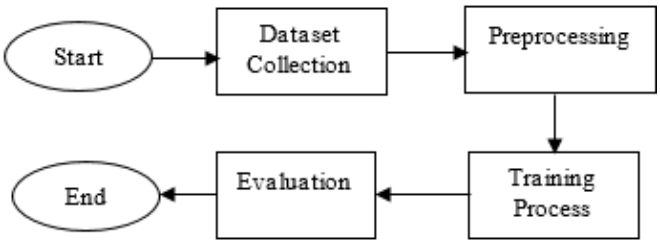

Figure 1. The Flow of Research Stages

A. Dataset Collection

This research will use the Yahoo Finance site's stock price time series dataset. Data was collected starting March 24 2024, on that date the stock index declined sharply due to the market crash, but then rose fluctuatingly [16]. A market crash is a condition where the stock market experiences a significant price decline quickly due to particular sentiments, in this case, the lockdown due to COVID-19 [17].

In this research, the features used are open, high, low, and close. Each column has varying values, and to get a more accurate prediction model, a new feature, namely, an average, is created. The average feature is the average value of the open, high, low, and close prices. Other features such as date, adjusted close, and volume are not used to form the prediction model. This is because these features do not influence the process of predicting stock prices in the short term [18]. The number of datasets in this research is 868, which comes from the Yahoo Finance site. The dataset that has been collected is divided into two parts, namely training data and testing data. The division of the dataset used is 80:20, meaning 80% of the data will be training data, while 20% will be used as testing data.

B. Preprocessing

In this preprocessing stage, missing values are checked to see whether the dataset has empty data. If there is empty data, the data column will be filled with the mean value from the previous and the following columns. The following preprocessing is data normalization to equalize the units in the data so that the range of values in the data is not too wide to provide a balance of values between one another using the Min-Max Scaling method [19].

Min-Max Scaling will change the range of values from 0 to 1. Min-max scaling calculates new values using the maximum and minimum values of the data so that the range of values formed from the calculation is more relevant to the original data than other normalization methods [19]. The calculation of Min-Max Scaling is shown in equation (1), where x is the sample value, min(x) is the minimum value of the set of values x, max(x) is the maximum value of the set of values x, and x' is the scaled value [20].

$$x' = \frac{x - \min(x)}{\max(x) - \min(x)} \quad (1)$$

C. ELM Training Process

After preprocessing, the next stage is to conduct the training process to build a prediction model from the ELM method. ELM is a method of feedforward neural networks that only has one hidden layer, known as single hidden layer feedforward neural networks (SLFNs). ELM's learning speed is often faster than other feedforward network algorithms, such as back-propagation, and it will perform better. The weighting on the input and hidden layers will be initialized randomly so that ELM does not require repeated optimization, such as back-propagation [21].

Neurons in ELM's input, hidden, and output layers are connected. Connecting the input layer with the hidden layer uses a weight vector w, whose values are taken randomly. The bias value is also determined randomly. Randomly determined weighting of w values and bias can increase the model learning speed and overcome unstable prediction values. After that, calculations are done to get the vector in the hidden layer using the activation function, as seen in equation (2) [22].

$$g(xi) = \frac{1}{1 + e^{(-(x_i * w^T + b))}} \quad (2)$$

Where *g(xi)* is the value of the hidden layer in row *i*, *e* is the Euler number, *x* is the data value, w^T is the transposed weight value, and *b* is the bias value determined randomly. After obtaining the value from the hidden layer, calculations are carried out to obtain the output weight value using equation (3) [22].

$$\beta = (g^T * g)^{-1} * g^T * y \quad (3)$$

Where β is the output weight value, g is the hidden layer value, g^T is the transposed hidden layer value, and *y* is the target matrix value (expected output). The output layer calculation in the ELM model results from multiplying the vector produced in the hidden layer with the input data and the weight vector in the hidden layer with the output weight, as shown in equation (4) [22].

$$f(x) = g(x) * \beta \quad (4)$$

Where *f(*x) is the value in the output layer, *g(x)* is the value in the hidden layer, and β is the output weight value. ELM will train the model until it gets a bias weight value output with the minimum error value [22].

D. SVR Training Process

Apart from the ELM method, the training process to build a prediction model will also use the SVR method. SVR is an application of a Support Vector Machine to solve regression problems. In SVR, the output is a continuous number, and the aim is to obtain a function f(x) as a hyperplane (dividing line) that fits the data and allows for some deviations from a predicted value. The equation used to determine the hyperplane can be seen in equation (5) [23].

$$y = w * x + b \quad (5)$$

Where *y* is the resulting hyperplane value, *w* is the weight value, *x* is the input value, and *b* is the intersection point value when x = 0 [23]. SVR has several hyperparameters that must be determined to improve its performance, such as C, Kernel, Epsilon, and Gamma. C limits the error level from exceeding a predetermined tolerance value. The C value must be positive; by default, it is 1.0. The kernel will perform non-linear transformations on the input data so that the input data has higher dimensions that make it easier to separate. Commonly used kernels are rbf, linear, polynomial, and sigmoid [24]. This research will use the Radial Basis Function (RBF) as the kernel function, with the equation shown by equation (6) [25].

$$\exp\left(-\gamma \left|\left|x - x'\right|\right|^2\right) \quad (6)$$

Where *x* is the actual data value, *x'* is the predicted data value, and γ is the value obtained from the gamma parameter. The RBF kernel is used because stock price data is a type of non-linear data whose price movements tend to be irregular. The RBF kernel is very suitable for handling non-linear problems in data, so it is suitable for the data used and is easier to implement [25]. Next, the predicted output value of SVR is calculated using equation (7) [23].

$$f(x) = \sum_{i=1}^{n} a_i K(x_i, x) + b \quad (7)$$

Where *f(x)* is the prediction output value, *n* is the amount of data, and α is the Lagrange coefficient value. Meanwhile, $K(x_i,x)$ is a kernel function that measures the closeness between x_i and *x*, and *b* is the bias value [23].

E. Evaluation

After the training process, the next stage is to evaluate the prediction model resulting from the ELM and SVR methods. In this research, evaluation was carried out by calculating the

Mean Absolute Percentage Error (MAPE) value. MAPE is the average absolute percentage error measures the magnitude of the average error produced by a prediction model. The MAPE calculation is obtained from the average absolute differential of the predicted value with the actual value. It is displayed as a percentage of the actual value, as shown in equation (8) [26].

$$MAPE = \frac{1}{n}\sum_{i=1}^{n}\left|\frac{y'_i - y_i}{y_i} * 100\right| \quad (8)$$

Where y'_i is the predicted value of the ith data, y_i is the actual value of the i-th data, and n is the amount of data tested. A small MAPE value indicates better prediction accuracy by the model, indicating a minimal error rate [26].

IV. RESULTS AND DISCUSSIONS

Based on the dataset collection process, the number of datasets in this research is 868, which comes from the Yahoo Finance site. The dataset that has been collected is divided into two parts, namely training data and test data. The division of the dataset used is 80:20, meaning 80% of the data will be training data, while 20% will be used as testing data. The prediction model is formed using the training data and the MAPE value calculation is carried out using the testing data.

Based on advice from an investment expert certified by *Badan Pengawas Perdagangan Berjangka Komoditi* (BAPPEBTI), the system is developed to predict a maximum of 10 days ahead of the price of a stock. The aim is to make the stock price predictions produced more accurate for a short period. It will be reflected that the stock prices are in a strengthening or weakening trend in recent years.

In training the prediction model using the ELM method, the hyperparameter values for the number of hidden neurons were experimented with, ranging from 1 to 20. Then, the number of hidden neurons will be selected based on the best evaluation value for each hidden neuron value. Figure 2 shows a graph of MAPE values for evaluation of prediction models using the ELM method for shares in BCA, BRI, Mandiri, and BNI banks.

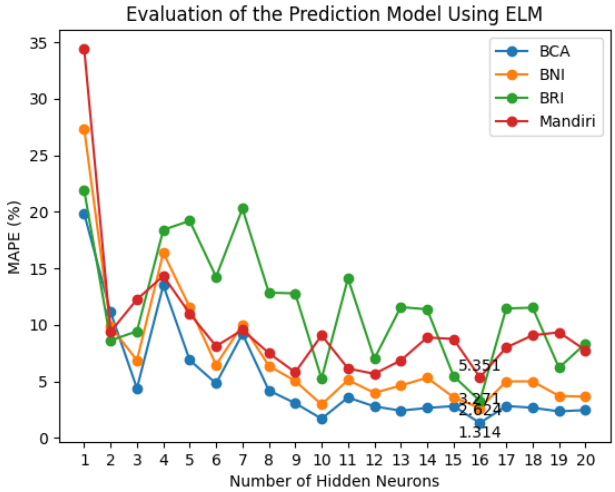

Figure 2. Evaluation of the Prediction Model Using ELM

Based on the evaluation results, the ELM method's most optimal number of hidden neurons is 16. This is because the number of neurons has the smallest MAPE value for BCA, BRI, Mandiri, and BNI bank shares. Of the four banks, the BCA bank share prediction model has the smallest MAPE value, namely 1.314%, while the highest MAPE value occurs in the Mandiri bank share prediction model, at 5.351%, as shown in Table 1. Based on Table 1, it can be seen that the best average MAPE is in the BCA stock prediction model with a MAPE value of 5.221%.

Table 1. MAPE for ELM Prediction Model for Each Bank

Bank Name	MAPE (%)		
	Min	Max	Avg
BCA	1.314%	19.839%	5.221%
BNI	2.624%	27.345%	7.268%
BRI	3.271%	21.888%	11.656%
Mandiri	5.351%	34.417%	9.855%

The following prediction model training process is carried out using the SVR method. To determine the hyperparameter values gamma and epsilon, experiments were carried out using a combination of gamma values 0.1, 0.01, 0.001, and 0.0001, while the epsilon values used were 0.1, 0.01, 0.001, and 0.0001. Epsilon represents the margin width tolerance value around the hyperplane line and the value must be non-negative, by default 0.1. While Gamma aims to control how much curvature is desired in decision limit making. Determination of gamma values is only required when using RBF kernel functions. It will affect the partitioning outcome in the feature space. Too large gamma value will result in over fitting while too small value will lead to under fitting [27]. Table 2 shows the evaluation results of combining gamma and epsilon values for implementing the SVR method for predicting BCA, BRI, Mandiri, and BNI bank shares.

Table 2. Evaluation of the Prediction Model Using SVR

Bank Name	Gamma	Epsilon	MAPE (%)
BCA	0.1	0.1	3.894
		0.01	2.061
		0.001	1.479
		0.0001	1.484
	0.01	0.1	4.386
		0.01	0.619
		0.001	0.595
		0.0001	0.595
	0.001	0.1	1.753
		0.01	**0.569**
		0.001	0.575
		0.0001	0.584
	0.0001	0.1	1.509
		0.01	0.796
		0.001	0.789
		0.0001	0.789

Bank Name	Gamma	Epsilon	MAPE (%)
BNI	0.1	0.1	8.091
		0.01	3.244
		0.001	2.870
		0.0001	2.636
	0.01	0.1	2.476
		0.01	1.086
		0.001	1.028
		0.0001	0.987
	0.001	0.1	1.980
		0.01	0.833
		0.001	0.813
		0.0001	**0.800**
	0.0001	0.1	2.515
		0.01	1.231
		0.001	1.191
		0.0001	1.187
BRI	0.1	0.1	9.488
		0.01	2.120
		0.001	2.234
		0.0001	2.190
	0.01	0.1	5.234
		0.01	0.828
		0.001	0.889
		0.0001	0.903
	0.001	0.1	3.843
		0.01	0.803
		0.001	0.790
		0.0001	**0.786**
	0.0001	0.1	4.495
		0.01	1.185
		0.001	1.126
		0.0001	1.121
Mandiri	0.1	0.1	6.236
		0.01	11.330
		0.001	9.389
		0.0001	9.464
	0.01	0.1	7.342
		0.01	2.126
		0.001	1.991
		0.0001	2.041
	0.001	0.1	4.172
		0.01	1.271
		0.001	**1.078**
		0.0001	1.112
	0.0001	0.1	13.215
		0.01	1.822
		0.001	1.570
		0.0001	1.573

Table 2 above shows that the gamma value that produces the best MAPE value for implementing the SVR method is 0.001 for all banks. However, three epsilon values produce the best MAPE values, namely 0.01 for BCA bank share predictions, 0.001 for Mandiri bank, and 0.0001 for BNI and BRI banks. The best test results for the SVR method from the four banks were from BCA bank, which had a MAPE value of 0.569%. Meanwhile, the worst MAPE value occurred in the Bank Mandiri stock prediction model at 13,215% with a gamma value of 0.0001 and an epsilon of 0.1.

Based on the two evaluation results, the SVR method had a better MAPE value than the ELM method. In addition to measuring the MAPE value of the prediction model produced by the ELM and SVR methods, testing was also done by calculating the computing time. Table 3 compares computing time for implementing the ELM and SVR methods for predicting shares for each bank.

Table 3. Computation Time of ELM and SVR Methods

Bank Name	Method	Computation Time (seconds)
BCA	ELM	0.001
	SVR	0.222
BNI	ELM	0.002
	SVR	0.189
BRI	ELM	0.001
	SVR	0.204
Mandiri	ELM	0.002
	SVR	0.079

Based on the results of testing the computing time of the ELM and SVR methods to predict the share price of each bank, the ELM method has a faster computing time than the SVR method. The average computing time of the ELM method is 0.0015 seconds, while the SVR method is 0.694 seconds.

V. CONCLUSION

Based on the evaluation that has been carried out, the ELM and SVR methods can be used to predict the share prices of the big 4 Indonesian banks. This is because both methods have the best MAPE value of less than 2% and have an average computing time of less than 1 second. This also proves that the ELM and SVR methods are no less than the linear regression, neural network, polynomial regression, LSTM, and XGBOOST methods in the case of forecasting [10] [11] [12] [13].

Based on the level of accuracy, the SVR method is better than the ELM method because it has the best MAPE value. Meanwhile, judging from the computing time, the ELM method is better than the SVR method. Based on the advantages of each method, in future research, we can combine the ELM and SVR methods in order to obtain a prediction model that is computationally accurate and faster.

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