APPLICATION OF INTELLIGENT SYSTEMS (DEEP LEARNING) TOWARDS THE USE OF AI APPLICATIONS IN DAILY LIFE (PANCABUDI UNIVERSITY MEDAN)

Ardiansyah[1]*, Aldy Agustian [2], Perianus lombu[3]. Kiki wulandari[4], Muhammad Syahputra Novelan[5].

Program Studi Magister Teknologi Informasi, Universitas Pembangunan Panca Budi

E-mail: aldy.agustian720@gmail.com, ardiansyah.binjai@gmail.com. perianus.lombu@gmail.com. kikywullandari@gmail.com, putranovelan@dosen.pancabudi.ac.id.

Abstract

As technology advances in this digital era, technology has become a very important thing for human life and has a dependency, marked by the use of digital machines that cause very rapid, significant changes to all sectors of human life, making it easier for humans to carry out activities and have dependencies. Artificial intelligence or better known as AI (Artificial Intelligence) is a major supporter in the development of intelligent systems (Intelligence Systems) that increase efficiency and innovation in various sectors of life. Therefore, the latest advances in AI's predictive capabilities can create a productive work environment. Although AI offers great potential to encourage innovation and better decision-making, there are also challenges in the use of AI such as ethical issues, data security, and infrastructure limitations that must be overcome to ensure responsible use.

Keywords:intelligent systems, deep learning, education, technology

INTRODUCTION

As technology advances in this digital era, technology has become crucial to human life and is becoming increasingly interdependent, marked by the use of digital machines, which are causing rapid and significant changes in all sectors of human life, facilitating human activities and increasing interdependence. Technological advances such as artificial intelligence (AI) are a key enabler in the development of intelligent systems that increase efficiency and innovation in various sectors of life. Artificial intelligence (AI) is defined as the science and engineering of creating intelligent machines capable of performing tasks that typically require human intelligence. AI encompasses various subfields, including machine learning, natural language processing, computer vision, and expert systems. This technology enables machines to learn from experience, adapt to new data input, and autonomously perform complex tasks. In the context of digital transformation, AI plays a crucial role by providing advanced analytical capabilities, process automation, and data-driven decision-making capabilities. The application of AI in digital transformation enables organizations to optimize operations, provide more personalized services to customers, increase efficiency, and create new business models that are more adaptive to technological and market changes. Examples of AI applications in digital transformation include intelligent automation in the manufacturing industry, recommendation systems in e-commerce, and chatbots in customer service that are able to interact dynamically with users. AI applications relevant to everyday life are becoming increasingly common. For example, recommendation systems on video and music streaming platforms use deep learning algorithms to predict user preferences and present relevant content. Virtual assistants like Siri, Google Assistant, and Alexa utilize natural language processing (NLP) to understand and respond to voice commands. In healthcare, AI is used to analyze medical images and detect diseases with greater accuracy than humans. Even simple applications like photo filters on social media are powered by deep learning technology. Given the rapid development of AI, understanding and skills in this field are crucial, especially among students and lecturers. Students need to be equipped with AI knowledge and skills to prepare them for the challenges and opportunities of an increasingly automated workplace. Lecturers, as educators, need to understand how AI can be integrated into learning and research to create more innovative and effective educational

experiences. Deep learning and AI are crucial for students and lecturers today, as they demonstrate the positive impact they can have on improving their competencies and innovation in education and everyday life. By understanding the basic concepts of deep learning and AI applications, lecturers can integrate these technologies into their teaching methods. This will create a more interactive, engaging, and effective learning experience for students. Furthermore, lecturers can utilize AI in their research to generate new innovations that benefit society. Thus, this activity will strengthen the role of lecturers as educators and researchers who are adaptive to technological developments.

FORMULATION OF THE PROBLEM

From the background above, the following problem formulation can be taken:

1. What is meant by Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), and Deep Learning Algorithms?
2. What is the level of satisfaction in implementing intelligent systems (deep learning) among students and lecturers?

METHOD

The methodology used in this study employs qualitative research with an emphasis on a comprehensive literature review, where qualitative research focuses more on case-based models that abstract from individual characteristics. Various relevant sources will be reviewed, including scientific journals, recognized textbooks, and industry trend reports. The literature search will focus on keywords related to artificial intelligence and intelligent systems (deep learning). Data collected from these sources will be analyzed thematically to identify trends, patterns, and different perspectives related to the improvement of deep learning algorithms for intelligent systems in everyday life. This analysis will involve synthesizing information from various sources to produce a comprehensive understanding of the problem under study. This research methodology emphasizes the importance of an iterative and flexible qualitative approach, allowing researchers to dynamically explore and understand the challenges and opportunities in the development of intelligent systems based on artificial intelligence, thereby producing in-depth and relevant insights for future technological development.

RESULTS AND DISCUSSION

Definition of Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), and Deep Learning Algorithms

In this discussion, we will discuss Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), and Deep Learning Algorithms.

1. Artificial Intelligence (AI)

Artificial Intelligence (AI) is a modern technology whose concept is to transfer human intelligence into machines. This may sound unreasonable, considering the complexity of human thinking. However, AI technology is actually closer than we think. Many aspects of our lives already use AI technology. Some examples of AI that we often encounter are facial recognition technology on mobile phones, mobile banking, and product recommendations on e-commerce pages. The application of AI in various areas of life presents its own challenges for the world of education, especially the world of higher education. Currently, higher education is striving to produce as many graduates as possible with AI qualifications to meet industry needs and improve the image of the university. In fact, AI-based technology has penetrated the education sector, from basic education to higher education, even professional education. AI is believed to help humans learn better and achieve their desired educational goals. One of the biggest challenges in the world of education is the different ways and speeds of learning in each individual. For example, some students are stronger in the left brain, while others have higher intelligence in fields that rely on the right brain. Some people also face physical and mental challenges in the learning process. Here's how Artificial Intelligence can be applied to address these challenges:

a) AI-Based Personalization

One of the developments in the application of AI in education is a system that can personalize learning for each person or student. AI systems can help create learning profiles for each student and tailor learning materials to their abilities, learning styles, and experiences. AI systems enable education professionals to utilize intelligent assistance that can present various learning materials based on established curricula but tailored to the specific needs of each student. Personalized digital learning content can also be presented thanks to AI and machine learning. Thick textbooks can now be sorted into more concise, easier to read and

understand content, such as study guides, summaries, flashcards, or short notes. AI systems also allow people to learn with the help of educational assistants such as robots. In addition to assisting with the learning process, the presence of these educational assistants also provides adaptive learning where each person can learn at their own pace.

b) Voice Assistant

Another application of AI in education is the use of voice assistants in the classroom. The presence of voice assistants, such as Amazon Alexa, Google Home, Apple Siri, and Microsoft Cortana allows students to interact with learning materials without having to interact with teachers or lecturers, both in the classroom and at home. In higher education environments, AI-based voice assistants are used to provide information about campuses. This way, students no longer need to carry thick guidebooks or go back and forth to visit websites when looking for information about the campus. An example of such an application is found at Arizona State University, USA. The university provides Amazon Alexa to each new student so they can get information about the campus at the right time and in more detail.

c) Administrative Duties

As we know, educators, beyond teaching, also face technical challenges related to classroom management and other tasks. This burdens educators, even those responsibilities that are not directly related to teaching, such as preparing reports, managing human resource issues, ordering classroom supplies, serving and responding to parent complaints and consultations, and so on. To assist with these tasks, AI is applied here to manage back-office activities. For example, AI systems are used to make assessments and provide personalized responses to each student. Routine and repetitive tasks can also be delegated to AI systems. AI can even be the front line in responding to parents by providing access to needed information sources and even providing feedback to parents on routine matters. Therefore, teachers can pay more attention to the needs of students who require more direct attention, of course the AI system can be utilized by educational institutions for administrative tasks, such as budgeting, new student admissions, HR management, purchasing activities, expense management, and management of educational facilities, so far AI-based artificial intelligence technology is believed to be able to help educational institutions increase efficiency, cut operational costs, provide more comprehensive visibility of income and expenses, and improve the ability to respond to requests quickly.

2. Machine Learning (ML)

Machine Learning, a branch of AI (artificial intelligence), is a scientific discipline that encompasses the design and development of algorithms that enable computers to develop behaviors based on empirical data, such as from sensor data or databases. It is a technique used to develop automated machines based on the execution of algorithms and a defined set of rules. Machine Learning is equipped with a number of program rules that are executed by the algorithm. Therefore, Machine Learning techniques can be categorized as instructions that are executed and learned automatically to produce optimal output, this is done automatically without any human intervention whatsoever. Everything is done automatically to transform data into several patterns and input deep into the system to detect automatic problems. The data entered into the machine will be analyzed, which then produces predictions, suggestions, or decisions. Deeper Machine Learning will later be called Deep Learning. Some examples of machine learning that we often encounter: Advertising optimization in digital marketing strategies; Translating handwriting into text; Translation and grammar checking software. Machine learning technology applications come in a variety of forms that are very familiar to everyday life, from transportation, technology, finance, education, health, and even the social media you frequently use. Here are some examples of machine learning applications:

a) Transportation

Machine learning in transportation is used to simplify travel times. For example, Google Maps, which uses location data from smartphones, can check traffic flow shifts in real time at any time. Moreover, it can also detect traffic reports such as congestion and accidents. By accessing relevant data, Google Maps can reduce travel time by showing the fastest route. In addition, machine learning can also analyze estimated trip prices, pinpoint pickup locations, optimize shortest routes, and detect fraud. Programs like this are very useful for online transportation services, Uber has used it to optimize its services.

b) Banking and personal finance

Machine learning is essential in the technology used by financial institutions such as banks. Several functions, such as fraud prevention, credit, and mobile banking are examples of the use of machine learning. Typically,

daily transaction volumes are very high and it is difficult for humans to manually review each transaction. Machine learning-based systems create neural networks to detect whether a transaction is fraudulent or not. By applying factors such as the frequency of recent transactions, transaction size, and the type of retailer included, machine learning can make a decision. Credit application acceptance decisions now also use AI. When applying for credit or loans, financial institutions must quickly determine whether or not to approve it. Machine learning helps in credit decisions based on specific risk assessments for individual users. In addition, AI technology also creates practical services in the form of personalized mobile banking so that users who do not have time to go to the bank can perform independent transactions wherever they are. Mobile banking allows users to check balances, make transactions, transfers, and other banking services simply by using a smartphone in their hand.

c) Education

The routine activities of academic crews are always inseparable from essay work and plagiarism checking as a standard of essay originality, an example of machine learning in education is to build an accurate plagiarism detector, it is able to quickly analyze numerical estimates of how identical an input document is to other documents in the database. Machine learning can also create Robo readers, namely automatic essay grading systems, essays are very complex writing, but thanks to the help of AI, grading essay assignments has become much easier, there is a GRE exam that uses a human grader and one Robo reader known as e-Rater to grade essays. Even in this education sector, machine learning helps in personalized learning, voice assistants, simplifying administration, and analyzing student dropout rates. In the implementation of higher education, the need for technology is very important in providing services to all academic communities.

d) Health

Machine learning also applies to the medical field, addressing diagnostic and prognostic issues. It can also analyze medical data to detect regularities, remove invalid data, explain data generated by medical units, and effectively monitor patients. This significantly improves patient management and administrative efficiency.

e) Social media

AI technology automatically suggests tagging friends when someone uploads a photo on Facebook. Facebook also uses AI to personalize feeds and display posts that entertain or interest users based on their interests. This also applies to displaying specific business ads that match the user's interests. Instagram, Pinterest, and Snapchat also use machine learning to recognize objects in images. Snapchat and Instagram's face filters (Lenses) can filter and track facial activity, allowing the filter's animation or digital mask to follow the user's facial movements.

f) Smart personal assistant

Siri, Google Assistant, Amazon Alexa, and Google Home are the closest examples of machine learning to us. By applying AI across the board, home devices and personal assistants can follow commands, including setting reminders, searching for information online, adjusting lights, and so on.

3. Deep Learning (DL)

Deep Learning is a subset of artificial intelligence and machine learning that utilizes multiple-layer neural networks to achieve precision in tasks such as object detection, speech recognition, language translation, and more. Deep Learning differs from traditional machine learning techniques because it automatically represents data such as images, videos, or text without introducing coding rules or human domain knowledge. Deep Learning is a set of machine learning algorithms that attempt to learn at multiple levels, corresponding to different levels of abstraction. This typically uses artificial neural networks. The levels in the learned statistical model correspond to different conceptual levels, where higher-level concepts are determined from lower-level ones, and lower-level concepts can help define many higher-level concepts. Furthermore, Deep Learning is a subfield of machine learning whose algorithms are inspired by the structure of the human brain. This structure is called Artificial Neural Networks, or ANN for short. Essentially, it is a neural network with three or more layers. It is capable of learning and adapting to large amounts of data and solving various problems that are difficult to solve with other machine learning algorithms. The following is an example of a deep learning network diagram:
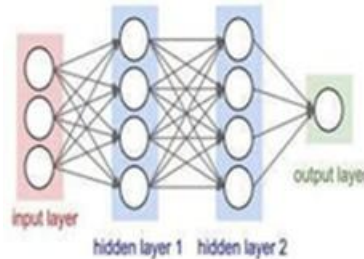
One of the most common examples of Deep Learning implementations is the chess algorithm system. You might wonder why AI in chess games (especially hard mode) is so difficult to beat, even by experts. This is because the algorithm used by the game can analyze millions of moves obtained from previous matches. These moves are carefully recorded, and the computer can find the right solution to face these moves. This learning is certainly done in a matter of seconds. Therefore, we can say that deep learning is a model that can learn its own computational methods with its own 'brain'. A deep learning model is designed to continuously analyze data with a logical structure similar to how humans make decisions. To be able to achieve this capability, deep learning uses a layered algorithm structure called an artificial neural network (ANN), this term was first introduced to the machine learning community by Rina Dechter in 1986. Developments continue to occur. In 2009, Nvidia, an American technology company, was involved in the "big bang" of deep learning. Nvidia graphics processing units (GPUs) continued to train deep learning with neural training. In the same year, Google Brain also used Nvidia GPUs to create a deep neuron network (DNN). The types of deep learning are as follows:

a) Deep Learning for Zero Learning

Unsupervised Learning: This type of Deep Learning is used when the labels of the target variable are not available and higher value correlations must be calculated from the observed units to analyze the pattern.

b) Hybrid Deep Networks (combined Deep Learning)

This type of approach aims to achieve good results by using supervised learning to conduct pattern analysis or by using unsupervised learning.

In its application process, the way Deep Learning works is based on the optimal network architecture and procedures used in the architecture. Each output from the hidden layer can be monitored using a special graph designed for each neuron output. The combination and recombination of each interconnected neuron from all hidden layer units is carried out using a combination of activation functions, these procedures are known as Non-Linear Transformations which are used for optimal procedures to produce optimal weights in each layer unit to obtain the required target value. When in the design process, if the number of neurons added is very large, it will never be suitable to solve every problem. The most important problem in Deep Learning is that the neural network is trained by simple gradient descent, when we add more and more network layers, then conversely the descent of the gradient decreases so that it can affect the output value.

4. Deep Learning Algorithm

In deep learning technology, according to several types of algorithms used, including:

a) Convolutional neural networks (cnn)

CNN, or sometimes called ConvNets, consists of several layers, usually this type of deep learning algorithm is used to process data in the form of images or detect objects, when it was first introduced, CNN was still called LeNet and functioned as a system to detect characters such as postal codes.

b) Recurrent neural network (rnn)

Next, there's the RNN algorithm. This type of deep learning algorithm generates connections that form regular cycles. These cycles then process the output from the LSTM to serve as input for the current phase. This is possible because RNNs have internal memory. RNNs are typically used for captioning images, analyzing time series, processing natural language, and even recognizing handwriting.

c) Long short term memory network (LSTM)

LSTM is a type of RNN that can learn and remember long-term dependencies. As a result, this algorithm is able to recall information from the past. LSTM prioritizes information over time. Therefore, LSTM is suitable for estimating time series because this algorithm can remember previous input. When viewed, LSTM has a chain-like structure.

d) Self-organizing maps (som)

SOM enables data visualization by reducing the dimensionality of data through autonomously operating artificial neural networks. The SOM algorithm is designed to help users understand high-dimensional information. Deep learning technology is now increasingly widespread in everyday life.

e) Virtual assistants
Your smartphone being able to recognize voice and language when running the Virtual Assistant feature is an example of the application of deep learning.

f) Automatic car
Tesla's driverless self-driving cars use Deep Learning technology. To avoid crashes and achieve human-like driving capabilities, the machines need to collect a wealth of data related to traffic signs, road user behavior, and potential road risks.

g) Chatbots
The use of chatbots is now increasingly widespread. Chatbots have proven to be effective in easing human workloads, particularly in the customer service industry. With chatbots enhanced with deep learning technology, the system continuously learns appropriate responses when interacting with customers.

h) Translation
Virtual Assistant, using deep learning technology in translation services learns the voice and language used by humans, this mechanism makes things very easy for many people.

i) Facial recognition biometrics
Biometrics is considered the most secure security method, as breaching the system requires genuine biometric data, such as fingerprints, facial features, or even retinal scans. This biometric recognition process is actually a form of deep learning technology.

Level of Satisfaction in the Implementation of Intelligent Systems (Deep Learning) Among Students and Lecturers

The Workshop on the Use of AI Applications for Daily Life was attended by 50 students and 10 lecturers from Pancabudi University Medan, with a total of 60 participants. This workshop aims to provide basic understanding and practical skills in utilizing Artificial Intelligence (AI) technology, especially deep learning, to support academic activities and daily life. Based on the results of the questionnaire distributed at the end of the session, as many as 85% of participants stated that they were very satisfied, 10% were satisfied, and 5% were quite satisfied with the implementation of this activity. The following diagram illustrates the percentage of participants' satisfaction levels with the activity, the histogram image one depicts the results of the questionnaire on the level of participant satisfaction. This diagram shows that the majority of participants felt "Very Satisfied" (85%), while "Satisfied" (10%) and "Quite Satisfied" (5%).

Diagram Hasil Kuesioner Tingkat Kepuasan Peserta

Participants provided positive feedback on the use of deep learning. Students stated that the workshop materials opened new insights regarding the use of AI to assist with academic tasks, such as article writing, data analysis, and presentation development. Several lecturers also expressed that the workshop inspired them to integrate AI technology into their teaching methods, particularly in project-based learning and digital innovation. Furthermore, participants expressed their hope that similar activities could be held regularly with more in-depth discussions, such as training on creating simple AI applications or educational chatbots.

Furthermore, most participants expressed that the approach used in delivering the material, which combined theory and hands-on practice, significantly helped them understand the concepts and uses of AI. Students felt more confident in trying out the various AI applications introduced, such as ChatGPT, Canva AI, and several other AI tools that can support their academic productivity. In fact, several students admitted that this was their first time trying an AI application in this activity and were interested in continuing to explore the technology. This

demonstrates that the workshop not only provided new knowledge but also increased participants' motivation to continue learning independently. In addition to this feedback, several participating lecturers also emphasized the importance of further guidance or mentoring regarding the application of AI in education. They stated that even though they understand the basics of AI, specialized guidance is still needed to develop more complex practical skills, such as creating interactive AI-based learning modules or creating automated learning systems using chatbots. Therefore, the lecturers hope that Prasetiya Mandiri Polytechnic can facilitate further training on more applicable topics, so that lecturers and students can collaborate in innovating using AI to improve the quality of learning and academic services.

During the practical training session, participants were asked to try several easy-to-use AI applications, such as ChatGPT, DALL-E for creating digital images, and speech-to-text tools to assist with report writing. The practical results showed that most students were able to produce creative and relevant output, such as automated article summaries, AI-generated visual designs for posters, and automated transcriptions for audio recordings of class discussions. The participating lecturers also successfully created examples of interactive teaching materials using AI, which can be applied in the learning process. In addition to producing various digital works, participants were also encouraged to present their practical work at the end of the session. Students demonstrated the results of creating digital images using DALL-E that were relevant to the theme of their course assignments, such as educational posters, illustrations of scientific concepts, and infographic designs. These presentations provided a forum for sharing ideas and creativity among participants, as well as a forum for discussion about the potential and limitations of using AI in an academic context. Through this process, participants not only practiced technical skills but also learned to convey ideas and received feedback from peers and lecturers. In addition, several lecturers who participated in the practical session successfully drafted AI-based interactive teaching materials, such as learning modules with AI-generated illustrative images and automated quizzes that can be used in online learning platforms. Lecturers also explored the speech-to-text feature to simplify the creation of lecture transcripts and class discussion notes. These results demonstrate that the application of AI in the teaching and learning process has great potential to improve the effectiveness of material delivery and facilitate students' understanding of complex topics. The lecturers also appreciated the practical session because it provided real-world insights into how AI can be directly integrated into daily academic activities.

For Pancabudi University Medan, innovative and technologically responsive education can enhance the university's image and appeal to prospective students, industry partners, and the general public. Furthermore, it also encourages faculty to develop their competencies in AI and integrate this technology into their teaching and research. For students, it provides an opportunity to improve their digital skills and enhance their competitiveness in the workplace. An understanding of deep learning and AI is becoming increasingly important in the digital age, and these skills will be valuable assets for students in their job search and career development. Furthermore, this activity inspires students to develop innovative solutions using AI and contribute to technological advancement in Indonesia. Increasing AI literacy among students and lecturers contributes to improving the quality of human resources in the AI field. This is crucial for supporting the development of the AI industry in Indonesia and establishing Indonesia as a major player in AI technology development globally. Furthermore, this activity can serve as a model for other educational institutions to organize community service activities focused on digital skills development and technological innovation.

CLOSING
Conclusion
1. Based on the results of the explanation above, it can be concluded that artificial intelligence is developing very rapidly. Problems that were previously very difficult for humans to solve can now be solved easily with artificial intelligence. The role of Artificial Intelligence (AI) technology is increasingly evident in various sectors, including the education sector. The presence of AI technology has transformed the educational curriculum, especially in the fields of technology, science, mathematics, and engineering. However, AI will also change the face of the world of education as a whole. This significant growth is in line with the increasing demand for AI technology in the education sector. Machine learning technology has been used in various forms that are very familiar with everyday activities, ranging from transportation, technology, finance, education, health, and also the social media that you often visit. The application of deep learning technology in everyday life is now increasingly widespread, including in the world of education such as virtual assistance, mobile automation, and online tutoring. Artificial intelligence (AI)

technology offers significant opportunities in the development of intelligent systems that can increase efficiency and innovation in various sectors, such as health, transportation, and education. However, the challenges faced, including ethical issues, data security, limited user understanding, inadequate infrastructure, and unclear regulations, require serious attention from researchers and practitioners. With the right approach, AI can be a powerful tool for driving responsible and sustainable progress, creating an ecosystem that supports the ethical use of this technology, and increasing public trust in its potential and benefits. Overall, research into the challenges and opportunities in the development of AI-based intelligent systems is crucial for understanding the risks and benefits involved and for encouraging responsible innovation in the future.

2. Participants provided positive feedback on the use of deep learning. Students stated that the workshop material opened new insights regarding the use of AI to assist with academic tasks, such as article writing, data analysis, and presentation preparation. Several lecturers also expressed that the workshop inspired them to integrate AI technology into their teaching methods, particularly in project-based learning and digital innovation. Furthermore, participants hoped that similar activities could be held regularly with more in-depth discussions, such as training on creating simple AI applications or educational chatbots. For Pancabudi University Medan, innovative and responsive education to technological developments can improve the image and attractiveness of Pancabudi University Medan in the eyes of prospective students, industry partners, and the general public. Furthermore, it also encourages lecturers to develop their competencies in AI and integrate this technology into their learning and research. For students, it provides an opportunity to improve their digital skills and competitiveness in the workplace. An understanding of deep learning and AI is becoming increasingly important in the digital era, and these skills will be valuable assets for students in finding jobs and developing their careers. Furthermore, this activity also inspires students to develop innovative solutions using AI and contribute to technological advancement in Indonesia.

REFERENCES

Ahmad. (2017). Understanding Artificial Intelligence, Machine Learning, Neural Networks, and Deep Learning. Yayasan Cahaya Islam, Jurnal Teknologi Indonesia., 1(1), 1–5.

Apiyani, A. (2022). Implementation of Continuous Professional Development (PKB) for Madrasah Teachers in Improving Professionalism. JIIP-Scientific Journal of Educational Sciences, 5(2), 499–504

Arifudin, O. (2021). Implementation of the Balanced Scorecard in Realizing World-Class Higher Education. Edumaspul: Journal of Education, 5(2), 767–775.

Bahri, AS (2021). Introduction to Educational Research (A Theoretical and Practical Review). Bandung: Widina Bhakti Persada.

Deng. (2014). Deep Learning: Methods and Applications. Foundations and Trends in Signal Processing, 7(3), 197–387.

Hasyim, M., & Novelan, M. (2018). Home Lighting Control System Using Android Smartphone. Journal of Informatics and Computers (JIKO), 3(2), 67-73.

Mulyani, S., Novelan, M., & Syahputra, A. (2021). Design of a Web-Based Inventory Management Information System. Journal of Information Systems Technology and Computer Systems TGD, 4(1), 12-20.

Nasri. (2014). Artificial Intelligence. Journal of Artificial Intelligence, 1(2), 1–10.

Novelan, M. (2020). Implementation of the C4.5 Algorithm for Predicting Late Payments of Student Tuition Fees. Journal of Science and Computer Science (JSAK), 19(1), 45-52.

Novelan, M., & Syahputra, A. (2019). Decision Support System for Selecting the Best Employees Using the Profile Matching Method. Journal of Informatics Engineering, Unika St. Thomas, 4(1), 55-64.

Novelan, M., Hasyim, M., & Syafrizal. (2021). Design of a Room Temperature and Humidity Controller Based on Arduino Uno. Journal of Computer Systems and Informatics (JSON), 2(3), 312-319.

Pawito. (2007). Qualitative Research (A. Rahim (ed)). LkiS Yogyakarta

Primartha. (2018). Learning Machine Learning Theory and Practice. Palembang.

Purnama, I., Novelan, M., & Khairunas. (2022). Sentiment Analysis of E-Commerce Services Using the Naive Bayes Classifier Method. Informatics Journal: IT Development Journal, 7(1), 33-39.

Syahputra, A., & Novelan, M. (2020). Design and Construction of Web-Based E-Learning Applications Using the CodeIgniter Framework. Journal of Technology and Information (JTI), 10(2), 156-168.

Student Research Workshop, Pancabudi University, Medan, 2025