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PROCEEDING

#5th ISRITI 2022

Yogyakarta - Indonesia
8 December 2022

BUSINESS INTELLIGENCE IN DIGITAL ERA

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UNIVERSITAS TEKNOLOGI DIGITAL INDONESIA

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Welcome Speech from the Chairman of Universitas Teknologi Digital Indonesia

The honorable
- Dr. Petrus Usmanij Lecturer of Management Information Systems, La Trobe University, Australia.
- Head of LLDIKTI Region V
- Chairman of Widya Bakti Foundation and his staff,
- Representatives from IEEE Indonesia Section,
- Researchers and conference attendees,
- Ladies and Gentlemen,

Assalamu'alaikum Wr. Wb.
May peace and health be upon us all.

First, let us express our utmost gratitude to God Almighty (SWT) for His blessings and grace so that we can all still participate in the 5th ISRITI international conference, even in this coronavirus pandemic atmosphere. On this occasion, let me express my sincere appreciation to the Keynote Speakers: Dr. Petrus Usmanij, Lecturer of Management Information Systems, La Trobe University, Australia; and Dr. Bambang Purnomosidi for their willingness to share their brilliant ideas and insights to be presented at this conference.

Dear ladies and gentlemen,
As the head of Universitas Teknologi Digital Indonesia (UTDI), I am saddened to state that the 2022 5th ISRITI conference had to be held online, considering that the coronavirus pandemic has not ended. Even though a pandemic currently hit us, the researchers' enthusiasm is apparent in the number of research articles submitted. We received up to 282 articles from 16 countries. Around 140 articles were accepted to be readily presented online in a conference forum with the theme: Artificial Intelligence for Social Interactions. As the organizers of iSriti, we are very proud and grateful for the researchers' participation who have been willing to submit their research results to be published in this conference forum. We would also like to thank IEEE and IEEE Indonesia, who have trusted and supported this conference from the very beginning. We still hope to build networks and information exchanges between academics, practitioners, researchers, and the government to identify and explore issues, opportunities, and solutions to face challenges in the current era of technological disruption.

Finally, on this occasion, I would like to express my utmost gratitude to the following:

1. The distinguished speakers who have been willing to share their valuable knowledge at this conference;
2. The third ISRITI researchers who have presented and will present their research results;
3. Reviewers who have carefully reviewed the articles of the researchers;
4. Moderators who are more than willing to lead the plenary session;
5. IEEE and IEEE Indonesia Section for trusting us to hold this international conference;
6. The committee that has been working hard to prepare this international conference according to plan; Last but not least, as the organizer, I would like to apologize for any shortcomings or inconveniences during this event sincerely.

Thank you very much for your kind attention, and Wassalamu'alaium Wr. Wb.
Yogyakarta, 8 December 2022

The Rector of Universitas Teknologi Digital Indonesia (UTDI)

Totok Suprawoto, M.M., M.T.

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Welcome Speech from General Chair

Dear colleagues and friends.

On behalf of the organizing committee, I am delighted to welcome all participants to the 5th International Seminar on Research of Information Technology and Intelligent Systems (ISRITI 2022). This is the third international conference held by Universitas Teknologi Digital Indonesia (UTDI), Indonesia, virtual on December 8th, 2022.

In this conference, the committee chose the following theme: "Business Intelligence in Digital Era". This highlight was chosen because various advances in AI have recently raised concerns that AI will replace various things in the human domain. For us, AI can be used to understand social interactions better and build machines that work more collaboratively and effectively with humans. Therefore, by highlighting that theme in the 5th ISRITI 2022, we hope to raise awareness of AI for social interactions.

The conference aims to provide an interactive international forum for sharing and exchanging information on the latest research in information technology, computer sciences, informatics, and related fields. Nearly 142 academicians, researchers, practitioners, and presenters from 16 countries (Indonesia, Philippines, China, Thailand, India, United Arab Emirates, Iraq, Malaysia, Taiwan, Brunei Darussalam, Japan, USA, United Kingdom (Great Britain), Bangladesh, Kuwait, and Pakistan) gathered in this event. In total, there are 328 active papers submitted to this conference. Each paper has been reviewed with tight criteria from our invited reviewers. Based on the review result, 142 papers have been accepted, which leads to an acceptance rate of 43.29%. This conference will not be successful without extensive effort from many parties.

I thank all plenary speakers for allocating valuable time to share their knowledge. I would also like to express my sincere gratitude to all participants who participated in this conference. Special acknowledgment should go to the Technical Program Committee Chairs, Members, and Reviewers for their thorough and timely reviewing of the papers. We would also like to thank our sponsors: IEEE Indonesia Section and Research and Society Service Institution at Universitas Teknologi Digital Indonesia (UTDI).

Last but not least, recognition should also go to the Local Organizing Committee members who have put enormous effort and support into this conference. At last, we hope that you have an enjoyable and inspiring moment during our conference. Thank you for your participation in ISRITI 2022.

Yogyakarta, 8 December 2022
General Chair of the 5th ISRITI 2022

Dr. Widyastuti Andriyani, S.Kom., M.Kom.

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Preface

Understanding the changing business environment and describing how an organization can survive is a definite step that needs to be done. It must be separated from the support of appropriate decision-making from technological devices, mainly computerized devices or machines. Business intelligence is a term for categorizing applications and technologies in collecting, storing, analyzing, and providing access to data for decision-making in a case. The application of business intelligence includes all the technology and methodologies needed to obtain information to make decisions to improve the performance of a business. This concept always emphasizes quality improvement based on a data-based system. The description of the business intelligence methodology must understand the main problems in implementing business analytics. This set of plans includes techniques, methods, software, infrastructure, and the like, which is necessary to gain knowledge so that decisions can be made correctly and on target. Closing the strategic gap facilitates the difference between current and desired performance and is usually manifested in the mission, vision, goals, and strategies to be achieved. Making these decisions requires data from business intelligence systems that come from factual data, planning data, and predictive data. These data can produce basic information from an activity's past, present, and future trends. These processes can analyze consumer behavior, patterns, and activity trends. Considerations related to process optimization and operational performance are needed to increase business effectiveness.

This conference seeks to present discussions on improving and optimizing services to answer the needs required to overcome problems in various business domains. It is hoped that the solutions provided by these studies can be used to evaluate, analyze and report research results. Data that initially cannot help in decision making, with business intelligence, data can be integrated and easily understood in decision making. The entire computer system has a primary purpose for all users according to the needs of each user. The presentation of a variety of information can be adapted to the needs of different users. This conference's availability of relevant data and easy access to information is vital. In addition, capabilities in analyzing and fulfilling requests require knowledge and information that can be viewed from various perspectives. The contributions presented in these papers can help business people understand the context of the methodology that will be developed.

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			Brain MRI
Zy, Ahmad Turmudi	1-2.3	34	*Wireless Ad hoc Networks on Motorcycle Ride-Hailing Services: A Comparative Analysis of 802.11n and 802.11p*

A

A B C D E F G I K L M N O P S T U V W

B

A B C D E F G I K L M N O P S T U V W

C

A B C D E F G I K L M N O P S T U V W

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Classification And Clustering Performances on The Protocol of The Wireless Sensor Network - Chimpanzee Leader Election Optimization

Classification of Sentiment Analysis Against Omnibus Law on Twitter Social Media and News Websites Using the Naïve Bayes Method

Classification of Tsunami Warning Level using Artificial Neural Network and its Comparison in Southern Java Region

Cluster selection technique with fuzzy logic-based wireless sensor network to increase the lifetime of networks

Combination Of Markov Random Field And K-Means Clustering In Water Bacteria Image Segmentation

Combining Support Vector Machine - Fast Fourier Transform (SVM - FFT) For Improving Accuracy on Broken Bearing Diagnosis

Comparative Analysis of Bone Age Assessment Techniques using Hand X-Ray Images and Gender Feature

Comparison of Model in Predicting Customer Churn Based on Users' habits on E-Commerce

Computer Vision for Autonomous Vehicles - Semantic Segmentation using Jetson Nano

Congestion Control in VANETs based on Message Rate Adaptation by the Exponential Function

Consumer Intention to Use Online Food Delivery Ordering (OFDO) Services In Indonesia: The Impact Of Covid-19 Pandemic

Conveyor Frame Simulation of Magnetic Separator Machine for Recycling Lithium-Ion Batteries Model 18650

Critical Success Factor Using Career-Oriented Social Networking Site (CSNS) for Fresh Graduates

D

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Data Mining Using C4.5 Algorithm in Predicting Student Graduation

Deep Learning Approach based Classification of Alzheimer's Disease Using Brain MRI

Design and Building a Stair-lift Prototype for Disabilities at Bandung Institute of Technology

Design and Implementation of Hybrid Equalization Battery Management System for Lithium-Ion Batteries

Design of Wearable Device for Monitoring the Position of A Person with Dementia

Detecting the Effect of Internet Skill and e-Leadership on Productivity of Working from Home

Detection of Acute Lymphoblastic Leukemia Subtypes using YOLO and Mask R-CNN

Determination of Attack Points on IoT Devices based on Particle Swarm Optimization to Support Intrusion Prevention System

Determination of COVID-19 Transmission Status in East Java Using the Fuzzy Inference System

Determination of Relevant Feature Combinations For Detection Stunting Status of Toddlers

E

A B C D E F G I K L M N O P S T U V W

F

A B C D E F G I K L M N O P S T U V W

G

A B C D E F G I K L M N O P S T U V W

I

A B C D E F G I K L M N O P S T U V W

Imbalanced Text Classification based on Corporate Culture by using Support Vector Machine, Case Study: PT XYZ, Indonesia

Impact Of Celebrity Attractiveness and Celebrity Credibility on Digital Brand Awareness on Perceived Celebrity Digital Branding

Impact of Power and Expertise on Perceived Celebrity Credibility on Digital Brand Awareness

Implementation Brute Force-KNN Method for Scholarship Program Selection

Implementation of FCL in Hybrid AC/DC Distribution Network System

Implementation of IoT Sensored Data Integrity for Irrigation in Precision Agriculture Using Blockchain Ethereum

Implementing Machine Learning in Students Qur'an Memorization Prediction

Improving Parallel Pattern Discovery from Directly Follows Graph Model

InceptionV3, ResNet50, and VGG19 Performance Comparison on Tomato Ripeness Classification

Information Security Evaluation Using the Information Security Index: A Case Study in Indonesia

Information Services Financing Scheme Model with Marginal Costs and Supervisory Costs for Modified Cobb-Douglas and Linear Utility Functions

IP Hash Algorithm Optimization Analysis On P4 Using The Round Robin Algorithm

Irrigation Management: A Pilot Study for Automatic Water Level Measurement and Report System Development Using Machine Learning Associated with Modified Images

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K-Means Clustering Based on Distance Measures: Stunting Prevalence Clustering in South Kalimantan

L

A B C D E F G I K L M N O P S T U V W

Latency and RAM Usage Comparison of Advanced and Lightweight Service Mesh

M

A B C D E F G I K L M N O P S T U V W

Machine Learning Model using Times Series Analytics for Prediction of ATM Transactions

Machine Learning Models for Classifying Imbalanced Class Datasets Using Ensemble Learning

Mathematical Model of Traffic Management-Perfect Substitute-Selfish User Scheme

Mitigating electrical energy cost for residential building based on wall composition

Mobile Robot-Ackerman Steering Navigation Using Localization based on Kalman Filter and PID Controller

Modeling Sales Person Performance Based On Sales Data Clustering

Multiple Climacteric Fruits Classification by Using Machine Learning Approach

N

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Network Quality Prediction with QoS and QoE Data for Digital Television Using WebGIS

NLP Text Classification for COVID-19 Automatic Detection from Radiology Report in Indonesian Language

NOMA Implementation in OFDM-MIMO-VLC Network Serving 9 User Equipments

O

A B C D E F G I K L M N O P S T U V W

Opinion-based sentiment analysis related to 2024 Indonesian Presidential Election on YouTube

Optimal Coordination PID-PSS Control Based on Craziness Particle Swarm Optimization In Sulselrabar System

Optimal Trajectory Planning for Autonomous Vehicle using Frenet Reference Path

Optimization of Feature Extraction in Indonesian Speech Recognition Using PCA and SVM Classification

Outdoor Social Distancing Violation System Detection using YOLO Algorithm

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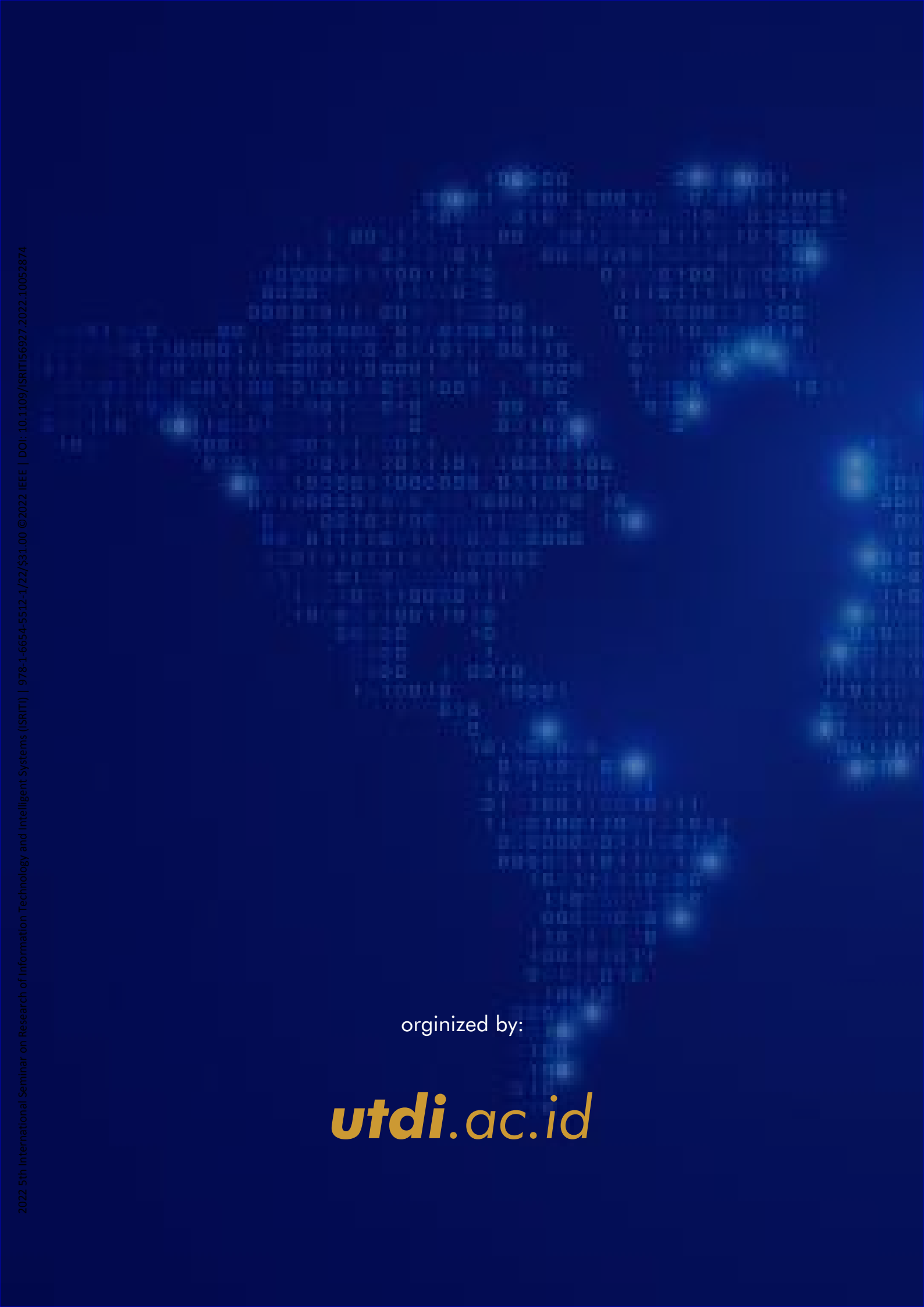

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Usage of LSTM Method On Hand Gesture Recognition For Easy Learning of Sign Language Based On Desktop Via Webcam

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***Abstract*— This paper implements hand gesture recognition for some words in Sistem Isyarat Bahasa Indonesia (SIBI). Trained hand gesture images are created based on words that can be recognized on system ('air', 'api', 'bagaimana', 'burung', 'dengar', 'film', 'halo', 'jumpa', 'kasih', 'kucing', 'makan', 'mandi', 'nasi', 'pagi', 'sapi' ,'saya', 'selamat'). The lack of interactive sign language learning media makes it difficult for the deaf to find support for interactive sign language learning. Therefore, SIBI sign language interactive learning media is needed that can support interactive learning with computers. LSTM method is used on this system to avoid vanishing gradient issues.**

Keywords—hand gesture, recognition, SIBI, LSTM.

I. INTRODUCTION

The deaf communicate with people through hand pose communication. Sistem Isyarat Bahasa Indonesia (SIBI) is the sign language officially approved by the government and currently used in educational curriculum for children in school. Some difficulties in sign language communication may arise when the parties involved do not understand SIBI at all. The most common solution to this problem is by having another person as a translator to bridge the communication between them. However, alternative solution has to be provided because a translator, unlike a computer program, may not be available at any given time.

Lack of learning media that provide understanding hand pose and how we should practice the pose cause people to have difficulties in finding learning media to help them communicate with the deaf. Therefore learning media that provide learning about sign language is needed on this case. This learning media is used to make people easier learn and understanding sign language.

Human computer interaction is the essential base to provide the alternatives. In this work, there are some methods to deal with such as computer vision, machine learning, and speech recognition. Computer vision focuses on acquiring image with the support of image processing and extracts the essential data of the image. After that, there will be a classification process that compares and classifies the current gestures that users perform according to the training model. This process is based on machine learning and classification method used in this project is LSTM (Long Short Term Memory).

In the interactive learning feature, hand gestures that can be captured and translated are symbolic hand gestures for one word where in this feature the system through the webcam media can detect the user's hand gesture and translate it into the form of the words “air”, “api”, “bagaimana”, “burung”, “dengar”, “film”, “halo”, “jumpa”, “kasih”, “kucing”, “makan”, “mandi”, “nasi”, “pagi”, “sapi”, “saya”, “selamat”. [1]

II. LITERATURE REVIEW

A. Sign Language

Sign language is one of the media for communication that prioritizes manual communication, body language and lip movements. In the world, the use of sign language in each country is very unique and may vary, for example, Britain and America use different sign languages even though they have the same written language, it is different with English and Spanish even though they have different written languages but the two countries use the same language. the same sign language, because until now there has been no successful international sign language to be implemented. In Indonesia, the sign language used is the Indonesian sign system (SIBI).

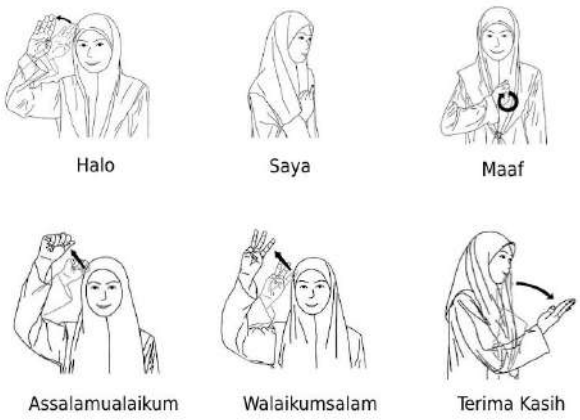

Fig. 1. SIBI Sign Language Gesture Examples

[1]

B. SIBI

Until now, the use of sign language for speech-impaired children is still not uniform. Sign language is a language that prioritizes manual communication, body language, and lip movements, rather than sound, to communicate. Deaf people are the main group who use this language, usually by combining hand shape, orientation and movement of hands, arms and body, and facial expressions to express their

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thoughts. For Indonesia, the system that is now commonly used is the Indonesian Sign System (SIBI).

Government policies outlined in the Law of the Republic of Indonesia No. 2 of 1989 concerning the National Education System, among others, state that:
"National education aims to educate the nation's life and develop a complete human being, namely a human who has faith and is devoted to God Almighty and has noble character, has knowledge and skills, physical and spiritual health, a strong and independent personality and a sense of community and national responsibility. ". This policy also applies to citizens with disabilities, including the deaf. Therefore, the preparation of the Indonesian Language Sign System (SIBI) was carried out.

C. *Preprocessing*

The system uses Mediapipe Face Detection to detect faces. Mediapipe uses the BlazeFace method to detect faces. In the BlazeFace method, objects that have the potential for facial images will be given a box around them. The system will compare the vector of the sample faces in the dataset with the user input image. BlazeFace has 5 steps in preprocessing starting from resizing the image to finding facial landmarks in the image. [2]

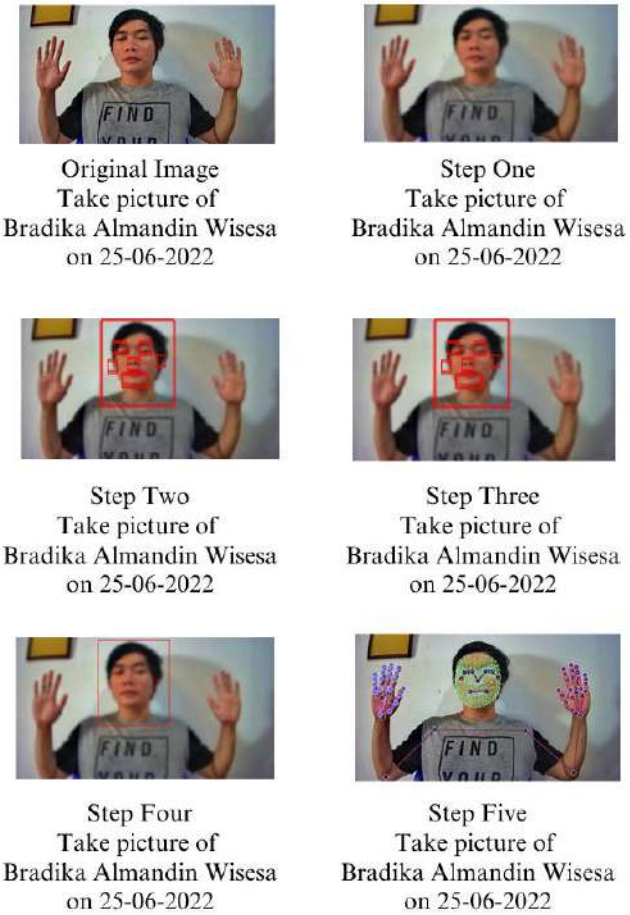

Fig. 2. Preprocessing Steps

Take picture of Bradika Almandin Wisesa on 25-06-2022

D. LSTM (Long Short Term Memory)

Long Short-Term Memory (LSTM) is a variant model of the *Recurrent Neural Network* (RNN). LSTM appears to be able to remember a long term of information (long term dependency). In the LSTM there are three gates that control the use of the previous text information, namely input gates, forget gates, and output gates. The memory cell and three gates are designed to be able to read, store, and forward information.

The LSTM architecture was developed as a solution to the vanishing gradient problem encountered in conventional RNNs. the gradient disappears because the gradient is getting smaller until the last layer makes the weight value unchanged so that it never gets a better result or converges. On the other hand, the increasing gradient causes the weight values in several layers to increase so that the optimization of divergent or explosive gradients is called. As shown in Figure below illustrates a memory block on an LSTM with a single layer. [3]

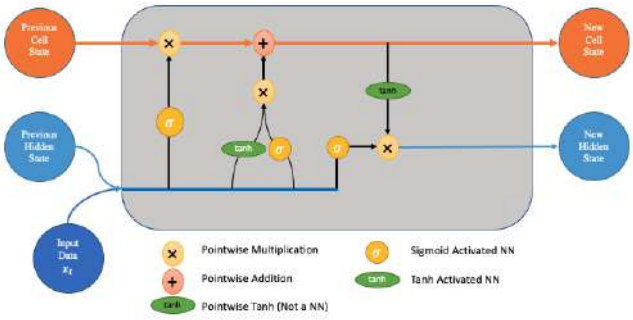

Fig. 3. LSTM Diagram

- *Step One*

The first step in the process is the forget gate. Here we will decide which bits of the cell state (long term memory of the network) are useful given both the previous hidden state and new input data.

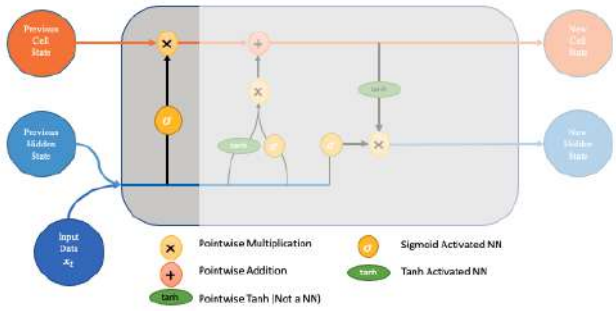

Fig. 4. Forget Gate

- *Step Two*

The next step involves the new memory network and the input gate. The goal of this step is to determine what new information should be added to the networks long-term memory (cell state), given the previous hidden state and new input data.

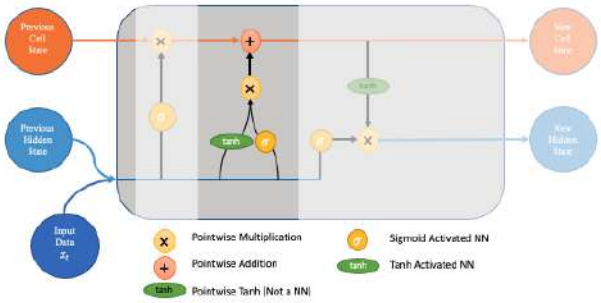

Fig. 5. Input Gate

- *Step Three*

Before applying the filter, the cell state is passed through a tanh to force the values into the interval [-1,1].

The step-by-step process for this final step is as follows :

1. Apply the tanh function to the current cell state pointwise to obtain the squished cell state, which now lies in [-1,1].
2. Pass the previous hidden state and current input data through the sigmoid activated neural network to obtain the filter vector.
3. Apply this filter vector to the squished cell state by pointwise multiplication.

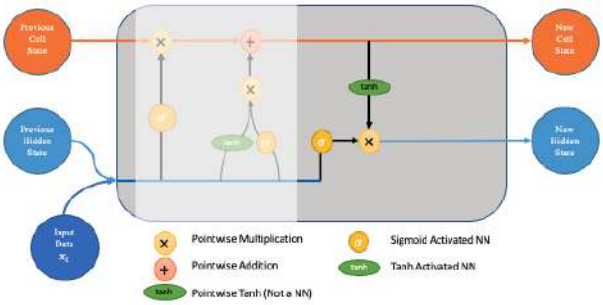

Fig. 6. Output Gate

III. ANALYSIS AND DISCUSSION

A. *Overall System Stages*

The following is a flowchart of the whole system.

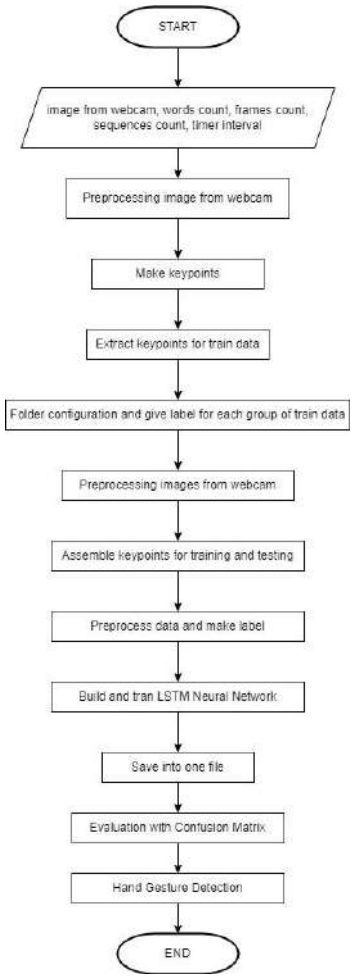

Fig. 4. Flowchart of System

B. *Preprocessing*

The system uses Mediapipe Face Detection to detect faces. Mediapipe uses the BlazeFace method to detect faces. In the BlazeFace method, objects that have the potential for facial images will be given a box around them. The system will compare the vector of the sample faces in the dataset with the user input image. BlazeFace has 5 steps in preprocessing starting from resizing the image to finding facial landmarks in the image.[4]

- *Step One*

The image will be resized to a smaller size to speed up the process. This preprocessing uses the nearest neighbor interpolation method which replaces each pixel with four pixels of the same color. The image is reduced in resolution using the Gaussian Pyramid technique.

- *Step Two*

Images will be processed using the Proposal Network (P-Net). P-Net uses regression technique to predict bounding box. The system will predict the location of the face and will give a box between the predicted locations. In face detection BlazeFace will detect 6 objects inside the face

(2 eyes, 1 nose, 1 mouth, 2 ears). BlazeFace uses the regression method to predict each object to be detected, if the correlation coefficient value from the regression results is close to 1, it indicates that the combined coordinates that make up a prediction box have faces in it.

- *Step Three*

After that, non-maximum suppression (NMS) was used to combine highly overlapping candidates. In the second step, the previous output candidate becomes the input to another CNN, which is called Refine Network (R-Net). This CNN will also reject a large number of false candidates and predict more accurate bounding boxes and apply NMS to remove overlapping squares.

- *Step Four*

The system will eliminate all prediction boxes of objects in the face, leaving the final prediction box. Once the final prediction box is defined, red dots will be drawn to indicate the location of each object.

- *Step Five*

Next, the system will eliminate the prediction box and draw landmarks around the face.

C. Collect Train Data

In order for the system to translate hand gestures into words, a keypoint collection process is needed for training and testing. The system needs to track the interrelationships between landmarks by using a holistic function that functions to lock the position between landmarks with the condition of dynamically moving hand gesture video input which will later be used as a reference for hand gesture translation. Word count is 17, each word has 10 sequences, each of which has 30 frames containing a sequence of hand gestures from the start position to the end position. So the system will have 17 x 10 x 30 = 51.000 frames. The system will take a hand gesture reference 10 times. For example, below is taking the frame for the word 'air' in sequence number 6.

Fig. 11. Collect Train Data for Word 'air'
Take Picture of Pak Abu on 25-06-2022

D. Apply the LSTM Method

After the trained image is collected, the next step is to train computer with the collected trained images. For example below is the transition between each frame on word 'air' on 6th sequence that has 30 frame. On 1st frame of Vector it has 12 value for Red, 65 value for Green and 34 for Blue then on 2nd frame it has transition 23 value for Red, then on 3rd frame it has 54 value for Red, 23 value for Green, and 65 value for Blue so on until 30th Frame it has 76 value for Red, 219 value for Green and 65 value for Blue. All the transitions value will be calculated through the LSTM method with the given threshold (30%), finding the best value that match with the transition.[5]

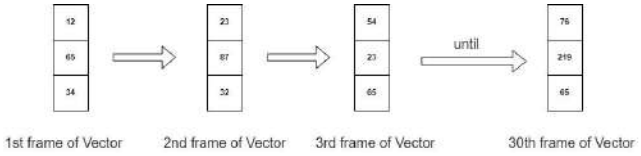

Fig. 12. Transition value of word 'air'

System will detect words based on combined transition value on each frame with the given threshold (30%). If input hand gesture meets the value, system will show the result 'air'.[6]

IV. RESULTS AND DISCUSSION

In the following discussion contains software testing. This test is intended to see whether the software that has been made is as planned or not. Testing is carried out by going through several stages continuously. In this test, the first thing to do is testing the routine parts that have been made, then testing the software as a whole.[7]

This software testing aims to determine the results of the software planning that has been made, whether it is as expected, but it also serves to find out the weaknesses of the existing system. Because as a medium for taking pictures using a camera, the light factor plays an important role in the image capture process.

A. Attempt

The following are the attempt for system to detect word 'air'. Gesture for 'air' require 3 pose so it can be defined as true. Words above the user picture is the translated words from system. On the first pose it requires hand of the user to be placed similar like on below picture.

Fig. 13. 1st Pose of Word 'air'
Take Picture of Pak Abu on 25-06-2022

On the second pose it requires hand of the user to be placed similar like on below picture.

Fig. 14. 2nd Pose of Word 'air'
Take Picture of Pak Abu on 25-06-2022

On the third pose it requires hand of the user to be placed similar like on below picture.

Fig. 15. 3rd Pose of Word 'air'
Take Picture of Pak Abu on 25-06-2022

After some proper gesture from user is implemented, system will mark it as a result with certain calculated prediction. For example gesture above has transition value below.

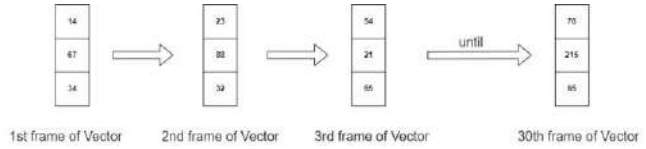

Fig. 16. Transition value of input hand gesture

System will compare it with existing transition value for word 'air'. If it's still include inside given threshold (30%), system will mark it as a result word. Threshold value is obtained from 255(maximum value for RGB). For example 1st frame of vector have 12 value. Range of threshold can be explained below.[8]

Value	Minimum Threshold
12	(12 - 255 x 70/100) = -166.5
65	(65 - 255 x 70/100) = -113.5
34	(34 - 255 x 70/100) = -166.5

1st frame of Vector

Value	Maximum Threshold
12	(12 + 255 x 70/100) = 190.5
65	(65 + 255 x 70/100) = 243.5
34	(34 + 255 x 70/100) = 190.5

1st frame of Vector

Fig. 17. Transition value of input hand gesture

Minimum and maximum threshold are obtained from value of vector increased/decreased by, 100% decreased by threshold value. Below is the comparison between 1st frame of input and real vector value for word 'air'.

Value	Range Threshold
12	(-166.5 until 190,5)
65	(-113.5 until 243,5)
34	(-166.5 until 190,5)

1st frame of Input Vector

Value	Inside Range ?
14	Yes
67	Yes
34	Yes

1st frame of 'air' Vector

Fig. 18. Transition value of input hand gesture

If value of input vector on 1st frame is still inside threshold range, system will mark it as a true on 1st frame and continue to 2nd frame and so on. All values on 1st frame are still inside range of 'air' Vector, so system will show it as a result.[9]

B. Confusion Matrix

After 2 attempts of hand gesture recognition for all words, confusion matrix table is created to show all the accuracy results of each words. [10]

	air	api	bagaimana	burung	dengar	film	halo	jumpa	kasih
air	7	5	0	0	0	0	0	0	0
api	6	6	0	0	0	0	0	0	0
bagaimana	0	0	8	0	2	0	0	2	0
burung	0	0	0	5	0	0	0	0	3
dengar	0	0	0	0	8	0	4	0	0
film	0	0	0	0	4	8	0	0	0
halo	0	0	2	0	4	0	5	0	0
jumpa	0	0	0	0	0	0	0	6	0
kasih	0	0	0	0	2	0	0	0	4
kucing	0	0	0	0	0	2	0	3	0
makan	0	0	0	0	0	0	2	1	1
mandi	0	0	0	3	0	0	3	0	0
nasi	0	0	0	0	0	0	0	0	0
pagi	0	0	0	0	0	0	0	3	0
saya	0	0	0	0	0	0	0	0	0
sapi	0	0	0	0	0	0	0	0	0
selamat	0	0	2	0	0	0	2	0	0

	kucing	makan	mandi	nasi	pagi	saya	sapi	selamat
air	0	0	0	0	0	0	0	0
api	0	0	0	0	0	0	0	0
bagaimana	0	0	0	0	0	0	0	0
burung	1	0	3	0	0	0	0	0
dengar	0	0	0	0	0	0	0	0
film	0	0	0	0	0	0	0	0
halo	0	1	0	0	0	0	0	0
jumpa	0	3	0	3	0	0	0	0
kasih	0	0	4	0	0	0	0	0
kucing	7	0	0	0	0	0	0	0
makan	0	8	0	0	0	0	0	0
mandi	0	0	6	0	0	0	0	0
nasi	0	4	0	8	0	0	0	0
pagi	3	0	0	0	4	2	0	0
saya	0	3	0	0	0	11	0	0
sapi	1	0	0	0	0	0	11	0
selamat	0	6	0	0	0	0	0	2

Fig. 19. Confusion Matrix

TP = 114, FP = 57, FN = 33, TN = 0

$$\text{Accuracy} = \frac{TP+TN}{TP+FP+FN+TN} = \frac{114+57}{114+57+33+0} = \frac{171}{204} = 0{,}55$$

$$\text{Precision} = \frac{TP}{TP+FP} = \frac{114}{114+57+33+0} = \frac{114}{204} = 0{,}66$$

$$\text{Recall} = \frac{TP}{TP+FN} = \frac{114}{33+0} = \frac{114}{33} = 0{,}77$$

$$\text{F1} = \frac{2 \times Precision \times Recall}{Precision + Recall} = \frac{2 \times 0{,}66 \times 0{,}77}{0{,}66+0{,}77} = \frac{1.0164}{1.43} = 0{,}71$$

Fig. 20. Accuracy, Precision, Recall, and F1

TP = True Positive is words that have predicted value true and actual value true (“air”, “api”, “bagaimana”, “burung”, “dengar”, “film”, “halo”, “jumpa”, “kasih”, “kucing”, “makan”, “mandi”, “nasi”, “pagi”, “sapi”, “saya”, “selamat”)

TN = True Negative is words that have predicted value false and actual value false (“kasih”, “lihat”)

FP = False Positive is words that have predicted value false and actual value true (none)

FN = False Negative is words that have predicted value true and actual value false (none)

V. CONCLUSION

Based on the results of the research, discussion and interpretation that have been described in previous chapters, with reference to several theories and the results of previous studies, conclusions can be drawn words that can be translated properly are 'air', 'api', 'bagaimana', 'berapa', ‘burung’ , ‘dengar’ , ‘film’ , ‘halo’ , ‘jumpa’, ‘kucing’, ‘makan’, ‘mandi’, ‘nasi’, ‘pagi’, ‘sapi’, ‘saya’. Words ‘selamat’ have unproper translation because it has similarity with word ‘makan’.

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