ICVEE 2022

2022 The Fifth International Conference on Vocational Education and Electrical Engineering (ICVEE)

CERTIFICATE

NO. 57228/UN38.I/DL.01.02/2022

THIS CERTIFICATE OF APPRECIATION IS AWARDED TO

Naim Rochmawati

as

Presenter

In The Fifth International Conference on Vocational Education and Electrical Engineering (ICVEE) 2022

THE FUTURE OF ELECTRICAL ENGINEERING, INFORMATICS, AND EDUCATIONAL TECHNOLOGY THROUGH THE FREEDOM OF STUDY IN THE POST-PANDEMIC ERA

Surabaya, 10-11 September 2022

VICE RECTOR FOR ACADEMICS AFFAIRS

Prof. Dr. Bambang Yulianto, M. Pd.

CONFERENCE CHAIR

Dr. Rr. Hapsari Peni Agustin T, S.T., M.T.

PROCEEDING

ICVEE 2022

2022 Fifth International Conference on Vocational Education and Electrical Engineering (ICVEE)

THE FUTURE OF ELECTRICAL ENGINEERING, INFORMATICS, AND EDUCATIONAL TECHNOLOGY THROUGH THE FREEDOM OF STUDY IN THE POST-PANDEMIC ERA

2022 Fifth International Conference on Vocational Education and Electrical Engineering (ICVEE) | 978-1-6654-7581-5/22/$31.00 ©2022 IEEE | DOI: 10.1109/ICVEE57061.2022.9930425

September

10-11, 2022

ISBN : 978-1-6654-7581-5 Part Number : CFP22X27-ART

2022 Fifth International Conference on Vocational Education and Electrical Engineering (ICVEE) | 978-1-6654-7581-5/22/$31.00 ©2022 IEEE | DOI: 10.1109/ICVEE57061.2022.9930388

2022 Fifth International Conference on Vocational Education and Electrical Engineering (ICVEE)

"The Future Of Electrical Engineering, Informatics, And Educational Technology Through The Freedom Of Study In The Post-Pandemic Era"

Proceeding

Surabaya, Indonesia

(Virtual Conference)

10-11 September 2022

IEEE Conference Number : 57061

IEEE Catalog Number : CFP22X27-ART

ISBN : 978-1-6654-7581-5

Sponsor:

2022 Fifth International Conference on Vocational Education and Electrical Engineering (ICVEE) Proceeding

2022 Fifth International Conference on Vocational Education and Electrical Engineering (ICVEE) on September 10-11, 2022 in the virtual event, Surabaya, Indonesia.

IEEE catalog number	: CFP22X27-ART
ISBN	: 978-1-6654-7581-5

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Welcome Message from the General Chair

ICVEE 2022 is the fifth International Conference on Vocational Education and Electrical Engineering organized by the Faculty of Engineering, Universitas Negeri Surabaya. This year, the theme of this conference is "THE FUTURE OF ELECTRICAL ENGINEERING, INFORMATICS, AND EDUCATIONAL TECHNOLOGY THROUGH THE FREEDOM OF STUDY IN THE POST-PANDEMIC". Following the theme, this conference aims to bridge the scientists, education experts and practitioners, and students in the scientific forum through sharing ideas and issues about theoretical and practical knowledge in electrical engineering, informatics engineering, engineering education and vocational education.

ICVEE 2022 is attended by presenters from overseas, such as the Brazil, Marocco, Germany, and Indonesia. Hopefully, we can have a productive conference with exciting and encouraging discussions, knowledge exchanges, and networking.

This conference will not be possible without tremendous supports and help from those who give their all-out efforts and hardworking. I am very grateful to all the organizing committee and scientific committee members for their outstanding work to support this conference. Through this conference, we wish to increase our knowledge and work together to advance technology for the humanities.

Sincerely yours,

Dr. Hapsari Peni Agustin T., S.Si., M.T.
Conference Chair
e-mail: hapsaripeni@unesa.ac.id

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PROGRAM SCHEDULE

10th September 2022

MC: *Paramitha Nerisafitra*, S.ST., M.Kom

Roswina Dianawati, S.Pd., M.Ed

Time (GMT+7)	Activity
07.00 – 08.00	Online Registration
08.00 – 08.05	Opening and Rule Guidance
08.05 – 08.10	Listening Indonesia National Anthem
	Listening Mars of Universitas Negeri Surabaya
08.10 – 08.15	Conference report by ICVEE chair
08.15 – 08.25	Welcome Speech from Rector of Universitas Negeri Surabaya Prof. Dr. Nur Hasan.M. Kes
08.25 – 08.35	. IEEE Comsoc Indonesia Chapter Chair Opening speech: Dr. Bambang Setia Nugroho
08.35 – 08.45	Advisory Board Committee Representative Speech: Prof. Nobuo Funabiki Okayama University
08.45-08.55	Photo session
PLENARY SESSION I	
09.00 – 09.50	**Keynote speaker 1** Prof. Auzuir Ripardo de Alexandria Instituto Federal de Educação Ciência e Tecnologia do Ceará: Fortaleza, CE (Brazil) Moderator : Dr. Pradini Puspitaningayu, S.T., M.T

09.50 – 10.40	**Keynote speaker 2** Prof. Dr. I Gusti Putu Asto B., S.T., M.T. Dept. of Electrical Engineering State University of Surabaya (Indonesia) Moderator : Dr. Yeni Anistyasari
10.40-10.45	Awarding Token of Appreciation I
11.00 – 12.00	**PARALLEL SESSION I** (5 breakout rooms) Room 1 – 5
12.00 – 12.30	BREAK
PLENARY SESSION II	
12.30 – 13.20	**Keynote speaker 3** Dr. Sven Schulte Scientific Researcher and Lecturer TU Dortmund University (Germany) Moderator : Dr. Lilik Anifah, M.T
13.20 – 13.25	Awarding Token of Appreciation II
13.25 – 13.45	Break
13.45 – 15.30	**PARALLEL SESSION II** (5 breakout rooms) Room 1-5
15.30 – 15.45	Closing Ceremony

Parallel Session:

Room 1

Moderator : Dr. Lilik Anifah

No	ID	Time	Author	Title
1	625	11.00-11.15	Fiqey Indriati Eka Sari, Frederick William Edlim, Fitrah Arie Ramadhan, Muhtadin Muhtadin and Dini Adni Navastara	Performance Analysis of Resampling and Ensemble Learning Methods on Diabetes Detection as Imbalanced Dataset
2	2238	11.15-11.30	Evianita Dewi Fajrianti, Sritrusta Sukaridhoto, Nobuo Funabiki, Muhammad Udin Harun Al Rasyid, Rizqi Putri Nourma Budiarti and Yohanes Yohanie Fridelin Panduman	Design and Implementation of Indoor Navigation for PENS Visitors Using Augmented Intelligence
3	3145	11.30-11.45	Raymond Sunardi Oetama, Ford Lumban Gaol, Benfano Soewito and Harco Leslie Hendric Spits Warnars	When Candlesticks are different among Forex Brokers, can Traders still win?
4	4765	11.45-12.00	Lilik Anifah, Puput Wanarti Rusimamto, Haryanto Haryanto, I Made Arsana, Subuh Isnur Haryudo and Meini Sondang Sumbawati	Dentawyanjana Character Segmentation Using K-Means Clustering CLAHE Adaptive Thresholding Based
5	5178	13.45-14.00	Hapsari Peni Agustin Tjahyaningtijas, Laras Suciningtyas, Naim Rochmawati, Lusia Rakhmawati, Cucun Very Angkoso and Andi Kurniawan Nugroho	Brain Tumor Classification Using Deep Neural Network Based on MRI Images
6	5527	14.00-14.15	Rommel Traya, Raisa Mel Verona, Lady Ann Malatbalat, Lyra Nuevas, Dindo Obediencia, Ma. Windie Velarde and Raymond Daylo	Android Mobile Application: Tsunami Alert System with an Escape Route for Evacuation in Municipal

				Disaster Risk Reduction and Management Office
7	6340	14.15-14.30	Surjandy Surjandy and Cadelina Cassandra	The Influence of Information Quality, Trust, and Risk Factors of The Digital Advertising on Buying Decision
8	7011	14.30-14.45	Yuni Yamasari, Anita Qoiriah, Naim Rochmawati, I.M. Suartana, Oddy Virgantara Putra and Andi Iwan Nurhidayat	Exploring the Kernel on SVM to Enhance the Classification Performance of Students' Academic Performance
9	9057	14.45-15.00	Yeni Kustiyahningsih, Eza Rahmanita, Devie Rosa Anamisa and Jaka Purnama	An integrated approach to determine mapping of SMEs during Covid-19 pandemic
10	9414	15.00-15.15	Evi Pane, Diah Risqiwati, Adhi Dharma Wibawa and Mauridhi Hery Purnomo	Gender Difference in EEG Emotion Recognition with Overlapping Shifting Window
11	9654	15.15-15.30	Cucun Very Angkoso, Ari Kusumaningsih, Hapsari Peni Agustin Tjahyaningtijas and Andi Kurniawan Nugroho	Multiclass Deep Transfer Learning for Covid 19 Classification

Room 2

Moderator : Dr. Nurhayati

No	ID	Time	Authors	Title
1	892	11.00-11.15	Sepyan Purnama Kristanto, Lutfi Hakim, Dianni Yusuf, Endi Sailul Haq and Aditya Roman Asyhari	Classification of Public Opinion on Vaccine Administration Using Convolutional Neural Network
2	2181	11.15-11.30	Yohanes Yohanie Fridelin Panduman, Nobuo Funabiki, Pradini Puspitaningayu, Masaki Sakagami and Sritrusta Sukaridhoto	Implementations of Integration Functions in IoT Application Server Platform
3	3087	11.30-11.45	Beatriz Silva Brasil, Auzuir Ripardo de Alexandria and Glendo de Freitas Guimarães	Artificial Intelligence applied to the classification of retinal diseases in Optical Coherence Tomography images
4	3229	11.45-12.00	Abdul Rahman Patta, Nobuo Funabiki, Yan Watequlis Syaifudin and Wen Chung Kao	An Implementation of Solving Activity Monitoring Function in Android Programming Learning Assistance System
5	6606	13.45-14.00	Pradini Puspitaningayu, Nobuo Funabiki, Yuanzhi Huo, Yohanes Panduman, Xinyu Wu, Minoru Kuribayashi and Wen-Chung Kao	Accuracy Investigations of Fingerprint-based Indoor Localization System Using IEEE 802.15.4 in Two-Floor Environment
6	7160	14.00-14.15	Naim Rochmawati, Hanik Badriyah Hidayati, Wiyli Yustanti, Yuni Yamasari, Hapsari Peni Agustin Tjahyaningtijas,	Brain Tumor Classification Using Transfer Learning

			Ricky Eka Putra and I Made Suartana	
7	7548	14.15-14.30	Cahya Rahmad, evi Enggar Sukmana and Arie Rachmad Syulistyo	An Automatic Egg Quality Grading Using Nature-Inspired Algorithm Based Classification
8	7992	14.30-14.45	Irin Tri Anggraini, Nobuo Funabiki, Pradini Puspitaningayu, Shih-Wei Shen, Wan-Chia Huang and Chih-Peng Fan	Implementation and Evaluation of Exercise and Performance Learning Assistant System Platform for Yoga Pose Practices Using Node.js
9	8015	14.45-15.00	Shintami Hidayati, Nafa Zulfa, Pima Safitri and Yeni Anistyasari	Exploring the Potential of Adopting Computer-graphics Animation to the Switch to a Plant-Based Diet
10	8979	15.00-15.15	Glenn Gumba and Jessie Paragas	Prediction Analysis of Student Admission to Information Technology education (ITE) Programs using Classification Algorithm
11	9126	15.15-15.30	Miftahur Rohman, Farid Baskoro, Widi Aribowo, Yuli Sutoto Nugroho, Aristyawan Putra Nurdiansyah and L. Endah Cahya Ningrum	Selection of the modulation, distance, and number of hop nodes parameters to determine the minimum energy in the wireless sensor network

Room 3

Moderator : Unit Three Kartini. Ph.D

No	ID	Time	Authors	Title
1	276	11.00-11.15	Unit Three Kartini, Bambang Suprianto, I.G. P Asto Buditjahjanto, Lilik Anifah, Nurhayati Nurhayati and Mochamad Nur Adiwana	Optimalization Global Horizontal Irradiance Based On Weather Data Using Hybrid model Modified Decomposition FeedForward Neural Network
2	409	11.15-11.30	Rifqi Firmansyah	Power Sharing Control and Voltage Restoration in DC Microgrid Using PI Fuzzy
3	3634	11.30-11.45	Widi Aribowo, Reza Rahmadian, Ayusta Wardani, Mahendra Widyartono, Bambang Suprianto and Aditya Chandra Hermawan	Marine Predators Algorithm For Tuning DC Motor
4	4967	11.45-12.00	Adhi Kusmantoro	Enhancement DC Microgrid Power Stability With a Centralized
5	6910	13.45-14.00	Yanuar Zulardiansyah Arief, Hendri Masdi, Nur Izziani Roslan, Mohd Hafiez Izzwan Saad, Hamzah Eteruddin and Rosyid Ridlo Al Hakim	Investigation on Various Faults of 500 kV Transmission Line Design in Sarawak, Malaysia Using Power Systems Computer Aided Design
6	7243	14.00-14.15	Unit Three Kartini, Hariyati Hariyati, Widi Aribowo and Ayusta Lukita Wardani	Development Hybrid Model Deep Learning Neural Network (DL-NN) For Probabilistic Forecasting Solar Irradiance on Solar Cells To Improve Economics Value Added

7	7547	14.15-14.30	Ilham A.E. Zaeni, Wahyu Primadi, Dessy Rif'A Anzani and Anik Nur Handayani	Detection of the Imbalance Step Length using the Decision Tree
8	8559	14.30-14.45	Yanuar Zulardiansyah Arief, Hendri Masdi, Kelvin Juing Anak Tinggom, Aulia, Irza Sukmana and Rosyid Ridlo Al Hakim	Simulation of Water Tree Defect on Different Type of XLPE Underground Power Cable Using Finite Element Analysis
9	9022	14.45-15.00	Widi Aribowo, Reza Rahmadian, Mahendra Widyartono, Aditya Chandra Hermawan, Ayusta Lukita Wardani and Unit Three Kartini	Tasmanian Devil Optimization For Economic Load Dispatch
10	9597	15.00-15.15	Nibras Syarif Ramadhan, Indra Ferdiansyah and Era Purwanto	Voltage Booster for Optimizing Scalar Control Methods on Single Passenger Electric Vehicles
11	9806	15.15-15.30	Jamiu Omotayo Oladigbolu, Mustafa M.A. Seedahmed, Rifqi Firmansyah Muktiadji and Amir A. Imam	Optimal Design and Viability Assessment of a Stand-alone Hybrid Power System for the Electrification of a Grid-unconnected Location in Saudi Arabia

Room 4

Moderator : Dr. Lusia Rakhmawati

No	ID	Time	Authors	Title
1	2684	11.00-11.15	Yuli Sutoto Nugroho, Munoto Munoto, Ismet Basuki and Rr. Hapsari Peni Agustin T	Study of Electrical Engineering Students' Interests Comparison between Video-Based Learning and Online Meetings
2	4772	11.15-11.30	Hakkun Elmunsyah, Wahyu Nur Hidayat, Hary Suswanto, Khoir, Muhammad Akhsan Hakiki and Kusumadyahdewi Kusumadyahdewi	Development of Mobile Learning Applications With Augmented Reality to Build VHS Students' Critical Thinking
3	5137	11.30-11.45	Banni Satria Andoko, Putra Prima Arhandi, Faiz Ushbah Mubarok, Mungki Astiningrum, Tsukasa Hirashima and Muhammad Fachry Najib	Constructing Toulmin's Logical Structure Through Viat-map Application For Reading Comprehension of EFL Students
4	5716	11.45-12.00	Arda Editya, Neny Kurniati and Angga Lisdiyanto	Optimalization Jaro Winkler Algorithm Using Fuzzy Logic to Evaluate Essay Questions in E-Learning System Based Microserver
5	5985	13.45-14.00	Mohammad Idhom, Munoto Munoto, I Gusti Putu Asto Buditjahjanto and Muchlas Samani	Performance Evaluation of Automated Essay Scoring Online System for Competency Assessment of Community Academy
6	8164	14.00-14.15	Joko Joko, Agus Budi Santoso and Parama Diptya Widayaka	The Effect of Learning Readiness and Prerequisite

				Courses on Project-Based Learning on Student Competencies in Working on Electrical Machine Repair Projects in The Post Covid-19 Transition Period
7	8336	14.15-14.30	Khoirudin Asfani, Hakkun Elmunsyah, Syaad Patmanthara, Wahyu Nur Hidayat, Hary Suswanto and Halizah Binti Awang	Distance Learning Scheme with Remote Desktop Application for Mikrotik Configuration Practice in the Covid-19 Pandemic Era
8	8415	14.30-14.45	Lusia Rakhmawati, Achmad Imam Agung and Miftahur Rohman	Virtual Laboratory-Based Student Worksheets Development for Computational Thinking Practices
9	9697	14.45-15.00	Subuh Haryudo, Euis Ismayati and Farid Baskoro	Development of Training Kit for Solar Cell Off-Grid System based on Project-based Learning to improve learning outcomes
10	9816	15.00-15.15	Sunarti Sunarti and Irawan Dwiwahyono	Optimizing the Certainty Factor on K-Nearest Neighbor to Determine the Learning Model during the Pandemic

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List of Article

Brain Tumor Classification Using Transfer Learning

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2022 Fifth International Conference on Vocational Education and Electrical Engineering (ICVEE) | 978-1-6654-7581-5/22/$31.00 ©2022 IEEE | DOI: 10.1109/ICVEE57061.2022.9930403

***Abstract*— One type of deadly disease is a brain tumor. To determine the presence of a brain tumor, it can be seen from an MRI image. In this research, we classified brain tumor MRI. The classification system uses transfer learning because only a few datasets are used. The Pre-Trained models used to extract features are VGG-16 and ResNet-50. Tests are carried out using several different parameters such as different batch sizes, optimizers, and learning rates. We evaluate the results using the confusion matrix. VGG-16 got the best accuracy of 0.96 using the Adam optimizer and ResNet-50 got the best accuracy of 0.94 using the RMSprop optimizer. From several different parameter variations, there is a relationship between parameter selection and accuracy results.**

Keywords— transfer learning, pre-trained model, Vgg-16, ResNet-50, brain tumor, optimizer, Adam, SGD, RMSProp

I. INTRODUCTION

Humans live side by side with many diseases. One type of deadly disease is a brain tumor[1]. The brain is a vital organ that functions to move other body systems. It can be said, this organ is the center for regulating other body organs to work. If there is a disturbance or problem with the brain, it certainly affects on the performance of the body's organs as a whole.

Magnetic resonance imaging (MRI) is an imaging test that uses a magnetic field and radio waves to assess the inside of the body. This imaging examination is good for assessing soft tissues in the body, including the brain. So to find out whether the brain contains a tumor or normal can be seen from an MRI images

Machine learning is a branch of artificial intelligence (AI) where the way it works is imitating the way humans learn without the need to be given explicit instructions. Examples of machine learning apparently exist in various forms that are very familiar with daily activities. Starting from transportation, technology, finance, education, health, and also social media. In short, it has been used for a lot of real-world applications[2]

One of the methods commonly used in machine learning is Convolutional Neural Network (CNN). Convolutional Neural Network or sometimes also called as ConvNet is part of a deep neural network, which is a type of artificial neural network that is generally used in image recognition and processing. This algorithm is specially designed for processing pixel data and visual images.

However, to find a model that has good accuracy and avoids overfitting, a large dataset is required. The more and more varied a dataset that is trained, it allows the resulting model to have better accuracy. The problem arises when the dataset used is small. One solution to overcome this is to use the transfer learning method.

Transfer learning is a method that has the basic principle of utilizing a previously trained model to be re-implemented in a new dataset where the existing dataset is not ideal enough to be trained from the beginning.

A pre-trained model is the use of pre-trained models which were trained on a large dataset by other people to solve our problem. There are many kinds of pre-trained models that have been published and are usually used as references in research, namely VGG, ResNet-50, Inception, Mobilenet, and many others. This study uses VGG-16 and ResNet-50.

In deep learning, to get good accuracy results, an optimization algorithm is needed or what is commonly called an optimizer. An optimizer is a function or algorithm that will modify NN attributes such as weight and learning rate so that it will improve the accuracy value. There are many kinds of optimizers. Three of them are Stochastic Gradient Descent (SGD), Adam, and Root Mean Square Propagation (RMSProp).

This study aims to classify brain tumors using a small dataset using the transfer learning method. The second goal is to explore the optimizer, learning rate, batch size, and epoch in the classification of brain tumor datasets to determine the relationship and their effect on the accuracy of results obtained.

A. Related Work

Several researchers have conducted research related to brain tumors. Brain tumor comparisons were carried out by Mehrotra et al using transfer learning methods AlexNet, SqueezeNet, ResNet-50, and GoogleNet. The best accuracy is obtained from Pre-Trained Alexnet with 99.4% accuracy with optimizer SGD and RMSProp[3]. Another study that compared the VGG-16, VGG-19, and Alexnet transfer learning methods has also been carried out with the best

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accuracy results being VGG-19[4]. Deepak et al. perform feature extraction using GoogleNet transfer learning with KNN and SVM classifiers[5].

In addition, there are also other methods used in classifying brain tumors using ensemble learning [13].

Research on brain tumor was developed by several researchers with various methods such as CNN-SVM [6], AlexNet [7], GoogleNet [8][9][10], VGGNet [11], ResNet-50 [12], In addition, there are also other methods used in classifying brain tumors using ensemble learning [13].

II. RESEARCH METHOD

This chapter describes the sequence of methods used in this research. This research has 6 steps, namely data retrieval, image preprocessing, Split dataset, Augmentation, comparing two methods of Pre-Trained VGG-16 and ResNet-50 models, Measurement. The sequence of steps can be seen in Fig..1.

The following is an explanation of each step in the diagram in Fig. 1:

A. Dataset

The dataset used in this study was taken from Kaggle[14]. The brain tumor MRI dataset consists of 253 images. these images are divided into two folders with the title yes and no. in the yes folder, there are 155 images consisting of brain images containing tumors and in the no folder, there are about 98 images where brain images do not contain tumors aka normal.

Some sample datasets of normal brain images without tumors can be seen in Fig. 2.

This dataset is a public dataset and can be downloaded from the Kaggle website.

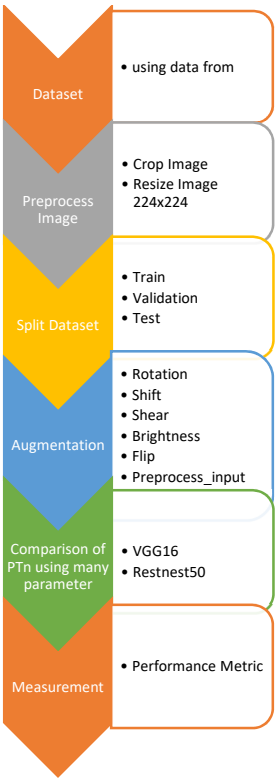

Fig.1. Research Method Diagram

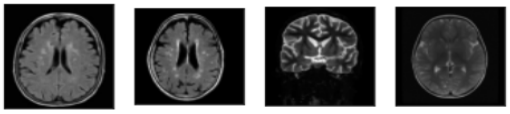

Fig. 2. Sample dataset of Brain MRI Images of NO

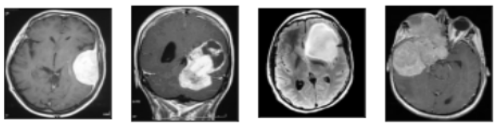

Fig. 3. Sample dataset of Brain MRI Images of YES

While the brain image dataset containing the tumor is shown in Fig. 3

B. PreProcessing

The preprocessing consists of two steps, cropping the image by looking for the left, right, top, and bottom points. Then the image will be cropped to the point where it is obtained.

Then the image is resized to 224x224. Because the transfer learning method used is VGG-16 and ResNet-50, the image size will be changed to 224x224.

Next, the dataset is divided into three parts, training, validation, and testing.

C. Augmentation

Because the dataset used is small, it is necessary to do augmentation before training. Augmentation is a technique of manipulating data by performing input operations of rotation, shift, shear, brightness, flip, and preprocessing.

This operation is done to avoid overfitting by making the data more varied. If the dataset is trained without augmentation first, the performance and accuracy will be worse than the dataset that has been augmented.

D. Comparison of Pre-Trained Models

Before discussing the comparison, we will first explain about Transfer learning.

1) Transfer Learning

Transfer learning is a technique that utilizes a pre-trained model to be used to classify new datasets so that there is no need to train data from the beginning. More details can be seen in Fig. 4.

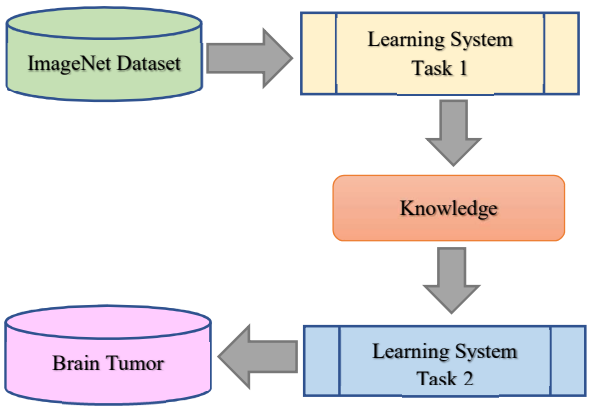

Fig. 4. Transfer Learning

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There are two kinds of pre-trained that will be used:

a) VGG-16

VGG-16 is one of the CNN architectural models that won the ILSVR competition in 2014. VGG16 is a CNN model that utilizes a convolutional layer with a small convolutional filter specification (3×3). With the size of the convolutional filter, the depth of the neural network can be increased by more convolutional layers. As a result, the model is more accurate than previous CNN models.

The VGG16 model consists of 16 convolutional layers. The VGG-16 architectural model can be seen in Fig..5.

b) ResNet-50

ResNet-50 was first introduced by Kaiming et al in their paper entitled Deep Residual Learning for Image Recognition. ResNet-50 consists of 50 deep layers. ResNet-50 architectural model in Fig. 6.

Both VGG-16 and ResNet-50 images were obtained from a paper describing brain tumor classification using MRI images by Srinivas et. al[15].

2) Optimizer Adam, RMSProp, SGD

Deep learning is part of machine learning that is commonly used for various tasks, one of which is image classification. Deep learning will train the dataset using activation functions, hidden layers, loss functions, input, output, etc.

Modification of NN attributes such as weight and learning rate needs to be done so that the accuracy results can increase. The accuracy can be imporved by using the optimizer algorithm. There are many kinds of optimizers. Three of them are SGD, Adam, and RMSProp

a) Stochastic gradient descent (SGD)

SGD is an optimization algorithm that is a variant of gradient descent. The way it works is iteratively reduces a loss function by moving in the direction opposite to that of the steepest ascent.

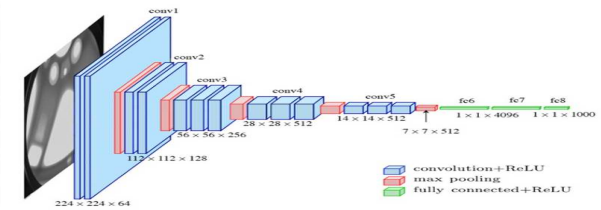

Fig. 5. VGG-16 architecture

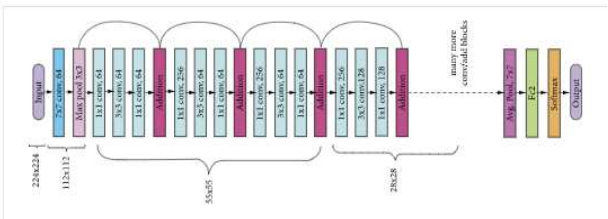

Fig. 6. ResNet-50 architecture

b) .Adam

Adam is actually a combination of the SGD optimizer and RMSprop. The way it works is that the learning rate for each weight will be adjusted according to the estimates of the first and second gradients. Therefore the term is called "adaptive moment estimation" or abbreviated as Adam.

c) Root Mean Square Propagation (RMSProp)

Basically RMSprop is a refinement of AdaGrad. although not published, but this optimizer is one of the most popular and well-known. RMSprop does not use the learning rate as a hyperparameter, but the learning rate used is adaptive where the learning rate changes over time..

3) Scenario of comparison

The comparison scenarios in this study are:

- Using VGG-16 with the Adam optimizer uses two different learning rates
- Using VGG-16 with three different optimizers
- Using ResNet-50 with three different optimizers
- Comparing the results of VGG-16 and ResNet-50 with three different optimizers
- Comparing the results of VGG-16 using the Adam optimizer and several different batch sizes.

E. Assessment

Prediction results from classification algorithms need to be measured whether the results obtained are good or not. How many predictions were correct and how many turned out to be wrong. In this study, measurements were made using performance metrics. In performance metrics, there are several terms known as a confusion matrix, precision, recall, and F1 Score. The confusion matrix is a 2x2 matrix that contains the actual and predicted values as shown in Fig. 7.

From the confusion matrix, several formulas can be derived, including:

a. Accuracy:

$$\frac{TP + TN}{TP + TN + FP + FN}$$

b. Sensitivity:

$$\frac{TP}{TP + FN}$$

c. Specificity

$$\frac{TN}{TN + FP}$$

d. Precision

$$\frac{TP}{TP + FP}$$

e. F1 score

$$2x\frac{recallxprecision}{recall + precision}$$

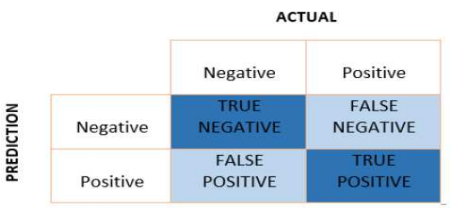

Fig. 7. Confusion Matrix

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Where TP stands for True Positive, TN is True Negative, FP is False Positive and FN is False Negative.

III. Result and Discussion

After preprocessing by cropping and resizing the images, then dividing the data into training, validation and testing, the main process is to create a CNN model using Pre-trained VGG-16 and ResNet-50. The experiment result discussed below:

First, a comparison is made using Pre-Trained VGG-16 with batch size 32, epoch 20, and the Adam optimizer with two different learning rates, 0.0001 and 0.001. From Fig. 8, the resulting accuracy is higher when using a learning rate of 0.001.

The second test was carried out using Pre-Trained Model VGG-16 with batch size 8, epoch 10, and three different optimizers, SGD, Adam, and RMSProp parameters. All use the same learning rate of 0.0001. The experimental results can be seen in Fig. 9.

The best accuracy value is generated by using the Adam optimizer. This is not to say that Adam's optimizer is always better than the other two. It could be that when using a different learning rate, another optimizer is better. Need more experiments to find out.

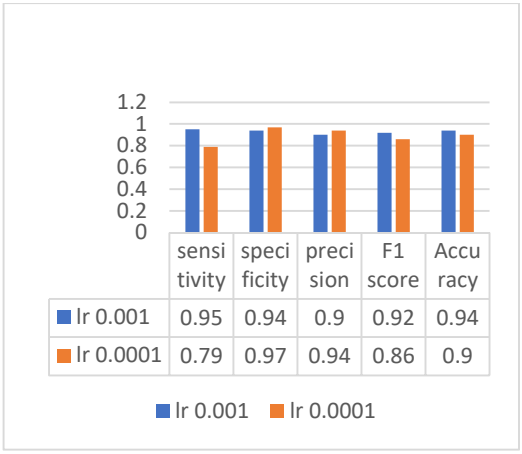

Figure 8. VGG-16 using Adam optimizer with different learning rate

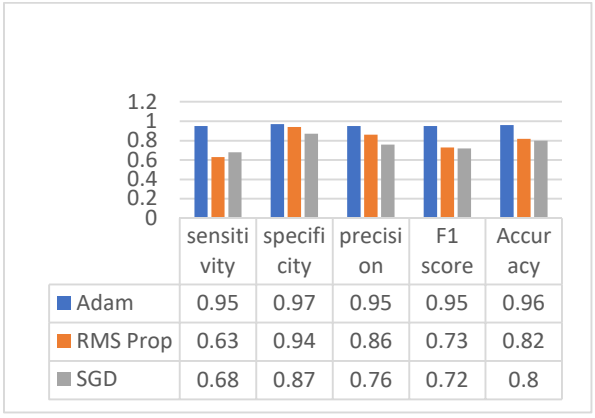

Figure 9. VGG-16 using different optimizers

The third experiment was carried out using the pre-trained ResNet-50 model with batch size 8, epoch 10. This experiment used three different optimizers and the learning rate was the same, 0.0001.

The experimental results can be seen in Fig. 10. The best accuracy is obtained from the RMSProp optimizer, which is 0.94 which turns out to be different from the previous study in Fig. 9, where VGG-16 obtained the best results when using the Adam optimizer.

When the results of the second and third experiments are compared, in Fig. 11, as previously explained, the best accuracy results are obtained by VGG-16 when using the Adam optimizer of 0.96 and ResNet-50 using RMSPro with an accuracy of 0.94.

The last experiment used the Pre-Trained VGG-16 model by using a combination of different batch sizes and epochs. The optimizer used in this last test uses the Adam optimizer with a learning rate of 0.0001. The test results can be seen in Fig. 12.

By using pre-trained VGG-16, the highest accuracy results when using batch size 8 and epoch 10 are 0.96. while the smallest value of accuracy is obtained when using batch size 32 and epoch 20. When Fig. 9 and Fig. 12 are compared, VGG-16 when using the Adam optimizer and a learning rate of 0.0001 the results may differ due to the difference in the selected batch

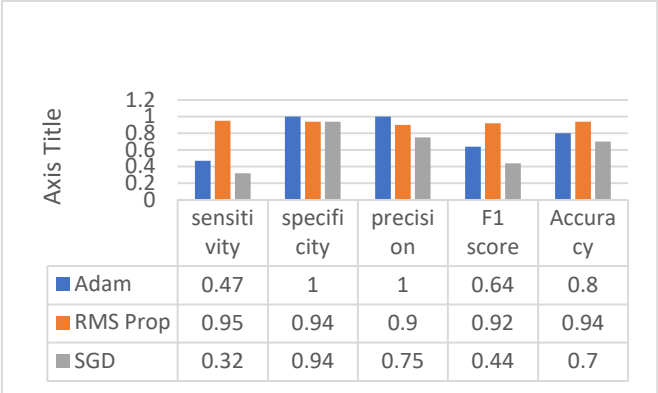

Figure 10. ResNet-50 using different optimizers

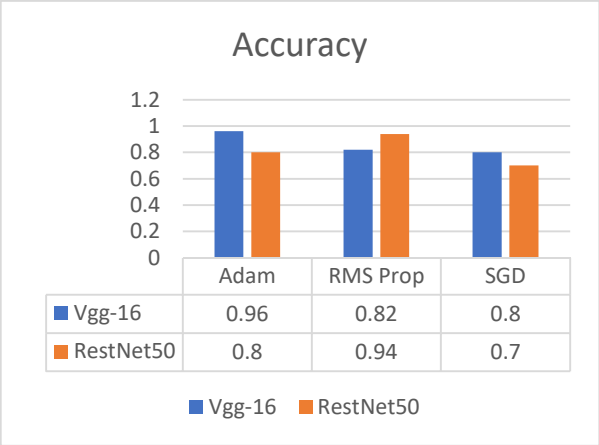

Figure 11. VGG-16 vs ResNet-50 using different optimizers

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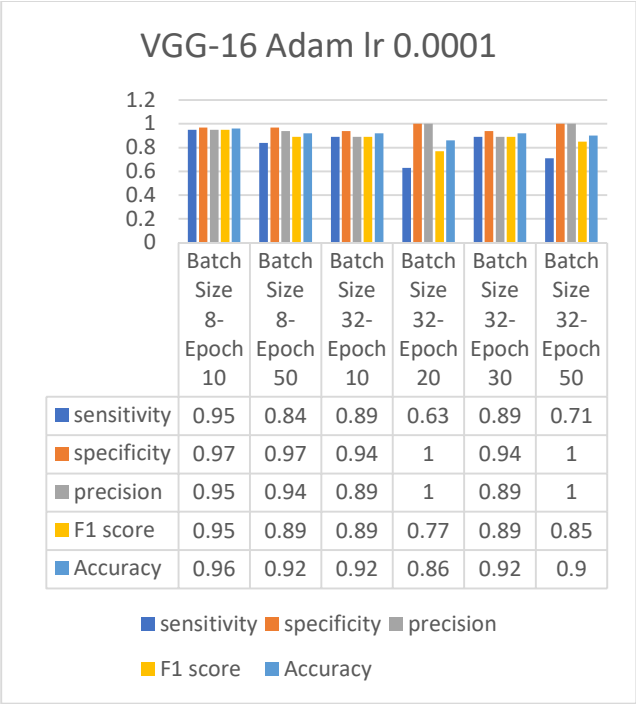

	Batch Size 8-Epoch 10	Batch Size 8-Epoch 50	Batch Size 32-Epoch 10	Batch Size 32-Epoch 20	Batch Size 32-Epoch 30	Batch Size 32-Epoch 50
sensitivity	0.95	0.84	0.89	0.63	0.89	0.71
specificity	0.97	0.97	0.94	1	0.94	1
precision	0.95	0.94	0.89	1	0.89	1
F1 score	0.95	0.89	0.89	0.77	0.89	0.85
Accuracy	0.96	0.92	0.92	0.86	0.92	0.9

Figure 12. VGG-16 using different batch sizes and epochs

size. in Fig. 9. When using batch size 32, the accuracy is 0.94 while when using batch size 8 in Fig. 12, the accuracy is 0.96.

IV. Conclusion and Future Work

Brain tumor classification experiments conducted with a small dataset of only 253 images turned out to be completed using the Transfer learning method. The Pre-Trained models used to extract features are VGG-16 and ResNet-50. By using several different parameters such as different batch sizes, optimizer, and learning speed, the result is that VGG-16 gets the best accuracy of 0.96 using the Adam optimizer and ResNet-50 gets the best accuracy of 0.94 using the RMSprop optimizer.

From the many comparison experiments carried out, there is a strong relationship between parameter selection and the accuracy of results obtained. Choosing the right batch size, epoch, optimizer, and learning rate will produce good accuracy results. On the other hand, if the selected parameters do not fit, the results are not very good.

For future research, it is necessary to do research on how to select hyperparameters automatically for transfer learning because searching is expensive and takes time and effort.

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