

Development of Ergonomics Checklist on Stroke Therapy Aids (Wearable Elbow Exoskeleton)

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This study aims at building a checklist used for each stage of wearable Elbow Exoskeletons development. The Wearable Elbow Exoskeleton is one of the handstroke therapy aids which was developed by Diponegoro University. The product is still in the form of a prototype so some tests must be carried out before the product is tested on respondents. The test so far is still focused on functionality tests. This study provides a general checklist for ergonomics testing of stroke therapy aid products. The method of the checklist is developed based on an ...

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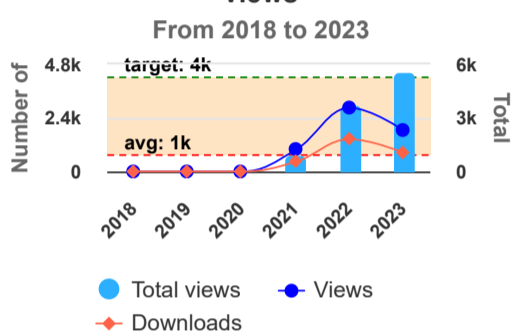
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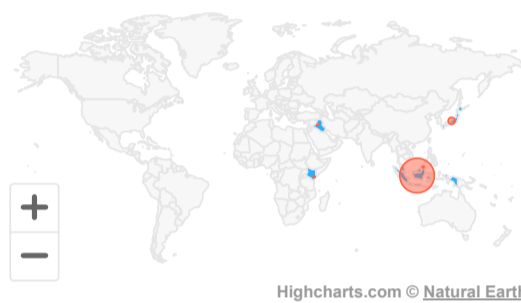
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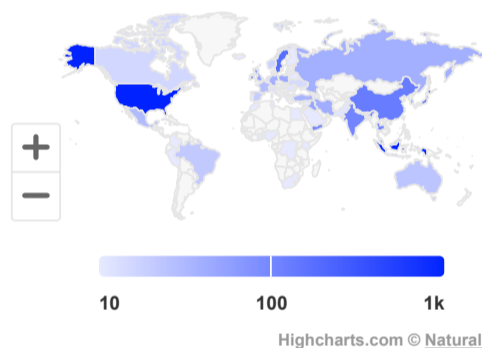
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Vol 2, No 1 (2022)

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1-6

Elvira Sukma Wahyuni

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7-13

Eunike Thirza Hanita Christian, Basari Basari, Siti Fauziah Rahman, Yudan Whulanza

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Vol 2, No 1 (2022)

DOI: <https://doi.org/10.14710/jbiomes.2022.v2i1> (<https://doi.org/10.14710/jbiomes.2022.v2i1>)

Table of Contents

Articles

[The Performance Comparison of Machine Learning Models for COVID-19 Classification Based on Chest X-ray](https://ejournal2.undip.ac.id/index.php/jbiomes/article/view/14326)

(<https://ejournal2.undip.ac.id/index.php/jbiomes/article/view/14326>)

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(<https://ejournal2.undip.ac.id/index.php/jbiomes/article/view/14327>)

Eunike Thirza Hanita Christian, Basari Basari, Siti Fauziah

Rahman, Yudan Whulanza

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(<https://doi.org/10.14710/jbiomes.2022.v2i1.7-13>)

Received: 24 May 2022; Published: 27 Jul 2022.

[Implementation of Brain Computer Interface \(BCI\) as a Smart Wheelchair Motion Commands](https://ejournal2.undip.ac.id/index.php/jbiomes/article/view/13864)

(<https://ejournal2.undip.ac.id/index.php/jbiomes/article/view/13864>)

Serly Yuliana, Munawar Riyadi

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(<https://doi.org/10.14710/jbiomes.2022.v2i1.14-17>)

Received: 15 Mar 2022; Published: 27 Jul 2022.

[Experimental and Numerical Evaluation of Mechanical Properties for Carbon Fiber Reinforced Epoxy LY5052 Composite for Prosthesis Structures](https://ejournal2.undip.ac.id/index.php/jbiomes/article/view/14328)

(<https://ejournal2.undip.ac.id/index.php/jbiomes/article/view/14328>)

Mahfud Ibadi, Yudan Whulanza, Herry Purnomo

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(<https://doi.org/10.14710/jbiomes.2022.v2i1.18-22>)

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PDF **iliations**
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1-6

Issues list

- > [Vol 2, No 2 \(2022\)](https://ejournal2.undip.ac.id/index.php/jbiome)
(<https://ejournal2.undip.ac.id/index.php/jbiome>)
- > [Vol 2, No 1 \(2022\)](https://ejournal2.undip.ac.id/index.php/jbiome)
(<https://ejournal2.undip.ac.id/index.php/jbiome>)
- > [Vol 1, No 2 \(2021\)](https://ejournal2.undip.ac.id/index.php/jbiome)
(<https://ejournal2.undip.ac.id/index.php/jbiome>)
- > [Vol 1, No 1 \(2021\)](https://ejournal2.undip.ac.id/index.php/jbiome)
(<https://ejournal2.undip.ac.id/index.php/jbiome>)
- > [Complete issues](https://ejournal2.undip.ac.id/index.php/jbiome)
(<https://ejournal2.undip.ac.id/index.php/jbiome>)

PDF
14-17

PDF
18-22

**Development of Ergonomics Checklist on Stroke Therapy Aids
(Wearable Elbow Exoskeleton)**

PDF

<https://ejournal2.undip.ac.id/index.php/jbiomes/article/view/14260><https://ejournal2.undip.ac.id/index.php/jbiomes/article/view/14260/pdf>

23-29

Novie Susanto, Christ Novia Saraswati, Wiwik Budiawan, Rifky

Ismail



0

([https://badge.dimensions.ai/details/doi/10.14710/jbiomes.2022.v2i1.23-29?](https://badge.dimensions.ai/details/doi/10.14710/jbiomes.2022.v2i1.23-29?domain=https://ejournal2.undip.ac.id)
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The Performance Comparison of Machine Learning Models for COVID-19 Classification Based on Chest X-ray

Elvira Sukma Wahyuni*, Eka Putra Prasetya

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ABSTRACT. COVID-19 has become a pandemic spread to nearly all countries in the world. This virus has caused many deaths. Screening using a chest X-ray is an alternative to find out positive COVID-19 patients. Chest X-ray is advantageous because every hospital must have an X-ray device so that hospitals do not need additional equipment to detect COVID-19-positive patients. This study aims to compare the machine learning models of Naive Bayes, Decision Tree, K-Nearest Neighbor, and Logistic Regression to predict COVID-19 positive patients. The stages of the research carried out by this study are the Pre-process stage, feature extraction, and classification. The results showed that the Naïve Bayes classification method got the highest performance with an accuracy of 95.24%.

Keywords: COVID-19, Chest X-Ray, Machine Learning, Naive Bayes, Logistic Regression, K-NN, Decision Tree

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1. INTRODUCTION

Corona Virus Disease or COVID-19 is a virus that can infect the respiratory system. This virus first discovered in Wuhan city, China on the end of December 2019. This virus spread vastly to various countries within a few months [1]. As of December 22, 2021, there were 275 million positive cases of COVID-19 and 5.3 million people had died worldwide [2]. The symptoms of people affected by COVID-19 include cough, fever, shortness of breath. In more serious cases, COVID-19 can cause lungs inflammation or commonly known as pneumonia [3].

One way to detect COVID-19 is to use X-ray. X-ray is used to scan the patient's lungs. The results of scanning images of the patient's lungs are needed to analyze whether the patient's lungs are detected to have been infected by COVID-19. The use of X-ray as a COVID-19 detection tool can be used as an alternative solution since every hospital must have X-ray so no additional equipment is needed [4].

Similar studies on the comparison of machine learning models for the classification of COVID-19 on chest X-ray have been carried out before. The machine learning models used are Support Vector Machine (SVM) and K-Nearest Neighbor (KNN). This research resulted in SVM being more reliable than KNN. SVM produces a precision value of 97%, while KNN produces a precision value of 86% [5].

This study aims to compare machine learning models to classify patients positive for COVID-19 and normal patients using X-ray images of lung scans. The machine learning models that are compared in this study include Naive Bayes, Decision Tree, K-NN, and Logistic Regression. The X-ray scan image was preprocessed to make it easier for the model to classify COVID-19 patients and normal patients. U-Net was used to segment the patient's lungs from objects other than lungs and U2Net was used to remove objects other than lungs. Feature extraction was also used to obtain information from X-ray images of lung scans.

2. LITERATURE REVIEW

2.1 Database

The dataset used is a free dataset from Kaggle. This dataset contains chest X-ray images with a size of 2746 x 2382 pixels. A total of 317 images have been divided into training and test data. There are 3 classes, namely Covid, normal, and viral pneumonia. Covid class shows a chest X-ray of a Covid patient. Normal class shows chest X-ray images of normal people. The viral pneumonia class shows a chest X-ray of a patient with pneumonia. In the test section, there are 26 images in the covid class, 20 images in the normal class, and 20 images in the viral pneumonia class. In the training section, there are 111 images in the covid class, 70 images

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Development of Ergonomics Checklist on Stroke Therapy Aids (Wearable Elbow Exoskeleton)

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ABSTRACT. This study aims at building a checklist used on each stage of wearable Elbow Exoskeletons development. The Wearable Elbow Exoskeleton is one of the hand stroke therapy aids which was developed by Diponegoro University. The product is still in the form of a prototype so that some tests must be carried out before the product is tested on respondents. Test during this far is still focus on functionality test. This study provides a general checklist for ergonomics testing of stroke therapy aid products. Method of checklist is developed based on exploration study and literature review for producing appropriate test related to product characteristics. There are three iteration on development product and each version repair the previous version. The implementation of checklist shows that on third iteration, product is in accordance with objective of development and reach the targeted level of respondents' satisfaction.

Keywords: Checklist, Ergonomics, Stroke, Therapy, Wearable Elbow Skeleton

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1. INTRODUCTION

Stroke is still the main cause of disability in Indonesia. Based on data from the Ministry of Health [1], the prevalence of stroke in urban areas is 0.82% and 0.57% in rural areas. The prevalence of stroke in Jakarta is 1.46% among individuals aged 15 years and over. Stroke is also the leading cause of death in urban areas (15.9%) and the second leading cause of death in rural areas (11.5%) in Indonesia. In the age range of 45-54 years, the main cause of death due to stroke is 28.8% in urban areas and 17.4% in rural areas.

The burden that must be borne by stroke sufferers is long-term physical disability. In addition, from the side of the patient's family, the treatment for stroke therapy is quite complicated and difficult to take because a stroke suddenly affects the patient's quality of life. The uncertainty of healing also creates a burden, both mentally and financially. Rehabilitation is one way to recover stroke sufferers. One of the ways to do rehabilitation is through regular physical therapy performed by professionals. However, because the therapy is carried out by stroke therapists, exercise is limited due to time, so it is necessary to have an alternative form of rehabilitation that is safe but in accordance with the rehabilitation standards for stroke patients. Condition The pandemic also spawns worries that contact physique therapist and patient by direct could increase the potency transmission of the COVID-19 virus.

Some of the previously described limitations and support from technological advances have made it possible to manufacture a stroke therapy device for the limbs called a

Wearable Elbow Exoskeleton therapy aids. The exoskeleton is one of the first-hand stroke therapy aids in Indonesia that can be set automatically. This therapy aids can be set up automatically so that it gives the therapist an advantage, such as that therapy can be carried out simultaneously using only one therapist. In addition, with the current condition that is being hit by the corona virus outbreak, this product can be used for stroke patients who are affected by Covid because the therapist does not have long-term contact with the patient so the risk of transmission is reducing. Elbow Exoskeletons also have the advantage of being relatively cheap. This can be seen from the Elbow exoskeleton product benchmark, for example Myopro. The price of stroke therapy aids from Myopro products ranges from \$20,000 - \$50,000 or when converted to Indonesian currency Rp. 300,000,000, - to Rp. 750,000,000, - while the wearable elbow exoskeleton is estimated to have a selling price of IDR 60,000,000. With a cheaper price compared to its closest competitors, it is expected that this product can be a new alternative for hospitals or the patients. This product has been tested for ergonomics and reusability to see the response from patients and therapists regarding the use of the device [2]. Several other studies related stroke therapy aids with various approach has conducted as based on tele-rehabilitation with consumer technology [3], robots for stroke therapy [4], design of robot-assisted neurorehabilitation strategies [5], manufacture of bilateral therapeutic hand devices [6], design therapy web -based [7], even in form of care continuum or empowerment program [8-9]. A number of local and

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