DEEP LEARNING FOR FACES ON ORPHANAGE CHILDREN FACE DETECTION

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Abstract: The field of computer vision is research in development technology to obtain information from images and replicate or imitate human visual processes, so that they can understand the objects around them. Deep learning is a term used to describe a new era in learning that supports computer learning from big data machines. Convolutional Neural Networks (CNN) algorithms have made significant progress in the fields of object detection, image classification, and semantic segmentation. Object detection is a technique used to identify the type of object in a given image and the location of the object in the image. The field of computer vision is research in development technology to obtain information from images and replicate or imitate human visual processes, so that computers can know objects around them. Deep learning is the buzzword as a new era in machine learning that trains computers to find patterns from large amounts of data. Convolutional Neural Networks (CNN) algorithms have made significant progress in the fields of object detection, image classification, and semantic segmentation. Object detection is a technique used to identify the type of object in a particular image as well as the location of the object in the image.

Keywords: CNN, Computer Vision, Deep Learning, Face Detection;

Abstrak: Bidang computer vision merupakan penelitian dalam teknologi pembangunan untuk memperoleh informasi dari citra dan mereplikasi atau meniru proses visual manusia, sehingga dapat memahami objek - objek disekelilingnya. Pembelajaran mendalam adalah istilah yang digunakan untuk menggambarkan era baru dalam pembelajaran mesin yang memungkinkan komputer belajar dari sejumlah besar data. Algoritma Convolutional Neural Networks (CNN) telah membuat kemajuan yang signifikan di bidang deteksi objek, klasifikasi gambar, dan segmentasi semantik. Deteksi objek adalah teknik yang digunakan untuk mengidentifikasi jenis objek dalam citra yang diberikan serta lokasi objek di dalam citra. Bidang computer vision merupakan penelitian dalam teknologi pembangunan untuk memperoleh informasi dari citra dan mereplikasi atau meniru proses visual manusia, sehingga komputer dapat mengetahui objek - objek disekelilingnya. Deep learning adalah kata kunci sebagai era baru dalam machine learning yang melatih komputer dalam menemukan pola dari jumlah besar data. Algoritma Convolutional Neural Networks (CNN) telah membuat kemajuan yang signifikan di bidang deteksi objek, klasifikasi gambar, dan segmentasi semantik. Deteksi objek adalah teknik yang digunakan untuk mengidentifikasi jenis objek dalam citra tertentu serta lokasi objek di dalam citra.

Kata kunci: CNN, Computer Vision, Deep Learning, Deteksi Wajah

INTRODUCTION

In the realm of data processing and interpretation, computer vision has become a popular and successful technique[1][2]. Deep learning is being applied in the industrial sector for recognition in oil mining facilities[3]. Deep learning in robotics is used to create robots that can offer information and navigate to assist people. Computer vision has been widely utilized for face and object recognition[4][5]. As a result, Facebook uses computer vision, machine learning, and a massive quantity of photo data to develop a very accurate face identification system, allowing Facebook to propose which areas or faces in the photo should be labeled[6][7]. Artificial intelligence includes machine learning[8]. However, machine learning includes many manual algorithms that must be analyzed and determined which algorithm is best for a specific problem, and deep learning, which is a subset of machine learning, has the ability to extract more algorithms from a given algorithm (which is done manually in machine learning), making it much more intelligent and faster than simple machine learning[9].

Machine learning is a type of artificial intelligence (AI) that allows computers to learn from data without the need of explicit programming procedures. This implies that machine learning can make its own preferences-based judgements, categorize things, forecast things, and suggest things[10]. Deep learning based on human brain anatomy and function[6]. The human brain comprises a neural network that is made up of linked neurons that process information and transmit messages to one another. Geoffrey Hinton (the Godfather of Deep Learning) constructed a neural

network that can conduct operations and process information based on this idea. Convolutional Neural Network (CNN) is a common artificial neural network that is used for facial or object identification, picture grouping and classification, and other tasks [6]. Detection to discover the location and quantity of items in the picture, which requires scanning objects at each position, scale, and direction, then Alignment to align all objects in a frontal shape, which may be performed by modeling 3D objects, are the three primary steps around object processing. and converting items into canonical frontal representations using 3D models and Recognition to identify and categorize observed and normalized items [8]. The technique of recognizing and defining real items (such as individuals, animals, buildings, and so on) in a picture is known as object detection [11]. Object detection, in particular, is a way in which robots may replace people in defining and grouping things[12][13].

Researchers conducted this study because object detection is now widely used in a variety of industries, with applications ranging from personal safety to business productivity[14]. Image capture, security, surveillance, autonomous vehicle systems, item counting, and industrial inspection have all used object detection and recognition [8]. Deep learning object identification necessitates a significant quantity of data, substantial computer power, and resources to train the deep learning system[15].

Several research have used machine learning to develop object or face identification apps that is, used K-Nearest Neighbor to build a glass type identification system that achieved a 64% accuracy rate[16], AdaBoost will

create a face detection system with an accuracy rate of 83.45% and an error rate of 6.79%[17], Viola Jones and the Support Vector Machine were utilized to create a face detection system with a 27% to 30% accuracy[18], constructed an 84.04% accurate face identification system utilizing Local Receptive Field (LRF)-ELM[12], The Viola Jones algorithm is used to build the face detection program, while the AlexNet algorithm obtains an accuracy rate of 79.24%[19], AdaBoost was used to construct a face detection system with an accuracy rate of 84.1% and an error detection rate of 34.4%[20].

According to this research, the degree of accuracy remains an issue. A system to recognize vegetables in agriculture with an accuracy of 90.3% - 90.5% is built using a lightweight Deep Convolutional Neural Networks algorithm[21]. The Gradient Histogram technique is utilized to construct a damaged road item recognition system with 90% accuracy and 86.5% precision[22]. Create an R-CNN-based vehicle detection system with a 96.85% accuracy rate[23]. Viola Jones and ResNet algorithms are utilized to create a 92% accurate mobile-based face identification application[11].
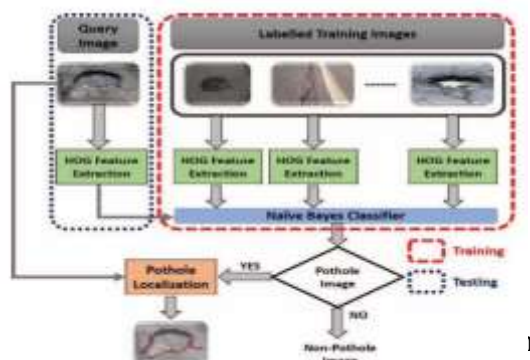
this study is a face-based detection application. orphanage using face detection. Based on interviews with representatives of the orphanage, this

application system will be used to obtain real-time information about the number of children attending the orphanage. Because the orphanage has hundreds of children, the information obtained can be used as a benchmark for the success of activity in the orphanage to assist the company in making decisions and reporting data to the orphanage leadership.

METHOD

To recognize faces in real time, this study used the Convolution Neural Networks (CNN) model in the deep learning approach. Face detection accuracy using machine learning yields poor results. The accuracy of recognizing faces using the deep learning approach is the subject of this study. Every machine learning classifier, such as logistic regression, decision tree, support vector machine, decision support system, and so on, calculates the confusion matrix.

Researchers who are willing to apply deep learning to object detection on mobile can even achieve relatively high accuracy and reduce computational costs significantly. a lightweight deep learning version that is very efficient, tiny in size, and can be utilized on devices with low processing capabilities, such as mobile phones, there is an explanation in the following image:
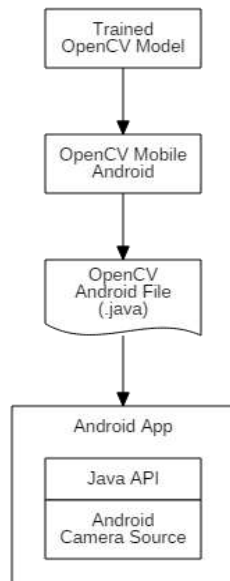
Image 2. Example Algorithmic
Workflow diagram[8]

Study of literature

At this stage, conducting a literature study, which is the process of collecting references from various journals and books related to the topics discussed in this study, the author uses the Mendeley application.

Doing Observations

At this stage, the review was carried out directly to the object of research,

Conducting interviews

At this stage, it can analyze the problems encountered and analyze to recognize faces in real time, this study used the Convolution Neural Networks (CNN) model in the deep learning approach. Face detection accuracy using machine learning yields poor results. The accuracy of recognizing faces using the deep learning approach is the subject of this study. Every machine learning classifier, such as logistic regression, decision tree, support vector machine, decision support system, and so on, calculates the confusion matrix.

Table1. Confusion Matrix Sampel

	Actual	
Predicted	TP	FN
	FN	TN

RESULTS AND DISCUSSION

This section will demonstrate how to calculate recall, precision, and accuracy by using four examples from previous tests. This talk will make use of the Confusion Matrix formula. The image to be captured has 102 faces to recognise faces accurately and precisely. To recognize faces on orphanage children, use the table 2:

Table 2. Application Testing for Face Detection

Days	Total Faces	successfully detected	Recall (%)	Precision (%)	Accuracy (%)	Fscore (%)
1	102	102	100	100	100	100
2	102	100	0.9803	100	0.9803	99,00
3	102	102	100	100	100	100
4	102	99	0.9705	100	0.9705	98,50
5	102	102	100	100	100	100
6	102	101	0.9901	100	0.9901	99,50
7	102	102	100	100	100	100
8	102	102	100	100	100	100
9	102	98	0.9607	100	0.9607	97,99
10	102	102	100	100	100	100

The face detection page is used to detect faces and label those that have been detected. The face detection page displays. Face detection testing to measure face detection accuracy. The photo below shows orphanage youngsters who were photographed standing correctly

True Positive: It displays all records in which both the actual and forecasted values are true. False Negative: This displays all records in which the true value is true, but the projected value is false. Incorrect Positive: When the actual value is false, but the anticipated value is true, this is referred to as a "false positive". True Negative: In this case, both the actual and anticipated values are incorrect.

PERFORMANCE FORMULA

The confusion matrix's most common computations:

Image 3. a test samples

Recall describes the model's effectiveness in recovering information. The ratio of genuine positive predictions to the total quantity of true positive data is known as recall.

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

Precision describes the degree of agreement between the desired data

and the model's forecast outputs. Precision is defined as the ratio of correct positive predictions to total positive expected outcomes, in the formula (1).

$$Presisi = \frac{TP}{TP+FP} \qquad (1)$$

Accuracy is the degree to which the predicted value is near to the real (actual) value, or how accurately the model can categorize properly, in the formula (2).

$$Akurasi = \frac{TP+TN}{TP+TN+FP+FN} \qquad (2)$$

The F Score is a formula that combines, or averages recall and accuracy, in the formula (3).

$$F\ Score = \frac{2*P*R}{P+R} \qquad (3)$$

This section will describe how to calculate recall, precision, and accuracy using four samples from previous tests. The Confusion Matrix formula will be used in this discussion. If it is known from the image that there are 102 faces and 102 labels that accurately and precisely detect faces, then the table for the Confusion Matrix is:

Table 3. Confusion Matrix Sampel Day 1

	Actual	
Predicted	TP (102)	FN (0)
	FN (0)	TN (0)

Based on Table 3, it is possible to deduce that the TP (True Positive) values are 102 acquired from 102 box labels that effectively detect faces. Results for FP (False Positive) and FN (False Negative) is 0 since the sample test contains no incorrect or improper detections. The formula for recall, precision, and accuracy:

$$Recall = \frac{TP}{TP+FN} = \frac{102}{102+0} = 1,0 = 100\%$$

$$\text{Presisi} = \frac{TP}{TP+FP} = \frac{102}{102+0} = 1,0 = 100\%$$

$$\text{Akurasi} = \frac{TP+TN}{TP+TN+FP+FN} = \frac{102+0}{102+0+0+0} = 1,0 = 100\%$$

$$\text{F Score} = \frac{2*P*R}{P+R} = \frac{2*1*1}{1+1} = 1,0 = 100\%$$

According to the formulae and calculations 3.1, 3.2, 3.3, and 3.4, the recall calculation results are 100% because all faces were successfully identified, 100% precision is because all face detection results are correct, and the accuracy and F Score of the sample from the third test are 100%.

CONCLUSION

The methods and algorithms used in this study yielded an accuracy rate of up to 99.4%. The results show that methods and algorithms can not only run-on Android, but also achieve high levels of acclaim and This method was implemented in an Android-based fingerprint detection app, and it used lightweight deep learning and CNN algorithms to detect fingerprints.

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