Implementation of the Tensorflow Framework with the API Detection Object Method and Convolutional Neural Network on Land Documents in Electronic Services at the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency

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Keywords: TensorFlow framework, CNN, land documents, document's spatial quality, electronic-based services

SUMMARY

This study aims to analyze land documents by the type and year of change, test the accuracy of object detection by employing TensorFlow's object detection API and CNN Algorithm, and classify land documents by the type and year. The research is divided into two segments; the model training process and the model testing process. The model training process started from the dataset collection stage in the form of 960 images where 80% of the datasets were training images and 20% of the datasets were testing images. Furthermore, the pre-processing stage was to label the objects in each image into four different classes; the cover of the land document (the first page of the certificate), the content of the land document (the second page of the certificate), the measurement page (the third page of the certificate), and the parcel drawing page (the fourth page of the certificate). The system testing processes were performed by utilizing the spatial resolution and the condition of the original document. Each set of tests were tested repeatedly to get the accurate results. The test results showed a 90% success rate for identification of the documents with good spatial resolution and its condition are in a good and complete state, however, the success rate decreased linearly based on the quality or the condition of the document. The tests on the documents showed that the system was able to work properly up to the document that published in 1997. The overall accuracy detection test showed that an average of 87% of the objects were accurately recognized..

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1. INTRODUCTION

In today's digital age, human life is highly dependent and related to computing technology. Humans are constantly developing technologies to ease their work (Doga, Lami, & Pella 2019). One of the stakeholders who is actively developing computing technology on their system aside from the private sector is the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN). As one of the government's agencies providing public service, they continue to improve by developing the electronic-based service. This is in accordance with the fifth point of strategic vision of the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) 2020-2025; to create a modern service office that provides an electronic product, service and information about land affairs and spatial planning based on information technology. By the establishment of a digital transformation road map towards an international-standard government, the Ministry of Agrarian Affairs and Spatial Planning aspires to be a trusted and an international standard land and spatial management agency on 2025 (Jaya 2020). One of its current targets is to register all land areas in the territory of Indonesia (ATR/BPN 2020; Hardiansyah 2020).

AI or Artificial Intelligence is one of the fields in the scope of technology that is very popular in recent days. AI implementation, specifically the deep learning that is part of the machine learning, has a significant result on object identification and is widely used to solve problems related to object detection and image classification (Doga, Lami, & Pella 2019). Machine learning is a form of artificial intelligence that allows systems to learn from data without the need to be explicitly programmed (Hurwitz & Kirsch 2018). One of the types of machine learning is neural network. The development of neural network these days has allowed software to perform something that are usually done by human, such as voice recognition, facial recognition, object detection, text recognition, text classification and others (Permana and Budayawan 2020). The ability of neural network to identify and classify text should be able to help human in numerous fields, especially on those that usually use documents; office administration, written psychology, as well as object detection and classification, which are the main focus of the research.

Land document is a land-parcel data obtained from the land registration activities (Complete Technical Guidelines to Land Registration for District/City (2019)). Land document consists of: registration map, measurement book, and land book. For all land services activities in Indonesia, land document is a mandatory. The Ministry of Land Affairs and Spatial Planning continues to enhance its services by implementing an integrated electronic system based on the Presidential Decree number 95 of 2018 about Electronic-Based Government System (SPBE). The new normal condition set by the government also adds the necessity of the electronic-based land services

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However, due to the limited resource and the delayed on utilizing technology, the implementation of electronic-based system on land services in Indonesia has not been very optimal. On the other hand, a world-class land data centre needs to be built in order to support the full-scale implementation of electronic-based land services on 2025. Hence, the transition from analog-based land document to the more electronic-based is massively needed. One of the ways to accelerate it is by involving communities and land partners (village apparatus and land registry officer (PPAT)) since they are the parties that are the most directly related to the transition. Jaya (2020) explained that in order to get a full-scale electronic-based services system, it is necessary to have a credible land database first. A credible land database could be observed if the data have gone through the validation process to determine the quality of those electronic land documents. Therefore, it is essential to do validation and re-validation to ensure its credibility.

Considering the current circumstances, a land service that can be obtained and accessed through online media without the need to do face-to-face interaction is essentially needed. This is in line with the health protocols set by the government in order to prevent the spread of the Corona Virus 2019 (COVID 19) disease. The current land services counters can be transformed into digital counters, hereinafter would be referred as virtual counters. These virtual counters are expected to be able to facilitate all land services based on the Head of BPN Decree, number 1 of 2010 and Government Regulation, number 128 of 2015. The presence of these virtual counters would be very beneficial for the Ministry of Land Affairs and Spatial Planning while maintaining the transition through the participation of the system's users.

By utilizing the technologies offered in this industry 4.0, the Ministry of ATR/BPN's virtual counters might make use of the artificial intelligence technology to enhance its service. TensorFlow's Object Detection API and CNN algorithm would play a very essential role on the concept. Hence, this paper aims to analyze land documents based on the type and year of changes, test the accuracy of TensorFlow's Object Detection API and the CNN Algorithm, as well as design a flow diagram for the development of the TensorFlow's Object Detection API and CNN Algorithm to be applied to the virtual counters.

2. METHOD

2.1 System planning

Land documents are divided into two major categories; training data that would be used for the training process and testing data that would be used for the testing process. The detailed description of this stage is started by collecting the data in the form of images, then classified them into two categories; training data and testing data. The images are labelled according to the documents number and its year, as well as the page number. Furthermore, the images are processed by binarization and thresholding approach. Binarization is a process to transform digital images into binary images that have 2 grayscale values; black and white, black as the object marker and white as the background marker, which afterwards is transformed into black and white images through the thresholding process to develop a more prominent difference.

The following processes are segmentation and normalization. These are done in order to separate the object and the background of the images in addition to decrease the images resolution to establish a more accurate detection. The data are then employed as the training data as TFRecord, which then will be configured as label map.

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pipeline to the neural network training. If the margin of error is as expected, the data would then be utilized to test the accuracy of TensorFlow's Object Detection API. The final processes were labelling and classifying the data by the type and the year. These processes are presented on the Figure 1 below:
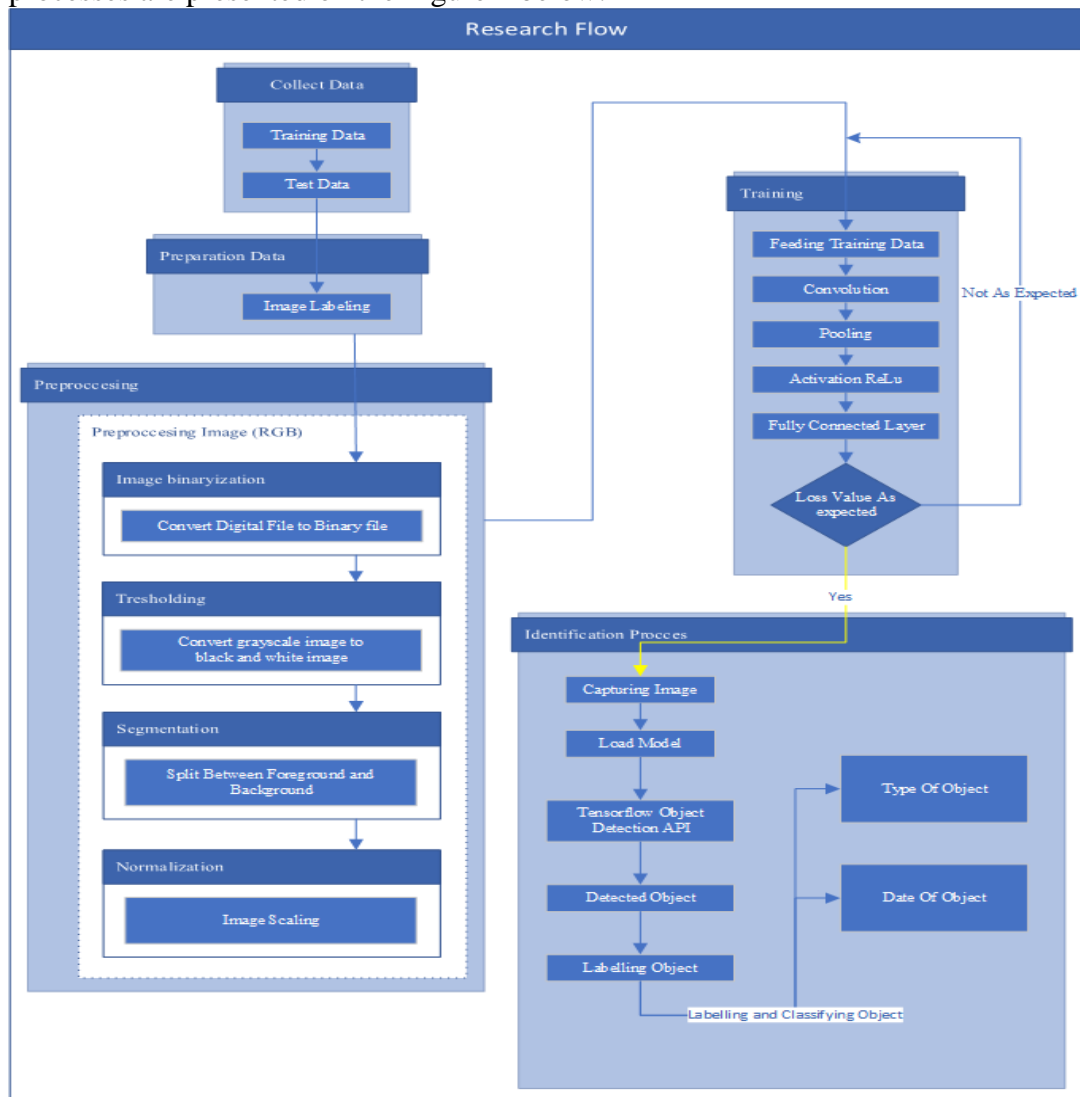

Figure 1. Research Stages
Source: Researchers' Processed Data 2021.

2.2 Network Architecture

The Input Layer is a pre-processed digital image that has black and white colour that forms a convolution and is then processed through the neural network to make the down-sampling process easier to manage. Each fully connected Neuron at the end of the network serves as the number of classes that have to be forecasted. The result of this training model would be the data for object detection test by employing the TensorFlow Object Detection API, specifically for the object labelling and the classifying process. The Network Architecture process is presented on the Figure 2.

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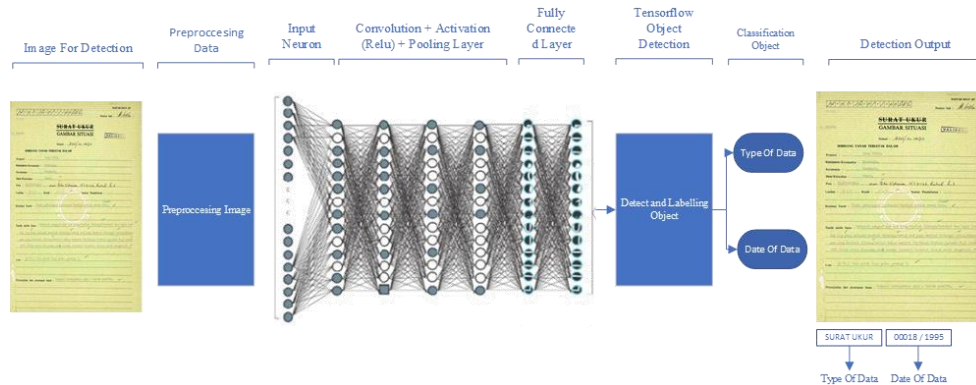Virtually in the Netherlands, 21–25 June 2021

Figure 2. Network Architecture
Source: Researchers' Processed Data 2021

2.3 Evaluation tech

In this stage, not only the speed of the image detection process was measured manually based on the type and the year of the documents, but also the accuracy of the image detection process on detecting the object in the form of documents. To measure the accuracy of the object detection process, the number of images that are correctly detected by the system would be compared to the total of all images detected by the system. These are the parameters that determine the accuracy of object detection;

1) True
The actual object is correctly detected by the system.

2) False
The actual object is not correctly detected by the system.

3) Accuracy
Accuracy is the result of measuring the object detection accuracy to the vehicle object detected in the frame. Manajang, Dompie, and Jacobus (2020) formulate the formula to measure the accuracy. In this research, the measurement of object detection accuracy was done to land documents and measurement letters, which were classified by the year of publication.

$$Accuracy = \frac{The\ number\ of\ objects\ that\ are\ correctly\ detected}{The\ number\ of\ objects\ detected\ by\ the\ system}$$

3. A BRIEF LITERATURE REVIEW

3.1 Land Services according to the Head of the National Land Agency Regulation No. 1 of 2010

The government issued the Head of the National Land Agency Regulation Number 1 of 2010 that controls the land service management which is the implementation of Law Number 25 of 2009 on public services. It aims to establish a standardize service system in order to adjust to the developments and the requirements of public services, especially on the land management field. This standardized services system is a mandatory since the public always expects a good service. According to Sutrisna (2016) the system that is created to increase the public satisfaction index should focuses on several points; the ease of service procedure, the punctuality of the service, and the clarity of cost and requirement

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3.2 The Employment of Integrated Land Services Electronic System during the New Normal

Agostino, Arnaboldi, & Lena (2020) stated that COVID 19 pandemic has prompted the digitalization of public services. The newly emerged social issues have obliged public institutions to do digital acceleration. It is needed in order to optimize the public services and ultimately lead to the transformation of public services into e-government. According to Zhiyuan Fang in Lumbanraja (2020), e-government is defined as a way for the government to use innovative information and communication technology, especially web-based internet application, to provide the citizen an easier access to information and services.

The Ministry of ATR/BPN has been doing its digitalization since 2013 and it is developing until today. On 2019, The Ministry of ATR/BPN has established four integrated electronic-based services; mortgage right, land registration certificate, land value information, and land certificate examination (ATR/BPN 2021). 2021 is the year of digitalization, hence it is a top priority to have a full-scale electronic-based system on land services (Jaya 2020).

3.3 Concept and Design for Land Services Virtual Counters

Electronic-based services system in Indonesia became a major attention after the government issued the Presidential Decree Number 95 of 2018, about the Electronic-based Government System. The electronic services need to fulfil several principles; effectivity, integrity, sustainability, efficiency, accountability, interoperability and security. One of the main objectives to establish electronic-based services is to achieve an efficient and effective public service activity. However, land services in Indonesia are still not fully electronic-based.

The Ministry of ATR/BPN continues to develop in preparation for the full-scale electronic-based services system in accordance with the digital transformation roadmap of 2020-2025. This shows the legitimate commitment of the Ministry of ATR/BPN to support the actualization of e-government. The current land services system forces the user to come to an offline services counter. However, the New Normal condition has obligated the system to adapt into an online method where the user does not have to do face to face interaction. Thus, the virtual counters might be the solution that fits all the circumstances. These counters are digital land services counters that could be accessed online by following certain operational protocols while still referring to the Head of National Land Agency Regulation, Number 1 of 2010.

3.4 Land Registration Document (Land Document)

Land document is a land-parcel data obtained from land registration activities (Complete Technical Guidelines to Land Registration for District/City (2019)). Land document consists of: registration map, measurement book, and land book. The land document that is employed in this research are the measurement book and land book.

3.4.1 Types of Land Document

There are two types of land document; spatial document and textual document. Spatial document presents its information in the form of images or maps, for example; measurement letter, measurement image, registration map, work map, and another map. On the other hand, textual document presents its information in the form of written texts or numbers; measurement book and land book. The

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mixture of those land documents would be the ideal materials to establish a credible land document (Complete Technical Guidelines to Land Registration for District/City (2019); Nugroho 2020).

3.4.2 Land Book and Measurement Book

A land book is a document in the form of lists that contains both juridical and physical data on an object that has been registered. Meanwhile, a measurement book is a document that contains physical data on a plot of land in the form of map and description (Government Regulation Number 24 of 1997). Land book is classified as a textual document since it only contains textual information. Whereas a measurement book could be classified as both since there are not only spatial data (images at a certain scale), but also textual data (content of the letter) (Complete Technical Guidelines to Land Registration for District/City (2019)). In this research, the researchers examined the changes in the land book and measurement book format since the first time it published in 1960 until now. Furthermore, the researchers would employ it as an input for training data on the system. Changes in the format of land book and measurement book are shown in the following table:

Table 1. Periodic changes in the format of land book and measurement book (1960-2021)

No.	Interval Years	Land Book	No.	Interval Years	Measurement Book
1	1960-1970	Change	1	1960-1970	Change
2	1971-1980	Change	2	1970-1989	Change
3	1981-1990	Change	3	1990-1997	Change
4	1991-1998	Change	4	1997-2007	Change
5	1999-2000	Change	5	2008-2021	Change
6	2001-2015	Change			
7	2016-2021	Change			

Source: Researchers' primary data 2021

3.4 Media Transition to develop a Standardize Electronic Land Data Centre (Ministerial Decree Number 1 of 2021 about Electronic Certificate)

The Ministry of ATR/BPN has been preparing themselves to organize a full-scale electronic-based service by the issued of Ministerial Decree Number 1 of 2021 about Electronic Certificate. However, based on the researchers' observation, not all of the registered land documents are electronic-based. In other words, in order to establish a full-scale electronic-based document centre, it is necessary to transform all the traditional-based land documents into the electronic version in accordance to the standard operational that can be read on Ministerial Decree Number 1 of 2021, article number 4. Those electronic-based documents are; rights owner document, physical document and juridical document that is credible and authentic. All of those documents will be stored in a safe electronic document centre which is then not only can be legislated by an electronic signature, but also can be validated by a digital stamp by an authorized official.

3.5 Tensorflow Framework

Tensorflowis TensorFlow is one of the deep learning frameworks that can be utilized to develop various AI programs (Manajang, Dompie, and Jacobus 2020). In addition,

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Manajang (2020) stated that TensorFlow is an opensource deep learning framework as well as a digital library for data science developed by Google. Moreover, TensorFlow is a machine learning system that operates in a large scale and heterogenous ecosystem (Abadi et al. 2016). The employment of TensorFlow to detect an object can ease the constructing, the training and the deploying processes of an object. TensorFlow's Object Detection API provides a pretrained object detection model for the user, however it also provides the other pretrained object detection models, such as Faster R-CNN, SSD, Retinanet, and others (Manajang, Dompie, and Jacobus 2020).

TensorFlow framework helps the developer to experiment with a new optimization and training algorithm. Moreover, on the pretrained object detection model, TensorFlow helps the training and large-scale inference. TensorFlow efficiently utilizes hundreds of powerful servers (GPU powered) for fast training, and perform a pretrained model for production inference on various platforms, started from the large cluster in the data centre, reaching up to the mobile devices. Meanwhile, it is also flexible enough to push experiment and research into the new machine learning and system optimization (Abadi et al. 2016).

3.6   Object Detection

Object detection is a computer-based engineering that finds an object on an image or a video. Object detection algorithm generally utilizes machine or deep learning method to get a significant result (Aningtyas, Samin, and Wirawan 2020). Machine learning data recording imitates how human's brain remember and identify objects. However, for the learning that is done by machine would require a very complex computer engineering. Aningtyas (2020) explained that the method of object detection works by placing the object presence on an image, and then drawing a box around the object. There are practically two steps involved here; classifying the object and drawing a box around the object.

3.7   Convolutional Neural Network (CNN)

Artificial Neural Network (ANN) is a computer-based system that is inspired by biological neural system, like human's brain. ANN consists of a large number of computer nodes that are connected (neuron) and collectively continue to learn from user input to enhance the end result. Convolutional Neural Networks (CNN) works exactly the same as the traditional ANN; both of them are consisted of a large number of neurons that keep optimizing itself from the learning process. From the earliest input into the end result, each of the networks will always express some score that is commonly called as a weight and on the final layer there will be a loss function that is related to the existing class (K.O Shea and R. Nash 2020; Manajang, Dompie, and Jacobus 2020).

4.   RESULT AND DISCUSSION

4.1 Developmental Analysis of Measurement Book and Land Book Formats

Table 2. Analysis of changes in measurement book and land book from 1960 to 2021

No.	Years Interval	Land document analysis (land book and measurement book)
		Land Book (BT)

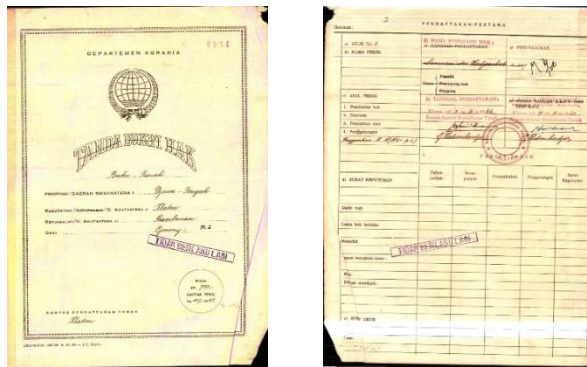Implementation and Book of TensorFlow Framework with the API Detection Object Method and Convolutional Neural Network on Land Documents in Electronic Services at the Ministry of Agrarian Affairs and Spatial Planning / National Land Agency (11020)
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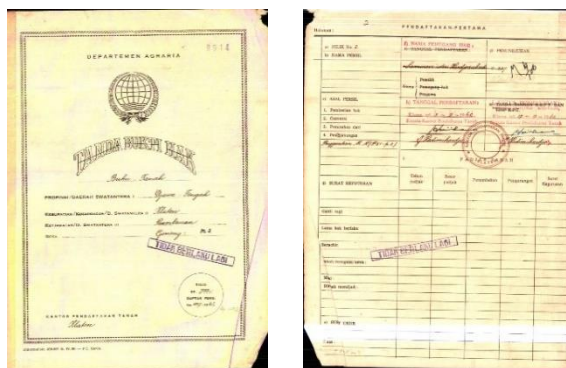| 1	1960-1970	Land Book (First and Second page of the certificate)

The results of the analysis:
- The image in the first page of the certificate is a globe logo, accompanied by the name of the publishing agency: Ministry of Agrarian Affairs, the cover is labelled with proof of right, the colour of the paper is white, the writing is in the old spelling version of Bahasa Indonesia.
- The order of contents in the second page of the land book is as follows: number and type of the right to the land, the name of the parcel, the origin of the parcel, decree, measurement letter, the name of the right holder, appointment, the date of registration, issuance of the certificate and land tax

2	1971-1980	Land book (First and Second page of the certificate)

The results of the analysis:
- The image in the first page of the certificate is a globe logo, accompanied by the name of the publishing agency: Ministry of Home Affairs Directorate General of Agrarian Affairs, the cover is labelled with proof of right, the colour of the paper is white, the writing is in the old spelling version of Bahasa Indonesia.
- The order of contents in the second page of the land book is as follows: number and type of the right to the land, the name of the parcel, the origin of the parcel, decree, measurement

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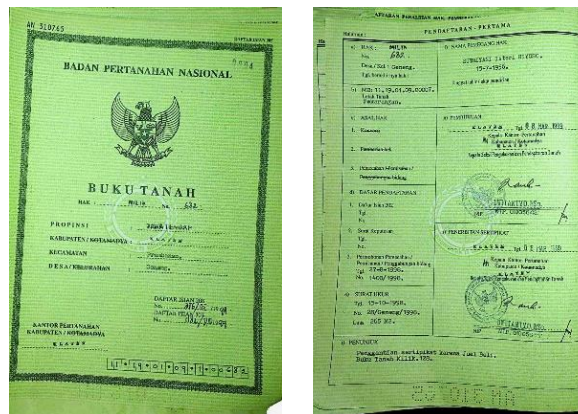Virtually in the Netherlands, 21–25 June 2021

		letter, the name of the right holder, registration, issuance of the certificate and tax record.
3	1981-1990	Land book (First and Second page of the certificate)

		The results of the analysis:
		- The image in the first page of the certificate is a Garuda logo, accompanied by the name of the publishing agency: Ministry of Home Affairs, the title of the cover is 'Land Book', the colour of the paper is white, the writing is in the old spelling version of Bahasa Indonesia.
		- The order of contents in the second page of the land book is as follows: number and type of the right to the land, the name of the street/parcel, the origin of the parcel, decree, measurement letter/boundaries of land, the name of the right holder, registration, issuance of the certificate, designation and tax record.
4	1991-1998	Land book (First and Second page of the certificate)

		The results of the analysis: - The image in the first page of the certificate is a Garuda logo, accompanied by the name of the publishing agency: Ministry of Home Affairs, the title of the cover is 'Land Book', the colour of the paper is white, the writing is in the old spelling version of Bahasa Indonesia. - The order of contents in the second page of the land book is as follows: number and type of the right to the land, the name of the street/parcel, the origin of the parcel, decree, measurement letter/boundaries of land, the name of the right holder, registration, issuance of the certificate, designation and tax record.
5	1999-2000	Land book (First and Second page of the certificate)
		The results of the analysis: - The image in the first page of the certificate is a Garuda logo, accompanied by the name of the publishing agency: The National Land Agency, the title of the cover is 'Land Book', the colour of the paper is green, there is a watermark of 'The National Land Agency'. - The order of contents in the second page of the land book is as follows: number and type of the right to the land, the name of the street/parcel, the origin of the parcel, decree, measurement letter/site plan, the name of the right holder, bookkeeping, issuance of the certificate and designation.

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6	2001-2015	Land book (First and Second page of the certificate)

		The results of the analysis: - The image in the first page of the certificate is a Garuda logo, accompanied by the name of the publishing agency: The National Land Agency, the title of the cover is 'Land Book', the colour of the paper is green, there is a watermark of 'The National Land Agency'. - The order of contents in the second page of the land book is as follows: number and type of the right to the land, the Parcel Identification Number (NIB), origin of right, basis of registration, measurement letter, the name of the right holder, bookkeeping, issuance of the certificate and designation.
7	2016-2021	Land book (First and Second page of the certificate)

		The results of the analysis:
		- The image in the first page of the certificate is Garuda logo, accompanied by the name of the publishing agency: The Ministry of Agrarian Affairs and Spatial Planning/The National Land Agency of The Republic of Indonesia, the title of the cover is 'Land Book', the colour of the paper is green, there is a watermark of 'The National Land Agency'.
		- The order of contents in the second page of the certificate is as follows: number and type of the right to the land, the Parcel Identification Number (NIB), origin of the right, basis of registration, measurement letter, the name of the right holder, bookkeeping, issuance of the certificate and designation.
		-

Measurement Book (SU)

8	1960-1970	Data has not been discovered
9	1970-1989	Measurement book (Third and fourth page of the certificate)

		The results of the analysis:
		- The colour of the paper is white, the title of the third page is Measurement book, the document's number formatting is as follows: number/year, the third page of the certificate contains the code of right and the right number, the writing is from manual typewriter;
		- The third page of the certificate contains its serial number on the top left corner, moreover, on the fourth page there is a manual drawing of the parcel, north orientation and the scale of the drawing.

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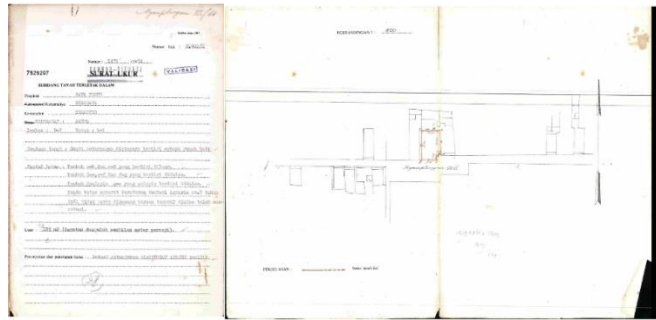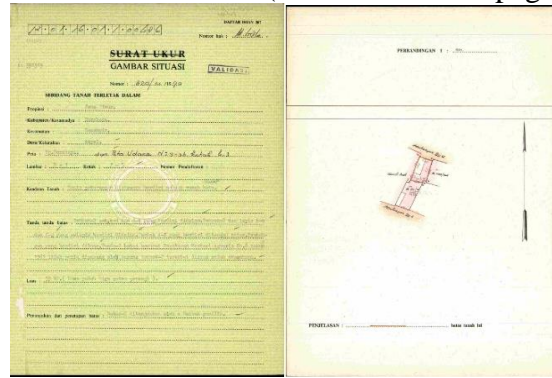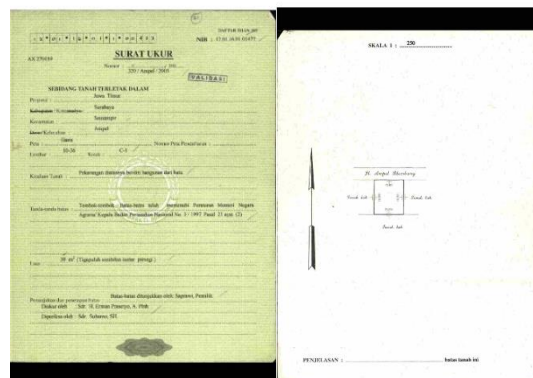| 10	1990-1996	Measurement book (Third and fourth page of the certificate)

		The results of the analysis: - The colour of the paper is green, the title of the third page is situational drawing, and a watermark of the National Land Agency former logo; - The document's number formatting is as follows: number/year, the third page of the certificate contains the code of right and the right serial number; - The third page of the certificate contains its serial number on the top left corner, moreover, on the fourth page there is a drawing of the parcel, north orientation and the scale of the drawing.
11	1997-2007	Measurement book (Third and fourth page of the certificate)

		The results of the analysis: - The colour of the paper is green, the title of the third page is measurement book, and a watermark of the National Land Agency former logo; - The document's number formatting is as follows: number of the measurement letter/year, name of the sub-district, the published year of the measurement letter; - The third page of the certificate contains the code of right and the right number, serial number of the certificate, meanwhile, on the fourth page of the certificate there is a drawing of the parcel, north

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Fajar Buyung Permadi, Dony Ferdiansyah, Yuli Ardianto Wibowo, Gama Eko Nurwanto and Wahyuni Wahyuni
(Indonesia)

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12	2008-2021	Measurement book (Third and fourth page of the certificate)

The results of the analysis:
- The colour of the paper is green, the title of the third page is measurement book, and a watermark of the National Land Agency current logo;
- The document's number formatting is as follows: number of the measurement letter/year, name of the sub-district, the published year of the measurement letter;
- The third page of the certificate contains the code of right and the right number, serial number of the certificate, meanwhile, on the fourth page of the certificate there is a drawing of the parcel, north orientation and the scale of the drawing.
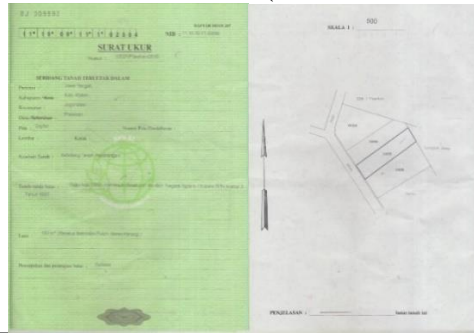
Source: Researchers' primary data 2021

4.2 CNN Algorithm's Accuracy Test to Land Document

The test to determine the image detection's accuracy level was done to 140 land books and 100 measurement letters. The land books were divided into 7 categories based on its year of change. On the other hand, the measurement letters were divided into 5 categories. The land documents that were being tested can be observed from the Table 3 below.:

Table 3. The results of CNN algorithm's accuracy test

No	Types of land data	Year interval	The total number of objects	Page 1	The number of objects detected is correct	Page 2	The number of objects detected is correct	Page 3	The number of objects detected is correct	Average number detected is correct	Accuracy
1	Land Book	1960-1970	20	20	16	20	16	-	-	16	**0.80**
2	Land Book	1971-1980	20	20	17	20	17	-	-	17	**0.85**
3	Land Book	1981-1990	20	20	17	20	17	-	-	17	**0.85**
4	Land Book	1991-1998	20	20	18	20	18	-	-	18	**0.90**
5	Land Book	1999-2000	20	20	17	20	18	-	-	18	**0.88**
6	Land Book	2001-2015	20	20	18	20	17	-	-	18	**0.88**
7	Land Book	2016-2021	20	20	18	20	18	-	-	18	**0.90**
8	Measurement Letter	1960-1970	20	-	-	-	-	0	0	0	**0.00**
9	Measurement Letter	1970-1989	20	-	-	-	-	20	17	17	**0.85**
10	Measurement Letter	1990-1997	20	-	-	-	-	20	18	18	**0.90**
11	Measurement Letter	1997-2007	20	-	-	-	-	20	18	18	**0.90**
12	Measurement Letter	2008-2021	20	-	-	-	-	20	18	18	**0.90**
Accuracy test results											**0.873**

Source: The researchers' primary data 2021

Based on the information provided by the Table 3 above, it can be inferred that the earlier the documents were published, the lower the accuracy of the object detection. This happens because of the images' level of visibility on the older documents are lower than the more recent ones, hence, it influences the object detection process. On the documents that published before 1997, the average percentage of objects detected are 85% (17 out of 20 tested documents). Meanwhile, on the measurement books that published before 1997, the average percentage of objects detected are also 85% (17 out of 20 tested documents).

Furthermore, the average percentage of objects being correctly detected on land documents are 86.4%. While on the measurement books, the average percentage of objects being correctly detected are 88.7%. Hence, the overall average percentage of objects being correctly detected on both the land documents and the measurement books are 87.3%

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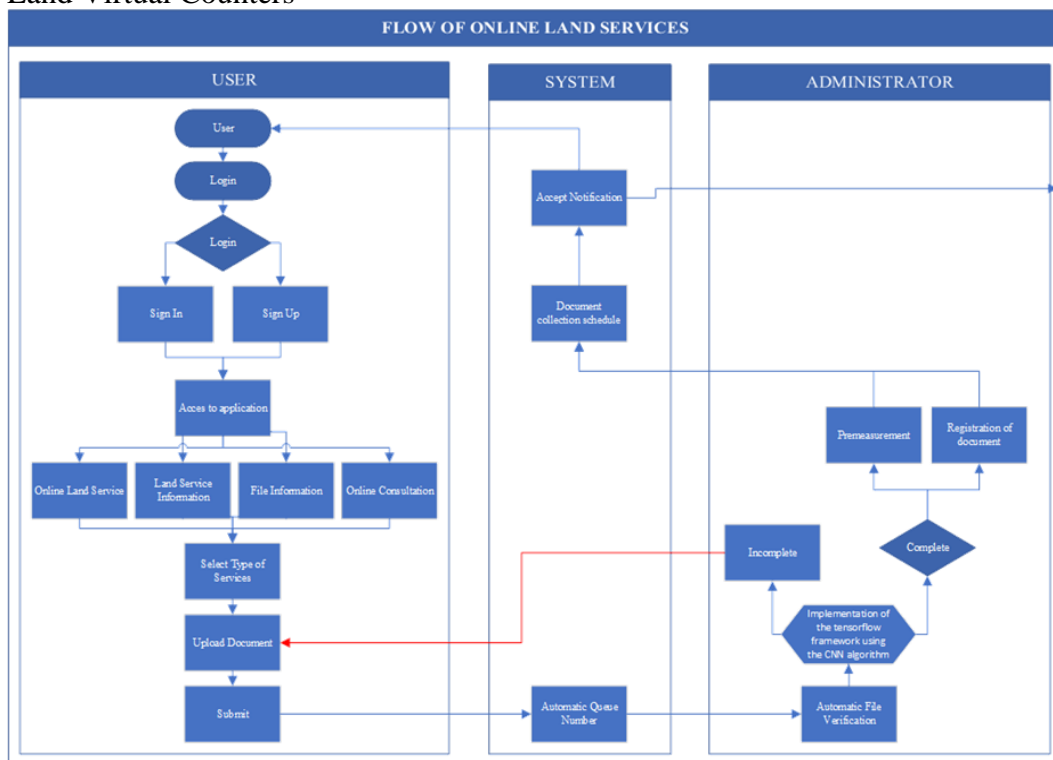## 4.3 The Establishment of TensorFlow Framework and CNN Algorithm on the Future Land Virtual Counters

Figure 3. The flow diagram of land service virtual counters
Source: The researchers' primary data 2021

Both TensorFlow Framework and CNN Algorithm are appropriate to be applied to the future land virtual counters (Figure 3). Its advantages will ease land officers to automatically verify a document registered by a system user. The main responsibility of both TensorFlow Framework and CNN Algorithm is to automatically identify the authenticity of land documents: land books and measurement letters. The system will compare the similarities between documents uploaded by the user to its training data. Consequently, the system will automatically determine that the document is approved or rejected. The approved documents are those that fulfil the specified standards. As a case example: a system user uploaded his/her measurement letter that published in 1997. Then, the document will be examined and compared by the system to its training data. If the similarity level between the uploaded document and the training data reaches the specified requirement, it will be approved. However, if the similarity level is under the minimum requirement, then it will be rejected.

In addition, the CNN Algorithm can still be developed to the point that it can classifies the type of document based on its year, displays serial number of the right to the land from the land book, displays the serial number of the measurement letter, displays the name of the owner, and others. On this stage, the results can be enhanced as a connection to the integration of the Second Version of KKP, the main app of the Ministry of Agrarian Affairs and Spatial Planning/The National Land Agency.

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5. CONCLUSIONS

Based on the findings and the tests performed to the system, it can be inferred that both **TensorFlow's Object Detection API and Convolutional Neural Network** are appropriate to use in order to build a system that can identify and classify objects, specifically in this research are land documents: land books and measurement books. The test to determine the level of accuracy of the object detection to the documents based on its type and year showed that the earlier the documents were issued, the lower the accuracy and the reliability of object detection. In addition, the overall average percentage of objects being correctly identified are 87.3%.

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REFERENCES

ATR / BPN, Ministry of 2020, 'The strategy of the ministry atr / bpn to complete the 2020 work program', web posted on 7 October 2020, viewed on 15 January 2021, https://www.atrbpn.go.id/?menu=baca&kd=   KyQj34vLHNR9   +   1TTpmu   / 8kjhUS4uVh4Rps0Ld + jKh1gSqyoRIDBUBpYlJCnYEflO

Abadi, M. et al. (2016) 'TensorFlow: a system for large-scale machine learning this paper is included in the proceedings of the tensorflow: a system for large-scale machine learning', *in 12th USENIX Symposium on Operating Systems Design and Implementation (OSDI '16)* , p. 282.

Agraria, M. et al. (2018) 'Minister of Agrarian Affairs and Spatial Planning / Head of the National Land Agency', pp. 2015–2016.

Aningtyas, PR, Sumin, A. and Wirawan, S. (2020) 'Making object detection applications using ssd mobilenet v2 as a pre-trained tensorflow object detection fire model', *Scientific Journal of Computing,* 19 (3).

Doga, RA, Lami, HFJ, & Pella, SI, (2019) 'The nominal identification system for coins uses tensorflow and convolutional neural network based on raspberry pi ', *National Seminar on Science and Engineering FST Undana (Sainstek)*, Kupang, 25 October 2019.

Hardiansyah (2020) 'Integrated digital land data management (studies in Cirebon city land office)', *Thesis* in Diploma IV Study Program, National Land College.

J. Hurwitz & Kirsch. D, (2018), 'Machine Learning for Dummies. IBM Limited Edition ', *John Wiley & Sons Inc*, Hoboken, NJ.

Jaya, Virgo Eresta 2020, 'A vision for the digital era of land systems in Indonesia', *Online guest lecture on geodesy & geomatics engineering study program, Bandung Institute of Technology*, Bandung, 12 November.

Junirianto, E. and Wita, DS (2020) 'Development of online queuing applications for the Samarinda public service mall', Scientific Journal of Computer Science, 15 (2), pp. 127–132.

Manajang, D., Dompie, S. and Jacobus, A. (2020) 'Implementation of the tensorflow object detection framework in classifying types of motorized vehicles', *Journal of Informatics Engineering*, 15 (3), pp. 171–178.

Permana, A. & Budayawan, K. (2020), 'An android application for semantic text classifiers using tensorflow lite in summaries of scientific works', *Journal of Vocational Engineering Electronics and Informatics*, 8 (4), pp. 129-135

Rohman, A. and Larasati, DC (2020) 'Public service standards in the new normal transition era',

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Reformasi, 10 (2), pp. 151–163. doi: 10.33366 / rfr.v10i2.1952.

Suprenda, A. (2016) 'Implementation of regulation of the head of the national land agency number 1 of 2010 concerning service standards and land regulations (case study at the ministry of agrarian and spatial planning of the Pekanbaru City National Land Agency)', *Jom FISIP*, 3 (1).

Sutrisna and Wahyudi, PT (2016) 'Implementation of the regulation of the head of the national land agency number 1 of 2010 concerning service standards and land regulation', *Journal of the Repertorium*, 3 (2), pp. 137–144.

Taufik & Warsono (2020) 'The new bureaucracy for the new normal: a review of the model of bureaucratic change in public services in the Covid-19 era', *Dialogue: Journal of Public Administration*, 2 (1), pp. 1–18.

Wahyuningsih, CD (2020) 'Transformation and challenges in public affairs in the new normal era', Volume 13 No. 18 October 2018 ', *Scientific Magazine of FISIP UNTAG Semarang*, 1 (21), pp. 104–122.

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