Validation of Vote Counting Supervision Based on Vote Tally at West Bangka District

Ekariva Annas Asmara[1], Mochammad Afiffudin[1], Tri Basuki Kurniawan[1*], Edi Suryanegara[1]

[1] Faculty of Computer Science, University of Bina Darma, Palembang, Indonesia

[*]**Email:** tribasukikurniawan@binadarma.ac.id

Abstract

In Indonesia, the supervision of regional head elections is carried out by the Election Supervisory Board (Bawaslu) and its staff. Bawaslu conducts supervision starting from the initial stage to the final stage. The mechanism for using the people's right to vote is carried out at the Voting and Counting Stages. In the 2020 Regional Head Elections, the General Election Commission uses the SIREKAP system (Electronic Recapitulation Information System) in the calculation of SIREKAP. According to the author, there are still problems, one of which is a manual summation, calculation errors, and input errors. On the Model C Form, the results of the KWK vote tally are calculated manually, then the officer adds up the tally and enters it into the SIREKAP. Supervision of Vote Count Recapitulation is an urgent matter because supervision is a comparison of vote acquisition results which can prevent manual summation errors on Form Model C and Results-KWK. The author proposes a validation method for monitoring vote counting using an artificial neural network approach. With this method, the sum is done from Tally's votes.

Keywords

Vote Counting, Validation, Vote Supervision, Artificial Neural Networks

Introduction

Indonesia is a country that adheres to a democratic system. The system of government is organized by the people, by the people, and for the people. One form of democracy is the holding of Regional Head Elections (KPU,2020). Regional Head Election is a process of transferring power that involves all citizens who live in the area sovereignly. Elections for Regional Heads consist of Governor and Deputy Governor Elections, Mayor and Deputy Mayor Elections, and Regent and Deputy Regent Elections (UU, 2016). Elections for regional heads have the function of determining regional leaders for a certain period and also producing leaders who are close to the will of the people. In Indonesia, the supervision of regional head elections is carried out by the Election Supervisory Board and its staff. Bawaslu conducts supervision starting from the initial stage to the final stage. The mechanism for using the people's right to vote is carried out at the Voting and Counting Stages.

According to our findings, SIREKAP's calculation still has problems with manual summing, calculation errors, and input errors. During the 2020 Regional Head Elections, the General Election Commission will use the SIREKAP system, an electronic recapitulation information system. The officer manually calculates the results of the KWK vote tally on the Model C Form, then adds the results and enters them into the SIREKAP. It is essential to supervise vote count recapitulation since oversight entails comparing the results of vote acquisition. This prevents tedious addition, counting errors, and entry errors on the Model C Form. For monitoring the vote-counting procedure, KWK-Results' developer proposes an artificial neural network-based validation mechanism. The vote acquisition will be automatically read as a number using this method, and the accuracy and speed of the number will allow it to be utilized as comparison data in accordance with the field and the availability of information disclosure.

Methodology

Data Collection Method
Observation, interviews, and documentation were used in the research to collect the necessary data.

Observation
The methods utilized to get the data via observing the research's subject, namely voting locations and vote tallying while West Bangka Regency Bawaslu supervision is in place. Data – information gathered by direct observation, including:
- Be aware of who is overseeing the counting of the votes.
- Understanding how the West Bangka Bawaslu and the West Bangka Regency KPU conduct the calculating and vote-counting processes.
- Obtaining a sample of the Model C. Hasil-KWK Form from SIREKAP, namely from the SIREKAP website at https://pilkada2020.kpu.go.id/#/pkwkk/tungsura/1905. furthermore, from the SIWASLU Database.

Interview
In order to gather information about the technology (hardware) and software (software) utilized on the network, as well as to learn about the issues that users encounter, this strategy directly approaches the users. This interviewing technique produced the following data:
- Being aware of the hardware (hardware) and software (software) requirements.
- Being aware of the issues or limitations faced by users.

Documentation
Is a method of gathering information that is based on beliefs or hypotheses from an earlier study that is pertinent to this investigation.

Design Research

The stages of research in this study are as follows and are presented in the following order:
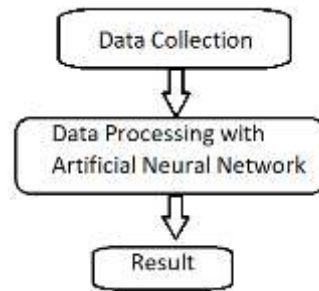

Figure 1. Data process flow drawing

Preparation

At this point, the authors gather up to 200 TPS worth of Model C.Results-KWK samples from SIREKAP and SIWASLU before creating 200 sheets of the C.Hasil-KWK model sheet.
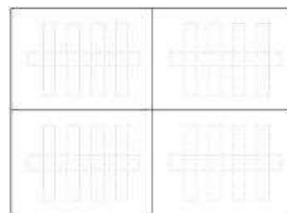

Figure 2. Draft Design Form C. Results-KWK

The information from the Model C.Hasil-KWK Vote Count Form was then transferred, using a black marker, to the design of the C.Hasil-KWK Form. The filled-in image pattern is then photographed (see picture 3.1), cropped to fit each box, and saved as a file with the.jpg extension.

Figure 3. Line pattern that has been filled with black marker

Preprocessing

That is, the image's color is changed to gray to begin the initial processing stage on the data that has been filled in (grayscale). The next phase is character segmentation, which involves turning the image into a black-and-white or binary image to eliminate noise and improve the clarity of the image because the quality and brightness are different from the photos that were shot.

Feature Extraction

That is, the image will include one value for each pixel with the numbers 1 and 0, characterizing the process's intended target. The pattern with a value of 1 contains something, and the pattern with a value of 0 is empty.

Figure 4. the image's numerical value

Image algorithm

Additionally, the image is analyzed using an information processing method that aims to replicate how the human brain solves problems by evaluating the value of bits (0 and 1) and applying learning through changes in synapses' weight. The artificial neural network can identify actions from the past. The artificial neural network will analyze historical data so that it can decide on data that has never been analyzed.
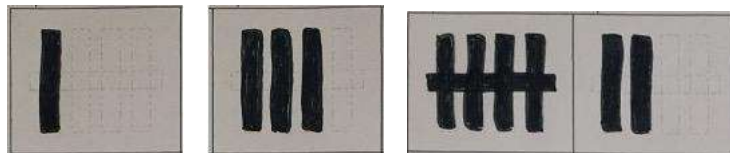

Figure 5. Result of image number 1, 3 and 7

We now go over the outcomes of number pattern recognition utilizing the neural network technique (artificial neural network). The researcher draws conclusions in this stage based on the findings and conversations made in the stage before.

Artificial Neural Networks / ANN

The system made up of a number of compact processing units that are based on the human nervous system. An adaptive system, an ANN can adjust its structure to address issues based on information coming through the network from both the outside and the inside. due to the fact that it is adaptable.
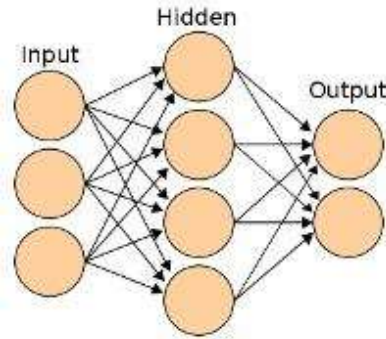
Figure 6. Artificial Neural Network Model

The mathematical model that defines the function f: X➔Y serves as the basis for the ANN model. The interconnection of several neurons arranged in various levels is referred to as a "network" in an ANN.

Mathematically, a neuron is a function that receives input from the previous layer $g_i x$ (layer - i). Typically, this function transforms a vector into a scalar value using a nonlinear weighted sum composition, where $f(x) = K(\sum w_i g_i(x))$ W stands for the load or weight, while K is a particular function that is frequently referred to as the activation function.

Linear algebra demonstrates that a number of layers can be reduced to a two-layer input since each neuron in a perceptron multilayer has a linear activation function, which translates the weighted input to each neuron's output. A nonlinear activation function created to simulate the frequency of the action potential, or firing, of biological neurons, is used by some neurons in the MLP output model. The two historically prevalent sigmoid activation functions are described as follows $y(v_i) = tanh(v_i)$ and $y(v_i) = (1+e^{-v_i})^{-1}$ With, where d is the desired value and is the value produced by the perceptron, degrees at the output node I at the nth data point (training example) can be represented as follows. The node weights can then be modified in accordance with

modifications that reduce mistakes in the output, as indicated by $\mathcal{E}(n) = \frac{1}{2} \sum_j e_j^2(n)$. The change in each weight using gradient descent is $\Delta\omega_j(n) = -\eta \frac{\partial\varepsilon(n)}{\partial v_{j(n)}} y_i(n)$. The derivative to be calculated depends on the local field induced j, which itself varies. It is easy to prove that for the output node, this derivative can be simplified to $-\frac{\partial\varepsilon(n)}{\partial v_j(n)} = e_j(n)\phi'\left(v_j(n)\right)$. Then for Φ' is the derivative of the activation function described above, which $e_j(n) = d_j(n) - y_j(n)$ by itself does not vary. The analysis is more difficult for weight changes to hidden nodes, but it can be shown that the relevant derivative is

$$-\frac{\partial\varepsilon(n)}{\partial v_j(n)} = \phi'\left(v_j(n)\right)\sum_k - \frac{\partial\varepsilon(n)}{\partial v_k(n)}$$

Changing the node weight to kth, which stands for the output layer, is necessary to do this. The weight of the output layer adjusts in accordance with the derivative of the activation function, changing the hidden layer's weight accordingly. As a result, this technique mimics the backpropagation of the activation function.

Anaconda
Changing the node weight to kth, which stands for the output layer, is necessary to do this. The weight of the output layer adjusts in accordance with the derivative of the activation function, changing the hidden layer's weight accordingly. As a result, this technique mimics the backpropagation of the activation function.

Python Programming Language
Python is a programming language that can carry out instructions using an intuitive object-oriented approach. The Python design philosophy places a strong emphasis on code readability and makes liberal use of whitespace. Its language design and object-oriented methodology are intended to assist programmers in creating logical and understandable code for both little and big projects (Fathan Qibthyo, 2019), Muhammad Zacky Ary'ari (2019) , Norkandir (2017) .

Problem Identification
The goal of this task is to identify the relevant related studies. We are mainly focusing on understanding the issues facing the development of an effective text classifier. This task was realized by reviewing the most recent text classifiers and their details to identify the existing techniques' strengths and drawbacks.

Two major text classifiers- related problems were identified in this phase. The identified problems are, first, the ambiguity performance of three classifiers with the aim of detecting the class of new documents. Second, feature reduction while maintaining high performance in FS problems.

Detection and Identification Cases
The advancement of the Internet and the increased amount of online information has significantly impacted the ability to detect and identify huge documents. The classification approach is capable of simulating human thinking, and it has been successfully applied in various areas due to its salient features in mining. However, text classification to detect and identify new events, documents, or sentiments is complicated. This is because a large volume of data degrades classifiers' performance due to the high dimensionality of feature space (Norkandir ,2017).

Results and Discussion

Detection Box and Crop
The image is first displayed, after which a box in the image is found and any objects inside are found. The Python programming language algorithm and the Anaconda application tool are used to carry out the process. for images with the filename Aziz Arrahman.jpg that were extracted from the source folder in the jpeg format. The following order to clearly discern which portions of the image comprise objects and the background, the image function is thresholded, which converts the grayscale image into a binary or black-and-white image. Results from threshold image processing are typically used later for feature extraction and object recognition. It uses the cv2.threshold function. The source image that will be turned into a grayscale image is what we do first. The

second is the pixel value classification threshold. The third option, maxVal, represents the value that will be applied depending on whether the pixel value is greater or lower than the threshold value. 128x255 pixels were used in total.
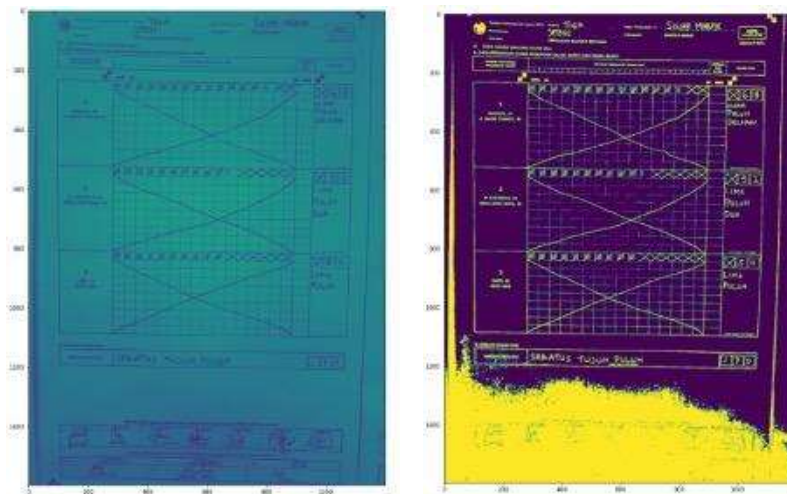

Figure 7. Display both horizontal and vertical lines

The following algorithm merges two images, combining horizontal and vertical images by calculating the weights alpha = 0.5, beta = 1.0 - alpha, and producing a new image. The third image is produced by adding the first two using the following algorithm.
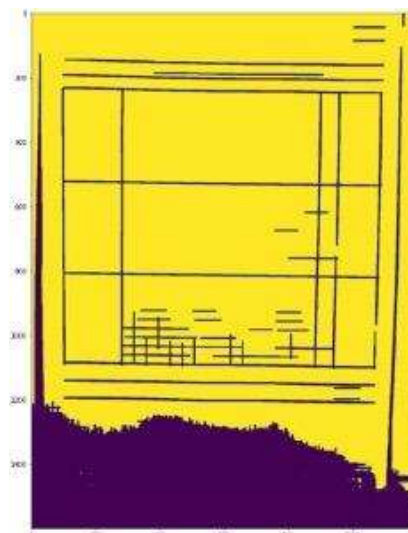

Figure 8. Combined view of Vertical and Horizontal lines

Use the sort-contours command to order objects for reading from top to bottom and left to right. Find the image form that will detect all of the squares next. The value of the image size will be provided at the time of the command to read the image for the cropped image, on the command for the image height of 100 and width of 200. Cropped detection data are saved in the original storage folder after being detected.
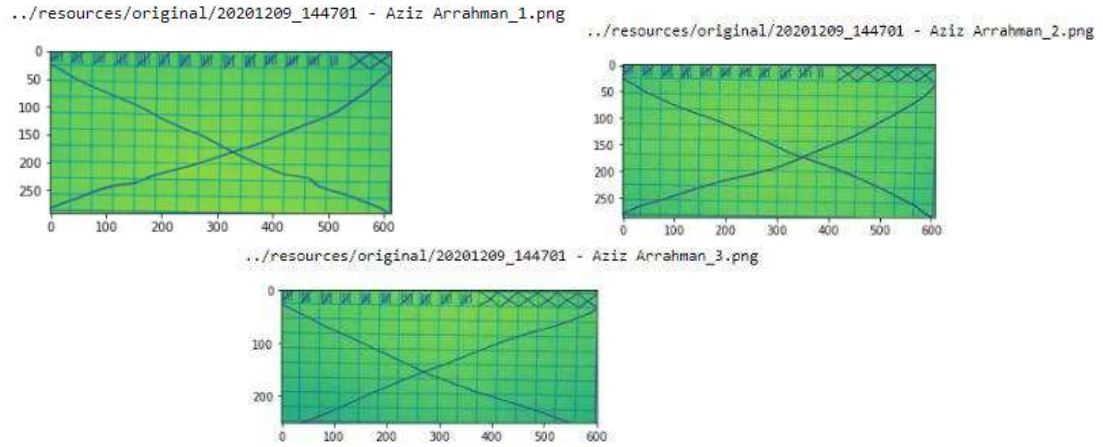
../resources/original/20201209_144701 - Aziz Arrahman_1.png
../resources/original/20201209_144701 - Aziz Arrahman_2.png
../resources/original/20201209_144701 - Aziz Arrahman_3.png

Figure 9a. Detection results in the order pair boxes 1, 2 and 3

Detection Box and Display
We will connect and provide the image as a BGR image in this section. The photo was taken from the source folder.
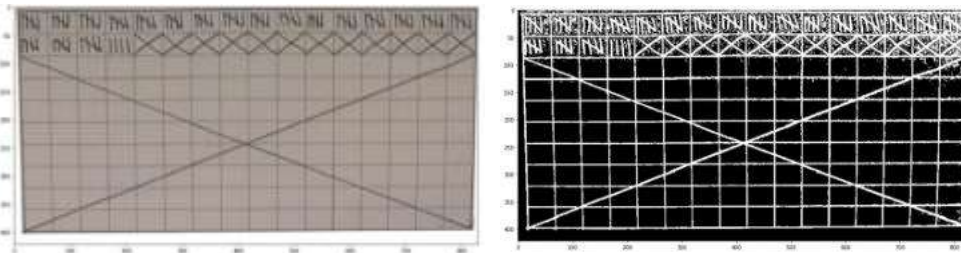
Figure 9b. BGR Image Display

The image will be read vertically and horizontally using the kernel command, and the function is to sort objects both ways.
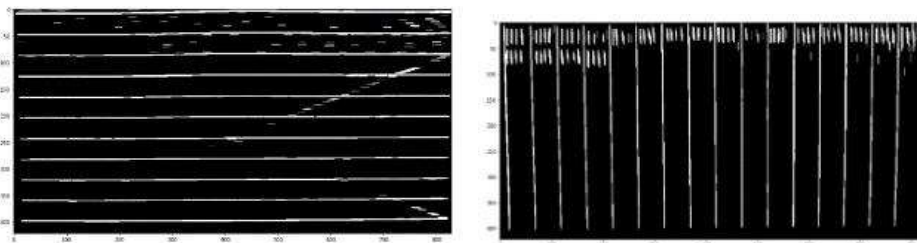
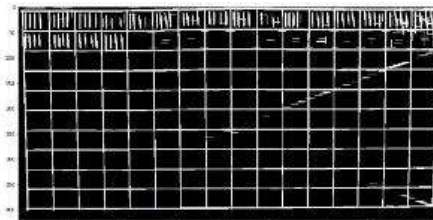Figure 10. Display a gray image both horizontally and vertically.

Figure 11. Image display of vertical and horizontal detection results

The color that is used to identify the item in the box will be shown alongside the image.
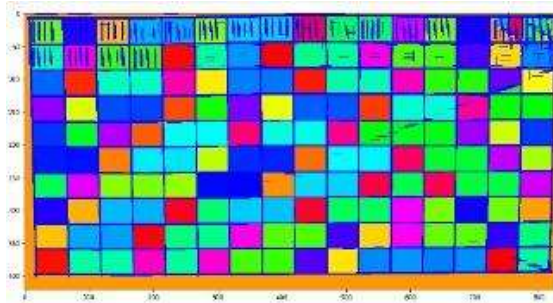

Figure 12. Displays in color

The thing in the box will be visualized in the following stage so that it can be identified. The item is then read box by box.
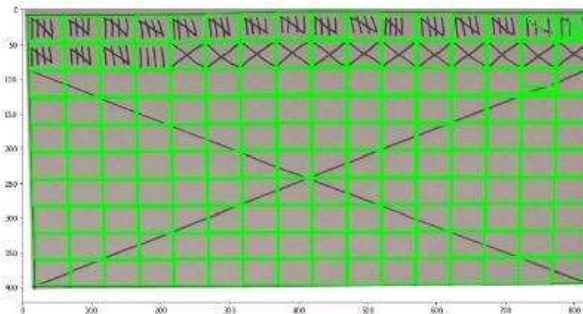

Figure 12. Visualization Display

Automatic Crop and get the bigger bounding box

Additionally, the image will be automatically cropped to fit within the box and classified and saved in a folder according to the type of identified objects. The processed data is taken from the original folder, after which the image object pieces are automatically saved into the crop folder. For instance, if an object is identified in the box marked with the number 1, it will be saved in folder 1, followed by folders marked with the numbers 2, 3, and 4, and then folder 5.
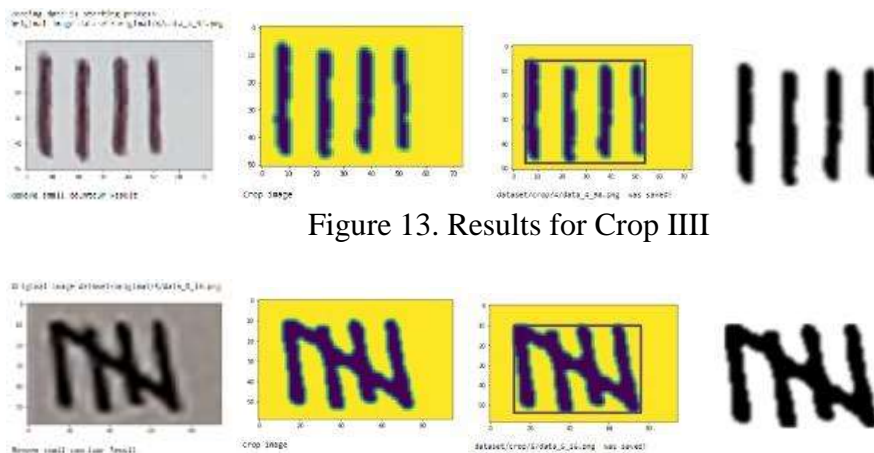

Figure 13. Results for Crop IIII

Figure 13. Results for Crop V
The results are more readable and become clearer when the crop is seen above.

Combine Data
Combine data This function is used to combine a raw folder with the original folder's .png extension.

```
Moving data ...
move file: dataset/raw/1/Layer 26.png dataset/original/1/data_1_1.png
move file: dataset/raw/1/Layer 32.png dataset/original/1/data_1_2.png
move file: dataset/raw/1/Layer 248.png dataset/original/1/data_1_3.png
move file: dataset/raw/1/Layer 24.png dataset/original/1/data_1_4.png
move file: dataset/raw/1/Layer 34.png dataset/original/1/data_1_5.png
move file: dataset/raw/1/Layer 110.png dataset/original/1/data_1_6.png
move file: dataset/raw/1/Layer 23.png dataset/original/1/data_1_7.png
move file: dataset/raw/1/Layer 79.png dataset/original/1/data_1_8.png
```
Figure 14. Process of combining data

ANN Classification
The last procedure in this software is an Artificial Neural Network (ANN), where a command identifies the veracity of the data read on an item.
The training and testing data are as follows:

```
Reading data is starting process
Reading for label: 1 : [ 100 ] data
Reading for label: 2 : [ 100 ] data
Reading for label: 3 : [ 70 ] data
Reading for label: 4 : [ 146 ] data
Reading for label: 5 : [ 208 ] data


Total: [ 624 ] data
Reading data done


Splitting data training dan testing ...
Data Training: [ 374 ] data
Data Testing: [ 250 ] data
Splitting data Done!
```
Figure 15. Data Tested

With a total of 624 data read, the data in the original folder is read for processing with details for Number 1 up to 100 data, Number 2 up to 100 data, Number 3 up to 70 data, Number 4 up to 146 data, and Number 5 up to 208 data. Separation is then carried out with the process for Training data is 374 data, and Testing data is 250 data.
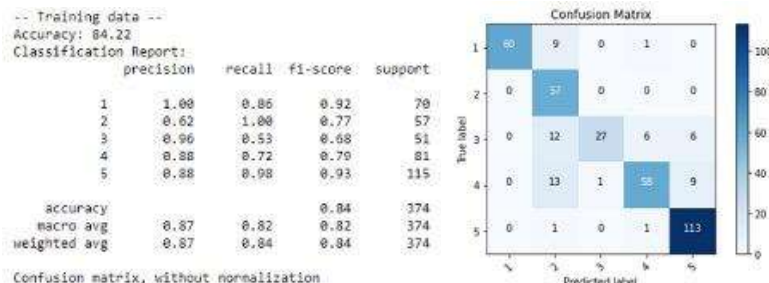
Figure 16. Results of Training Data

The results of the training data above are explained as follows:

1) Identification of object number 1; 70 data read total; 60 data reads for number 1, 9 for number 2, and 1 for number 3.
2) Identification of object number 2 with up to 57 data read overall and up to 57 data read for the object.
3) To identify object number 3, read as many as 27 data; read number 3; read number 2; read number 4; read number 5; read as many as 12 data; total data read as much as 51 data.
4) Read number 4, read number 2 as much as 13 data, read number 3 as much as 1 data, read number 5 as much as 9 data, and total data read as much as 81 data to identify object number 4.
5) The identification of object number 5 required 113 data, while numbers 2 and 4 only required one each, for a total of 115 data.

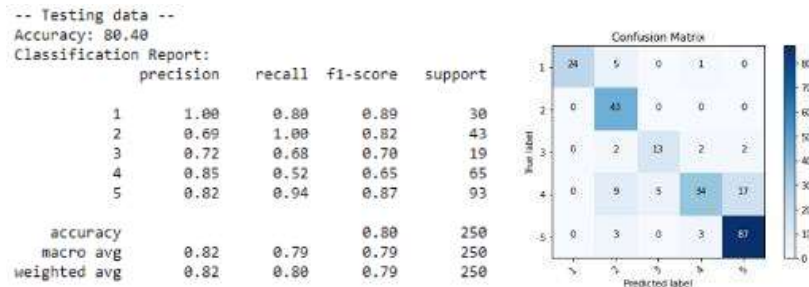Figure 17. display Testing Data original folder

The findings of the analysis of the aforementioned data are explained as follows:

1) To identify item number 1, 24 data points were read for number 1, 5 for number 2, and 1 for number 4, for a total of 30 data points.
2) Identification of item number 2 with up to 43 data read, with a total of up to 43 data read.
3) Identification of object number 3 as much as 13 data; number 3 read; numbers 2 read; numbers 4 read; numbers 5 read; total data read as much as 19 data.
4) Read number 4, read number 2, read number 3, read number 5, and totaled 34 data for object number 4, 9 data for number 2, 5 data for object number 3, and 17 data for object number 5, for a total of 65 data.
5) Identification of item number 5: 87 data points are read for number 5, 3 for number 2, and 3 for number 4, for a total of 93 data points.

Then process the data from the crop folder

```
Reading data is starting process
Reading for label: 1 : [ 100 ] data
Reading for label: 2 : [ 100 ] data
Reading for label: 3 : [ 70 ] data
Reading for label: 4 : [ 142 ] data
Reading for label: 5 : [ 208 ] data

Total: [ 620 ] data
Reading data done

Splitting data training dan testing ...
Data Training: [ 434 ] data
Data Testing: [ 186 ] data
Splitting data Done!
```

Figure 18. Crop folder data processing results

With a total of 620 data read, the crop data folder is read for processing with information for numbers 1 through 100, 2 through 100, 3 through 70, 4 through 142, and 5 through 208. Separation is then performed with the process for training data, which totals 434 data, and data testing, which totals 186 data.
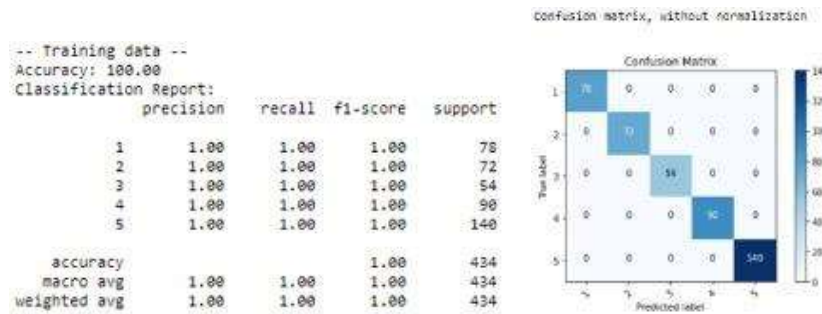

Figure 19. Results of Training Data Crop

The results of the training data crop above are explained as follows:
1) 78 data are read in total for object number 1, representing the identification of that thing.
2) 72 data are read in total for object number 2's identification, making a total of 72 data.
3) The identification of object number 3 requires 54 data readings, for a total of 54 data.
4) 90 data readings for item number 4's identification; a total of 90 data were read.
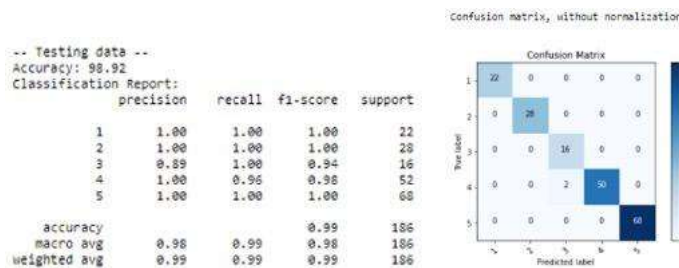5) The identification of item number 5 and the total number of data read up to 140.

Figure 20. Results of Training Data Crop

The results of the testing of the data above are explained as follows:

1) The identification of object number 1 requires 22 data reads, making a total of 22 data.
2) Identification of item number 2 with up to 28 data read, with a total of up to 28 data read.
3) Identify object number 3 by performing up to 16 data reads on it; the total amount of data read is 16.
4) Read number 4, read number 2, and a total of 52 data were read for the identification of item number 4 up to 50 data.
5) Identification of object number 5, total data read up to 68 data, total data read up to 68 data.

The findings of the image object identification after data processing are as follows:
   a. The accuracy of the data that has been successfully read according to the picture object for the training data from the original folder is 84.22%.
   b. The accuracy of the data that has been correctly read in accordance with the picture object, as determined by evaluating the original folder data, is 80.40%.
   c. The crop data demonstrates 100% accuracy for the data that has been correctly read in line with the image object in the training results.
   d. The accuracy of the data that has been successfully read in accordance with the picture object is shown to be 98.92% for the results of testing the crop folder data from the results above.

According to the outcomes of the identification of the object in the aforementioned image, the overall success rate for the artificial neural network approach for identifying objects in the box is 98.92%.

Conclusion

The calculation of Tally's vote acquisition can employ the artificial neural network method for automatic summation. Reducing the total vote count inaccuracies made by Tally. The discovery of cutting-edge voting acquisition technology by Tally. Effective and efficient supervision is achieved. To achieve the best results and enable official use, monitoring validation based on Tally's voice processing with an artificial neural network approach needs to be established. To make up for the absence of research, contributions and ideas are required.

References

Presiden Republik Indonesia (2016) Undang-Undang Nomor 6 tahun 2016 tentang Perubahan kedua atas Undang-Undang Nomor 1 Tahun 2015 tentang penetapan Peraturan Pemerintah Pengganti Undang-Undang nomor 1 Tahun 2014 tentang Pemilihan gubernur, Bupati, dan Walikota menjadi Undang-Undang. Jakarta : Presiden RI

Komisi Pemilihan Umum (2020) Peraturan Komisi Pemilihan Umum Nomor 5 Tahun 2020 tentang Perubahan ketiga atas PKPU Nmor 15 Tahun 2019 tentang tahapan, program dan jadwal penyelenggaraan Pemilihan Gubernur dan Wakil Gubernur, Bupati dan Wakil Bupati, Dan/atau Walikota dan Wakil Walikota Tahun 2020. Pada Pasal 8B menyatakan bahwa " Pelaksanaan pemungutan serentak yang ditunda karena terjadinya bencana nonalam Corona Virus Disease 2019 (COVID-19) dilaksanakan pada tanggal 9 Desember 2020.". Jakarta : KPU

Komisi Pemilihan Umum (2020) Peraturan Komisi Pemilihan Umum Nomor 18 Tahun 2020 tentang perubahan atas PKPU Nomor 8 Tahun 2018 Tentang Pemungutan dan Perhitungan Suara Pemilihan Gubernur dan Wakil Gubernur, Bupati dan Wakil Bupati, dan/atau Walikota dan Wakil Wali Kota. Jakarta : KPU

Komisi Pemilihan Umum (2020) Keputusan Komisi Pemilihan Umum Republik Indonesia Nomor 597/PL.02.2-Kpt/06/KPU/XI/2020 tentang Petunjuk penggunaan Sistem Informasi rekapitulasi dalam Pemilihan Gubernur dan Wakil Gubernur, Bupati dan Wakil Bupati, dan/atau Walikota dan Wakil Walikota tahun 2020

Wikipedia (2021) Jaringan Syaraf Tiruan https://id.wikipedia.org/wiki/Jaringan_saraf_tiruan . Diakses pada tanggal 10 Juli 2021 pukul 20.00 Wib.

Wikipedia (2021) Multilayer Perceptron https://en.wikipedia.org/wiki/Multilayer_perceptron. Diakses pada tanggal 10 Juli 2021 pukul 20.30 Wib

Wikipedia (2021) Anaconda pembagian Python) https://ms.wikipedia.org/wiki/Anaconda_(pembahagian_Python) Diakses pada tanggal 11 Juli 2021 pukul 19.30 Wib

Fathan Qibthyo (2019) Pengertian Anaconda dan Cara install Anaconda2 http://fathanbeatles.blogspot.com/2019/04/pengertian-anaconda-dan-cara-install.html Diakses pada tanggal 13 Juli 2021 pukul 21.00 Wib

Muhammad Zacky Ary'ari (2019) Cara mudah menggunakan Jupyter Notebook dengan mudah https://auftechnique.com/cara-menggunakan-jupyter-notebook/ . Diakses pada tanggal 14 Juli 2021 pukul 19.00 Wib

Norkandir (2017) Mengolah Image menggunakan OpenCV dan Phyton
https://norkandirblog.wordpress.com/2016/12/23/mengolah-image-menggunakan-opencv-dan-python/ . Diakses pada tanggal 14 Juli 2021 pukul 20.00 Wib

Wikepedia (2021) Estimasi kepadatan
kernel.https://translate.google.com/translate?u=https://en.wikipedia.org/wiki/Kernel_density_estimation&hl=id&sl=en&tl=id&client=srp&prev=search. Diakses pada tanggal 16 Juli 2021 pukul 19.30 Wib