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Implementation of Artificial Intelligence in Facilitating Feeding Monitoring Cattle in The Community

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***Abstract*— The increase in demand for beef in Indonesia has not been balanced with the growth of the poong cattle population, resulting in a gap between demand and supply. Cattle buying and selling transactions often face losses due to limited technology and tools. To overcome this, innovative solutions such as the application of Artificial Intelligence (AI) are needed to facilitate cattle transactions efficiently. This research aims to facilitate the determination of fair selling prices for sellers and buyers, as well as to reduce dependence on experience. The research methods used include literature reviews, interviews, and documentation. It is hoped that the results of this research will contribute to understanding the implementation of AI in cattle transactions, becoming a valuable reference for industry players and the general public.**

***Keywords*— Increase in demand for beef beef; Suitability of demand and growth of beef cattle population; Gap between demand and supply**

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I. INTRODUCTION

The need for beef as a source of animal protein in Indonesia is increasing in line with the increasing public awareness of the importance of balanced nutrition, population growth and people's purchasing power for beef is also increasing. However, the increase in demand for beef has not been matched by the increase in population and the quality of the beef. [1]

Animal feed requires the provision of good nutrition accompanied by good management strategies in order to increase cattle productivity to meet the basic needs of life, growth, production, and reproduction. The feed given to beef cattle can be divided into two types, namely forage feed and concentrated feed. Another function of feed is to maintain immunity and health. The productivity of beef cattle is very sensitive or sensitive to changes in feeding, therefore the feed provided must be in accordance with the availability, continuity of quality and quantity.

Based on the survey that has been carried out, feed management in this area is still not implemented properly, so that livestock growth is not optimal and many diseases in cows have been found. In addition, the condition of the cow's body showed a poor body conditioning score (BCS) for beef cattle which is one of the indications of growth disorders or health problems. [2]

II. THEORETICAL STUDIES

A. Relationship between diet and cattle growth

Basically, the source of cattle feed can be provided in the form of forage and concentrates. Livestock need a long time to adapt to both feed, cage environment, workers and the environment. The forage feed provided is in the form of elephant grass and rice straw, while the concentrate is in the form of a mixture of several feed ingredients such as fermented straw (bran, corn cobs, molasses). In the business of fattening beef cattle, the giving of feed is intended to meet the needs of basic life and production. The basic needs of life are very dependent on the weight of the livestock, namely the heavier the weight of the livestock, the

higher the number of feed needs, while the needs of the location of the cage are quite strategic because it is close to the road so that it makes transportation easier [1]

The Bali cattle fattening farm company Enhal farm in meeting the feed needs given to livestock utilizes agricultural waste or agricultural industry waste that is not consumed by humans. The feed used is in the form of forage and concentrate. The forage used is in the form of fresh and dried forage. The fresh forage provided is in the form of elephant grass because fresh forage contains vitamins and minerals needed by the livestock body. Meanwhile, dry forage is in the form of rice straw. Rice straw is given in the form of fermented straw. Because the feeding of rice straw is intended to meet the needs of feed sources of fiber and cause satiety. Rice straw is an agricultural waste that has the potential to be used as animal feed because it is available in large quantities and is easy to obtain around livestock areas [3].

Feed at Enhal farm is in the form of concentrates and forage. The provision of forage in the form of elephant grass and rice straw is also based on the weight of the cow, the ability of the cow to consume rations is measured in the form of dry ingredients. The higher the cow's body weight, the lower the percentage of its ability to consume ration dry ingredients. In the beef cattle fattening business at Enhal farm, the feeding is sufficient because it is given 10% of the cow's BB [1]

B. AI (Artificial Intelligence)

Artificial intelligence or in English Artificial Intelligence is often abbreviated as Al is a lesson about how to make computers can do things that at that time were better done by humans. In Artificial Intelligence, computers are designed to be intelligent and intelligent so that they can do the same and best work as humans do by imitating several functions of the human brain, such as understanding language, knowledge, thinking, reasoning, problem-solving, and even decision-making [4]

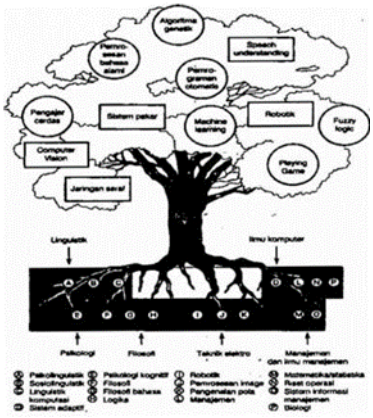


FIGURE 1. Al Tree

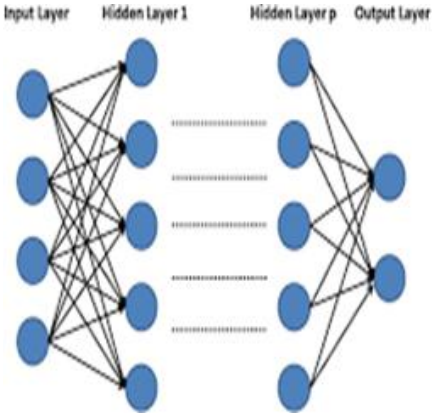


FIGURE 2 Layer layer on deep learning

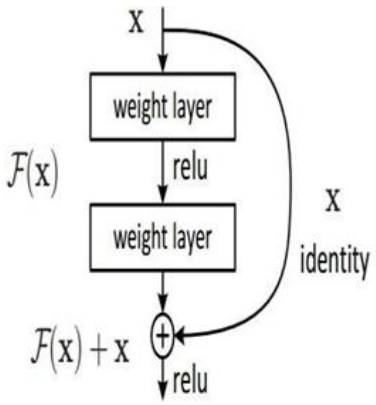


FIGURE 3 Residual block

The AI branches as depicted in the AI tree, can be briefly deordered as follows:

1. Expert System
   A system that uses human knowledge recorded in a computer to solve problems that usually require human expertise.
2. Natural Language Processing
   Natural language processing (NLP) technology allows computer users to communicate with a computer using its native language (colloquialism).
3. Speech Recognition (Speech Und=match)
   Recognition and comprehension of spoken language by computers. So, through speech recognition, it is hoped that humans can communicate with computers using voice
4. Robotics & Sensory Systems
   Intelligent robots have several types of sensor devices, such as cameras, that collect information about the robot's operation and environment.
5. Computer Vision
   The basic purpose of computer vision is to try to interpret images or visible objects through a computer, rather than producing images. Ulul Albab, Vol. 9 No. 2, 2008 Ririen Kusumawati 269
6. Intelligent Computer-Aided Instruction
   The intelligent CAI system was developed to create computerized teachers who form teaching techniques that are suitable for students' learning patterns (induvidual).
7. Artificial Neural Network
   A set of mathematical models that simulate the way the human brain functions.
8. Game Playing
   It is the perfect area to investigate new strategies and heuristics and to measure the results. Deep Blue is a great example of successful development.

9. Language Translation
   Automatic translation uses computers to translate words and sentences from one language to another without much human intervention.
10. Fuzzy Logic
    It is a technique for processing linguistic terms. In fuzzy logic, true or false values are replaced by degrees in membership sets.
11. Algoritrna Genetic Algorithm (Genetic Algorithm)
    It is an intelligent method that uses computers that simulate Darwin's evolutionary process and genetic operations on chromosomes to find patterns from a set of data.
12. Agen Cerdas (Intelligent Agents)
    A small program located on a computer to perform certain tasks automatically. Virus detection programs are a good example[5]

C. Deep Learning

Deep Learning is a branch of machine learning based on Artificial Neural Networks (JST) or it can be said that it is a development of JST which teaches computers to be able to perform actions that are considered natural by humans. For example, learning from examples. In Deep Learning, a computer can learn to classify directly from images, sounds, text, or even videos.

A computer is trained using a very large and labeled dataset that can then convert the pixel values of an image into an internal representation or feature vector whose classification can be used to detect or classify patterns in input inputs [6]

Describes the results of layers in deep learning that have p + 2 layers (p hidden layer, 1 input layer, and 1 output layer). The black circles depict neurons. Each hidden layer has one or more neurons. These neurons will connect directly with other neurons in the next layer. Connections or relationships between neurons will only occur between 2 layers (input and output) and there will be no connections or relationships on the same layer, although technically they can be made and also fully connected [6]

A. Residual Networt (Resnet)

Residual Neural Network is a CNN architecture that consists of several variations of layer types including 18, 34, 50, 101, and 152 layers. The purpose of the ResNet architecture is to map the identity of image data which is done with the principle of skip connection or passing through several layers to avoid losing gradients. It can be seen as shown in Figure 5. shows the skip connection block and Figure 6. is the architectural structure of ResNet [7]

B. Confusion matriks

A confusion matrix is a table that is often used to describe the performance of a classification model (or "classifier") on a set of test data that is actually valued. This allows visualization of the algorithm's performance. Most performance actions are calculated from the confusion matrix. [8]

Class 1 Positive Predictions
Class 2 Negative Predictions
Class 1 Actual Positive TP FN
Class 2 Actual Negative FP MR
Accuracy=(TP +TN)/(TP+TN+FP+FN)
Recal=TP/(TP+FN)
Precisio=TP/(TP+FP)
F-Measure=(2*Recall*Precision)/(Recall+Precision)

III. RESEARCH METHODS

A. Step by Step Research

1. Start
2. Literature Review
3. Conduct Measurements and Collect Data
4. Perform Calculations Based on the Measurement Results
5. Analyze the Measurements and Calculations
6. Prepare the Report
7. Complete

B. Place *and* Time of research

This report will focus on the process of creating a cattle feeding monitoring application that aims to control feeding.

C. Tools and Materials

In this study, equipment and materials are needed to carry out the implementation, design tests, validate the software, and

prepare reports and the entire process that supports this research. The following are the tools and materials used in this study:

1. Laptop
2. Hp
3. Software MATLAB

D. Data Acquisition

At this stage, the author collects data sets using Vivo Y93 brand mobile phones, then the cow is photographed to get data results to take data in photos of the side view of the cow and the back view of the cow. Here is the data obtained in the field before being filtered:

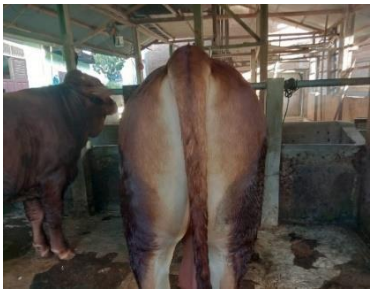
NO	SIDE VIEW IMAGE	GANBAR REAR VIEW	BPS (KG)	BSD (KG)
1			75	80
2			141	150
3			241	250
4			300	300

FIGURE 4 Photo of Cow before filtering

FIGURE 5 of the data after being manually filtered.

IV. DISCUSSION

A. Proses Training

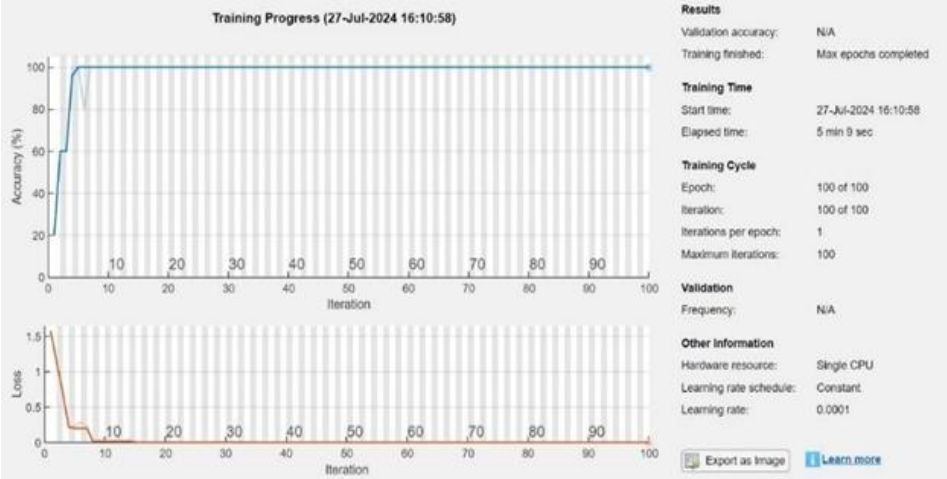


FIGURE 6 Training Process

The following is an explanation of the training process:

- Accuracy: The blue line indicates the percentage of accuracy of the model in predicting training data. The higher the line, the better the model will learn from the data. In this graph, it can be seen that the accuracy increases sharply at the beginning of the training and then reaches a plateau (flat) around the 10th iteration, indicating that the model has found an optimal pattern in the data.
- Loss: The orange line indicates the value of the model's loss or prediction error. The lower the loss value, the better the model will be at minimizing prediction errors. This chart shows a rapid decrease in losses at the beginning of the training, then slows down and tends to converge.
- Iteration: Each dot on the graph represents a single iteration of the training. Iteration is the process by which a model updates its parameters based on a prediction error on a single batch of data.
- Epoch: A single epoch is a one-time pass through the entire training dataset. In this case, each epoch consists of 100 iterations.
- Learning Rate: This is a parameter that controls how much the model takes in updating its parameters. A learning rate that is too large can cause the model to not converge, while a learning rate that is too small can slow down the training process.

B. Proses Testing

At the beginning of the iteration, the accuracy graph shows a sharp increase from about 20% in the first iteration to almost 100% in the 5th iteration. After the 10th iteration, the accuracy reaches 100% and remains stable until the 100th iteration. This shows that the model managed to achieve convergence quickly, learning important features of the dataset in a short period of time. The stability of accuracy at 100% also indicates that the model is able to classify the training data perfectly without experiencing performance degradation.

The loss graph shows a significant drop from an initial value of about 1.5 in the first iteration to close to 0 after the 10th iteration. After this iteration, the losses remain stable at a very low number until the 100th iteration. This signifies that the model is not only fast in learning, but also effective in minimizing prediction errors. The low stability of the loss reinforces the indication that the model is not overfitting, demonstrating a good ability to generalize to the training data. The training process started on July 27, 2024 at 16:10:58 and lasted for about 5 minutes and 9 seconds. The model is trained for 100 epochs with one iteration per epoch, so there are 100 iterations in total. Training is carried out using a Single CPU, which shows that the model can be trained efficiently even though it uses limited hardware resources. In addition, the model uses a constant learning rate of 0.0001, which most likely contributes to the stability of the model and prevents overfitting. However, the absence of data regarding validation accuracy (shown as N/A) is a concern, as validation is an important step to ensure model performance on previously unseen data.

C. Assesment

FIGURE 7 Matrix Confusion Test Results

TABLE 1 the matrix confusion results

	HCMC	FP	FN	TN
150	0	1	4	5
250	3	3	1	3
300	0	1	1	8
80	0	0	1	1

For the calculation look for Precision, acurasiy, reacal, F1-Score as follows: Weight 150

Precision = TP/(TP+FP)
Precision = 0/(0+1) =0

Acurassiy = (TP+TP)/(TP+TN+FP+FN)
Acurassiy = (0+5)/(0+5+1+4)
Acurassiy = 5/10
Acurassiy = 0,5

Recal = TP/(TP+FN)
Recal = 0/(0+5) =0

F1-SCORE =2× (Recal ×Precision)/(Recal +Precision)
F1-SCORE =2× (0 ×0)/(0+0)
F1-SCORE =0

Weight 250
Precision = TP/(TP+FP)
Precision = 3/(3+3) =0,5
Acurassiy = (TP+TP)/(TP+TN+FP+FN)
Acurassiy = (3+6)/(3+6+3+1)
Acurassiy = 9/13
Acurassiy = 0,692

Recal = TP/(TP+FN)
Recal = 3/(3+1) =0,75
F1-SCORE =2× (Recal ×Precision)/(Recal +Precision)
F1-SCORE =2× (0,75 ×0,5)/(0,75 +0,5)

F1-SCORE =0,6

Weight 300
Precision = TP/(TP+FP)
Precision = 0/(0+1) =0

Acurassiy = (TP+TP)/(TP+TN+FP+FN)
Acurassiy = (0+8)/(0+8+1+1)
Acurassiy = 8/10
Acurassiy = 0,8

Recal = TP/(TP+FN)
Recal = 0/(0+1) =0

F1-SCORE =2× (Recal ×Precision)/(Recal +Precision)
F1-SCORE =2× (0 ×0)/(0 +0)
F1-SCORE =0

Weight 80
Precision = TP/(TP+FP)
Precision = 0/(0+0) =0

Acurassiy = (TP+TP)/(TP+TN+FP+FN)
Acurassiy = (0+9)/(0+9+0+1)
Acurassiy = 9/10
Acurassiy = 0,9
Recal = TP/(TP+FN)
Recal = 0/(0+0) =0

F1-SCORE =2× (Recal ×Precision)/(Recal +Precision)
F1-SCORE =2× (0 ×0)/(0 +0)
F1-SCORE =0

V. CONCLUSION

This application allows sellers to provide more complete and accurate information to buyers, as well as allows sellers to set the selling price of cattle transparently by selling cattle directly to buyers. The app provides features that facilitate the transaction process, such as: Ordering, confirmation, and digital payment allow buyers to confirm the details and price of cattle before purchasing according to existing market standards. With this application, buyers no longer depend on the tengkukak or a second person in cattle buying and selling transactions. With the implementation of netTransfer to be able to display the exact weight of the cow based on the results of the confusion matrix, farmers can make the right decision to determine the next step in how the feeding process in cattle to be able to reach the desired weight Based on the 10 data tested, a low accuracy value was obtained, only the 250 class was correctly identified, namely in the form of 3 data, while the others were included in the TN, FP, FN while the other classes, namely 150, 300, and 80, none of which were correctly identified, were all identified as True False, False Positive, False Negative

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