

Grading Beef CNN

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CLASSIFICATION OF BEEF FRESHNESS LEVELS BASED ON IMAGE USING CONVOLUTIONAL NEURAL NETWORK

M.Subhan Anshori¹, *Fatra Nonggala Putra², Lestariningsih³, Febbi Senna Lestari⁴

^{1,2,3}Universitas Nahdlatul Ulama Blitar

Email: subhanshori@gmail.com¹, fatranp@unublitar.ac.id², tariunu@gmail.com³

Abstract

Beef is an essential food commodity with high economic value and a primary source of protein for society. The quality of beef affects consumer preferences, pricing, and market competitiveness. Quality assessment is generally conducted manually through visual inspection and smell, but this method is subjective and time-consuming and requires trained experts. This study aims to design and develop a beef quality classification system using a Convolutional Neural Network (CNN) model based on digital imagery. The dataset used consists of three beef quality categories: Grade 1 (fresh beef), Grade 2 (beef stored at room temperature for 7-14 hours), and Grade 3 (beef stored at room temperature for more than 14 hours). The dataset includes 180 images processed using cropping, resizing, and data augmentation techniques to enhance model variation and accuracy. The CNN architecture employs four convolutional layers with max pooling, followed by dropout and fully connected layers. The model was trained using the Adam optimizer, with a training-to-test data ratio of 80:20. Evaluation results demonstrated the model achieved an accuracy of 91.67%, with precision, recall, and f1-score values of 93.33%, 91.67%, and 91.82%, respectively. These findings suggest that the developed system has the potential to be used as an automatic tool for objective, fast, and accurate beef quality assessment.

Keywords: Beef, freshness level, Classification, Convolutional Neural Network (CNN)

1. INTRODUCTION

Beef is one of the food commodities that has high economic value and is an important source of protein for humans. Beef quality is one of the main factors that determine the level of consumption, price, and competitiveness in the market [1], [2]. Beef quality assessment criteria include various physical aspects such as color, texture, and freshness. Traditional assessment of meat quality is generally done manually, either by experts or through visual inspection. However, this method is often inconsistent because it is subjective, takes a long time, and depends on the skill of the workers [3].

As technology evolves, artificial intelligence-based methods and digital image processing provide opportunities to improve accuracy and efficiency in the beef quality assessment process. One promising approach is the use of the Convolutional Neural Network (CNN) algorithm. CNN is known to be effective in image analysis, as it has the ability to automatically extract important features in images. With the CNN model, the process of grading or classifying beef quality can be done based on the physical attributes recorded in the digital image [3], [4], [5], [6], [7].

In this study, beef image data is categorized into three quality levels or grades, namely Grade 1 (fresh), Grade 2 (after 7-14 hours at room temperature), and Grade 3 (more than 14 hours at

room temperature). The image data is then processed using preprocessing techniques such as cropping, resizing, and augmentation to increase data variation. The CNN model designed uses multiple convolution layers and dense layers to optimize the classification of beef quality.

This research aims to develop a CNN-based automated system that can classify beef quality based on physical parameters with high accuracy. This system is expected to help related government agencies in checking the quality of beef so as to increase work efficiency, as well as reduce dependence on manual methods that are less consistent.

2. RESEARCH METHODOLOGY

The stages in this research consist of 6 (five) stages of research shown in Figure 1, namely: 1) Literature Study, 2) Data Collection, 3) Data Preprocessing, 4) CNN Model Building, 5) CNN Classification, and 6) Testing. The research stages are explained as follows:

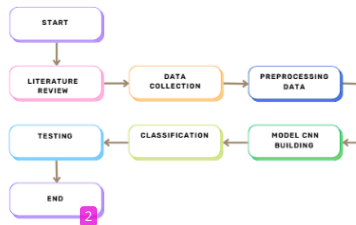


Figure 1: Research Stages

2.1. Data Collection

The population in this study is beef image data. The image data is obtained through direct shooting of beef categorized into three grades, namely Grade 1, Grade 2, and Grade 3. Grade 1 is photographed when the meat is still fresh or freshly cut, Grade 2 is photographed when the meat has been at room temperature for 7-14 hours, and Grade 3 is photographed when the meat has been at room temperature for more than 14 hours. The dataset generation was done using 12 pieces of meat, where each piece was photographed five times with different surfaces displayed. Therefore, each grade has 60 image data, so the total data sampled in this study is 180 beef image data. The image used is an RGB (Red, Green, Blue) image with *.jpg file format. Data sampling is done randomly to divide the data into training data and test data with a ratio of 80:20, which is 80% training data and 20% test data. The amount of training data and test data is as follows.

Table 1. Equipment specifications

	Data Latih	Data Uji	Jumlah
Grade 1	48 data	12 data	60 data
Grade 2	48 data	12 data	60 data
Grade 3	48 data	12 data	60 data
Total	144 data	36 data	180 data

2.2. Preprocessing Data

In this research, the image data preprocessing stages carried out are as follows.

- Cropping, which is cropping or selecting the image area in the part that will be used [8].
- Resize, which is changing the image resolution size so that it is different from the original image size [9].
- Augmentasi data, which is a technique to generate a variety of image data through a transformation process on the original image [10]. This stage increases the variety of training data due to the limited number of datasets so that the model performance can be better. In this research, the data augmentation performed is rescale, rotation range, zoom range, height shift range, width shift range, and flip.

2.3. CNN Model Building

The architecture of the Convolutional Neural Network model is compiled by the researchers with the layer arrangement shown in the following table.

Nama Lapisan		Ukuran
Convolution (Conv2D)	Layer	16 filter ukuran 3x3 dan aktivasi ReLU
Pooling (Maxpooling)		Filter 2x2
Convolution (Conv2D)	Layer	32 filter ukuran 3x3 dan aktivasi ReLU
Pooling (Maxpooling)		Filter 2x2
Convolution (Conv2D)	Layer	64 filter ukuran 3x3 dan aktivasi ReLU
Pooling (Maxpooling)		Filter 2x2
Convolution (Conv2D)	Layer	64 filter ukuran 3x3 dan aktivasi ReLU
Pooling (Maxpooling)		Filter 2x2
Dropout		0,2
Flatten		-
Dense		64 neuron dan aktivasi ReLU
Dense		32 neuron dan aktivasi ReLU
Dense		3 neuron dan aktivasi Softmax

Based on the layer arrangement, the Convolutional Neural Network model has four convolution layers with a filter size of 3x3. The number of filters in this layer are 16, 32, and 64 arranged from the smallest to the largest number of filters. The arrangement of the number of filters is so that larger filters can extract image features from previous smaller convolutions. In the arrangement of these layers, the Stride value is not specified, so a standard Stride value of 1 is used so that the filter moves one step or pixel when performing convolution operations. Every time one convolution layer is completed, Pooling is performed with the Maxpooling method of 2x2. After that, the process continues with Dropout 0.2, Flatten, and then a Fully Connected Layer. The Fully Connected Layer consists of three Dense layers with the number of neurons 64, 32, and 3. ReLU activation is used in each Convolution Layer and the first two Dense layers, while Softmax activation is used in the last Dense layer because the classification consists of three classes.

2.4. Classification with CNN

In this research, the classification process is carried out using a Convolutional Neural Network (CNN) model that has been created at the model building stage. The model used is equipped with Adam optimization as an optimization algorithm, which plays a role in improving the efficiency and effectiveness of the model training process. Experiments were conducted iteratively based on a predefined procedure, by implementing variations in the batch size parameter and the number of epochs. The purpose of these variations is to explore their influence on model performance, so as to obtain the

best configuration that produces optimal classification performance.

2.5. Testing

Evaluation of the performance of the model to be built in this study uses a confusion matrix to determine the number of correctly classified test data and incorrectly classified test data. From the confusion matrix, we can know the performance of the model by calculating the accuracy, precision, recall, and F1-score values [3].

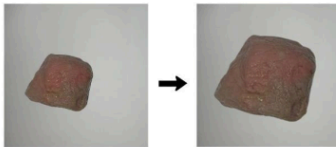
3. RESULT AND DISCUSSION

In this section, the results of the research conducted are given and discussed comprehensively. Results can be in the form of pictures, graphs, tables, and others that make it easier for readers to understand and be referred to in the manuscript. If the discussion is too long, sub-subheadings can be made, such as the following example.

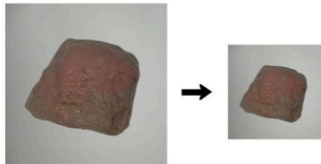
3.1. Preprocessing Data

The Preprocessing stages of beef image data before modeling are as follows.

- a. *Cropping*, in this research, cropping is done on the input image to focus the required object and homogenize its size into a 1:1 ratio.



- b. *Resize*, in this research, each input image is resized to 256x256 pixels so that the size is uniform and the classification process is not too heavy.



- c. *Data augmentation*, which consists of rescale, rotation range, zoom range, height shift range, width shift range, and flip. The data augmentation stages carried out in this research include:

- 1) *Rescale* is normalizing the image by dividing each pixel by 255 as the largest pixel so that the image pixel value is in the 0-1 range [11]. In this research, the rescale value is $1/255$.
- 2) *Rotation range*, which rotates the image position randomly based on the specified rotation range [11]. In this research, the

rotation range value is 20 which indicates a rotation range of $\pm 20^\circ$. This means that the image can be rotated up to 20° clockwise and 20° counterclockwise.

- 3) *Zoom range*, which enlarges the image display or vice versa based on the ratio range used from the original image [12]. In this research, the zoom range value is 0.2, which indicates a zoom in and zoom out range of $\pm 20\%$. This means that the image can be enlarged up to 120% and reduced to 80% of its original size.
- 4) *Height shift range*, which shifts the position of the image display vertically [13]. In this research, the height shift range value is 0.1, which indicates a shift range of $\pm 10\%$ of the image height.
- 5) *Width shift range*, which shifts the position of the image display horizontally [13]. In this study, the width shift range value is 0.1, which indicates a shift range of $\pm 10\%$ of the image width.
- 6) *Flip*, which is flipping or reflecting the image both vertically and horizontally [14]. In this research, the flip is done horizontally.

In this stage, the fill mode is not included because it is sufficient to use the default *fill mode*, which is nearest. *Fill mode* is used to fill in gaps in image pixels caused by image rotation or shift [15]. Data augmentation is performed with "ImageDataGenerator()" from Keras. In its application, "ImageDataGenerator()" performs data augmentation on the image randomly by combining predefined augmentation types, either partially or completely with an example result shown in Figure 2.

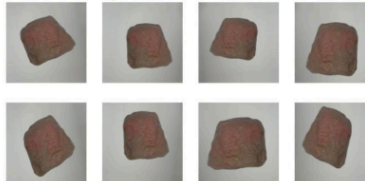


Figure 2. Example of Beef Image Augmentation

Result

3.2. Model Building

In this research, the classification process is carried out with the Convolutional Neural Network model that has been built. The model is equipped with Adam optimization to optimize the performance of the training model. The batch size value used is 6 so that each epoch has 24 steps per epoch ($144/6 = 24$) and 6 validation steps ($36/6 = 6$). Meanwhile, the epoch value is set at 100, which applies early stopping, a technique used to stop the training process when the model has reached a certain condition. In this modeling, the

training process will stop when the *val_accuracy* value has not increased after 5 iterations of the highest *val_accuracy*.

First Convolution Layer

The first convolution layer with a filter count of 16 performs feature extraction from the input image resulting in a feature map containing the unique features of the original image. The feature map is then activated with ReLU to retain positive values and convert negative values to zero. The convolved *feature map* has a smaller size than the input image due to the effect of the filter size used. The size of the convolved feature map can be calculated using the formula where the first convolution becomes $(256 - 3) + 1 = 254$ so that the *feature map* is 254x254 pixels. Meanwhile, the number of parameters in the convolution layer can be calculated where the first convolution becomes $(3 \times 3 \times 3) + 1 = 16 = 448$ parameter.

After activation, the process proceeds to the *Maxpooling operation* to reduce the pixel size of the feature map. *Maxpooling 2x2* indicates that one of the largest pixel values from every four adjacent pixel values in the feature map is taken to retain the important information in the image. Therefore, the *feature map* resulting from *Maxpooling* has a pixel size of 50% of the previous size. In the first *Maxpooling*, the feature map size becomes 127x127 pixels.

Second Convolution Layer

The second convolution is performed with 32 filters so that it has as many as $(3 \times 3 \times 16) + 1 = 32 = 4,640$ parameters. The *feature map* resulting from the second convolution has a size of $(127 - 3) + 1 = 125$ or 125x125 pixels. After activation with ReLU, the *feature map* undergoes a second *Maxpooling* so that its size becomes 62x62 pixels.

Third Convolution Layer

The process continues to the third convolution layer with 64 filters so that it has as many parameters as $(3 \times 3 \times 32) + 1 = 64 = 18,496$ parameters. The *feature map* resulting from the third convolution has a size of $(62 - 3) + 1 = 60$ or 60x60 pixels. After undergoing ReLU activation, the *feature map* undergoes the third *Maxpooling* so that its size becomes 30x30 pixels.

Fourth Convolution Layer

The fourth or final convolution is performed with 64 filters so that it has as many as $(3 \times 3 \times 64) + 1 = 64 = 36,928$ parameters. The *feature map* resulting from the fourth convolution has a size of $(30 - 3) + 1 = 28$ or 28x28 pixels.

After undergoing ReLU activation, the *feature map* undergoes the fourth *Maxpooling* so that its size becomes 14x14 pixels.

Dropout

After completing four convolutions, the process continues to the *Dropout* stage to remove some neurons randomly. This stage is done to reduce the dependency between neurons due to the complexity of the *Hidden Layer* which can lead to overfitting. The value of 0.2 in *Dropout* indicates that 20% of neurons will be randomly discarded in each training iteration.

Flatten

Before heading to the *Dense Layer (Fully Connected Layer)*, the *feature map* which is a multidimensional array goes through the Flatten stage to transform it into a one-dimensional array or vector. This stage is necessary because the Fully Connected Layer can only process one-dimensional arrays. The one-dimensional vector size can be calculated where $(14 \times 14 \times 64) = 12,544$.

Second Dense Layer

The *Fully Connected Layer* is the final layer of the CNN model that performs image classification. One-dimensional vectors are input to the first *Dense Layer* which has 64 neurons. Each neuron in the layer is connected to all neurons in the input data so that the model can learn complex patterns. Each neuron is then activated with ReLU to produce a 64-dimensional vector. The number of parameters in this layer can be calculated where $(12,544 \times 64) + 64 = 802,880$ parameters.

Second Dense Layer

After that, the vector becomes the input for the second *Dense Layer*, which has 32 neurons and is activated with ReLU. The number of parameters of this layer can be calculated where $(64 \times 32) + 32 = 2,080$ parameters.

Third Dense Layer

Next, the vector becomes the input for the third *Dense Layer* which has 3 neurons and is activated with Softmax. Softmax activation is chosen so that the output of this layer which becomes the prediction result is in the form of values 0, 1, and 2. The prediction value is adjusted to the initial case in the form of *multiclass classification* or classification with more than two classes. The number of parameters of this layer is $(32 \times 3) + 3 = 99$. Thus, the total number of parameters that can be trained in this model is 865,571.

3.3. Testing

The testing or evaluation stage is carried out using the Confusion Matrix method which measures the value of accuracy, precision, recall, and F1-score using testing data in the form of 36 beef images, each class totaling 12 Grade 1, Grade 2, and Grade 3 images. Based on the test results presented in Figure 3 the confusion matrix below, it can be concluded that there is 1 Grade 1 image that is wrongly predicted as Grade 2, and 2 Grade 3 images that are wrongly predicted as Grade 2, while Grade 2 images can all be predicted correctly.

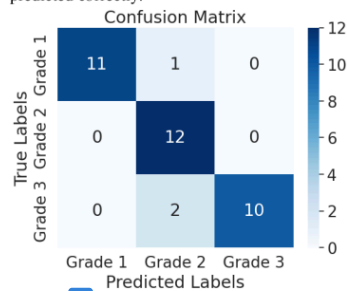


Figure 3. Confusion Matrix of Beef Classification Test Results

	precision	recall	f1-score	support
Grade 1	1.0000	0.9167	0.9565	12
Grade 2	0.8000	1.0000	0.8889	12
Grade 3	1.0000	0.8333	0.9091	12
accuracy			0.9167	36
macro avg	0.9333	0.9167	0.9182	36
weighted avg	0.9333	0.9167	0.9182	36

Figure 4. Classification Report Beef Testing

Based on the value calculation in the Figure 4 Classification report, it can be seen that the accuracy, precision, recall, and f1-score values have an accuracy value of 91.67%, precision 93.33%, recall 91.67%, and f1-score 91.82%.

4. CONCLUSION

Beef freshness classification was conducted using self-shot beef image data with a total of 180 images consisting of 144 training data and 36 testing data divided into 3 (three) classes: Grade 1, Grade 2, and Grade 3. Each class has 36 training data and 12 testing data. Based on the test results, the model built has an accuracy value of 91.67%, precision of 93.33%, recall of 91.67%, and F1-score of 91.82%. These results prove that the model formed using CNN can work well in grading the freshness level of beef.

REFERENCES

- [1] P. D. dan S. I. Pertanian, "Analisis Kinerja Perdagangan Daging Sapi," vol. 14, no. 1G, pp. 1–67, 2024.
- [2] M. A. Nasrudin, *PENGARUH FASILITAS, KUALITAS DAN HARGA TERHADAP MINAT BELI ULANG (Studi Kasus Pada Konsumen Daging Sapi Rumah Potong Hewan Semarang)*. 2022.
- [3] P. B. Asmoro and A. Solichin, "Penerapan Metode Convolutional Neural Network Untuk Klasifikasi Kualitas Daging Sapi Pada Aplikasi Berbasis Android," *Fakt. Exacta*, vol. 16, no. 4, pp. 286–298, 2024, doi: 10.30998/faktorexacta.v16i4.19564.
- [4] A. Rizky pratama, "Klasifikasi Daging Sapi Berdasarkan Ciri Warna Dengan Metode Otsu dan K-Nearest Neighbor," *Techno Xplore J. Ilmu Komput. dan Teknol. Inf.*, vol. 6, no. 1, pp. 9–18, 2021, doi: 10.36805/technoexplore.v6i1.1239.
- [5] S. Bagus Valentino, "Klasifikasi Kualitas Daging Marmer Berdasarkan Citra Warna Daging Menggunakan Metode Convolutional Neural Network," *JATI (Jurnal Mhs. Tek. Inform.)*, vol. 7, no. 1, pp. 125–129, 2023, doi: 10.36040/jati.v7i1.6128.
- [6] T. Ekamila, F. Rahayu, A. Zuchriadi, and A. Octa Indarso, "Penerapan Deep Learning Untuk Klasifikasi Kesegaran Daging Sapi Berbasis Mobile Apps," *Edu Komputika J.*, vol. 10, no. 1, pp. 10–16, 2023, doi: 10.15294/edukomputika.v10i1.68478.
- [7] D. N. Gonçalves *et al.*, "Carcass image segmentation using CNN-based methods," *Inf. Process. Agric.*, vol. 8, no. 4, pp. 560–572, 2021, doi: 10.1016/j.inpa.2020.11.004.
- [8] A. Antoni, T. Rohana, and A. R. Pratama, "Implementasi Algoritma Convolutional Neural Network Untuk Klasifikasi Citra Kemasan Kardus Defect dan No Defect," *Build. Informatics Technol. Sci.*, vol. 4, no. 4, pp. 1941–1950, 2023, doi: 10.47065/bits.v4i4.3270.
- [9] R. A. Pangestu, B. Rahmat, and F. T. Anggraeny, "Implementasi Algoritma CNN untuk Klasifikasi Citra Lahan dan Perhitungan Luas," *J. Inform. dan Sist. Inf.*, vol. 1, no. 1, pp. 166–174, 2020.
- [10] L. H. Ganda and H. Bunyamin, "Penggunaan Augmentasi Data pada Klasifikasi Jenis Kanker Payudara dengan Model Resnet-34," *J. Strateg.*, vol. 3, no. 1, pp. 187–193, 2021.
- [11] R. W. Wiratama, "Implementasi dan Klasifikasi Jenis-Jenis Batik Menggunakan Algoritma Convolutional Neural Network

(CNN) dengan Model Arsitektur Resnet,”
Politeknik Negeri Malang, 2023.

- [12] M. F. Naufal and S. F. Kusuma, “Pendeteksi Citra Masker Wajah Menggunakan CNN dan Transfer Learning,” *J. Teknol. Inf. dan Ilmu Komput.*, vol. 8, no. 6, pp. 1293–1300, 2021, doi: 10.25126/jtiik.2021865201.
- [13] R. Shinta, “Klasifikasi Citra Penyakit Daun Tanaman Padi Menggunakan CNN Dengan Arsitektur VGG-19,” Universitas Islam Negeri Sultan Syarif Kasim Riau, 2023.
- [14] M. Toyib, T. D. K. Pratama, and I. Aqil, “Penerapan Algoritma CNN untuk Mendeteksi Tulisan Tangan Angka Romawi dengan Augmentasi Data,” *J. Mat. Ilmu Pengetah. Alam, Kebumihan dan Angkasa*, vol. 2, no. 3, pp. 108–120, 2024.
- [15] G. P. H. P. Gusti, E. Haerani, F. Syafria, F. Yanto, and S. K. Gusti, “Implementasi Algoritma Convolutional Neural Network (Resnet-50) untuk Klasifikasi Kanker Kulit Benign dan Malignant,” *MALCOM Indones. J. Mach. Learn. Comput. Sci.*, vol. 4, no. 3, pp. 984–992, 2024, doi: 10.57152/malcom.v4i3.1398.

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