IMPLEMENTATION OF MACHINE LEARNING - BASED FOWL DISEASE DETECTION USING CNN

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Abstract

Poultry husbandry is an essential contributor to global food security, yet it faces significant challenges from complaint outbreaks, leading to profitable losses and high mortality rates. This paper presents an automated funk complaint discovery Model using CNNs - Convolutional Neural Networks. By using image bracket ways, the system classifies fecal images into complaint orders similar as Newcastle complaint, coccidiosis, and healthy. The proposed result achieves high delicacy and scalability, offering growers a dependable tool for early complaint discovery and intervention. Experimental results demonstrate the effectiveness of models like VGG16, EfficientNetB5, and MobileNetV3, with EfficientNetB5 achieving superior performance

Keywords: Convolutional Neural Networks, Poultry variety diseases,VGG16 Layer ML model, and MobileNetV3 ML model, EfficientNetB5, Deep Learning.

1. Preface

Flesh husbandry is vital for addressing the global demand for beast protein. still, conditions like coccidiosis, Newcastle complaint, and Salmonella pose significant pitfalls to productivity. Traditional individual styles calculate on homemade examination, which is time- ferocious and error-prone. Advances in deep literacy have enabled automated systems able of assaying large datasets to identify complaint patterns efficiently. This paper proposes a CNN- grounded system for funk complaint discovery using fecal image datasets, furnishing an accessible and accurate result for growers. Flesh husbandry is vital for addressing the global demand for beast protein. still, conditions like coccidiosis, Newcastle complaint, and Salmonella pose significant pitfalls to productivity. Traditional individual styles calculate on homemade examination, which is time- ferocious and error-prone. Advances in deep literacy have enabled automated systems able of assaying large datasets to identify complaint patterns efficiently. This paper proposes a CNN- grounded system for funk complaint discovery using fecal image datasets, furnishing an accessible and accurate result for growers.

2. Literature Review

colorful studies have explored complaint discovery in flesh using machine literacy. For case, Banakar et al.(2021) employed sound features to diagnose avian conditions with 91.15 delicacy. Another study by Vandana et al.(2023) employed the EfficientNetB7 model for fecal image analysis, achieving 97.07 delicacy. These styles demonstrate the eventuality of noninvasive ways for complaint discovery but highlight challenges similar as dataset imbalance and real- time deployment.

3. Methodology

3.1 Dataset Preparation

The dataset comprises labeled funk fecal images distributed as" Healthy,"" Coccidiosis,"" Newcastle Disease," and" Salmonella." Images were resized to 224x224 pixels for preprocessing. Data addition ways similar as gyration, flipping, and discrepancy adaptation were employed to ameliorate model conception.

3.2 Model Infrastructures

1. **VGG16 :** A deep CNN with 16 layers, primarily used for point birth through its invariant armature.
2. **EfficientNetB5 :** An optimized CNN exercising emulsion scaling to balance depth, range, and resolution.
3. **MobileNetV3 :** A featherlight CNN designed for mobile and edge bias, combining effectiveness with high performance.

3.3 Training Process

The models were trained using TensorFlow with categoricalcross-entropy as the loss function and Adam optimizer. The dataset was resolve into 70 training, 10 confirmation, and 20 testing subsets. Beforehand stopping and learning rate decay were applied to help overfitting.

4. Results and Discussion

The performance of the models was evaluated using metrics such as accuracy, precision, recall, and F1-score.Comparison Analysis performed on all Three Machine Learning Models and achieved good Accuracy by EfficientNetB5 Model.

ML Model Name	**Accuray (%)**	**Precision (%)**	**Recall (%)**	**F1-Score (%)**
VGG16	89.2	88.5	87.8	88.1
EfficientNetB5	96.7	96.9	96.4	96.6
MobileNetV3	93.4	93.2	92.8	93.0

EfficientNetB5 outperformed other models in terms of delicacy and robustness, making it suitable for real- world operations.

5. Perpetration

The system was stationed as a web operation using Beaker. The interface allows druggies to upload fecal images and choose a preferred model for vaticination. The backend processes images through the trained CNN model and returns the prognosticated complaint order. The operation is designed to be stoner-friendly, enabling growers to pierce individual results without specialized moxie.

6. Confusion Matrix

The confusion matrix states an analysis of the bracket model's performance of EfficentNet-B5 across four orders Healthy(Class 0), Coccidiosis(Class 1), Newcastle Disease(Class 2), and Salmonella(Class 3). The model shows high delicacy with true positive counts of 243 for Healthy, 226 for Coccidiosis, 53 for Newcastle Disease, and 255 for Salmonella. Misclassifica-tions are minimum, similar as 5 Healthy samples labeled as Coccidiosis and 1 NewcastleDisease case misclassified as Healthy.

Class 3(Salmonella) demonstrates the stylish performance with nearly no crimes. While the results validate the model's trustability in relating conditions, slight misclassifications in Classes 1 and 2 indicate room for enhancement through ways like fresh data collection or fine- tuning. These findings accentuate the effectiveness of the EfficientNetB5 model in flesh complaint bracket.The confusion matrix provides an analysis of the bracket model's performance of EfficentNet- B5 across four orders Healthy(Class 0), Coccidiosis(Class 1), Newcastle Disease(Class 2), and Salmonella(Class 3). The model shows high delicacy with true positive counts of 243 for Healthy, 226 for Coccidiosis, 53 for Newcastle Disease, and 255 for Salmonella. Misclassifications are minimum, similar as 5 Healthy samples labeled as Coccidiosis and 1 Newcastle Disease case misclassified as Healthy. Class 3(Salmonella) demonstrates the stylish performance with nearly no crimes, slight misclassifications in Classes 1 and 2 indicate room for enhancement through ways like fresh data collection or fine- tuning. These findings accentuate the effectiveness of the EfficientNetB5 model in flesh complaint bracket.

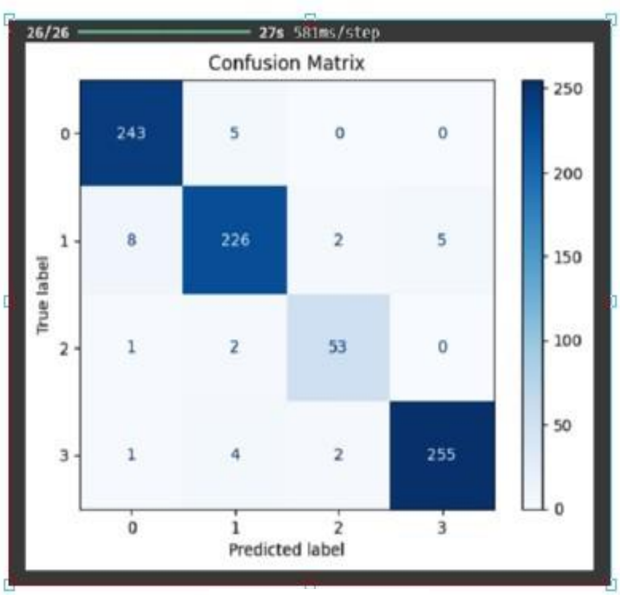

fig 6.1 : Matrix Representation of EfficientNetB5

7. Analysis Graph

The graphs illustrate the training and Testing accuracy and precision of the model over 20 epochs. The accuracy plot shows that the model achieves rapid improvement in both training and Evaluation accuracy within the first few epochs, stabilizing around 95.4% for training accuracy and 96.2% for validation accuracy, demonstrating effective learning. The loss graph reflects a sharp decline in both training and Testing loss during the initial epochs, with training loss converging close to zero and validation loss stabilizing at a low value of 0.1697. These trends indicate that the model generalizes well, with no signs of significant overfitting or underfitting, confirming its reliability for disease detection tasks.

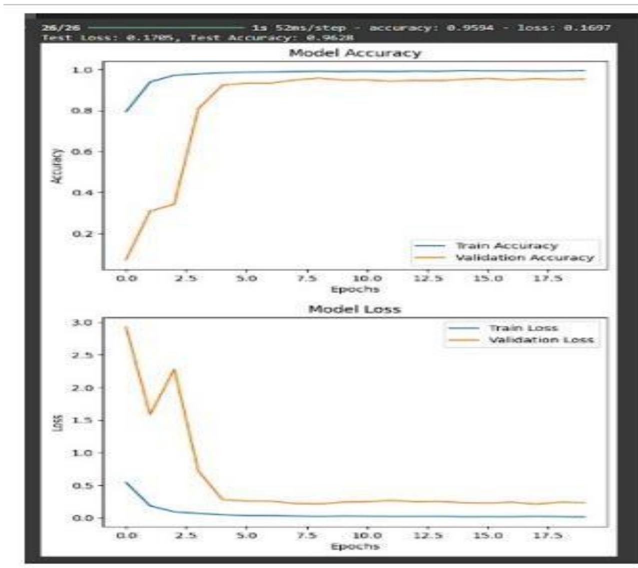

fig 7.1 : Trained model Accuracy Graph

8. Conclusion and Unborn Compass

This study demonstrates the eventuality of CNNs in automating funk complaint discovery. The EfficientNetB5 model, in particular, provides high delicacy and with vertical and Horizontal Types of scalability, offering a feasible result for flesh health operation. unborn work will concentrate on expanding the dataset to include different envir-onmental conditions and integrating IoT bias for real- time monitoring .This study demonstrates the eventuality of CNNs in automating funk complaint discovery. The EfficientNetB5 model, in particular it provides high delicacy and scalability, offering a feasible result for flesh health operation. unborn work will concentrate on expanding the dataset to include different environmental conditions and integrating IoT bias for real- time monitoring.

References

1. A. Banakar, M. Sadeghi, A. Shushtari,"
2. Avian complaint Discovery Using Sound Features," ScienceDirect, 2021.
3. V. Kumar Yogi, S. P. Yadav," EfficientNetB7 for Fecal Image Bracket," ScienceDirect, 2023.
4. R.- Y. Xu, C.- L. Chang," Deep literacy for Poultry Health opinion," ScienceDirect, 2024.
5. TensorFlow Documentation https// www.tensorflow.org/.
6. Flesh mecca https// www.poultryhub.org/..
7. Raman Mani, Dr. Himanshu Aggarwal, "Study and Comparison of Various Image Edge Detection Techniques", International Journal of Image Processing (lJIP), Vol. 3 (I), pp. 1-12, Jan. 2011
8. **Dataset Path :** Kaggle Dataset - www.Kaggle.com/datasets?search=chicken
9. **Web References -**
   https://www.poultryhub.org/
   https://towardsdatascience.com/
   https://www.researchgate.net/
10. C.H Arun, W.R Sam Emmanuel, D. Chris topher Dhurairaj, "Texture Feature Extrac tion for Identification of Medicinal Plants and Comparison of Different Classifiers", International Journal of Computer Applicati ons (0975 - 8887).
11. Ghazi, M.M., Yanikoglu, B. and Aptoula, E., 2017. Plant identification using deep neural networks via optimization of transfer learning parameters. Neurocomputing,
12. **Tools and Libraries:TensorFlow:**
   https://www.tensorflow.org/ OpenCV
   https://opencv.org/# Python
   https://www.python.org/
13. R. M. B. E. and A. V. B. (2020). "A clean survey on weed detection in the agriculture using machine learning techniques".Journal of Agricultural Informatics, vol. 11, no. 1, pp. 45-62.
14. N. A. Green and R. L. Mitchell (2021). The "Assessing the Impact of Machine Learning on Agricultural Productivity." Agricultural Systems, vol. 187, Article 102013.
15. Suvarna Nandyal, Supriya Bagevadi, The "Automated Identification of Plant Species from the Images of Leaves and Flowers are used in the Treatment of Arthritis", Inter - national Journal of Research in Engineering & Advanced Technology, Volume 1(5), pp 1-10, Oct. 2013.