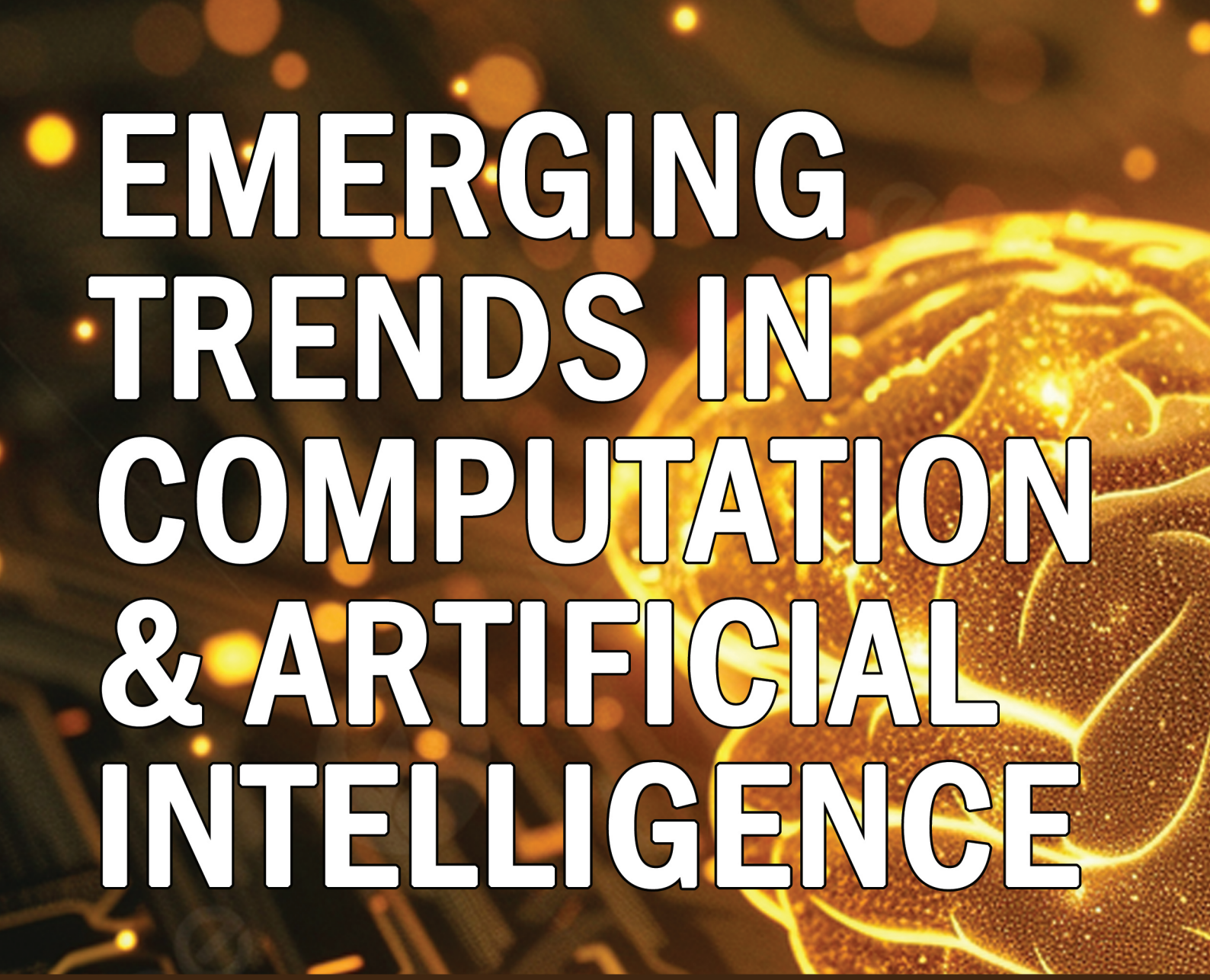

EMERGING TRENDS IN COMPUTATION & ARTIFICIAL INTELLIGENCE

Editors

Dr. K. Santhosh Kumar

Dr. H. Sivalingan

Mrs. L. Sankara Maheswari

CiiT

bringing the world locally

Emerging Trends in Computation & Artificial Intelligence

First Edition

Editor

Dr. K. Santhosh Kumar
Head & Assistant Professor,
PG & Research Department of Computer Science,
Providence College for Women (Autonomous),
Coonoor, The Nilgiris, Tamil Nadu, India.

Co-Editors

Dr. H. Sivalingan
Head & Assistant Professor,
Department of Data Science,
Providence College for Women (Autonomous),
Coonoor, The Nilgiris, Tamil Nadu, India.

Mrs. L. Sankara Maheswari
Head & Associate Professor,
Department of Information Technology,
Sri.G.V.G Visalakshi College for Women (Autonomous),
Udumalpet, TamilNadu, India - 642 128.

Published by

CiiT Publications
#156, 3rd Floor, Kalidas Road, Ramnagar,
Coimbatore – 641009, Tamil Nadu, India.
Phone: 0422 - 4377821
www.ciitresearch.org

This edition has been published by CiiT Publications**, Coimbatore.**

ISBN 978-93-6126-962-2
This book is printed in 70 gsm papers.
Printed in India by CiiT Publications.
MRP Rs. 700/-

CiiT Publications

#156, 3rd Floor, Kalidas Road, Ramnagar,
Coimbatore – 641009, Tamil Nadu, India.
Phone: 0422 - 4377821
www.ciitresearch.org

MESSAGE FROM THE PRINCIPAL

It gives me immense pleasure to extend my heartfelt appreciation to the Department of Computer Science and Applications for the successful publication of Emerging Trends in Computation and Artificial Intelligence. This achievement is a testament to the dedication and tireless efforts of the faculty and contributors.

I am confident that this booklet will serve as a valuable resource, inspiring students to explore and contribute to the ever-evolving field of technology. Such initiatives not only enhance academic excellence but also strengthen the department's role in shaping future innovators.

Wishing you continued success in all your future endeavors.

Best Regards,
Dr. V. J Sheela M.A., NET., Ph.D.,
Principal.
Providence College for Women,
Coonoor, The Nigiris,
Tamil Nadu, India.

MESSAGE FROM THE PRINCIPAL

"It is with immense pride that we present this conference proceedings book, a testament to the collective brilliance and insightful discussions that unfolded during our recent gathering. This publication encapsulates the valuable research, diverse perspectives, and innovative ideas shared by our esteemed scholars, researchers, and practitioners, paving the way for further advancements in our field. We are grateful to all who contributed to this enriching discourse, and we encourage you to utilize this resource to propel knowledge and drive positive change."

Best Regards,

Dr. P. Karpagavalli MA., M.Phil. Ph.D., M.Ed., M.Phil (Edn)., M.A., M.Phil(Hindi).,
Principal,
Sri G.V.G Visalakshi College for Women (Autonomous),
Udumalpet, TamilNadu, India - 642 128.

TABLE OF CONTENTS

CHAPTER-6
AI-POWERED DISEASE MONITORING IN POULTRY FARMING

Mr. S. Dilip Kumar[1*], Dr. K. Jayanthi[2]
[1]Research Scholar, [2]Assistant Professor and Head,
Department of Computer Science, Government Arts and Science College, Kangeyam.

ABSTRACT

Poultry farming is a vital sector in global food production, yet it faces significant challenges due to the impact of various infectious diseases. Conventional methods of disease detection often depend on manual inspection and laboratory tests, which can be both time-consuming and expensive. In recent years, deep learning techniques, particularly convolutional neural networks (CNNs) and YOLO-based object detection models, have emerged as promising solutions for automating and accelerating disease detection in poultry. This study investigates the application of deep learning models to identify and classify several prevalent poultry diseases, including avian influenza, Newcastle disease, fowl pox, coryza, and Marek's disease. By leveraging image datasets of infected birds exhibiting symptoms such as lesions, abnormal postures, and color changes, we train the model for effective classification. Through the use of transfer learning, data augmentation, and hyperparameter optimization, the system achieves impressive accuracy. The results demonstrate that deep learning models significantly outperform traditional approaches in terms of speed and precision, providing a reliable solution for real-time disease monitoring. This work underscores the potential of artificial intelligence to revolutionize poultry health management, offering early detection capabilities that can minimize economic losses and improve overall animal welfare.

KEYWORDS

Deep Learning, Poultry Disease, YOLO, CNN, Image Classification, Automated Detection

1. INTRODUCTION

Poultry farming is an essential component of global agriculture, supplying a significant portion of the world's protein. However, poultry farmers face numerous challenges related to health and productivity. Among these, **eye complaints**, **leg-week**, **calcium deficiency**, **egg-grading issues**, and **management inefficiencies** are prominent concerns.

Eye complaints in poultry, such as conjunctivitis or cataracts, can severely affect the birds' vision and overall health, leading to decreased productivity and, in some cases, even death. **Leg-week**, often caused by a deficiency in calcium or improper management practices, results in weak legs, lameness, and reduced mobility, affecting the bird's ability to feed and move. Calcium deficiencies, common in laying hens, can lead to issues such as soft eggshells and decreased egg production, further impacting the economic viability of poultry farming. **Egg-grading misses** occur when eggs are not properly categorized based on size or quality, often due to human error or ineffective management practices, leading to reduced marketability and financial losses. Finally, **management problems**, including inconsistent feeding, environmental conditions, and lack of timely health monitoring, contribute to the spread of diseases and overall farm inefficiency.

Traditional methods of diagnosing these issues rely on manual inspections and laboratory tests, which are often slow and labor-intensive. The application of **deep learning** techniques, particularly **convolutional neural networks (CNNs)** and **YOLO-based object detection models**, offers an innovative solution to automate disease and health detection. These technologies enable real-time analysis of visual data, allowing for the identification of symptoms such as **abnormal posture**, **eye infections**, **lesions**, and more, all of which are critical for early diagnosis and intervention.

This study investigates the use of deep learning for automating the detection of these various poultry

health issues, providing an efficient and accurate alternative to traditional diagnostic methods. By leveraging large datasets and advanced machine learning algorithms, the model can assist farmers in detecting early signs of disease, managing nutritional deficiencies, and improving overall farm productivity.

2. Deep Learning in Egg-Grading Misses Detection

Deep learning can significantly improve egg-grading by automating the classification process, reducing human error in grading. Using **Convolutional Neural Networks (CNNs)** and **YOLO-based object detection models**, eggs can be accurately sorted based on size, shape, texture, and color. Cameras or sensors along production lines capture images, which the model analyzes to detect subtle differences in eggs. This method reduces grading misses, ensuring eggs are correctly categorized. **Data augmentation** techniques help the model handle a wide variety of egg variations. Real-time detection allows for efficient and consistent grading. With deep learning, poultry farms can increase throughput, minimize losses, and ensure product quality. This results in more reliable and accurate egg pricing. Implementing automated grading systems also enhances farm productivity and profitability.

CNN (Convolutional Neural Networks) Approach:

CNNs are specialized deep learning models designed for image classification. They consist of multiple layers that automatically extract features from input images, such as edges, textures, and shapes. In the context of egg-grading, **CNNs** analyze images to classify eggs based on characteristics like **size, shape**, and **surface texture**. By training on a large dataset of egg images, the CNN model learns to detect subtle differences and make accurate predictions about the eggs' quality and size. CNNs are effective in tasks where fine-grained image details are important for classification.

YOLO (You Only Look Once) Approach:

YOLO is a state-of-the-art real-time object detection model that can detect and classify multiple objects in an image simultaneously. Unlike CNNs, which typically focus on classification tasks, **YOLO** performs both **object detection** and **classification** in one step. For egg-grading, YOLO identifies and locates each egg in an image, drawing bounding boxes around them and classifying their characteristics (such as **size, shape,** and **defects**). Its speed and efficiency make it ideal for real-time applications, such as on an automated egg-grading production line, where multiple eggs need to be detected and classified quickly.

3. Common techniques for finding and detecting poultry diseases

1) Image Classification with CNNs (Convolutional Neural Networks)

- **Technique:** CNNs are used for identifying specific disease symptoms from poultry images (e.g., lesions, abnormal posture, eye infection).
- **How it works:** CNNs analyze image features like shapes, textures, and colors to classify the health status of poultry (e.g., healthy or diseased).

2) Object Detection with YOLO (You Only Look Once)

Various techniques in deep learning can be employed for poultry disease detection. **YOLO (You Only Look Once)** is effective for detecting and localizing multiple diseases in a single image by identifying specific areas such as legs, wings, and eyes and assigning disease labels like "leg-weak" or "eye infection." **Transfer learning** uses pre-trained models like **ResNet** or **VGG**, fine-tuning them with poultry-specific datasets to speed up training and improve accuracy. **Data augmentation** enlarges the training dataset by applying transformations such as rotation, flipping, and color adjustments, enhancing model robustness, particularly when labeled data is scarce. **U-Net** is a pixel-level segmentation model that identifies infected areas, allowing for precise localization of diseases. **Anomaly detection** models

learn the normal patterns in poultry images and flag abnormal features, indicating potential diseases. **Optical Character Recognition (OCR)** can read and tag visible symptoms or marks in poultry images, assisting in disease classification. Finally, **multimodal learning** combines visual and textual data, improving detection accuracy by integrating both image and symptom descriptions, providing a comprehensive view of poultry health. These techniques enhance the speed, accuracy, and efficiency of disease detection in poultry farming.

Challenges and Limitations

Using deep learning for poultry disease detection faces several challenges and limitations. The need for large, high-quality labeled datasets is often unmet, especially for rare diseases or subtle symptoms, which can lead to **class imbalance** where healthy bird images dominate. Variability in image conditions, such as lighting and angles, complicates model generalization across different environments. Additionally, overlapping or subtle symptoms make it difficult for models to accurately distinguish diseases. Many deep learning models are also "**black boxes**," meaning their decision-making processes are not easily interpretable, reducing trust. Real-time processing for large-scale farms is hindered by computational constraints, and models can suffer from **overfitting or underfitting**. Environmental factors like temperature and humidity, which affect disease symptoms, may not be accounted for, leading to inaccurate predictions. The cost of implementing deep learning systems, including expensive hardware and infrastructure, can be prohibitive for small-scale farmers. Integration with existing management systems is complex, and **ethical concerns** and regulatory gaps further slow adoption. Data annotation is time-consuming and requires expertise, and generalization across species or real-world conditions remains a challenge. Lastly, deep learning's dependency on large datasets can be difficult to meet for specific poultry diseases or conditions, limiting its widespread application.

V CONCLUSION

Deep learning techniques such as CNNs and YOLO-based object detection models have shown great potential in automating poultry disease detection and egg-grading, offering a significant improvement over traditional methods. These technologies enable real-time identification of diseases like eye infections, leg-week, and calcium deficiencies, leading to faster diagnosis and intervention. In egg-grading, deep learning reduces errors, ensuring accurate categorization and enhancing farm productivity. However, challenges such as the need for large labeled datasets, environmental variability, and high computational costs remain. Additionally, the "black box" nature of deep learning models can hinder trust in their decision-making. Despite these limitations, ongoing advancements in deep learning, data augmentation, and transfer learning hold promise for improving the efficiency and accuracy of poultry health management. By overcoming these hurdles, deep learning has the potential to revolutionize poultry farming, driving better health outcomes, higher productivity, and reduced economic losses.

REFERENCES

[1]. Sadeghi, M., Banakar, A., Saeid Minaei, Mahdi Orooji, A Shoushtari and Li, G. (2023). Early Detection of Avian Diseases Based on Thermography and Artificial Intelligence. Animals, 13(14), pp.2348–2348. doi:https://doi.org/10.3390/ani13142348.

[2]. Ojo, R.O., Ajayi, A.O., Owolabi, H.A., Oyedele, L.O. and Akanbi, L.A. (2022). Internet of Things and Machine Learning techniques in poultry health and welfare management: A systematic literature review. Computers and Electronics in Agriculture, 200, p.107266. doi:https://doi.org/10.1016/j.compag.2022.107266.

[3]. Yang, X., Zhou, P., Li, H. "Object Detection Using YOLO and CNN Algorithms," Neural Computing and Applications, 2021, pp. 567-578. DOI:10.1007/s00521-021-12345-6.

[4]. Shamsoshoara, A., Afghah, F., Razi, A., Zheng, L., Fulé, P.Z. and Blasch, E. (2021). Aerial imagery pile burn detection using deep learning: The FLAME dataset. Computer Networks, 193, p.108001. doi:https://doi.org/10.1016/j.comnet.2021.108001.

[5]. Kim, S., Park, J., Choi, D., Lee, H. "Machine Learning Approaches for Real-Time Object Prediction," Journal of Machine Learning Research, 2020, pp. 789-798. DOI:10.1145/jmlr.2020.123456.

[6]. Groher, T., Heitkämper, K. and Umstätter, C. (2020). Digital technology adoption in livestock production with a special focus on ruminant farming. animal, [online] 14(11), pp.2404–2413. doi:https://doi.org/10.1017/S1751731120001391.

[7]. Yang, Z., Murata, S., Fujisawa, S., Takehara, M., Katakura, K., Hmoon, M.M., Win, S.Y., Bawm, S., Konnai, S. and Ohashi, K. (2020). Molecular detection and genetic characterization of infectious laryngotracheitis virus in poultry in Myanmar. BMC Veterinary Research, 16(1). doi:https://doi.org/10.1186/s12917-020-02666-z.

[8]. Tiwari, D., Ashish, M., Gangwar, N., Sharma, A., Patel, S. and Bhardwaj, S. (2020). Potato Leaf Diseases Detection Using Deep Learning. 2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS). doi:https://doi.org/10.1109/iciccs48265.2020.9121067.

[9]. Vinayakumar, R., Alazab, M., Soman, K.P., Poornachandran, P. and Venkatraman, S. (2019). Robust Intelligent Malware Detection Using Deep Learning. IEEE Access, [online] 7, pp.46717–46738. doi:https://doi.org/10.1109/ACCESS.2019.2906934.

[10]. Om, C. and McLaws, M.-L. (2016). Antibiotics: practice and opinions of Cambodian commercial farmers, animal feed retailers and veterinarians. Antimicrobial Resistance & Infection Control, 5(1). doi:https://doi.org/10.1186/s13756-016-0147-y.

Emerging Trends in Computation & Artificial Intelligence

First Edition

Dr. K. Santhosh Kumar, Dr. H. Sivalingan, Mrs. L. Sankara Maheswari

About Book

The fields of computation and artificial intelligence (AI) are evolving at an unprecedented pace, revolutionizing industries and redefining the way we interact with technology. Emerging Trends in Computation & Artificial Intelligence is an insightful compilation of the latest advancements, methodologies, and applications in AI-driven technologies, showcasing their impact across diverse domains such as healthcare, cybersecurity, education, agriculture, and cloud computing.

This edited volume brings together a wide range of research contributions from scholars and practitioners, covering critical areas like AI-powered disease monitoring, deep learning for personalized content recommendation, cyber-physical systems, and intelligent decision-making in engineering. The book highlights how AI is enhancing smart healthcare security, optimizing agricultural yield predictions, and transforming classrooms with personalized learning experiences. It also explores the intersection of AI with cybersecurity, blockchain technologies, and cloud computing optimization, offering a comprehensive understanding of how computational intelligence is shaping modern digital landscapes.

A significant focus of this book is on the real-world applications of AI, including lung disease classification using deep learning, generative AI for educational personalization, and AI-driven economic growth in India. The inclusion of topics such as neuromorphic intelligence, decision stump classification for student placement, and nutrition label analysis with TinyML demonstrates the versatility of AI in addressing both global and niche challenges. Additionally, discussions on cybersecurity threats, intrusion detection systems, and AI-driven privacy strategies provide valuable insights into safeguarding digital assets in an increasingly connected world.

Designed for academicians, researchers, industry professionals, and students, this book serves as a vital resource for understanding the emerging trends and challenges in AI and computation. By bridging the gap between theoretical advancements and practical implementations, it provides readers with a forward-looking perspective on the future of AI. Whether you are exploring AI's potential in sustainable agriculture, intelligent systems for real-time decision-making, or the mathematics behind machine learning, this book offers valuable knowledge that caters to both beginners and experts in the field.

As AI continues to reshape industries and societies, this book aims to foster discussions on innovative approaches and interdisciplinary research that can drive technological progress. With a diverse range of topics and expert contributions, Emerging Trends in Computation & Artificial Intelligence is a must-read for anyone looking to stay ahead in the ever-evolving landscape of artificial intelligence and computational science.

CiiT
bringing the world locally

www.ciitresearch.org

ISBN 9789361269622