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SUPERVISION OF ANIMALS USING MACHINE LEARNING

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Abstract— Machine learning is an evolving technology that allows computers to automatically learn from past data. Machine learning uses various algorithms to create mathematical models and make predictions using historical data or information. Currently, it is used for various tasks such as image recognition, voice recognition, email filtering, auto-tagging, recommendation systems, and many more. Behavioral analysis of companion animals is an important aspect of veterinary research and animal welfare. However, traditional behavioral analysis methods can be time-consuming, subjective, and error-prone. With recent advances in computer vision and machine learning, it is now possible to perform behavioral analysis of pets more accurately and efficiently using video footage and automated algorithms. The method involves using computer algorithms to process video footage of pets and detect, track and classify their behavior. These algorithms analyze an animal's movement, posture and other visual cues to identify and quantify different types of behavior. By analyzing large amounts of video data, it is possible to better understand the behavior and health of pets in different environments. Machine learning algorithms are used to train computers to recognize and classify different actions such as walking, running, playing or resting. This requires large amounts of labeled data, which can be obtained by manual annotation or using pre-existing labeled datasets. Behavioral analysis of pets using machine learning and video footage has many applications, including monitoring the behavior of pets at home or in a veterinary clinic, studying the effects of different treatments or environmental factors on pet behavior and identifying early signs of behavioral problems. or get sick. Overall, this approach has the potential to improve our understanding of companion animal behavior and well-being and lead to more effective and individualized care for companion animals..

Keywords: ***Machine learning, behavior, video clips, analytic, algorithm***

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I. INTRODUCTION

Animal behavior is a complex and interesting field of study with implications for ecology, conservation and animal welfare. Understanding how animals behave in their environment can provide better insight into their ecology, relationships and physiological evolution. However, it can be difficult to observe and analyze animal behavior, especially in the wild or in social groups.Recent advances in imaging technology and machine learning offer new opportunities to study animal behavior. With the availability of affordable video cameras and the development of machine learning algorithms, researchers can now capture and analyze large-scale images to identify and measure behavior. This has the potential to revolutionize animal behavior research by providing new insights into animal behavior that were traditionally difficult or impossible to obtain.

Animal behavior analysis using video images and machine learning has several important steps. First, scientists must record good videos of animals in their natural environment. This may include installing cameras in strategic locations, using drones or other remote sensing equipment, or collaborating with other researchers or wildlife managers to accept pictures. Researchers should prepare data for analysis when collecting video footage.This may include annotating videos to identify animals, tagging significant events or behavior, or extracting relevant features from video frames. The quality and accuracy of the description is an important step in this process, as it can have a significant impact on the accuracy and reliability of the machine learning model.

Next, scientists can use various machine learning methods to analyze the videos and reveal insights about the animal's behavior. These may include search and discovery algorithms, deep learning such as neural networks, or other specialized algorithms designed for specific behavior or data types.The results of these analyzes can provide information about animal behavior such as group relationships, animal behavior and behavior, or changes in the body of specific animals.This information can be used to inform conservation and management decisions, develop better

conservation strategies, or generate new ideas about animal behavior and ecology.

Overall, analyzing animal behavior using video recording and machine learning is a rapidly growing field with the potential to increase our understanding of animal behavior and ecology. This case study will explore methods, problems and opportunities in the field and will provide case studies and examples of successful methods.

With the emergent growth in internet technology, various strategies for hacking information have also been raised. Even though there are numerous deals for protecting methodologies such as encryption and other protecting schemes [1]. However, there are certain types of intrusion that is to be detected.

II. RELATED WORKS

[1] Automatic Object Tracking and Segmentation Using Unsupervised Siammask - Shaheena Noor, Maria Waqas, Muhammad Imran Saleem, And Humera Noor Minhas

The paper deals with the Siamese Network and proposed a simple approach to perform single object tracking and segmentation. Using object detection algorithms like Detectron2 and YOLO to detect the object and then track automatically using SiamMask . SiamMask is based on the fully convolutional Siamese framework. The algorithm that achieves real-time speed and performance gains.It implement a depth-wise cross correlation to generate a multi-channel response map. Several million video frames were used for training of SiamFC.YOLO detects more meaningful objects compared Detectron2, however Detectron2 is 2.15 times faster. In terms of tightened bounding boxes, both algorithms work fine and based on input video give interchangeably good results. A tighter box works better with SiamMask, because in this case the object is clearly separate from the background

[2] Animal Pose Estimation Algorithm Based On The Lightweight Stacked Hourglass Network - Wenwen Zhang, Yang Xu, Rui Bai, And Lili- The paper focus on the structure of the convolutional neural network in animal pose estimation. The construct of a lightweight and efficient stacked hourglass network model oriented to optimize the balance of model computation and accuracy, and implement the application algorithm design based on it. The model in this paper reduces the number of parameters and calculations of the network while ensuring less information loss and model accuracy. Behavior of animals is composed of different poses, and pose estimation is an integral part of behavior analysis. It consist of a lightweight dual-branch feature fusion module which improve lightweight network, and the context information is aggregated under the condition that the parameter amount does not change much. This, in turn, The model in this paper reduces the amount of model parameters and improves the accuracy of pose estimationthe method of deep learning to design a 3×3 convolution of a lightweight unit ECA-ICCW used to replace the residual module based on the stacked hourglass network and improve the residual module. which effectively reduces the parameters of the model and improves the ability of the model to obtain information at different scales.Secondly, A dual branch feature fusion method is proposed to enable the network to fully extract and fuse the feature information of the context

[3] Deep Learning-Based Recognition And Analysis Of Limb-Independent Dog Behavior For Ethorobotical Application - Balázs Nagy And Péter Korondi - In this paper presents measurement setup was proposed to examine the behavior of dogs and their interactions with humans.It uses a Behavior Transfer System (BTS) to model the behavior patterns of dogs and make it possible to implement the behavior patterns on mobile robots. The system relies on an iSpace based measurement system and a deep learning prediction algorithm. The neural networks can be utilized to analyze ethological measurements and predict different behavior patterns of the dog.Deep learning-based solutions were implemented to make the data procession task faster and more reliable. DeepLabCut is a toolkit that is used here to estimate the pose of different animals in an image.The motion capture camera system-based intelligent space was developed to collect quantitative data from the agents in the observed space tagged with infra reflective marker setshuman ethology scientists decode the behavior elements of a dog according to the video, which can be used as supervised labels during the training of the neural networks and also Trained neural networks make the labelling process consistentspecial combined neural networks can be used to mimic dog behaviors more realistically.

[4] Key Frame Extraction Algorithm of Motion Video Based on Priori Qi Zhong; Yuan Zhang; Jinguo Zhang; Kaixuan Shi; Yang Yu; Chang Liu Key frame extraction technology is one of the core technologies of content-based video retrieval. For video types with complex content, various scenes, and rich actions, the performance of existing key frame extraction methods is not ideal. Based on the Visual Geometry Group (VGG), this article proposes an image saliency extraction model assisted by deep prior information, and uses a large-scale data set for training on the server to obtain a trained model, and then integrates multiple features.

[5] SPF-CellTracker: Tracking Multiple Cells with Strongly-Correlated Moves Using a Spatial Particle Filter: Osamu Hirose; Shotaro Kawaguchi; Terumasa Tokunaga; Yu Toyoshima; Takayuki Teramoto; Sayuri Tracking multiple cells in a time-lapse 3D image sequence is an important task in bioimage computing. Inspired by whole-brain 4D studies of neural activity in Caenorhabditis elegans, we propose a new multicellular detection method. The type of data to which this method can be applied has the following characteristics: (i) cells are displayed as spherical objects, (ii) it is difficult to distinguish between cells by shape and size, (iii) cell number ranges from hundreds of cells, (iv) adjacent cells move close, and (v)) cells do not divide.

[6] Real-Time Dog Detection and Alert System using Tensorflow Lite Embedded on Edge Device;A real dog calling model with email notifications using built-in machine learning running on a Raspberry Pi at a university. Machine learning models such as SSD, YOLO v3 and YOLO v4 are used to capture dogs and submit reports to relevant authorities. It was determined that the YOLO v3 model outperformed all other models with the highest

III. PROPOSED SYSTEM

In this research paper, we have planned to achieve the following objectives

1. To detect and analyse the behavior of the cat and dog.
2. Detection of animal posture and behavior that can be associated with existence of pain
3. To build a hardware for animal monitoring using IoT in future.
4. To analyze the behavior of pet animals.
5. To analyze the behavior of wild animals.

To study animal behavior using video images and machine learning, we need a framework with three main components: data collection, data preparation, and machine analysis.

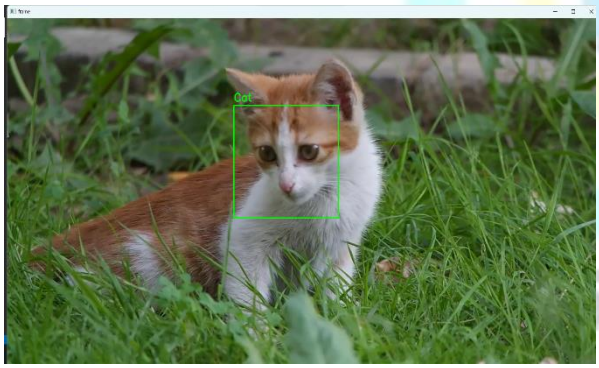

Figure 1. Animal detection

A. Data collection: The first part of our body is data collection. This includes capturing a good video of animals in their natural environment. Various methods can be used to collect data, depending on the specific research question and the type of purpose. One method is to use a fixed camera to capture images of animal behaviour. These cameras can be installed in strategic locations such as feeding or mating areas and record for extended periods of time. Alternatively, researchers can use mobile cameras such as drones to capture images of animals in flight or in hard-to-reach places. Another way is to collaborate with other researchers or wildlife managers who may have access to video footage of the target species. This is particularly useful for studying rare or endangered species or studying animals in harsh environments.

B. Information Preparation: The second part of our system is information preparation. This includes processing video clips to extract relevant features and preparing data for machine learning analysis. Data preparation includes several important steps, including annotation, feature removal, and data cleaning. Annotations include identifying key events or behaviour in video clips and highlighting them for later analysis. This may include identifying individual animals, marking geographic or social relationships, or tracking movement patterns. Annotations can be done manually using proprietary software or outsourced to a third-party service.Feature extraction involves identifying relevant features from the image, such as the location of the animal or the structure of the object. This can be done using various computer vision techniques such as object detection and tracking algorithms. Data cleaning involves removing errors or inconsistencies in data, such as illegal events or duplications. This is an important step in the process as it can affect the accuracy and reliability of machine learning models.

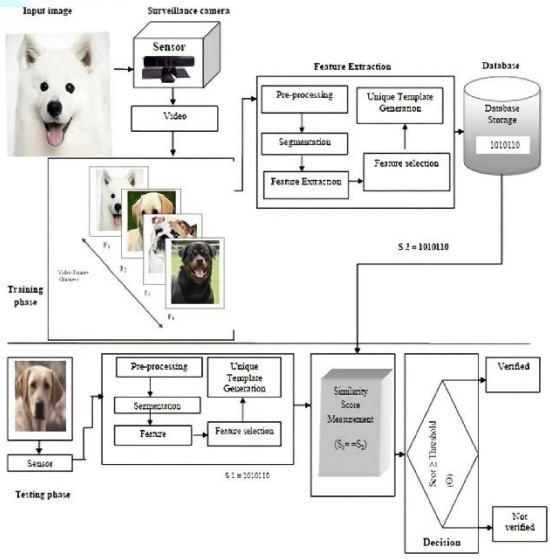

Figure 2. Architecture model

C. Machine Learning Analytics: The last part of our system is Machine Learning Analytics. This includes using machine learning algorithms to analyze video footage and uncover insights into animal behaviour. There are many different types of machine learning algorithms that can be used for this purpose, depending on the specific questions and data. One approach is to use unsupervised learning techniques such as clustering or core content analysis to identify patterns in the data. This is useful for searching large datasets and identifying new behaviour or interactions. Another approach is to use supervised learning techniques such as classification or regression to predict certain actions or outcomes based on videos. This can be used to study factors that influence animal behaviour, such as environmental or social conditions. Overall, the proposed method for studying animal behavior using video images and machine learning is a powerful method with the

potential to revolutionize animal research. By combining technology with advanced analytics, scientists can gain new insights into animal behaviour and ecology and contribute to the conservation and management of wild species.

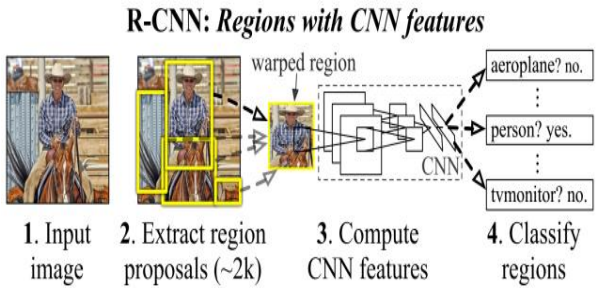

Figure 3. Video Extraction

IV. EXPERIMENTAL RESULTS

We plan to investigate patterns of behaviour in animals by analyzing data generated over time about the identity and location of humans. We want to show that animals spend most of their time with low-energy behaviours like sleep and rest, followed by high-energy behaviours like play and exploration. We also observed that animals that were more active during the day were more active at night, suggesting that individual animals had similar activity patterns over time. Additionally, we plan to investigate behavioural changes over time, such as before and after meals or cleaning activities, to determine their effects on behaviour.

Future Applications: Going forward, we hope that the proposed method for analyzing animal behaviour using video images and machine learning will have many applications in the improvement of animal behaviour.

First, it can be used to monitor the animal's behaviour and health in real time, providing valuable information to pet owners and veterinarians. This can allow for early detection of health or behaviour problems and provide more effective interventions to improve health.

Second, the system can be combined with other types of measurement data, such as heart rate measurement or activity measurement, to generate more data for analysis. This will provide a complete picture of the animal's behaviour and health and help identify early warning signs of health problems.

Finally, the system can be used to examine the effects of different environmental factors, such as lighting or noise, on an animal's behaviour and health. By understanding how these factors affect behaviour, it is possible to create better environments that support positive behaviour and health. Overall, we hope that the proposed method will provide new insights into different animal behavior and health. These insights can inform the development of new strategies to improve animal health and contribute to our future understanding of pet behavior and health.

Pattern	Training	Validation	Test
Contact	99%	92%	88%
Tail wag	94%	88%	82%
Attention	96%	74%	88%

Figure 4.Accuracy rate

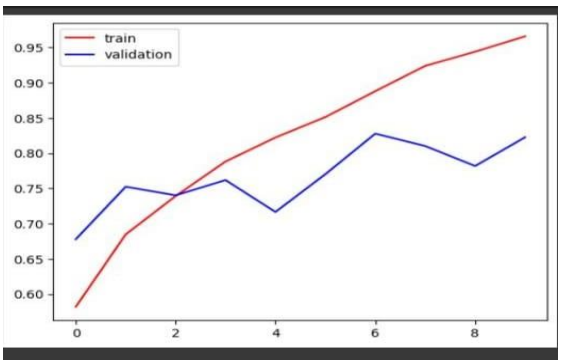

Figure 5. Accuracy Graph

V. CONCLUSION

A proposed method for analyzing animal behaviour using video footage and machine learning has the potential to change our understanding of animal behaviour and health. By analyzing large volumes of video, we can better understand individual animal behaviour, relationships, and the environment that affects animal health. The ability to identify early warning signs of health or behaviour problems can improve a pet's quality of life and help prevent negative consequences.

Combining machine learning algorithms with video capture provides a powerful tool for analyzing animal behaviour. By training models to accurately identify and track an animal's identity, we can generate large datasets of location and behavioural data that can be used to investigate many questions related to livestock and health.

Future research using this method may explore the effects of environmental variables on animal behavior and health, the effectiveness of interventions to improve animal welfare, and the development of self-care plans for animals.

Overall, the proposed method has the potential to improve our understanding of animal behavior and health. By improving our understanding of individual animal behavior and health, we can improve the quality of life of animals and create a better environment for animals. The system has many potential applications and we believe it could have a major impact on animal health in the future.

REFERENCES

[1]. M.Ramkumar Prabhu , V.Reji and A.Sivabalan, 2012. Improved Radiation and Bandwidth of Triangular and Star Patch Antenna in Research Journal of Applied Sciences, Engineering and Technology*,4(12) :1740-1748, 2012. ISSN:20407459,eISSN:2040-7467.

[2]. Anna Zamansky , Aleksandr Sinitca , Dirk Van Der Linen Dmirty Kaplun- Automatic Animal Behaviour Analysis (2021)International Symposium "Intelligent System".

[3]. Anusuya Ramasamy, J. R. Arunkumar, and M. Sundar Rajan, "A Secure and Energy Efficient Sensor Nodes in Wireless Sensor Networks using Improved Ant Lion Optimization." International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-9 Issue-1, May 2020. DOI:10.35940/ijrte.A2858.059120.

[4]. Prathima Chilukuri, R.Anusuya, M.Ramkumar Prabhu, Comprehensive Design Analysis Of Digital Marketing In Agriculture Sector, International Journal of Early Childhood Special Education (INT-JECSE) DOI:10.9756/INTJECSE/V14I5.81 ISSN: 1308-5581 Vol 14, Issue 05 2022.

[5]. Guiming Wang - Ml For Inferring Animal Behavior (2019) - Ecological Informatics

[6]. Banupriya Prakash, Saranya Srinivasan - Animal Detection Using Deep Learning Algorithm(2019) - Icidt

[7]. Automatic Object Tracking And Segmentation Using Unsupervised Siammask - Shaheena Noor ,Maria Waqas , Muhammad Imran Saleem And Humera Noor Minhas

[8]. Animal Pose Estimation Algorithm Based On The Lightweight Stacked Hourglass Network - Wenwen Zhang , Yang Xu , Rui Bai , And Lili

[9]. Deep Learning-Based Recognition And Analysis Of Limb-Independent Dog Behavior For Ethorobotical Application - Balázs Nagy And Péter Korondi

[10]. Key Frame Extraction Algorithm of Motion Video Based on Priori Qi Zhong; Yuan Zhang; Jinguo Zhang; Kaixuan Shi; Yang Yu

[11]. SPF-CellTracker: Tracking Multiple Cells with Strongly-Correlated Moves Using a Spatial Particle Filter: Osamu Hirose; Shotaro Kawaguchi; Terumasa Tokunaga; Yu Toyoshima; Takayuki Teramot

[12]. P. Nirmala, T. Manimegalai, J. R. Arunkumar, S. Vimala, G. Vinoth Rajkumar, Raja Raju, "A Mechanism for Detecting the Intruder in the Network through a Stacking Dilated CNN Model", Wireless Communications and Mobile Computing, vol. 2022, Article ID 1955009, 13 pages, 2022. https://doi.org/10.1155/2022/1955009.

[13]. Holger Frolich, Kasper Claes - Ml Approach To Automated Gait Analysis(2018) - IEEE

[14]. Dr.M.Ramkumar Prabhu,Dr.A.Rajalingam ,K.Venkateswara Rao & U.T.Sasikala, " Design of Rectangular Microstrip Patch Antenna with High Gain for Ku Band" in International Journal of Applied Engineering Research, ISSN 0973-4562 Vol. 10 No.75 (2015), Page 212-215J.

[15]. J.R.Arunkumar, Dr.E.Muthukumar," A Novel Method to Improve AODV Protocol for WSN" in Journal of Engineering Sciences" ISSN NO: 0377-9254Volume 3, Issue 1, Jul 2012.

[16]. J. R. Arunkumar, Tagele berihun Mengist, 2020" Developing Ethiopian Yirgacheffe Coffee Grading Model using a Deep Learning Classifier" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9 Issue-4, February 2020. DOI: 10.35940/ijitee.D1823.029420.

[17]. R.Prabha, M.Ramkumar Prabhu, SU.Suganthi, S.Sridevi, G.A.Senthil, D.Vijendra Babu, "Design of Hybrid Deep Learning Approach for Covid-19 Infected Lung Image Segmentation" in Journal of Physics: Conference Series 2040 (2021).

[18]. L. Saravanan, W. Nancy, K. P. Chandran, D. Vijayanandh, J. R. Arunkumar and R. T. Prabhu, "A Novel Approach for a Smart Early Flood Detection and Awareness System using IoT," 2022 8th International Conference on Smart Structures and Systems (ICSSS), 2022, pp. 1-4, doi: 10.1109/ICSSS54381.2022.9782286.

[19]. Accuracy rate citation form Deep Learning-Based Recognition And Analysis Of Limb-Independent Dog Behavior For Ethorobotical Application - Balázs Nagy And Péter Korondi