Global Journal of Computer and Engineering Technology (GJCET)

Vol. 2, No. 1, January, 2022 ISSN: 2767-1933

IDENTIFICATION OF ELEPHANT AGE USING CNN CLASSIFICATION MODEL IN DEEP LEARNING

Bakhtawer Shameem , MATS University, India (saba7shameem@gmail.com)
Bhavana Narain , MATS University, India (narainbhawna@gmail.com)

ABSTRACT

In this universe animals are one of the ancient creatures. An Elephant is one of such animal. They are friends of human beings and help them in many ways such as lifting heavy objects from one place to another, riding, etc. Today, there is a need to protect them we have done a survey work in this direction. We have used digital techniques for monitoring an animal. Data is collected regarding elephants kept in captivity of Tamor single, Surguja district Chhattisgarh. Our work shows the application of Deep learning in digital images of animals. In the first section of our work, we have surveyed various elephants in captivity; Digital image preprocessing was used to filter the acquired images. CNN classifiers are used for extracting features from the input data. Each layer is a set of nonlinear functions of weight sum at a different coordinate. In our paper, we have given introduced forests, elephants, and techniques used to identify the age of elephants. In the second section application of Deep learning in a dataset of elephants, images were discussed. In the third section, the result of the classifier was given analysis was done on the base of parameters CNN Classification is giving 97% accuracy. Finally, conclusions were made.

Keywords: Elephant, Captivity, Deep learning, Identification.

1. INTRODUCTION

The Elephant family structure is the largest creature on earth, in this way, The elephant group consists of members of the same family and leaves with the children in the middle of the group (Nad et al., 2018; Pedregosa et al., 2011; Georgeseif, 2018). Elephant are of two type Asian elephant and African elephant. Avery elephant's age is about 50 to 75 years. Asian elephant, African elephant their ear garment are also smaller, Asian elephant's ears may be or flattened (Wang et al., 2012; Borah et al 2005). Elephant body about 20 ribs (Joseph et al., 2017) 34 bones in the elephant tail (Das et al 2017). Elephant have about 326 to 351 bones. With 5 nails front legs and 4 nails in the back legs. Male elephant weight 5000 kg and female weights about 4000 kg the elephant's trunk (Crizzi et al., 2018; Spagnolo et al., 2020). In Asian elephant, the male elephant has only elephant teeth, most of the female elephant does not have most teeth if it is too small, the weight of the elephant teeth is about 25 to 35 kilograms (Norouzzadeh et al., 2017,2018). The Asian elephant skin is about 2.5 centimeters thick with dark grey and brown colure (Duporge et al., 2020; Yin et al., 2019). The ear, forehead, and chest have a pink patch. As many females are there, feeding any mother elephant milk to a child, even if the child is not their own, the safety of the children is first in their hands (sahu et al., 2012; Romero 2017). The elephant milk to a child, even if the child is not their own, the safety of the children is first in their hands (Chan et al., 2006; Mishra et al., 2015). The male elephant are given the work by the female elephant. They take care of them as the female leads (Singh et al., 2018). The group when the group is moving, if necessary, they also forward the male, and the male who is removed from the group or kept away from the group is behind the group (Dargan et al., 2008; Thammaiah et al., 2018). Most of the male elephant are guard duty in the group, the team of elephant's graze from evening to all night and morning, the group rests from morning to evening (Bhaga et al., 2017; Geonheo et al., 2019). Male elephant keep coming in the pulse, while some elephant sentry duty is done for the safety of the group (Shameem et al.; 2021, Narain et al., 2018). An adult elephant requires about 100 kg of dry fodder and about 300 kg of fodder feed. Elephant do 3 time as much fodder as the elephant eat (more et al., 2017; Narain et al., 2013). Any deep learning model requires a large amount of data to train and test it. In deep learning, a convolution neural network (CNN/ConvNet) is a part of a deep neural network that is applied to analyze visual image (More et al., 2021; More et al., 2018; Sharma et al., 2021). We convert neural networks to matrix multiplication but this is not the case with ConvNet. This is done using a special method called convolution, that how the shape of one is modified by the other (Narain Et al., 2013; Singh et al., 2021; Nayak et

al.,2020). An RGB image is matrix of pixel value with three planes whereas a grayscale imager is similar but has the same color (Nance et al., 2015)

2. METHODOLOGY

We have targeted thirteen elephants of Chhattisgarh state for our work. These elephants are kept in Tamor Pingla captivity in the Surajpur district of the Surguja region of Chhattisgarh. Elephants are divided into two categories i.e., Normal nature and attaching nature. By the use of deep learning, we identify the nature of each elephant.

- We have noted the daily process of elephants according to time zone.
- Elephant images have been collected in different time zone.
- The date and time of each elephant have been noted and parameters have been set.

We have used Deep Learning of Artificial Intelligence and checked the accuracy such as the Confusion matrix.

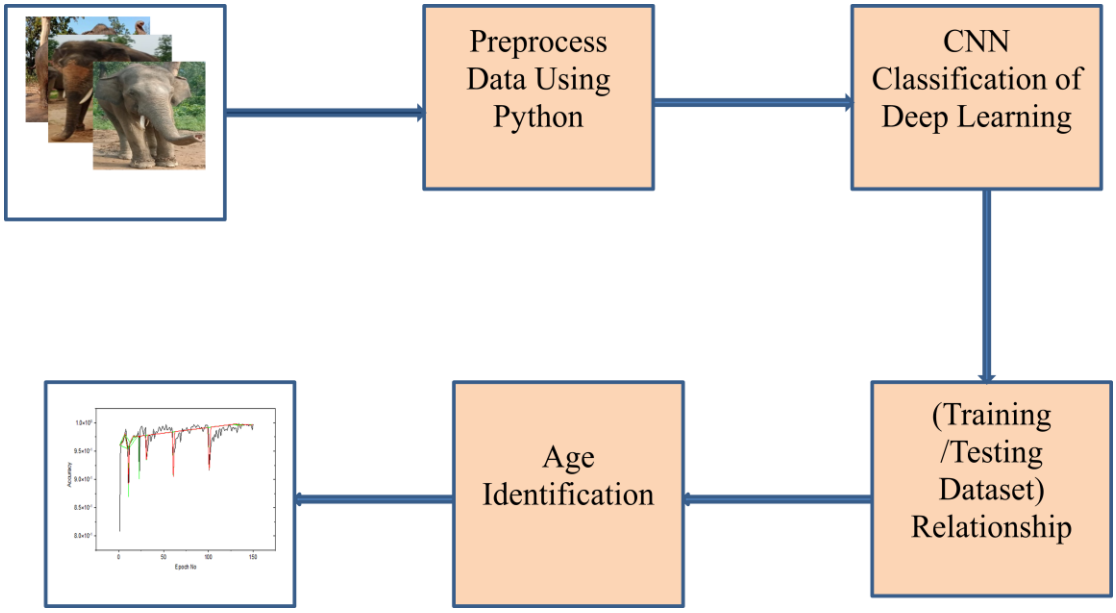

Figure 1: Flow diagram of our work

Preprocessing of data is done with the help of Image Resolution. The higher resolution of images is reduced as they take more time. Our image data set is of sequential nature and we use a binary classifier for our work.

We hypothesized the following for our work:

Hypothesis 1. The image identification technique could improve the robustness of our model by incorporating variability in input images, which might occur due to diverse imaging identification, exposure time, and varying Different elephant posture.
Hypothesis 2. The solid mathematical foundation and better generalization capability of sequential model could uncover the subtle characteristics associated with elephant images.
Hypothesis 3. The elephant identification based classifier could act as a multi-expert recommendation and reduce the probable chance of age of elephant.

2.1 Elephant Images as Dataset

In our present work, we have taken a sample of nine elephants. The age of these elephants was observed manually and their age was noted. These studies were verified by and deep learning technique.

Table 1: Image of elephant

Figure 1: Tirathram Male Elephant

Figure 2: Duryodhana Male Elephant

Figure 3: Parshuram Male Elephant

Figure 4: Raju Male Elephant

Figure 5: Sivil Bahadur Male Elephant

Figure 6: Sonu Male Elephant

Figure 7: Ganga Female Elephant

Figure 8: Lali Female Elephant

Figure 9: Yog Laxmi Female Elephant

2.2 Technical Discussion

To predict age, we have taken two parameters

Loss

Accuracy

These parameters are analyzed concerning the number of Epoch.

The analysis is done in three respects

Peak Analysis

Linear Curve Fitting

3. RESULT AND ANALYSIS

After running our dataset in Deep Learning classifier, we got the following results. These results were analyzed under four parameters.

3.1 Statistical Values of Accuracy

In the given table to we have calculated statistical value for accuracy of our model. Total number of points which represent Number of epoch is 151. It gives us 87% of accuracy. Degree of freedom represents the number of independent values in an analysis without breaking rules. In our calculation it is 149. Residual sum of squares it represent sum of the square of the vertical devotion for each data point to the fifty range line. In our calculation it is 9.07741. Pearson's r It is used to measure the qualification of linear relationship between connected data. In our calculation it is -0.34062. R-Square (COD) is statistical term to measure the line rogation qualification. It is also known as Coefficient of determination. In our calculation it is 0.11602. Adj. R-Square it represents the strength of a model to fits the data. In our calculation it is 0.11009.

Table 2: Statistical Values	
Name of Points	**Accuracy**
Number of Points	151
Degrees of Freedom	149
Residual sum of squares	0.06726
Pearson's r	0.41085
R-Square (COD)	0.16879
Adj. R-Square	0.16322

Accuracy of our Model

In our work, we have taken Accuracy's five peak indexes for all of the Gaussian types. The maximum Hight of each peak is -0.044. Center gravity ranges from 101. Degree of freedom 137, and Adjacent R-Square 3.45596. The number of data points is 152 and chi^2 2.64041.

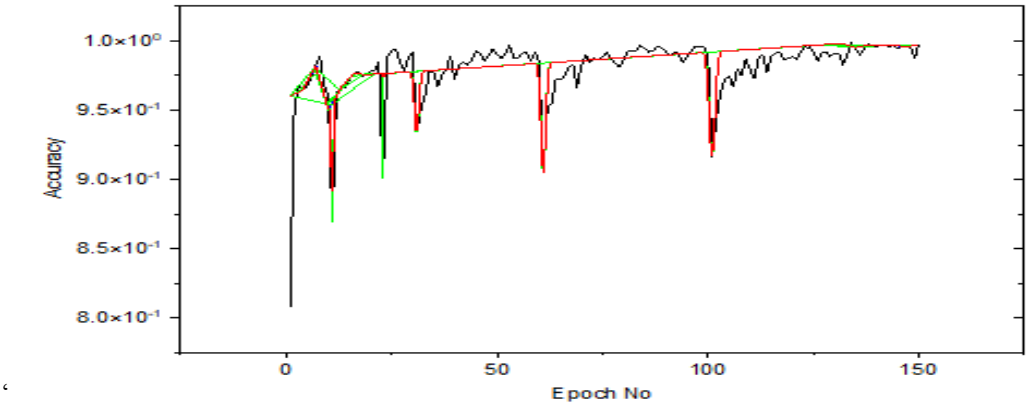

Figure 2: Graph of Accuracy

Accuracy Peak

In our work Peak type is a Gaussian peak. Its value is from 1 to 5 and the area is considered negative. In Full with half maximum (FWHM) maximum value is 1.64513 and the minimum value is -0.08904.Maximum height is considered in negative maximum center gravity is 101 and area integer p is also in negative.

Linear Fit

We have considered the Accuracy test for the linear fit data set. The equation for nodes is

$Y = a + b * x$

Where,

Y=Output of population statistic

a, b = Input variable of population statistic

x = independent variable for line and data

Input data is from the range 1 to 151. There is no masked data and bad data in the linear fit dataset.

Accuracy is under two sections interception and slope. Parameter and value of interception and slope are standard_error, t_value and probability. These values help us to find the accuracy of model. t_valueis the test statistic for t_test. It is calculated by the formula t_value= Fitted value/ Standard Error

is under two sections interception and slope. Their parameters and value standard error, t-value and probability.

Summary of Accuracy

In this section, Accuracy is calculated under the two-section intercept second is the slope. Value of intercept is

0.96399 and slope is 2.19461E-4, standard error of intercept is 0.00348 and slope is 3.98968E-5, t-value of intercept is 276.67127 and slope is 5.50071, probability>|t| is 6.28659E-204 and slope is 1.60706E-7.

Analysis of Variance for Accuracy

We have done ANOVA testing to find out the influence of the dependence factor Age on the independent factor body structure of elephants. In this section, Accuracy calculates three sections first one is a Model, the second one is Error, and the third one is Total. DF is model value 1, the Error value is 149, and the Total value is 150. The Sum of Squares in the Model value is 0.01366, the Error value is 0.06726, and Total value is 0.08091. The mean square in the Model value is 0.01366, the Error value is 4.51382E-4. F-Value it represent the ratio of pair of two mean square, in our calculation it is 30.25777, probability>F is model value 1.60706E-7.

3.2 Statistical values of Loss

In the given table to we have calculated statistical value for accuracy of our model. Total number of points which represent Number of epoch is 151. It gives us 87% of accuracy. Degree of freedom represents the number of independent values in an analysis without breaking rules. In our calculation it is 149. Residual sum of squares it represent sum of the square of the vertical devotion for each data point to the fifty range line. In our calculation it is 9.07741. Pearson's r It is used to measure the qualification of linear relationship between connected data. In our calculation it is -0.34062. R-Square (COD) is statistical term to measure the line rogation qualification. It is also known as Coefficient of determination. In our calculation it is 0.11602. Adj. R-Square it represents the strength of a model to fits the data. In our calculation it is 0.11009.

Table 3: Statistical Values

Name of section	Loss
Number of Points	151
Degrees of Freedom	149
Residual sum of squares	9.07741
Pearson's r	-0.34062
R-Square (COD)	0.11602
Adj. R-Square	0.11009

Loss Calculated in our Model

In our model we have calculated loss under loss peak and leaner peak

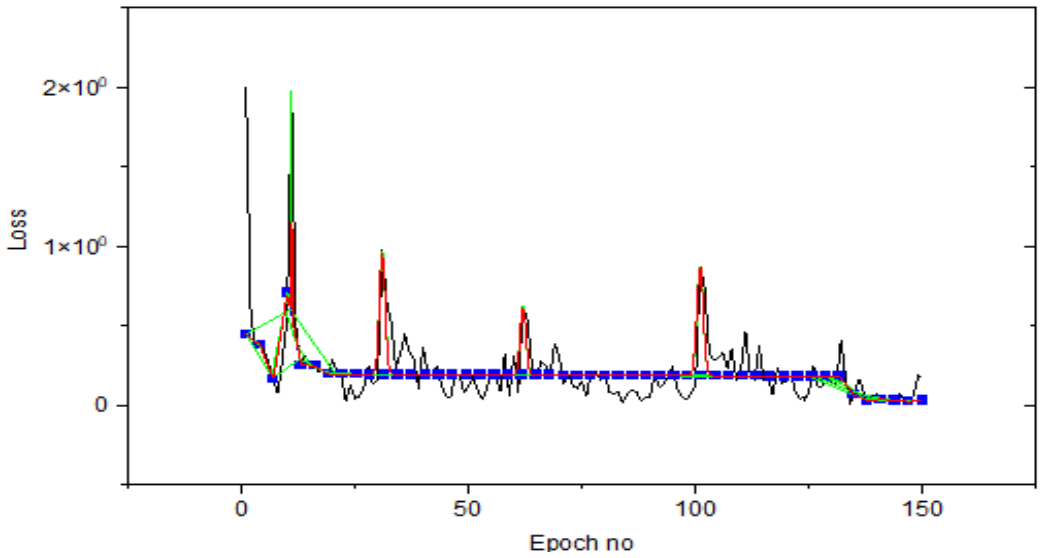

Figure 3: Graph of Loss

In our work, we have taken the Loss for peak index of all of the Gaussian types. The maximum Height of each peak is 1.39927. Center gravity ranges from 11 to 101. Degree of freedom 139, and Adjacent R-Square 3.90483. The number of data points is 151 and chi^2 = 4.32089.

Loss Peak

In our work Peak type is a Gaussian peak. Its value is from 1 to 4 and the area is considered negative. In Full with half maximum (FWHM) maximum value is 1.64535 and the minimum value is 0.14855.

Maximum height is considered in negative maximum center gravity is 101 and area integer p is also in negative.

Linear Fit

We have considered the Loss test for the linear fit data set. The equation for nodes is

$Y = a + b * x$

Where,

Y=Output of population statistic

a, b = Input variable of population statistic

x = independent variable for line and data

Input data is from the range 1 to 151. There is no masked data and bad data in the linear fit dataset.

Loss is under two sections interception and slope. Parameter and value of interception and slope are standard_error, t_value and probability. These values help us to find the accuracy of model. t_valueis the test statistic for t_test. It is calculated by the formula t_value= Fitted value/ Standard Error

Summary of Loss

In this section Losses calculated under the three sections first intercept second is the slope and the third section is Statistics. The value of the intercept is 0.37989 and Standard Error is 0.04048, the slope Value is -0.00205 and the Standard Error is 4.63505E-4. Statistics is Adj. R-Square value is 0.11009.

Analysis of Variance for Loss

We have done ANOVA testing to find out the influence of the dependence factor Age on the independent factor body structure of Elephant. In this section Loss calculate three sections first is a Model, the second one is Error, the third one is a Total. DF is model value 1, the Error value is 149, and the Total value is 150. The Sum of Squares in the Model value is 1.19144, the Error value is 9.07741, and Total value is 10.26885. The mean square in the Model value is 1019144, the Error value is 0.06092. F-Value in the model 19.55668, probability>F is model value 1.87265E-5.

4. CONCLUSION AND FUTURE WORK

It is manually known that; the behavior of Elephants depends on Age and Gender. With technical development, we try to find out the age of elephants. Our model is depended on digital images and various techniques of deep learning. In our work, we have collected datasets from the forest area of Ambikapur, Chhattisgarh. We have acquired image of various body parts of elephants as our data set. We have used a CNN classification model of deep learning technique to analyze the age of elephants. Peak analysis shows 87% accuracy. When we compared manual age estimation with technical estimations accuracy was 89%.. In the future, we increase the data set to reduce the loss function. We will increase the number of samples in the miner class. This will improve the class im balance and give a more accurate result. In future we will test our model with more dataset to increase the accuracy of our model.

REFERENCES

Bhaga, V., K., Yadav, D., K., & Jhariya, M., K., (2017), Human-Elephant Conflict and Its Consequences: A Preliminary Appraisal and Way Forward, BEPLS Vol 6 [7], Bull. Env. Pharmacol. Life Sci., June: 85-94 Academy for Environment and Life Sciences, India, 6[7], 1-6.

Borah, J., K., Thakuria, Baruah, K., K., N., K., Sarma, & K., Deka, (2005), Man-Elephant Conflict Problem: A Case Study", ZOOS' PRINT, XX(7), 1-3.

Chan, Philip, K. & Lippman, R., P., (2006), Machine Learning for Computer Security, Journal of Machine Learning Research 7 (2006), 2669-2672 Submitted 12/06; Published 12/06, This work is sponsored by the U.S. Air Force under Air Force Contract FA 8721-05-C-0002. Opinions, interpretations, conclusions, and recommendations are those of the author and are not necessarily endorsed by the United States Government, 1-9.

Crizzi, A., Bel, S., Le, G., Mike, L., Cornélis, D. & Tinashe, C., (2018), Urban human-elephant conflict in Zimbabwe : a case study of the mitigation endeavour. 49,76-85.

Dargan, S., Kumar, M., Ayyagari, M., R. & Kumar, G., (2019), A Survey of Deep Learning and Its Applications: A New Paradigm to Machine Learning, Received: 11 November 2018 / Accepted: 26 May 2019 © CIMNE, Barcelona, Spain 2019, Publishing Online: 1 June 2019, *Springer*, 1-10.

Das, K., Behera & R., N., (2017),International Journal of Innovative Research in Computer and Communication Engineering , (An ISO 3297: 2007 Certified Organization) Website: www.ijircce.com Vol. 5, Issue 2, February 2017, https://DOI.org: 10.15680/IJIRCCE.2017. 0502001, ISSN (Online): 2320-9801 ISSN (Print): 2320-9798, 1301-1309,

Duporge, I., Isupova, O., Reece, S., M., David & W., Wang, T., (2020), Using very-high-resolution satellite imagery and deep learning to detect and count African elephants in heterogeneous landscape, 1-13, DOI: 10.1002/rse2.195,

Geonheo, Y., & euijiong, W., S., (2019), senior member IEEE, A survey on data collection for machine learning, arXiv:1811.03402v2(csLG).

Georgeseif, (2018), The 5 clustering algorithms data scientist", Article- (2002) http://www.resarchgate.net/publication/2488725 source: -cite seer,

Joseph, V., J., Colin, T, Kings, M, Thornton, A. & Joah, M., (2017), Applications of machine learning in animal behavior studie, 0003-3472/© 2017 The Authors. *Published by Elsevier Ltd on behalf of The Association for the Study of Animal Behavior*. This is an open-access article under the CC BY license, 2017 MS. number: 16-00718.

Mishra, S., R, Sethy, J., & Bisht, H., K., (2015), Study on Human-Elephant Conflict in Baripada Division of, Mayurbhanj, Odisha, India, Journal of wildlife research Journal homepage: www.jakraya.com/journal/jwr, Journal of Wildlife Research | July-September, 2015, 3(3), 21-26 © 2015 Jakraya Publications (P) Ltd.

More, S., S., Narain, B., & Jadhav, B., T. (2021) Advanced Encryption Standard Algorithm in Multimodal Biometric Image. In: Rizvanov A.A., Singh B.K., Ganasala P. (eds) Advances in Biomedical Engineering and Technology. Lecture Notes in Bioengineering. Springer, Singapore. https://doi.org/10.1007/978-981-15-6329-4_7.

More, S., S., Narain & B, Jadahv, (2017) A comparative analysis of unimodal and multimodal biometric systems. In: International conference on innovative trends in engineering science and management (ITESM-2017).

More, S., S., Narain & B, Jadhav (2018), Data encryption standard algorithm in multimodal biometric image, Int. J. Comp. Sci. Eng, 2018.

Nad, C., (2018), Conflict with Wild Giant (Elephas Maximus) and Us in Northern West Bengal: A Review, *IOSR Journal of Humanities and Social Science* (IOSR-JHSS), 23,(1),13-22 e-ISSN: 2279-0837, p-ISSN: 2279-0845, https://DOI.org: 10.9790/0837-2301071322.

Nance, S., J.: Sentient A. (2015) Celebrity, 9-29, DOI: 10.1007/978-1-137-56207-4_2, ISBN: 9781137562074,

Narain, B, Zadgaonkar, A, S & Kumar, S, (2013) Impact of digital image processing on research and education. Natl Semin Work.

Narain, B., (2021), On-Line Big Data Analysis using K-Mean and Modified K-Mean Algorithm with Machine Learning Techniques.

Narain, B., Saha, P., & Nayak, M., (2018)," Impact of Emotions to Analyze Gender Through Speech, Publication in 4th International Conference on Signal Processing, Computing and Control (ISPCC), IEE Xplore 25 jan 2018, DOI: 10.1109| ISPCC. 2017.8269645.

Nayak, M, & Narain, B, (2020), Big Data Mining Algorithms for Predicting Dynamic Product Price by Online Analysis- Computational Intelligence in Data Mining.

Nayak, M & Narain, B, (2021), The Online Retail Market Analysis for Social Development with Machine Learning - SPAST Abstracts, 2021.

Mohammed, N., Sadegh, A. , Nguyen, M., Kosmala, Ali, S., Craig, P. & Jeff, C., (2017), Automatically identifying wild animals in camera-trap images with deep learning, See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/315382917, Article in Proceedings of the National Academy of Sciences March 2017 https://DOI.org: 10.1073/pnas.1719367115.

Mohammad, N.,Sadegh, A., Kosmalac, N., Swansond, M., Alexandra, M., S., Palmere, Craig, Packere & Jeff, C..Automatically identifying, counting, and describing wild animals in camera-trap images with deep learning, (2018), This open-access article is distributed under Creative Commons Attribution-Non-Commercial-No Derivatives License 4.0 (CC BY-NC-ND). Data deposition: Both the code and the models used in this study can be accessed on GitHub at Supplemental. Published online June 5, 2018, E5716–E5725 | PNAS | 115(25), 5716-5725.

Pedregosa, F., Varoquaux, G., Gramfort, A., Vincent, M., Bertrand, T., Olivier, G., Mathieu, B., Peter, Prettenhofer, R., Weiss, V., Dubourg, J., Vanderplas, A., Passos, D., Cournapeau, M., Brucher, M., Perrot & ´Edouard,

D., (2011) Scikit-learn: Machine Learning in Python", Journal of Machine Learning Research 12 (2011), 2825-2830 Submitted 3/11; Revised 8/11; Published 10/11.

Romero, L., O, (2017), Using Machine Learning Techniques for Sentiment Analysis, Contact Email: scarxx@gmail.com • Intensification: Information Technologies • Supervised work by: Jordi Duran (DEIC) Course 2016/17, June of 2017, School of Engineering (UAB), 1-13.

Sahu, H., K., Das & Sunit, K., (2012), Human-Elephant Conflict in Mayurbhanj Elephant Reserve Orissa, India, 36,17-20.,

Shameem, B., & Narain, B., (2021), An Elephant Identification by Trunk Using Digital Image Processing Using Convolution Neural Network, IEEE International Conference on Technology, Research and Innovation for Betterment of Society (TRIBES – 2021)

Sharma, U, Narain, B & Nohria, V, (2021), Hybrid Support Vector Machine and Distance Classifier in Breast Tumor Detection - SPAST Abstracts, 2021.

Singh, P & Narain, B, (2021), Student Satisfaction in Educational Organization using Machine Learning, - NOVYI MIR, 2021.

Singh, S., Kumar, C., Francisco & Jukan, A., (2018), Improving Animal-Human Cohabitation with Machine Learning in Fiber- Wireless Networks, Received: 15 June 2018; Accepted: 26 July 2018; Published: 9 August 2018, J. Sens. Actuator Netw. 2018, 7, 35; doi:10.3390/jsan7030035, pp7-35.,

Spagnolo, F., Perri, S., Frustaci, F.& Corsonello, P., (2020), Energy-efficient architecture for CNNs inference on heterogeneous FPGA, 10(1), DOI: 10.3390/jlpea10010001, ISSN: 20799268.

Thammaiah,. C. & K., Kumara, V., (2018), Elephant Conflict Hotspots in Coffee Agroforestry in Kodagu District, Karnataka", *International Journal of Environment*, Ecology, Family and Urban Studies (IJEEFUS) ISSN (P): 2250-0065; ISSN (E): 2321-0109, 8(5), 9-14, © TJPRC Pvt. Ltd**.**

Varma, S., Dang, S., Xuan, T., Tran, V., & Sukumar, R.,(2008), The Elephants Elephas Maximus of Cat Tien National Park, Vietnam: Status and Conservation of a Vanishing Population, *Oryx*, 42(1), 2008 FFI, Oryx, 42(1), 92–99 doi:10.1017/S0030605308010090 Printed in the United Kingdom, Received 12 October 2005. Revision requested 27 April 2006. Accepted 15 August 2006. First published online 14 January 2008.1 -8.

Wang, G., (2018), Machine learning for inferring animal behavior from location and movement data, *journal homepage: www.elsevier.com/locate/ecolinf*, *Ecological Informatics*, 49,69–76, Available online 10 December 2018 1574-9541/ © 2018 Published by Elsevier B.V.

Yin, Q., Zhang, R. & Shao, X., (2019), CNN and RNN classification mixed model for image, 02001,1-7, DOI: https://doi.org/10.1051/matecconf/201927702001,