e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

AUTOMATIC PUBLIC OPINION REVIEW SYSTEM USING MACHINE LEARNING

P Sathwik*1, G Manideep*2

*1,2Computer Science & Engineering, SRM Institute And Science And Technology, India.

ABSTRACT

Machine Learning has enhanced and brought excellent results in various domains. But, there are many difficulties which obstruct its usage for enhancing the government functioning and also its interaction's with citizens. Through this paper, we try to address the challenge and propose a solution to automate public opinion review process of government policies which helps in e-governance. We use naive bayes algorithm to detect sentiment from text sentences which gave an accuracy of about 76.7%. Then we use pretrained haar cascade and mini-xception cnn models to detect sentiment from person's face image.We integrate our models to a web portal created using tkinker module which shows the consolidated results. Our main aim is to use trustable machine learning techniques and algorithms in improving the e-government functioning in order to reduce time consumed, reduce the costs involved, and also to enhance the interaction between the government and the citizens of the nation.

I. INTRODUCTION

The notion of assessing automating the process of reviewing the public opinion about government policies and thereby assisting the development of e-governance using trusted and state-of-art machine learning techniques is explained in this research. Taking feedback and improving services based on the feedback is absolutely vital for the proper functioning of the government. But the process of collecting feedback and reviewing the policies based on the public feedback is very time consuming and difficult process. This process can be made easy and efficient using machine learning techniques. The public opinion review process can be automated using machine learning which will help the government make better judgments about its policies. We need have system which could facilitate in people giving opinion about government policies and which gets automatically classified into positive or negative feedback using which the government could make wise decisions about its proposed policies.

To construct an automatic public opinion review system, we use nave bayes algorithm for text sentiment detection, and haar cascade and mini-xception cnn model to recognize emotion from face images. We can create this model for any service and make it work as a default decision without requiring human intervention. The model can recognize emotions from the text phrases which are given by the people in the form of public opinion. Another model is used for detecting emotions from a human face images which is acts like a great feature in our project as facial expressions can convey emotions more effectively than words or sentences.

DEEP LEARNING

Apart from the availability of a wide range of electronic information about the government which is widely available to everyone at free of cost which can be used for various purposes, unfortunately, the information is not simplifying nor improving the functioning of the government. By using machine learning algorithms, we can greatly upgrade the government and its programs to make them more coherent and economical.

Deep learning is a subset of machine learning which has various benefits and is used extensively in the current world in various domains. It is defined as a map function which is between the input data and the needed output. Deep learning concepts are inspired by the neural networks in the brain and thus it is popularly known as artificial neural networks.

II. LITERATURE REVIEW

Artificial Intelligence can be used to solve various problems in real life. Various machine learning and deep learning techniques as proposed in [1],[2],[3] can be used to solve complex real world problems. It can also be used to improve the quality and efficiency of the government services. Andy Hon Wai Chun [4],through his work, gave practical solution to automate immigrant application assessment using AI. Yet, AI still faces many difficulties that create obstacle in its deployment in the e-government services–both for enhancing the

government systems and also the government and citizen interactions [5].E-government enhances the standard and effectiveness of government services while also decreasing the costs. It enhances transparency, increases public participation, and is also environmental friendly. But integrating AI in government services has several challenges like lack of expertise, inaccessibility especially in third world countries, lack of trust among citizens, and privacy issues. As the advantages outweigh the disadvantages, AI should be used in improving government services. In this paper we aim to use trusted and reliable machine learning techniques to automate the public opinion review system of the government policies. The current process of acquiring and reviewing the people's opinion about government policies has scope of automation using state-of-art techniques. Thus, we aim to use naïve bayes algorithm and convolution neural network to automate public opinion review system which helps government in making good decisions about their policies. The use of naïve bayes algorithm in sentiment analysis is clearly explained in [6].The use of haar cascade algorithm in face detection is explained in the work [7].Various architectures of CNN are been used for face emotion detection. The newest CNN architectures like the Xception [8] leverage from the two of the most successful experimental assumptions in CNNs i.e. the use of residual modules [9] and also the depth-wise separable convolutions [10]. Depth-wise separable convolutions reduces the amount of parameters by separating the feature extraction and combination processes within the convolutional layer. The Mini-Xception CNN architecture has been proposed in [11]

III. EXISTING AND PROPOSED WORK

In the current existing methods we get feedback from people for government services in the form of manual opinion, oral opinion, online opinion, etc. But the current systems are not using any AI based technologies to automate and detect the feedback of the people. Also, we don't have any facial recognition based opinion review system in the current scenario.

Thus, through our proposed work, we aim to create a web portal which automatically reviews public opinion about government policies. Using the portal, the users could give their opinion about a particular government policy in the form of text phrases aswell as their face images, and the sentiment from them gets classified into positive or negative opinion. After taking opinions in this manner, we finally get a consolidated result for each policy. An overall positive feedback means it's a good policy and an overall negative feedback means it's a bad policy and needs changes. We use multinomial naïve bayes algorithm to detect sentiment from text phrases. We use the pre-trained haar feature-based cascade classifiers for the face image detection and mini-xception cnn model for getting sentiment from detected face images. Finally, the model is integrated with front end part in the form of a web portal created using tkinker module.Our proposed system helps in automatically reviewing public opinion which helps in saving time, reducing costs, enhancing public satisfaction.

IV. METHODOLOGY

We firstly need create a sentiment based model which could detect sentiment from text sentences using the naïve bayes algorithm. Naive Bayes Classifier algorithm comes under the family of probabilistic algorithms which is based upon the Baye's theorem. It assumes that the feature pairs have conditional independence. The Bayes theorem calculates the probability P(c|x), where c is the class of the possible outcomes and x is the given instance which is to be classified, representing some features.

$$P(c|x)=P(x|c)*P(c)/P(x)$$

The algorithm predicts the tag of a text. It calculates the probability of each tag for a given text and then outputs the tag with the highest possible one. We use Multinomial Naïve Bayes algorithm which is naïve bayes used for multinomially distributed data, where the data is typically represented as the word vector counts.

Preprocessing of data is done by converting to lowercase, removing urls, punctuations, names, digits, emojis, and stop words. We also do stemming to save memory and reduce the computational process. The features are extracted from the text by the process of vectorization.

We also need to create a face emotion detection model which involves two steps i.e. face detection in the given image followed by the emotion recognition on the detected face. The following two techniques are been used for the respective tasks-

1. Haar feature-based cascade classifiers: It is a machine learning object detection algorithm which is used to identify the objects in an image or video was proposed in the paper[21].It is an approach where an cascade

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

function is been trained using lot of positive and negative images. It considers adjacent rectangular regions at a specific location in the detection window, adds the pixel intensities in each region, and finally calculates the difference between these sums. It detects frontal face in an image really well. It is faster compared to other face detectors and is also real time.

2. Mini-Xception CNN Model: The mini-xception architecture was proposed in paper [11] which is comparatively very small and achieves almost the state-of-art results of classifying sentiment from images.

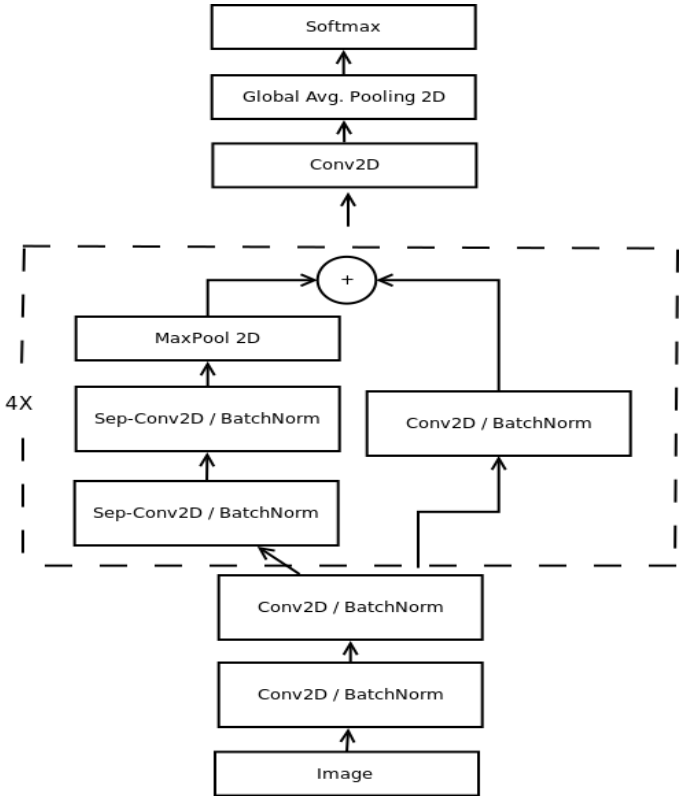

Fig 1: Mini-Xception architecture

As shown in the figure, the center block gets repeated about 4 times .This architecture is different from the commonly used CNN architectures as it uses both residual modules and depth-wise separable convolutions instead of fully connected layers. It is inspired by the Xception [8] architecture. This architecture uses residual modules [9] and also depth-wise separable convolutions [10]. Residual modules modify the desired mapping between two subsequent layers, so that the learned features become the difference of the original feature map and desired features. Then, the desired features H(x) are modified in order to solve an easier learning problem F(X) such that:

$$H(x) = F(x) + x$$

Depth-wise separable convolutions consist of two different layers: depth-wise convolutions and pointwise convolutions. It reduces the computation with respect to the standard convolutions by a factor of 1 N + 1 D2 [10].

Dataset

For text sentiment detection-

"Twitter Sentiment Extraction Dataset"

The training set contains 27,481 unique values and the test set contains 3,534 unique values. Each row contains the text of a tweet and a sentiment label.

For face sentiment detection-

"FER-2013 Dataset".

The dataset consists of 48x48 pixel gray scale images of people's faces. They are automatically recorded so that the face is more or less centered and occupies the same amount of space in each image. The training set consists

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

of about 28,709 examples and the public test set consists of about 3,589 examples.

Basic Architecture

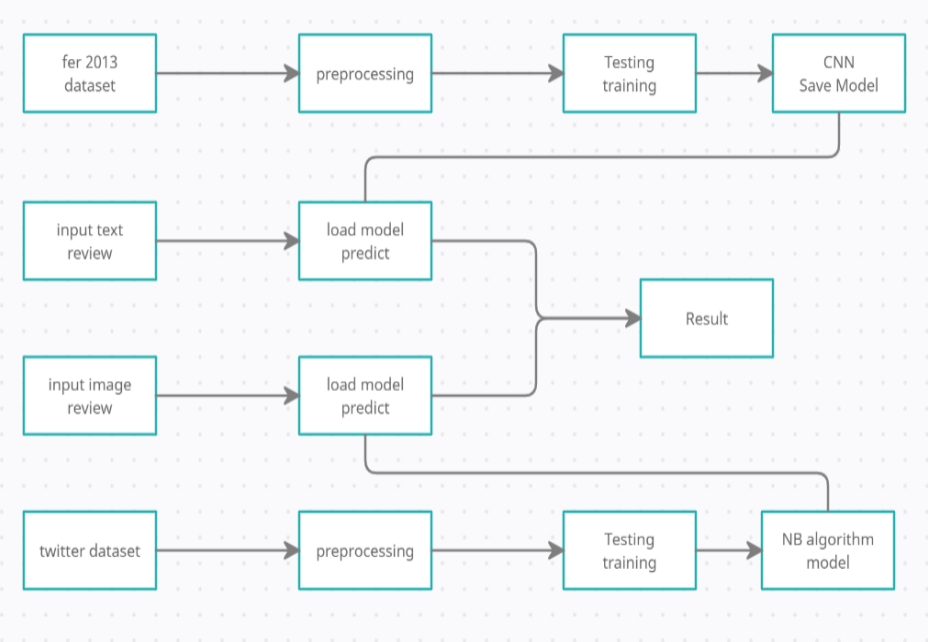

Fig 2: Block Diagram of the architecture

The twitter dataset containing labeled data is been preprocessed and then the training and testing is been done. Naïve bayes algorithm is been used and the model is saved. Similarly, the fer-2013 dataset consisting of labeled face images is been preprocessed and the pre-trained haar cascade and mini-xception cnn models are used for face sentiment detection. The three models are loaded and integrated with front end portal made using tkinker module. The loaded models are used to detect sentiment from text and face images which are inputed by the user in the portal.

Modules

TO CREATE TEXT & IMAGE BASED SENTIMENT DETECTION MODEL

This is the first module of the project and consists of most important part of the project. In this module, a text and image based sentiment detection model is created. We will use naïve bayes algorithm to detect sentiments from the text sentences. We are also using haar cascade and mini-xception cnn model to detect sentiments from person's face images. Most of the words will be used for the model. We will be using twitter extraction dataset which consists of more than 25,000 unique data values text sentiment analysis. FER-2013 dataset is also been used which consists of more than 25,000 face images for face images sentiment analysis. Various face images are used for the model. Sentiments from the given text or images will be predicted. The models are saved and loaded for further use.

USER OPINION ABOUT GOVERNMENT POLICIES

This is the second module of the project. In this module, we try to collect user's opinion about government policies. A user can enter his/her name in the portal and give his/her opinion about a particular policy of the government. Then we accept user's opinion about the policy along with the policy name and save that information in our application to detect sentiment from the given opinion. The user information is saved in a text file.The accepted opinion is used in the next module to detect the sentiment.

VIEW PEOPLES SENTIMENTS FROM OPINIONS

This is the third module in the project. Using this module, we can see the saved information of all the opinions of different user's and also their sentiment which is detected after sentiment analysis of text sentences using the already saved text sentiment model using naïve bayes algorithm. The detected sentiment will either be in the form of positive or negative emotion.All the data is saved locally in a text file. Finally, a complete list of user's opinion along with the detected sentiment and the policy name will be clearly displayed.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

UPLOAD & DETECT USER FACE EXPRESSION IMAGE ABOUT GOVERNMENT POLICIES

This is the fourth module of the project face image sentiment detection will be implemented. The already saved face detection and emotion detection models created using haar cascade and mini-xception cnn are loaded and used in this module. Using this module, the user will be able to upload his/her image with various facial expressions like anger, fear, joy, etc. which tells us whether user is content with the policy or expects more from the given policy. To reduce complexity, the face images are taken from the fer-2013 dataset and are uploaded which get analyzed. The face images are analyzed and the result is in the form of positive or negative feedback about government policies, which helps the government in making wise decisions about their policies. It helps the government in deciding whether tocontinue, or to make necessary changes in the policy.

CONSOLIDATED RESULT

This is the last module in the project. Using this module we will be able to see all the results in the form of a consolidated result. All the user's opinions about policies and also the positive or negative feedback from people's face image expressions will be clearly displayed. Finally, a consolidated result will be displayed which shows an overall positive or negative feedback of users about the policy. An overall positive feedback means it is a good policy and the government can move ahead and implement the policy, while an overall negative feedback means it's a bad policy which lacks public support and conveys message to the government that their policy needs changes before implementing it. Thus government can have glance of all the reviews easily and quickly which helps in reducing time, reducing costs and improves overall public satisfaction about the working of the government. Thus this project helps in automating the public opinion review process using machine learning algorithms and helping in facilitating and enhancing the functioning of e-governance.

V. IMPLEMENTATION & RESULTS

Text sentiment detection model is created using naïve bayes algorithm. Twitter extraction dataset is used to train the model where the data is split into 20% test data and 80% train data. Vectorization for feature extraction is done using sklearn's CountVectorizer. MultinomialNB is used to implement naïve bayes for multinomially distributed data. The model is trained and we get an accuracy of 76.7%.The model is saved as 'sentiment.Model.pkl' using pickle module.

Face image sentiment detection involves two steps i.e. face detection and sentiment detection from bounded face image. We are using 'haarcascade_frontal_face_default.xml' pre-trained haarcascade model for face detection. It is implemented using Open-CV. We are also using '_mini_XCEPTION.106-0.65.hdf5' which is a pre-trained model of mini-xception cnn model which is trained using fer2013 dataset giving an accuracy of 66% given in [11].

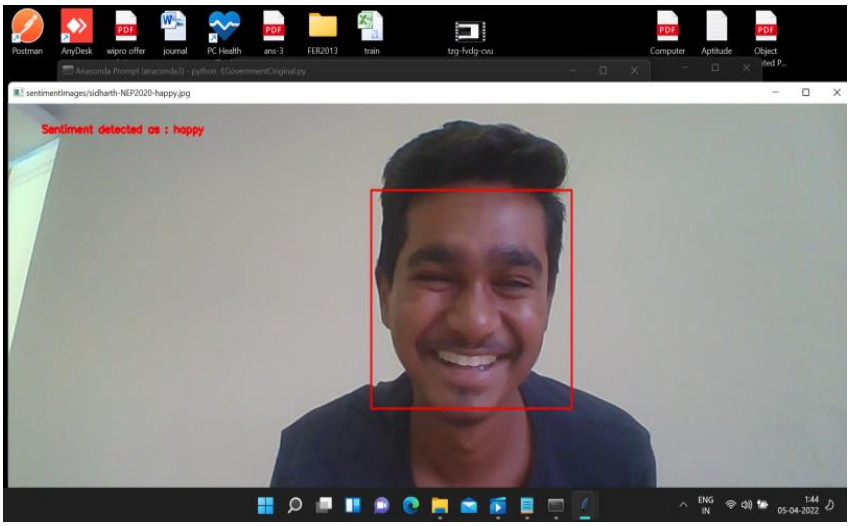

Fig 3: Sentiment detected from face image.

The front end part of the project in the form of a web portal is created using tkinker module. The saved models are loaded and connected to the front end part which completes the portal and automatically reviews public opinion of users on government policies.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

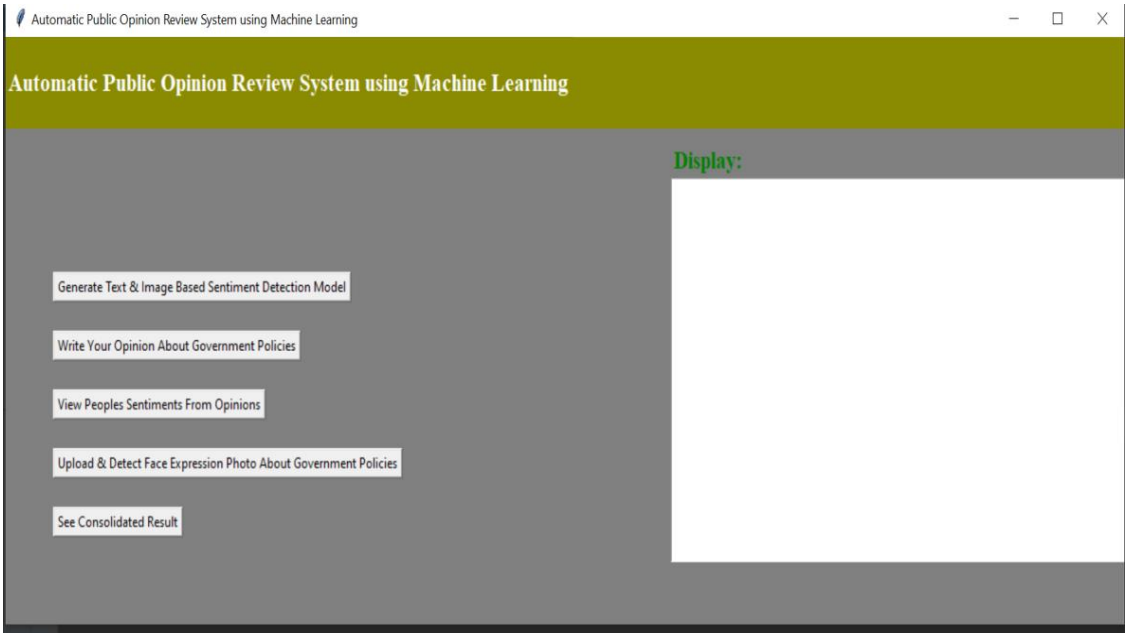

Fig 4: Front end of project

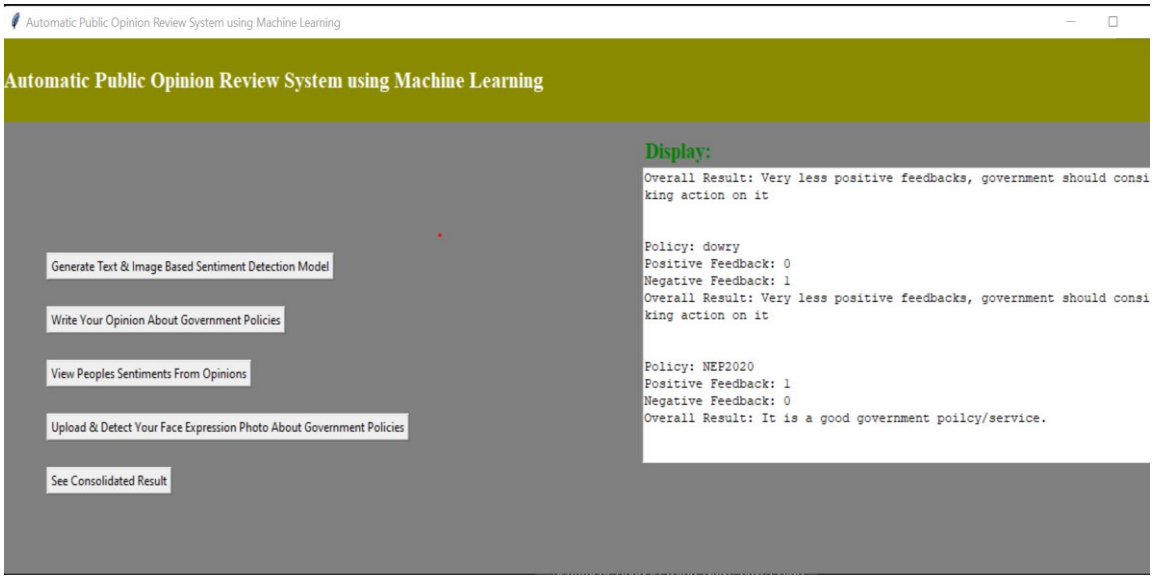

Fig 5: Consolidated Result

VI. CONCLUSION

By doing this project, we have given an introduction about machine learning and e-government, explained the current functioning of e-government services, and then gave a solution to the public feedback review process by automating it using machine learning algorithms. We have used naïve bayes algorithm and convolutional neural networks for text and face images sentiment analysis. Based on the positive and negative feedbacks of a particular policy, changes can be made to the respective policy. We have a consolidated final outcome which gives us the overall result by analyzing all the opinions of the public. Our aim is to use reliable machine learning techniques and algorithms for improving the working of e-government to decrease the time consumed, reduce charges, and also to improve the efficiency of the government.

In future we can maintain our own database to store the user's feedback. We can also connect to any (Government) remote database from our application to fetch the relevant details and do the analysis.

VII. REFERENCES

[1] Y.-D. Zhang, Y. Zhang, X.-X. Hou, H. Chen, and S.-H. Wang, "Seven-layer deep neural network based on sparse autoencoder for voxelwise detection of cerebral microbleed," Multimedia Tools Appl., vol. 77,

no. 9, pp. 10521–10538, May 2018

[2] Venugopalan, Subhashini & Xu, Huijuan & Donahue, Jeff & Rohrbach, Marcus & Mooney, Raymond & Saenko, Kate. (2014). Translating Videos to Natural Language Using Deep Recurrent Neural Networks. 10.3115/v1/N15-1173.

[3] L. Bottou, ''Large-scale machine learning with stochastic gradient descent,'' in Proc. COMPSTAT, 2010, pp. 177–186.

[4] Andy Hon Wai CHUN, ''Using AI for e-Government Automatic Assessment of Immigration Application Forms'', in Proc. IAAI-07(Volume:2),July 2007,pp. 1684-1691

[5] Omar Sayeed Al-Mushayt, ''Automating E-Government Services with Artificial Intelligence'' in Proc. IEEE Access(Volume:7), Oct. 2019, pp. 146821–146829.

[6] Mathapati, Pramod & Shahapurkar, Arati & Hanabaratti, Kavita. (2017). Sentiment Analysis using Naïve bayes Algorithm. International Journal of Computer Sciences and Engineering. 5. 75-77. 10.26438/ijcse/v5i7.7577.

[7] Mehtab, Sidra & Sen, Jaydip. (2020). Face Detection Using OpenCV and Haar Cascades Classifiers. 10.13140/RG.2.2.26708.83840.

[8] Franc¸ois Chollet. Xception: Deep learning with depthwise separable convolutions. CoRR, abs/1610.02357, 2016.

[9] Kaiming He, Xiangyu Zhang, Shaoqing Ren, and Jian Sun. Deep residual learning for image recognition. In Proceedings of the IEEE conference on computer vision and pattern recognition, pages 770–778, 2016.

[10] Andrew G. Howard et al. Mobilenets: Efficient convolutional neural networks for mobile vision applications. CoRR, abs/1704.04861, 2017

[11] Arriaga, Octavio & Valdenegro, Matias & Plöger, Paul. (2017). Real-time Convolutional Neural Networks for Emotion and Gender Classification.

[12] Y. LeCun, Y. Bengio, and G. Hinton, ''Deep learning,'' Nature, vol. 521, no. 7553, pp. 436–444, 2015.

[13] Kankanhalli, Y. Charalabidis, and S. Mellouli, ''IoT and AI for smart government: A research agenda,'' Government Inf. Quart., vol. 36, no. 2, pp. 304–309, 2019.

[14] Bishop, Pattern Recognition and Machine Learning. New York, NY, USA: Springer, 2006. Dwork, ''Differential privacy,'' in Encyclopaedia of Cryptography and Security, H. C. A. van Tilborg and S. Jajodia, Eds. Boston, MA, USA: Springer, 2011.

[15] Silver, A. Huang, C. J. Maddison, A. Guez, L. Sifre, G. van den Driessche, J.Schrittwieser, I.Antonoglou, V.Panneershelvam, M.Lanctot, S. Dieleman, D. Grewe, J. Nham, N. Kalchbrenner, I.Sutskever, T. Lillicrap, M. Leach, K. Kavukcuoglu, T. Graepel, and D. Hassabis, ''Mastering the game of Go with deep neural networks and tree search,'' Nature, vol. 529, no. 7587, pp. 484–489, 2016.

[16] G.D.Abowd, A.K.Dey, P.J.Brown, N.Davies, M.Smith, and P.Steggles, ''Towards a better understanding of context and context-awareness,'' in Proc. Int. Symp. Handheld Ubiquitous Comput. Berlin, Germany: Springer, 1999, pp. 304–307.

[17] L. Bottou, ''Large-scale machine learning with stochastic gradient descent,'' in Proc. COMPSTAT, 2010, pp. 177–186.

[18] Multilingual Twitter Sentiment Classification: The Role of Human Annotators

[19] Igor Mozetič, Miha Grčar, and Jasmina Smailovič, from the Department of Knowledge Technologies at the Jožef Stefan Institute

[20] Deep Learning for Hate Speech Detection in Tweets Pinkesh Badjatiya (IIIT-H) , Shashank Gupta (IIIT-H), Manish Gupta (Microsoft), Vasudeva Varma (IIIT-H)

[21] Image Processing: Research Opportunities and Challenges Ravidra S Hegadi

[22] Viola, Paul & Jones, Michael. (2001). Rapid Object Detection using a Boosted Cascade of Simple Features. IEEE Conf Comput Vis Pattern Recognit. 1. I-511. 10.1109/CVPR.2001.990517.