International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 03 | March - 2023 Impact Factor: 7.185 ISSN: 2582-3930

SMART INTRUSION DETECTION IN INDUSTRIAL DEVICES USING DEEP BELIEF NETWORK

Prof. T. P. Deshmukh[1], Sandesh Rayate[2], Manoj Shinde[3], Nachiket Thombre[4]

Assistant Professor[1] BE Students[2,3,4,]
Department of Information Technology,
Sandip Institute of Technology and Research Centre, College of Engineering, Nashik - 422213

Abstract - Utilization of smart systems everywhere through mobile devices, laptops and home pc are now become flexible. The increase in web usage also increases the web application cyber threats to be happening in most of the third-party connectivity websites. A robust approach on detecting the threats present in the IoT applications are discussed here. In the proposed architecture the collection of number of possible attacks is collected from KAGGLE NIDS dataset. The system detects the similar occurrence of intrusion creating task and triggers the model to prevent through immediate notification. In the existing system IDP-IOT is based on agent technology to support mobility, rigidness, and self-started attributes. Due to IoT limitations, the proposed solution is implemented in the middle, between IoT devices and the router that can be installed in a gateway. In the proposed research work cloud based advanced intrusion detection model is developed. The robust architecture provides the collection of number of possible attacks in the massive internet of things network. The collection of intrusion models we call bags of attacks. The proposed machine learning algorithm creates a robust prediction system for detection of feasible intrusions in the IoT network, the vulnerability of the IoT attacks act as a key for detecting the intrusion present in the network. The proposed design focuses on creating a Novel architecture though Adaptive convolution neural network for improving accuracy and increased security.

Keywords: CNN, Machine learning, Deep learning, Embedded System, Kaggle, IDP-IOT.

1. INTRODUCTION

As cyber-attacks evolve, attackers are exploiting unknown vulnerabilities and bypassing known signatures. One of the most representative network solutions is an intrusion detection system (IDS). There are two types of IDSs. One is misuse detection that detects attacks based on known signatures, and the other is anomaly detection which detects abnormal attacks based on normal use patterns. While misuse detection is difficult to detect unknown attacks, anomaly detection has the advantage of being able to detect unknown attacks. However, anomaly detection has high false alarms because it is challenging to define a variety of normal use patterns. Deep Learning (DL) is a technique that compensates for these weaknesses by learning its own features through a deep neural network. A network intrusion is any unauthorized activity on a computer network. Detecting an intrusion depends on the defenders having a clear understanding of how attacks work. In most cases, such unwanted activity absorbs network resources intended for other uses, and nearly always threatens the security of the network and/or its data. Properly designing and deploying a network intrusion detection system will help block the intruders.

2. LITRATURE REVIEW

The researchers have proposed several techniques for developing assistive devices for Visually impaired persons. Vision-based sensors (camera), non-vision-based sensors (e.g., IR, ultrasonic, inertial, and magnetic sensing, etc.), and other technologies such as low-energy Bluetooth beacons, GPS, GPRS, and so on have all been used in existing devices. Because of their importance to our proposed system, vision-based sensing devices receive special attention in this section.

- The object detection devices use sensors (laser scanners, ultrasonic devices) and cameras to collect information from the surrounding environment, process it, and provide feedback to the users. The basic working principle of such devices is that they detect the object around the user and give instructions about the object/obstacle and its distance using vibrations or sound waves. Saputra et al. [6] have presented an obstacle avoidance system with the help of a Kinect depth camera for VIPs. It helps detect the obstacle and calculate its distance using the auto-adaptive threshold. The device is tested on ten blind people aged 20-40 years to evaluate the system's performance. The result of the proposed system is promising as it detects obstacles without any collision from any direction. Yi and Dong [7] have presented a blind-guide crutch using multiple sensors. The triplet ultrasonic module detects the obstacle from the front, left, and right sides. It identifies the object using voice and vibration waves.
- Kumar et al. [8] have presented an ultrasonic cane that provides information related to the environment and enables the user to move safely. The ultra-Cane consists of a narrow beam ultrasound system that provides 100% obstacle detection. It detects objects which are 2- 4 meters away. The proposed device is tested on ten people (ages 20-26 years). The volunteers effectively detected the hurdles within the proposed range.
- Hanen Jabnoun, Faouzi Benzarti and Hamid Amiri, in paper - Object recognition for blind people based on features extraction provided an overview recent visual substitution system developed in the recent years. This method is based on video analysis, interpretation, and feature extraction. They give the results of comparison of SIFT and SURF in which they concluded that SURF is faster than SIFT, however SIFT is robust when the matches findings, scale variations are

considered. They used video to Audio transformation to provide the object information [3].

- Ricardo Chincha and YingLi Tian in paper entitled - Finding Objects for Blind People Based on SURF Features has proposed an object recognition method to help blind people find missing items using Speeded-Up Robust Features (SURF). The Proposed recognition process begins by matching in- dividual features of the user queried object to a database of features with different personal items which are saved in advance. From the experiments the total number of objects detected was 84 out of 100, this shows that their work needs better performance hence to enhance the object recognition SIFT can be used instead of SURF [4].
- Hanen Jabnoun, Faouzi Benzarti and Hamid Amiri, in their paper - Object Detection and Identification for Blind People in Video Scene has proposed system that restores a central function of the visual system which is the identification of surrounding objects. This method is based on the local features extraction concept. The simulation results using SIFT algorithm and key points matching showed good accuracy for detecting objects. They have worked for the key point detection in fast video using affine transformation in SIFT which is invariant to the changes in luminosity [5].

3. OBJECTIVES

The objectives of system are:

1. Protect the confidentiality of IoT Devices
2. Preserve the integrity of IoT devices.
3. Promote the availability of data for authorized users.

4. STEPS OF THE PROPOSED SYSTEM

The system consists of major steps:

- **Dataset:**
  Data scientists and machine learning enthusiasts can connect online at Kaggle. Users of Kaggle can work together, search and publish datasets, use notebooks with GPU integration, and compete with other data scientists to solve data science problems.

- **Preprocessing:**
  The initial image from the dataset is converted to an HSV image during image pre-processing in order to find exudates. Color space conversion is the process of converting an image from one color space to another, with the aim of producing a translated image that is as close to the original as feasible. Hue, Saturation, and Value are applied to the image's red, blue, and green channels. When we convert RGB to HSV, it is useful to extract yellow-colored exudates from the image. After that, adaptive histogram equalization, median filtering, and edge zero padding are used.

- **Feature Extraction:**
  The process of extracting the necessary unique data from a dataset and formulating the retrieved characteristics, such as Source Id, destination Id, connection time, flag, etc., is known as feature extraction or attribute selection.

- **Classification:**
  The adaptive CNN algorithm used in the classification process trains and tests on the given dataset. The classified results are divided into categories such as DoS assault, MIM attack, U2R attack, etc. based on the maximum matching score.

  Algorithm:
  CNN (Convolutional Neural Network):
  CNN is comparable to standard neural networks. Like a typical neural network, they have a minimum of one fully connected layer and at least one convolutional layer.
  The values of the neurons that make up CNN's variable weights are determined during the training phase. Given that CNN is made up of many multilayer perceptron systems, inputs only need to undergo a minimal amount of preprocessing. The design of the CNN architecture allows it to fully utilize a two-dimensional input stream. They are frequently employed in language processing and picture categorization.

5. ARCHITECTURE

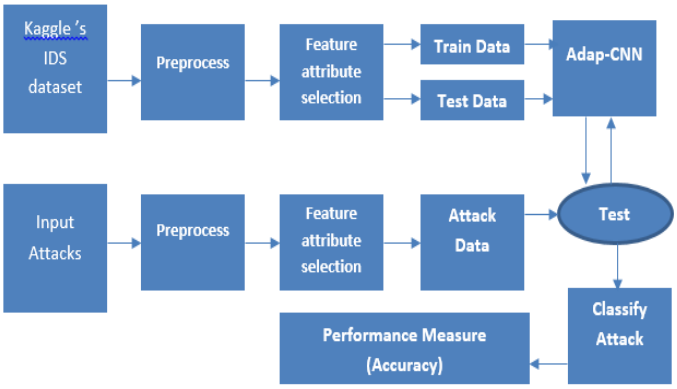

Fig -1: Architecture of the system

The enhanced intrusion detection model is cloud-based in the study work that is being suggested. The extensive internet of things network is equipped with a collection of several potential attacks thanks to the sturdy architecture. We refer to the group of intrusion models as "bags of attacks." The vulnerability of IoT attacks serves as a key for detecting the intrusion present in the network. The suggested machine learning technique offers a robust prediction system for detection of viable intrusions in the IoT network. The suggested architecture focuses on developing a novel structure using an adaptive convolution neural network to boost security and accuracy.

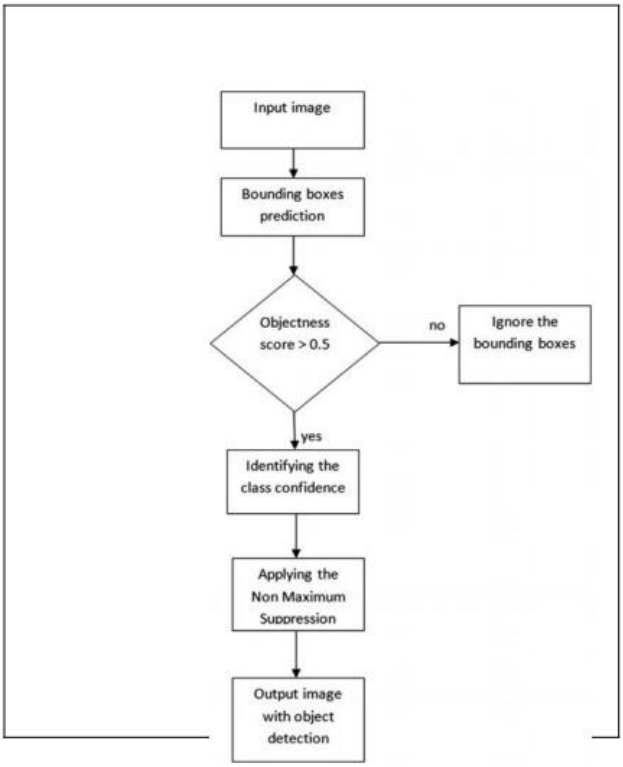

Fig -2: Flow Chart

6. METHODOLOGY

We selected the You Only Look Once (YOLO) model for our work since it is a cutting-edge, real-time object recognition system used on the Darknet. Systems that use prior detection locate targets by reusing classifiers or localizers. They use the model to alter the scale and position of a picture. High-scoring areas of the image are considered image detections.

This model has several benefits over classifier-based systems. It evaluates the complete image when testing, thus the global context of the image informs its predictions. Additionally, compared to R-CNN, which needs thousands of evaluations for a single image, it predicts with just one network assessment. The detection is carried out by dividing the image into a SxS grid.

In order to calculate SxSxN boxes, each cell will forecast N potential "bounding boxes" and their degree of confidence (or likelihood). The algorithm eliminates the boxes that are less than a predetermined minimum probability threshold because most of these boxes will have extremely low probabilities. "Non-max suppression" is applied to the remaining boxes, removing any potential duplicate detections, and leaving only the most accurate ones.

We used TensorFlow Object Detection API, Dark Flow, and OpenCV for object detection. Anyone (especially those with no genuine machine learning training) may easily design and deploy effective picture recognition software thanks to TensorFlow's Object Detection API. The API gives end users access to tools for developing and executing detection models as well as models developed using COCO datasets, such as Faster R-CNN, SSD Mobile, etc. We employ a translation of Darknet to TensorFlow dubbed Dark flow because YOLO is implemented on a C++ based deep learning framework named Darknet.

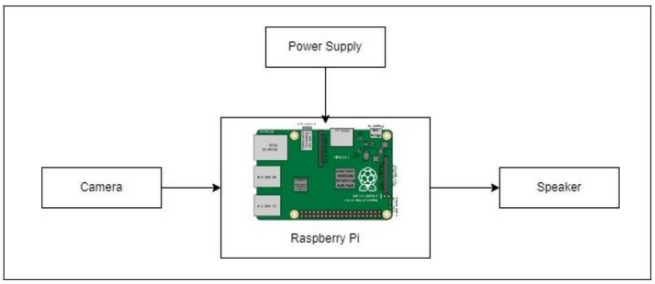

Fig -3: Block Diagram

7. CONCLUSIONS

In conclusion, the work presented a smart and intelligent system for visually impaired people to help them move around and stay safe. The proposed system is based on the needs of visually impaired individuals in their daily lives. It helps them visualize the environment and gives them a sense of their surroundings. Using CNN-based low-power Mobile-Net architecture, they can recognize objects around them and sense their surroundings.

In the digital world, IoT devices require greater security. For this reason, deep belief networks are used to create smart intrusion detection for cyberattack probes in industrial devices.

REFERENCES

[1] W. Elmannai and K. Elleithy, “Sensor-based assistive devices for visuall peo- ple: Current status, challenges, and future directions,” Sensors, vol. 17, no. 3, p. 565, 2017.

[2] R. Vel´azquez, “Wearable assistive devices for the blind,” in Wearable and Au- tonomous Biomedical Devices and Systems for Smart Environment. Berlin, Germany: Springer, 2010.

[3] L. B. Neto, F. Grijalva, V. R. M. L. Maike, L. C. Martini, D. Florencio, M. C. C. Baranauskas, A. Rocha, and S. Goldenstein, “A Kinect-based wearable face recognition system to aid visually impaired users,” IEEE Trans. Human-Mach. Syst., vol. 47, no. 1, pp. 52–64, Feb. 2017. [4] C. Shah, M. Bouzit, M. Youssef, and L. Vasquez, “Evaluation of RUnetratactilefeedback navigation system for the visually impaired,” in Proc. Int. Work- shop Virtual Rehabil., 2006, pp. 72–77.

[5] M. R. U. Saputra, Widyawan, and P. I. Santosa, “Obstacle avoidance for visually impaired using auto-adaptive thresholding on Kinect’s depth image,” in Proc. IEEE 11th Int. Conf. Ubiquitous Intell. Comput., IEEE 11th Int. Conf. Auton. Trusted Comput., IEEE 14th Int. Conf. Scalable Comput. Commun. Associated Workshops, Dec. 2014, pp. 337–342.

[6] K. Kumar, B. Champaty, K. Uvanesh, R. Chachan, K. Pal, and A. Anis, ’Development of an ultrasonic cane as a navigation aid for the blind peo- ple,” in Proc. Int. Conf. Control, Instrum., Commun. Comput. Technol. (ICCICCT). [7] C. T. Patel, V. J. Mistry, L. S. Desai, and Y. K. Meghrajani, “Multisensor– based object detection in indoor environment for visually impaired people,” in Proc. 2nd Int. Conf. Intell. Comput. Control Syst. (ICICCS), Jun. 2018, pp. 1–4.

[8] T. H. Nguyen, T. L. Le, T. T. H. Tran, N. Vuillerme, and T. P. Vuong, "Antenna design for tongue electrotactile assistive device for the blind and visually impaired," in Proc. 7th Eur. Conf. Antennas Propag. (EuCAP), 2013, pp. 1183–1186.

[9] P. Salavati and H. M. Mohammadi, "Obstacle detection using GoogleNet," in Proc. 8th Int. Conf. Comput. Knowl. Eng. (ICCKE), Oct. 2018, pp. 326–332. [10] S.-H. Chae, M.-C. Kang, J.-Y. Sun, B.-S. Kim, and S.-J. Ko, "Collision detection method using image segmentation for the visually impaired," IEEETrans. Consum. Electron., vol. 63, no. 4, pp. 392–400, Nov. 2017.

[11] M. Poggi and S. Mattoccia, "A wearable mobility aid for the visually im- paired based on embedded 3D vision and deep learning," in Proc. IEEE Symp. Comput. Commun. (ISCC), Jun. 2016, pp. 208–213.

[12] P. Salavati and H. M. Mohammadi, "Obstacle detection using GoogleNet," in Proc. 8th Int. Conf. Comput. Knowl. Eng. (ICCKE), Oct. 2018, pp. 326–332. [13] L.-B. Chen, J.-P. Su, M.-C. Chen, W.-J. Chang, C.-H. Yang, and C.-Y. Sie, "An implementation of an intelligent assistance system for visually im- paired/blind people," in Proc. IEEE Int. Conf. Consum. Electron. (ICCE), Jan. 2019, pp. 1–2.

[14] K. Kumar, B. Champaty, K. Uvanesh, R. Chachan, K. Pal, and A. Anis, "Development of an ultrasonic cane as a navigation aid for the blind peo- ple," in Proc. Int. Conf. Control, Instrum., Commun. Comput. Technol. (ICCICCT), Jul. 2014, pp. 475–479.

[15] C. T. Patel, V. J. Mistry, L. S. Desai, and Y. K. Meghrajani, "Multisensor– based object detection in indoor environment for visually impaired people," in Proc. 2nd Int. Conf. Intell. Comput. Control Syst. (ICICCS), Jun. 2018, pp. 1–4.

[16] L. B. Neto, F. Grijalva, V. R. M. L. Maike, L. C. Martini, D. Florencio, M. C. C. Baranauskas, A. Rocha, and S. Goldenstein, "A Kinect-based wearable face recognition system to aid visually impaired users," IEEE Trans. Human-Mach. Syst., vol. 47, no. 1, pp. 52–64, Feb. 2017.