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Crime Prediction System Using Deep Learning and Convolutional Neural Network: A Systematic Review and Future Enhancement

AbdulKalamAzad G[1], Sabari V[2], Prabu S[3], Sriganth R[4], Varshini S[5]

[1]Assistant Professor, Department of Computer Science and Engineering, Knowledge Institute of Technology, Salem, India.
[2,3,4,5]UG Students, Department of Computer Science and Engineering, Knowledge Institute of Technology, Salem, India.

Abstract:
Over the past decades, many machine learning approaches have been proposed to identify crime activities from inertial sensor data for specific applications Most methods, however, are designed for offline processing rather than processing on the sensor node. In this project, a crime prediction technique based on a deep learning methodology is designed to enable accurate and by using CNN-real-time classification using video processing by python. To obtain invariance against changes in human movement, motion, feature extraction and we design a feature generation process that is applied to the spectral domain of the inertial data. Specifically, the proposed method uses sums of temporal convolutions of the transformed input. Accuracy of the proposed approach is evaluated against the current state-of-the-art methods using both laboratory and real world activity datasets. A systematic analysis of the feature generation parameters and a comparison of activity recognition computation times on any device are also presented. This system mainly focuses on the prediction of the crime by CCTV footage and provide the type of crime, also generates the report based on crime location and time.

Keywords: Machine Learning, crime activities, CNN-classification, CCTV footage, Feature Extraction.

I. Introduction

Crime Vision is an advanced crime classification system that leverages deep learning algorithms to accurately and efficiently classify criminal activity. In this project we analyze visual data such as footage and images, to identify patterns and connections between different type of criminal behavior. Crime Vision uses a deep learning model that has been trained large datasets on criminal activity, allowing it to classify a wide range of crimes with high accuracy. An intuitive interface that enables law enforcement personnel to easily input and analyze visual data. The Crime Vision is to improve safety by providing law enforcement agencies. By accurately classifying criminal activity, law enforcement agencies can more effectively allocate resources, prioritize investigations and identify potential threats to public safety.

The purpose of the Crime vision is to develop an advanced crime classification system utilizes deep learning algorithm to accurately and efficiently classify criminal activity. One of the main objective of the crime vision is to improve the accuracy of crime classification. By leverging deep learning algorithms, crime vision can analyze visual data and identify patterns and connection between different types of criminal behavior, result in more accurate and reliable crime classification. This system mainly focuses on the prediction of the crime by CCTV footage and provide the type of crime, also generates the report based on crime location and time.

II. Literature Review

Face recognition has received a great deal of attention from the scientific and industrial communities over the past several decades owing to its wide range of applications in information security and access control, law enforce,

surveillance and more generally image understanding.

A general partial face recognition method based on Multi-Key point Descriptors (MKD) that does not require face alignment by eye coordinates or any other facial points. The invariant shape adaptation makes image matching more robust to viewpoint changes which are desired in face recognition with pose variations.

Face recognition has received a great deal of attention from the scientific and industrial communities over the past several decades owing to its wide range of applications in information security and access control, law enforcement, surveillance and more generally image understanding. In this paper we combine KLDA(combination of LBP and GABOR features) with gradient face features(which are more resistive to the noise effects) for more effective recognition process.

Less sensitive to noise in uniform regions, and show that replacing comparisons based on local spatial histograms with a distance transform based similarity metric further improves the performance of LBP based face recognition.

Industrial responses to this consumer desire can be exemplified by successful commercial face recognition systems included in and web sites such as Google Picasa, Windows Live Photo Gallery, Apple iPhoto, face.com, Polar Rose, etc. Second, the growing applications in public security also call for robust face recognition technologies that can identify individuals from surveillance cameras in uncontrolled situations.

In consumer digital imaging, face recognition must contend with uncontrolled lighting, large pose variations, a range of facial expressions, make-up, changes in facial hair, eyewear, weight gain, aging, and partial occlusions. Similarly, in scenarios such as visual surveillance, videos are often acquired in uncontrolled situations or from moving cameras.

III. Existing Solution

The RNN technology presents a novel framework for recognize human crime activities from video sequences captured by depth cameras. They extend the surface normal to polynomial by assembling local neighboring excited surface normal from a depth sequence to jointly characterize local motion and shape information.

The images retrieved from the depth video images cannot be used for the identification of the human activity or some other unique identification. Existing researches has a major drawback of inefficiency in the case of processing of videos for crime reduction.

Here preprocessing and classification done by same RNN algorithms no separate methods used for preprocessing.

IV. Proposed Solution

By deep learning architectures, the accuracy obtained can be higher and it also works better with large datasets, so error rate is low. The main purpose of efficient feature extraction method is to generate a reliable background model and thus significantly improve the detection of activity.

So time and speed is improved We creating huge no of frames to compare so a chances of missing the frames on which we are less so accuracy is high.

Being one of the most successful applications of the image processing, Activity recognition has a vital role in technical field especially in the field of security purpose. We are implementing human activity recognition approach by using CNN, Histogram of Gradient features extraction (HOG) and Kalman, Gaussion filter for preprocessing.

Histogram of Gradients:

- The histogram of oriented gradients(HOG) is a feature descriptor used in computer vision and image processing for the purpose of object detection.
- The technique counts occurrences of gradient orientation in localized portions of an image.
- This method is similar to that of edge orientation histograms, scale-invariant feature transform descriptors, and shape contexts, but differs in that it is computed on a dense grid of uniformly spaced cells and uses overlapping local contrast normalization for improved accuracy.

Kalman and Gaussian Filter:

A typical preprocess is separated into two distinct processes, namely, the prediction process and the measurement process. In general, the Kalman filter prediction model and gaussian to measurement model of a real-time system

The advantage of this algorithm is that we can apply it on any videos, even if the given input is partial, then also we can use this method.

V.Methodology

Temporal Analysis Methodology:

Temporal analysis focuses on studying patterns in crime occurrence over time. This includes analyzing data related to the day of the week, time of day, and seasonal variations in criminal activity. By understanding when crimes are most likely to occur, law enforcement agencies can deploy resources strategically, increase patrols during high-risk periods, and implement preventive measures to reduce opportunities for criminal behavior.

Social Network Analysis Methodology:

Social network analysis examines the relationships between individuals or groups involved in criminal activities. By mapping out social connections and interactions, law enforcement can identify key players in criminal networks, anticipate potential criminal behavior, and disrupt illicit activities. This methodology helps uncover hidden connections and patterns that may not be apparent through traditional investigative methods.

Machine Learning Methodology:

Machine learning involves leveraging algorithms to analyze large datasets of historical crime data. By identifying patterns, correlations, and trends within the data, predictive models can be developed to forecast future criminal activity. These models can take into account various factors such as demographics, location, and time, providing law enforcement agencies with valuable insights to aid in crime prevention and resource allocation.

Community Engagement Methodology:

Community engagement involves collaborating with local residents, businesses, and organizations to address crime and safety concerns. This methodology emphasizes building trust, fostering communication, and empowering communities to take an active role in crime prevention. By involving stakeholders in the decision-making process and implementing community-driven initiatives, law enforcement agencies can strengthen community resilience and promote a sense of ownership in crime prevention efforts.

VI. Process Diagram

1. Capture Image:

This is the starting point where an image is taken by a camera or any imaging device. It could be a surveillance camera capturing scenes in an environment.

2. Human Detection:

Once the image is captured, the system identifies and detects human within image. It locates where humans are present in the scene.

3. Preprocessing:

Before analyzing the detected humans, the image may undergo preprocessing steps. This involves cleaning up the image, adjusting colors or brightness, and removing any noise or unwanted elements to improve analysis accuracy.

4. Database:

The information about detected humans or the preprocessed image data may be stored in a database. This could include details like the timestamp of the image, location, and any other relevant metadata.

5. Feature Extraction:

After preprocessing, the system extracts relevant features from the detected human or the preprocessed image. These features could include characteristics like the shape of the human, their movement patterns, or other distinguishing attributes.

6. Feature Classification:

The extracted features are then classified or labeled based on certain criteria. For example, features related to specific human activities might be labeled accordingly, such as “walking”,”running”, ”standing”.

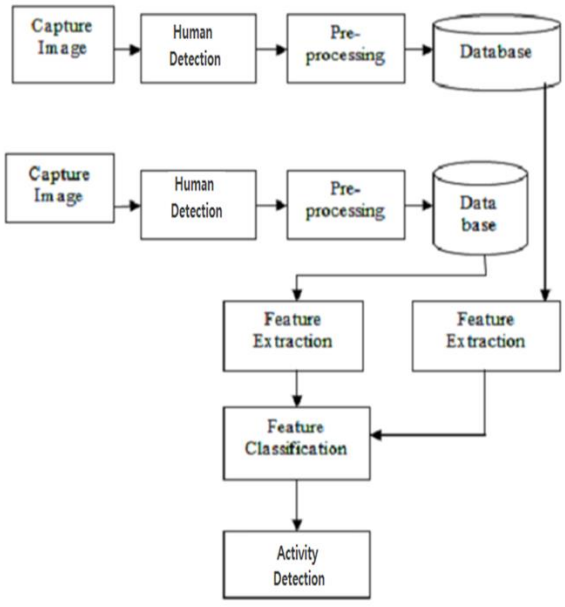

Fig: 1 Proposed Architecture

7. Activity Detection:

Finally, the system analyzes the classified to detect specific activities performed by the humans in the scene. This could involve recognizing actions like walking, running, fighting, or any other predefined activities of interest.

VII. Conclusion

In present world, almost all the people are aware of them importance of CCTV footages, but most of the cases these footages are being used for the investigation purposes after a crime/incident have been happened. The proposed model has the benefit of stopping the crime before it happens. The real time CCTV footages are being tracked and analyzed.

The result of the analysis is a command to the respective authority to take an action if in case the result indicates an untoward incident is going to happen. Hence this can be stopped. Even though the proposed system is limited to academic area, this can also be used to predict more suspicious behaviors at public or private places. The model can be used in any scenario where the training should be given with the suspicious activity suiting for that scenario. The model can be improved by identifying the suspicious individual from the suspicious activity.

References

1. Mr.S.Krishnaraj, Mr. M. V. Prabhakaran (2014).” An MKD-SRC Approach for Face Recognition from Partial Image”.International Conference on Engineering Technology and Science-(ICETS’14).
2. H. Benjamin Fredrick David and A. Suruliandi(2017).“Survey On Crime Analysis And Prediction Using Data Mining Techniques”.Ictact Journal On Soft Computing.
3. Fatima Dakalbab, Manar Abu Talib, Omnia Abu Waraga, Ali Bou Nassif, Sohail Abbas , Qassim Nasir (2022). “Artificial intelligence & crime prediction”.The Authors. Published by Elsevier Ltd.
4. Jyotsna Bhargavi Karri(2022). “Classification of Crime Scene Images using the Computer Vision and Deep Learning Techniques”. International Journal for Modern Trends in Science and Technology.
5. Dr. M. Bheemalingaiah, Dr. E. Nageswara Rao, Dr. Abburi Srirama Kanaka Ratnam & Sudhakar Vecha (2022). “Advanced Cyber Crime Rate Prediction Using Deep Learning & Ai Based Algorithm”.Journal Of Harbin Institute Of Technology Issn: 0367-6234.
6. Rafael Adnet Pinho, Walkir A. T. Brito, Claudia L. R. Motta and Priscila Vieira Lima(2017). “Automatic Crime Report Classification through a Weightless Neural Network”.European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning. Bruges (Belgium), 26-28 April 2017, i6doc.com publ., ISBN 978-287587039-1.
7. Panagiotis Stalidis, Theodoros Semertzidis, Member, IEEE and Petros Daras, Senior Member, IEEE(2018). “Examining Deep Learning Architectures for Crime Classification and Prediction”.DOI: 10.3390/forecast3040046.