Final Year Project (End term) Session:2021-2022
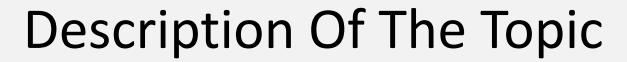
Crime Alert through Smart Surveillance using Deep Learning techniques

Supervisor (s): Name
Dr. Anuradha/Dr.Yogita

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- Mauktik Madan - 18CSU126

DEPARTMENT NAME - CSE

Description Of The Topic

- The automated video surveillance system has risen as a significant research topic in the field of public security.

- Real-time Anomaly Recognition Through CCTV Using Neural Networks.

- This project Aims to build a model to identify signs of aggression and violence from video, which filters out irregularities from normal patterns.

Feasibility Study

- The requirement for this project is based majorly upon software being used. The model building, dashboard analysis and UI being formed are with the help of software/tools. certain basic requirements are needed by a PC/Desktop in use such as:

- For model building we are using GPU and running the model on Google colab for better run time as it is much faster and resourceful than using the offline methods in such large data cases.

- For UI and integration we are forming the web pages via JavaScript and its frameworks. For the dashboard we are using Tableau software, whose basic requirements are 8gb of RAM in a PC.

- There is no cost required in building any applications other than the usage of developers PC/Desktop. The cost to send an alert message will also be included in the tool.

Existing Solutions/Literature Review

Literature Paper	Model Applied	Dataset	Accuracy
Abnormal Event Detection in Videos Using Spatiotemporal Autoencoder	Autoencoder+Conv LSTM	Avenue, UCSD Ped1 and Ped2, Subway entrance and exit datasets	80.3%
Human Action Recognition Using Deep Learning Methods	CNN+LSTM	HMDB-51 dataset	89.74%
Learning Spatiotemporal Features with 3D Convolutional Networks	C3D + 3D-CNN	UCF101 dataset	87.7%
Real-world Anomaly Detection in Surveillance Videos	C3D+CNN	UCF dataset	75.41%
Anomaly recognition from surveillance videos using 3D convolution neural network	Spatial annotation+C3D	UCF dataset	82%

- A breakthrough of deep learning techniques in the field of computer vision tasks, such as action recognition tasks, inspired us to explore these techniques in the anomalous event detection task.
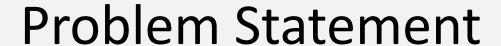
GAPS in existing solution/literature review

Current State

- Integrated User-Interface
- Business Analysis on Region wise Crime in India
- Real-Time crime detection model for a surveillance video

Final State

- Integrated User-Interface
- Business Analysis on Region wise Crime in India
- Crime Alert attached with Model

GAP

- Increasing Accuracy of the model
- SMS alert system

Action to Fill this Gap

- Increase the dataset and change some parameters
- Add twilio API

Problem Statement

- The number and forms of criminal activities are increasing at an alarming rate due to this, security has been given principal significance.

- Various missed accidents/felonies

- Impossible constant supervision

- Excessive human work

https://en.wikipedia.org/wiki/Chart

Objectives

- Once a pattern is detected, the information can be used to predict, anticipate and prevent crime.

- Crime patterns are automatically identified, then the authorities can immediately try to stop them.

- Crime Analytics using Tableau to determine what types of crimes are happening in Indian cities.

Tools/platform Used

Google Colaboratory: Colaboratory, or 'Colab' for short, allows you to write and   execute Python   notebook.
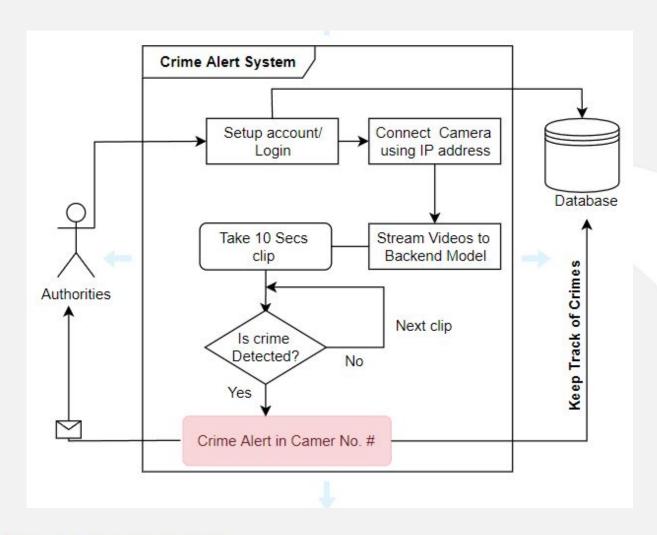
TABLEAU- Tool used for Data visualization

Visual Studio Code Visual Studio Code is a source-code editor built by Microsoft for Windows,

Linux and macOS.

StreamLit Streamlit is a Python-based open source app framework. It enables us to quickly

construct web apps for data science and machine learning. It works with popular Python libraries

Design Methodology

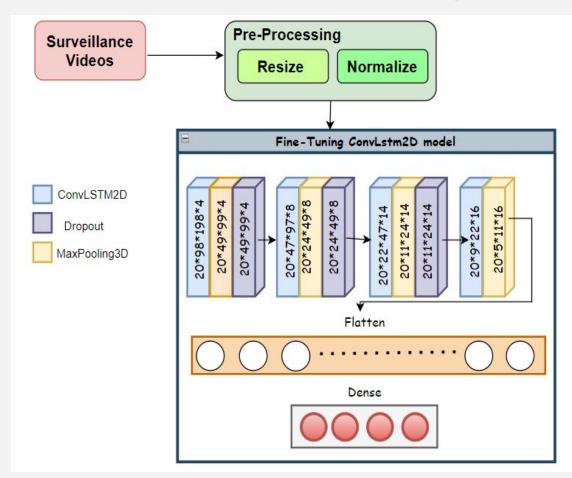# Challenges and Issues identified

Challenges:

- Access to CCTV cameras
- Few Authorities to check the alert accuracy
- High End GPU
- User-Interface to stream videos
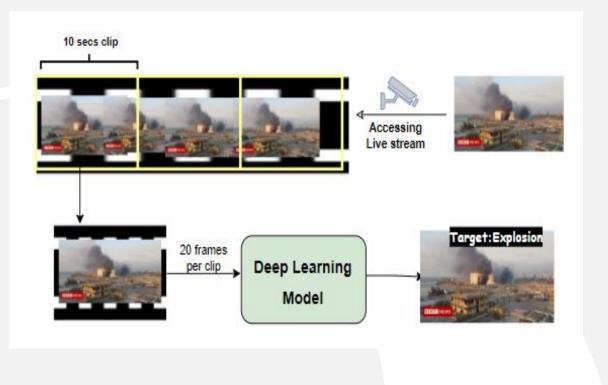- Call/text API for crime Alert notification

Show Stopper:

- Blurry crime footage
- Vandalism of cameras
- Blind-spot crimes

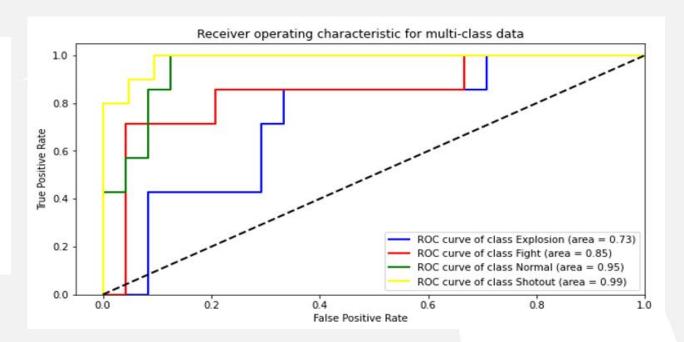# Methodology &Implementation/ Interface and Design Implementation

Testing and Performance Evaluation

- Performance is calculated using AUC-ROC curve.

TABLE 1 Comparison among popular Encoders

Deep Learning Approach	Testing Loss	Testing Accuracy
Conv2d + LSTM	0.88	0.64
ConvLstm2D	0.8	0.68

Receiver operating characteristic for multi-class data

ROC curve of class Explosion (area = 0.73)
ROC curve of class Fight (area = 0.85)
ROC curve of class Normal (area = 0.95)
ROC curve of class Shotout (area = 0.99)

Research Conclusion

The Research paper is presented in an "International Conference on Smart Innovations for Society (ICSIS-2022) under the Smart City Convergence, 2022 held at Poornima Institute of Engineering & Technology, Jaipur.

स्मार्ट सिटी के कन्वर्जेंस के तहत दो इंटरनेशनल कॉन्फ्रेंस आयोजित

जयपुर, समाचार जगत न्यूज। पूर्णिमा इंस्टीट्यूट ऑफ इंजीनियरिंग एंड टेक्नोलॉजी के कंप्यूटर साइंस और एप्लाइड साइंसेज डिपार्टमेंट की ओर से 'स्मार्ट सिटी कन्वर्जेंस 2022' आयोजित किया गया।

एआईसीटीई आईडिया लैब के सहयोग से आयोजित इस दो दिवसीय कन्वर्जेंस के तहत इंटेलीजेंट सिस्टम्स एंड कंप्यूटेशन और स्मार्ट इनोवेशंस फॉर सोसायटी विषय पर वर्चुअल इंटरनेशनल कॉन्फ्रेंस का आयोजन हुआ। इसमें देश?विदेश के शिक्षाविदों एवं शोधकर्ताओं द्वारा स्मार्ट इनोवेशंस पर चर्चा की गई और प्रतिभागियों ने रिसर्च पेपर प्रस्तुत किए। सीएसआईआर-नेशनल फिजीकल लेबोरेटरी, नई दिल्ली के चीफ

साइंटिस्ट डॉ. संजय यादव उद्घाटन समारोह के मुख्य अतिथि थे। इस अवसर पर मेजबान पूर्णिमा इंस्टीट्यूट के डायरेक्टर डॉ. दिनेश गोयल और रजिस्ट्रार डॉ. गौतम सिंह भी उपस्थित थे। शुरुआत में कंप्यूटर साइंस के एचओडी दीपक मोड ने सभी अतिथियों का स्वागत किया और कन्वर्जेंस 2022 के को चेयर डॉ. भनुप्रताप सिंह ने कॉन्फ्रेंस की

रिपोर्ट प्रस्तुत की। चीफ गेस्ट डॉ. संजय यादव ने वर्तमान समय में स्मार्ट सिटीज की महत्ता पर प्रकाश डाला और इसके विभिन्न पैमानों पर बात की। कन्वर्जेंस के दौनों दिनों में डिजीटल टेक्नोलॉजीज, स्मार्ट इंफ्रास्ट्रक्चर, स्मार्ट हार्डवेयर, इंटेलीजेंट कम्यूनिकेशन, ईवेस्ट मैनेजमेंट, एनर्जी एफिशिएंसी, नैनोटेक्नोलॉजी, सिक्योरिटी मैनेजमेंट, स्मार्ट मैटेरियल्स, स्मार्ट हैल्थकेयर, मैथेमेटिकल मॉडलिंग, सस्टेनेबल डवलपमेंट, कॉरपोरेट फाइनेंस और वर्चुअल लर्निंग जैसे विषयों पर चर्चा की गई और रिसर्च पेपर प्रस्तुत किए गए। अंत में पीआईईटी के फर्स्ट ईयर डिपार्टमेंट की एचओडी डॉ. समा जैन द्वारा धन्यवाद ज्ञापित किया गया।

Expected Outcome of Project

- The model allows us to narrow down the crime on the basis of **3 crime types** namely **(shot-out, fight and explosion)** reaching the suspect description of the crime series. By ruling out one the suspects, it really clarified what the suspect looked like and what crime type has been put under.

- The user can also see the crime analysis across the various regions in India and also the application can forecast crime based on Business Analytics.

Conclusion and Future Scope

A Deep Learning approach to detect real-world crimes in surveillance videos is proposed in our research work.

To further speed up the model and make it more efficient for future work(s) we can-

a) Increase the size of the dataset by adding more videos in each category.
b) Increase the accuracy

Broader Impact

- Smart India Hackathon Held at The NorthCap University
- Technovation Hackathon-4 Held at Sharda University
- Research paper published in International Conference On Smart Innovation For Society (ICSIS 2022) under convergence (May 6-7, 2022)

Acceptance Mail

Invitation: Inaugural Ceremony and Complete Schedule of ICSIS-2022 (Convergence 2022) 6-7 May, 2022

Inbox ×

International Conference on Smart Innovations for Society ICSIS 2022 <icsis2022@poornima.org>   Thu, May 5, 1:55 PM (10 days ago)

to Sama, Bhanu, Rekha, bcc: me

"Changes call for Innovation, and Innovation leads to Progress"
International Conference
On
" Smart Innovations for Society (ICSIS-2022)"
May 6-7, 2022
Under Convergence 2022

Dear Author(s)/Participants,

Greetings from Poornima Institute of Engineering and Technology, Jaipur !!

It is with great dignified pleasure that we would like to request your benign presence on the occasion of two days "International Conference on Smart Innovations for Society - ICSIS-2022" to be organized on May 6-7, 2022, by Department of Applied Science, Poornima Institute of Engineering and Technology, Jaipur.

References

- Chong Y.S., Tay Y.H. (2017) Abnormal Event Detection in Videos Using Spatiotemporal Autoencoder. In: Cong F., Leung A., Wei Q. (eds) Advances in Neural Networks - ISNN 2017. ISNN 2017. Lecture Notes in Computer Science, vol 10262. Springer, Cham.

- Dubey, Shikha & Boragule, Abhijeet & Gwak, Jeonghwan & Jeon, Moongu. (2021). Anomalous Event Recognition in Videos Based on Joint Learning of Motion and Appearance with Multiple Ranking Measures. Applied Sciences. 11. 1344. 10.3390/app11031344.

- Z. Yu and W. Q. Yan, "Human Action Recognition Using Deep Learning Methods," 2020 35th International Conference on Image and Vision Computing New Zealand (IVCNZ), 2020, pp. 1-6, doi: 10.1109/IVCNZ51579.2020.9290594.

- Tran, Du & Bourdev, Lubomir & Fergus, Rob & Torresani, Lorenzo & Paluri, Manohar. (2015). Learning Spatiotemporal Features with 3D Convolutional Networks. 4489-4497. 10.1109/ICCV.2015.510.

- Waqas Sultani, Chen Chen, Mubarak Shah, Real-world Anomaly Detection in Surveillance Videos, Cornell University Library, arXiv:1801.04264 [cs.CV], [v1] Fri, 12 Jan 2018.

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Responsibility Chart

TASK \ NAMES	Aarushi	Abhishek	Bhavya	Mauktik
Topic Planning	🟩	🟩	🟩	🟩
Literature Review	🟩			
UI Designing				🟩
Tableau Dashboard			🟩	
Model Building	🟩	🟩		
Research Paper	🟩	🟩	🟩	🟩
Implementation	🟩	🟩	🟩	🟩

GANTT Chart

Screenshot of MS-Meetings(online)/comments(offline) by Guide