SUSPICIOUS ACTIVITY DETECTION

A PROJECT REPORT

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Under the guidance of

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ABSTRACT

The amount of anti-social events happening in the current world has been established consistently increasing, and since then, security has been granted higher weight. Many organizations across the globe have also begun installing CCTV systems to track and interact with specific individuals continuously. In developing countries with more than 1,000 million people, each citizen is watched and caught on camera at least 20 times a day. And for a certain amount of time, many images are produced and stored, providing a high-quality image of 700x576 filmed at 20fps, which is creating approximately 25 GB every day. Because the level in abnormality in human data has been continuously monitored, it is an almost impossible activity to be odd as it takes continual tension. This then includes the simplification of the same issue. You ought to demonstrate which frame reflects the odd part, which allows it simpler for you to assess the suspicious behavior. This method involves the development of motion impact maps that are used for frames and represent picture interactions. The most distinctive features of the contours are therefore that objects and their intelligent characteristics are defined in the conceptual structure by the scale, direction, and consequently, calculation. It then eliminates frames with major movements to auto find both global and local phenomena. They compare them with check frames.

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Ayan Gupta

Shivom Goyal

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CHAPTER 1

INTRODUCTION

1.1 General

Artificial Intelligence is characterized as a computer science branch that focuses on developing algorithms that can induce intelligence in a machine so that it can act and function like a human being. Thus, in order for a computer to detect [3]behavior, artificially intelligent algorithms involving the use of neural networks are used to extract and replicate essential image blocks of video data in such a manner as to obtain the desired output. The identification of irregular activities therefore relies heavily on the concepts of deep learning, machine learning and artificial intelligence.

1.2 Machine Learning

The phrase "machine learning" was developed by Arthur Samuel, leader in the world of artificial intelligence. "The field of study that enables computers to learn without being specifically designed" he described machine learning. Machine Learning (ML) can be defined in layman terms as automation and enhancement of the machine learning process through its experience without actually being programmed, that is to say without human assistance. The program is started by providing good data and then training the machines through

machine learning models that capture the outstanding features of the data. Machine learning is used for the proposed program to learn the essential video data functional representation. The program provides a number of data with video inputs and the related target outputs with the machine learning algorithm. It's the duty of the algorithm to reduce the failure of the performance predictions. When the error is as small as practicable, the model is completely qualified. This can be told.

1.3 Numpy

NumPy is the simple science Python programming kit. It includes: • a efficient N-dimensional array object • advanced broadcast functions. It comprises among other things: Useful linear algebra, Fourier transform and random code functionality NumPy may also be used as an effective multi-dimension repository of common data as well as its apparent computational applications. C / C++ and FORTRAN application management devices. One may describe arbitrary data forms. This allows NumPy to interact with a wide number of databases easily and rapidly.

1.4 Deep Learning

Deep learning is a part of artificial intelligence (AI) that mimics the method to learning that people use to acquire other types to knowledge. Deep learning can also be seen as a way to automate predictive analysis and the recognition

of data patterns.In the conventional AI, it administers the learning process and when asking the machine what kind of items it will look at while choosing whether an image includes or does not contain a certain item, the planner must be clear. The performance rate of the program relies solely on the skill of the software developer to accurately and specifically define a set of functionality for some specific task. The benefit of deep learning is that the computation compiles a list of capacities which rely on someone else without supervision or, if any, near to zero. Not only is unregulated thinking quicker, it typically is more accurate and even stronger than human learning.

1.5 MOTION GENERATOR

The proposed system falls within the field of computer vision and artificial intelligence, which is one of the most attractive topics. In the last decade, this field has been worked extensively on by static images and 2D videos. Better perception models utilizing depth maps may be built via the creation of depth sensors. In this regard, earlier research suggested various ideas on choice and extraction of features, such as small points of interest, dense routes, skeleton details, etc. However, there are a variety of obstacles. There are often difficulties with the encoding of video and pictures. Variations in the contexts in which decisions are performed are a significant cause of identification confusion and shortcomings. The collection of features influence both the algorithm's accuracy and its computation costs, rendering it important for the proposed program. The exact issue in the program should be suggested.

To get going, seven simple activity categories are described and video-taped: drinking, dining, using tablets, using cell phones, making telephone calls and reading books. The following tasks may be accomplished by modeling each motion:

(1) Recognition of environmental action: recordings and research images are being practiced in the same area. That behavior is carried out in a manner that implies broad differences intra-class. To correctly classify any event, the algorithm should be robust.

(2) Knowledge of cross-environmental action: Images and research recordings are educated in multiple settings. It should be possible to remove the intervention of environmental variables and accurately classify the behavior.

(3) Awareness of ongoing activity: Test Videos include a series of ongoing activities per subject, where previous knowledge of the start and the end of each activity is lacking. It fulfills the demands that an ongoing human operation should be separated into separate, specified specific activities and properly described.

After the original video episodes have been pre-possessed, features are chosen and removed and can effectively reflect any event, including machine sophistication and model precision. [5]

1.6 Summary

The main part of the proposed system is outlined in this portion. It includes details on the forms and applications of artificial intelligence. It addresses how profound learning technologies for photos and outputs is used. The proposal outlines the difficulties, successes and goals.

CHAPTER 2

LITERATURE SURVEY

2.1 General

In this section the various approaches and procedures used for the identification of suspicious activities are thoroughly illustrated. The papers researched helped to find useful solutions to some of the problems present in the current technique and to optimize the detection accuracy produced by the proposed program.

2.2 LITERATURE SURVEY

A literature survey is described as a summary of an academic paper containing the substantive findings as well as theoretical and methods for the topic. No modern or initial experimental research is founded in a Literature Review. The literary review enables to learn from existing solutions to various issues and to contribute to the development of better solutions in the future. This report includes a literature review presenting the latest research so it is capable of describing the current situation in the field of study and setting the reader's context.

Most research was performed in the field of irregular behavior detection1 focused on the premise that a priori (normal and irregular) behavioral groups occur. In addition, how- ever, irregular behavior is uncommon but is not well

described, resulting in incomplete and well specified evidence required for controlled model construction. More modern, unattended modeling of behavioral models has been introduced for a variety of techniques. [1]

They can be further categorized into two different types according to whether an explicit model is built. Approaches that do not model behavior explicitly either perform clustering on observed patterns and label those forming small clusters as being abnormal , or build a database of spatiotemporal patches using only regular/ normal behavior and detect those patterns that cannot be composed from the database as being abnormal.[2]

It is thus appropriate only for postmortem examination but not on-the-fly identification of anomaly. This technique can not be extended to previously unexplained trends. The proposed solutions address this issue. However, all the usual trends of behavior, previously recorded, must be retained in the form of histograms for individual occurrences and/or spatiotemporal patches for the identification of deviations from unknown results.[4]

REF No.	Objective	ALGORITHM/ STRATEGIES USED	DATASET OR INPUT PARAMETERS	Relevance
[1]	Smart Surveillance as an Edge Network Service: from Harr-Cascade	SVM to a Lightweight CNN	Haar-Cascaded and HOG+SVM	Enhance security in smart cities by surveilling crowd.
[2]	Suspicious Activity Detection in Surveillance Video using Discriminative Deep Belief Network	Discriminative Deep Belief Network (DDBN)convolutional neural network (CNN)	PETS 2007 CAVIAR	Detects suspicious actiivity in local streets and residential areas.
[3]	Automated Invigilation System for Detection of Suspicious Activities during Examination	Eigen face Convolutional neural network	Created by themselves	Requires less processing power.Effective and efficient
[4]	Temporal Context Network for Activity Localization in Videos	Temporal Context Network (TCN)	ActivityNet dataset and the THUMOS14 dataset.	explicitly captures context around a proposal for ranking it

Table 2.1: Literature Survey

CHAPTER 3

PROPOSED SYSTEM

This section talks about the architecture of the detection system (figure 3.1). It explains the dataset used, tools used and approach to the system built. The objective of the paper is to analyze the motion of the people and depict any unusual activity.

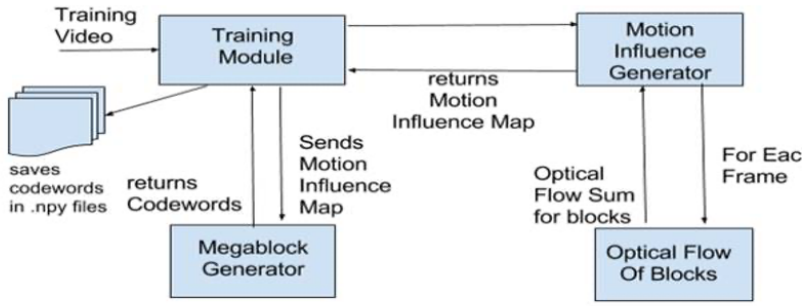


Figure 3.1: Motion Sytem

3.1 Training Module

The training data comprises of video clips rendered accessible on the Internet by groups of individuals. This video data set helped teach the model to identify the suspicious behavior conducted in public by community of citizens. This model has been equipped by way of different algorithms for this dataset.

- Optical Flow Of Blocks
- Motion Influence Generator
- Mega Block Generator

3.1.1 OPTICAL FLOW OF BLOCKS

Optical Flow For each pixel in a picture optical flow is released using the FarneBack algorithm after a pre-processing stage. Optical flow is the visible moving pattern in the visual image of objects, surfaces and edges induced by relative motion between an individual and the environment. Figure indicates each pixel's optical flux upwards in the era of a sphere. Opt-Flow is a shape (r,) vector, in which r reflects the size of each pixel and is the way the corresponding pixels in the previous context have shifted. The calcOpticalFlow-Farneback( ) function in openCV computes a dense optical flow using the Gunnar Farneback's algorithm .

Dividing the frame in blocks, frames are divided into M by N standardized blocks without lack of generality after it measures the optical flows for each pixel in a picture, where the blocks can be indexed by B1, B2,. , BMN. displays the entire 240 x 320 container, broken into 48 parts, each of which is 20 x 20 in dimension.

Optical Flow Measurement of each block The optical flow measurement for each block is rendered by measuring the average optical flow of the pixels of all block components after splitting the frames into sections. Here, bi corresponds to the I optical flow, J to the amount of pixels in a row, and f ji to the I optical flow jth pixel. The optical flow of the block is a vector (r), which indicates the orientation of each block and the position in which the previous frames are relative to the current block.

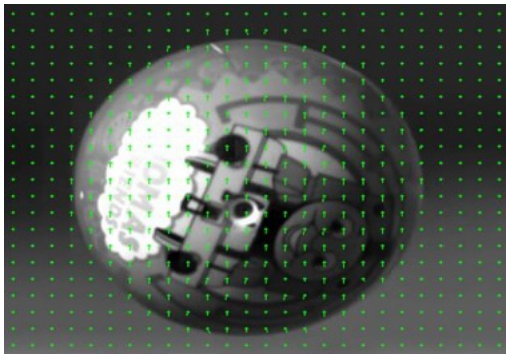


Figure 3.2: Optical Flow Of Blocks

3.1.2 MOTION INFLUENCE GENERATOR

Motion Impact map Varied variables including barriers along the road, surrounding people, and movable cart often named motion effect may affect movement of a pedestrian's path in the crowd. Assume the two variables impacting the blocks under impact of a traveling object:

1. the motion direction

2. the motion speed

The earlier an entity travels, the smaller the blocks that come under the object's impact. Nearby buildings have a greater effect than further distant ones.

Function Extraction A line, along with its corresponding objects, has identical vectors of effect on motion on the motion impact index. In addition, because multiple consecutive frames capture an operation, feature vector can be extracted from a cuboid identified by n to n blocks over the most recent t of frames.

Figure 3.3: Motion Influence Generator

3.1.3 MEGA BLOCK GENERATOR

The development of Megablocks Frames is divided into unoverlapped Super blocks, each of which is a mixture of multiple blocks of motion. A Megablock's Motion Influence is the summation of all the smaller bloc values, which make up a larger block.

Elements of extraction The 8 t-dimensional concatenated attribute vector is extracted from all the frames after the latest 't' frame number is divided into Megablocks for each Megablock. For example, a megablock (1.1) is used to build a concatenated feature vector for block (1.1) in all framework (not the number of frames) and to combine their feature vectors.

Clustering is done with spatiotemporal capabilities in a mega block and the

centers are marked. That is, the mega-block for I j) has K-coded terms, w(i, j) k k k=1. In this scenario, the video clips of daily tasks should be noticed only at the training period. Codewords from a mega-block layout template can be contained in the field concerned.

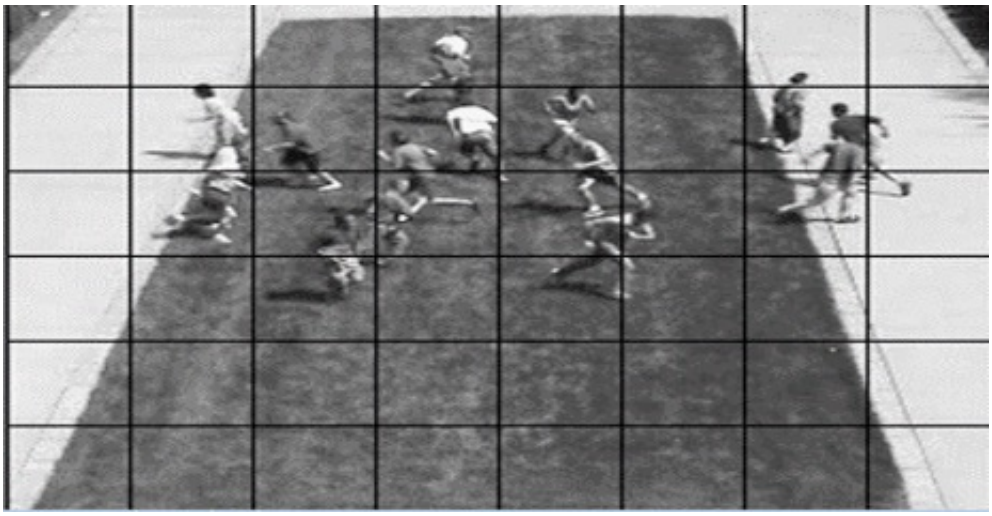


Figure 3.4: Creating Mega Blocks

3.2 TESTING OF MODEL

• Testing phase Now it is time to test the generated model with a test dataset containing unusual activities as code words are generated for normal activities.

• Minimum Distance Matrix We establish the minimum distance E matrix over mega blocks, after collecting spatio-temporal vectors for all mega blocks, in which the entity meaning is determined by minimum Euclidean distance between the current test frame function vector and the code words of the corresponding megablock. • Minimal distance matrix.

The lower the importance of an element, the less probable an irregular occurrence is to occur in the respective block in a minimum distance matrix. In

the other side, irregular behaviors may be observed for t consecutive frames if the minimum distance matrix includes a higher value. Therefore, when a frame representation value is sought, the maximum value is contained inside the minimum distance matrix. This block is marked as rare if the size is greater than the threshold.

• Odd pixel level identification The value of each megablock's minimum distance matrix is compared to the threshold value until an picture is identified as irregular. This block is marked as rare if the size is greater than the threshold. An example of irregular pixel level behavior detection is seen in the figure

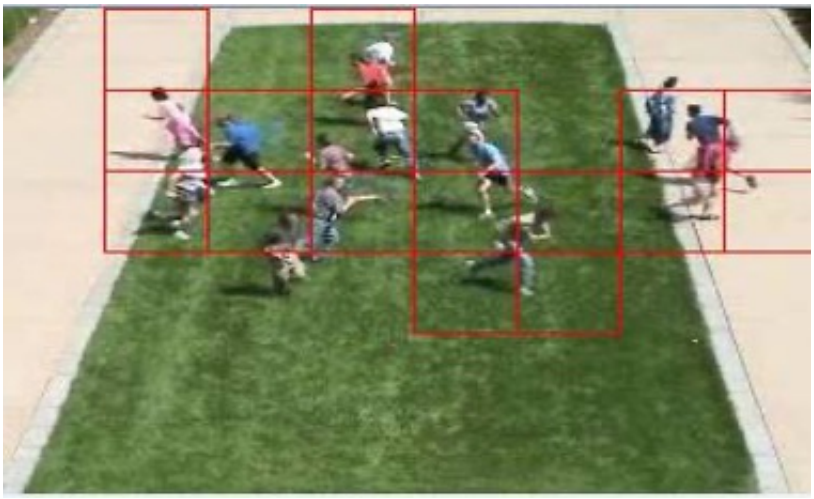


Figure 3.5: Testing of Dataset

CHAPTER 4

IMPLEMENTATION

This segment explores the manner in which motion technologies for the identification and localization of suspicious events are portrayed within the crowded scene or on the screen. The two forms of irregular behaviors are called local and worldwide in this regard. In a fairly limited region, the local suspicious operation is normally conducted. In the portion of the frame specific activity trends will occur, such as the particular look or gesture of a person while the other pedestrians walk steadily. The unusual world activity then comes. The odd global action typically happens in the pictures, as when each peasant in the scene unexpectedly begins running to flee. The figure indicates the total structure of the specific approach suggested in the scheme.

The frames are sequenced, then the motion information is placed at both pixel level and block level, which is sequentially calculated. Therefore, the motion effect is measured and the motion impact is then constructed from the energy of each object, based on the block level motion knowledge. Then both spatial and temporal features are represented in the proposed influence map in the single matrix frame. Then the motion effect map is separated into a standardized grid for the classification and then the k-means clustering takes place for each area. In comparison, the gap between the middle of the clusters and the frequency of the irregular behavior identification at frame level is used

as the signature attribute for any spatial temporal effect movement function. And the frame is marked as irregular, and the precise location of this uncommon occurrence is found farther on the pixel point.

4.1 The Motion Descriptor

For our special situation, the knowledge on the motion is measured informally and implicitly in the optical flows for each pixel. The frames will then be partitioned. Keep as M and N as the vector. Without lack of generality the frame is partitioned into M and N blocks or where the blocks can be sorted and the device is measured with the optical flow of each block on average by taking the optical flow of the pixel into the block

$$\mathbf{b}_i = \frac{1}{J}\sum_j \mathbf{f}_i^j$$

where the b(i) particularly denotes the optical flow of ith block, then j in it denotes the number of pixels in a particular block and F(i, j) then reflects the jth pixel optical current of the ith row. The two a and operators are then described, essentially calculating the direction and magnitude of the optical flows of a. After this, the difficult assignment took place using the following rule on direction of the optical flow for the device output.

where k 1,2,3,4,5,6,7,8

It should be noted here that the block in a context is known as a composite entity that is interchangeable in all cases, irrespective of the truth. Instead, actual items such as footballers or the cart are identified and monitored that

are ineffectual for this crowded video shot. In addition to this, it measures the movement properties of the block and uses it as movements, irregular or odd behaviour identification for the video clip of the crowded sequence.

4.2 Motion Influence Map

The direction of travel of the pedestrian in the crowd may be influenced by many factors, such as the obstacles along the path which lie next to the pedestrians and the moving carts. In previous crowd motion research experiments, the property known as activity control was effectively utilized. Then the blocks under the impact can be expected to affect the motion of the body which can be calculated by two parameters, namely the direction of travel and the speed of motion. The quicker the target travels the more the blocks away from the neighboring impact. In regard to the impact of moving object I to block j, the framework must first identify two variables d which mean, primarily, whether block j is under object I control by taking into account the distance between them and the visibility of block j to block i

$$\delta_{ij}^{d} = \begin{cases} 1 & D(i,j) < T_d \\ 0 & \text{otherwise} \end{cases}$$

$$\delta_{ij}^{\phi} = \begin{cases} 1 & -\frac{F_i}{2} < \phi_{ij} < \frac{F_i}{2} \\ 0 & \text{otherwise} \end{cases}$$

If D(i, j) is the Euclidean distance between object I and block j then Td is the threshold Ij denotes the angle between object I vector and object j, otherwise the direction of motion between object I and fi is object I view area. The weight of the object I to block j is then

$$w_{ij} = \delta_{ij}^{d} \delta_{ij}^{\phi} \exp\left(-\frac{D(i,j)}{\|\mathbf{b}_i\|}\right).$$

After all blocks wiji, j1,2, · · · ·, MN have been measured, the map of the motion effect represents the motion patterns which take place in the picture. And each block in the motion map is made up of an 8D vector. Where the quantified path of the motion vector is the block I for each variable. The Wij represents just block i impact on block j. To measure the vector of motion of block j, that is. Hj(k), which is inside the container, all other blocks that that influence block j movement must be handled as follows

$$H^{j}(k_i) = \sum_{i \neq j} w_{ij}$$

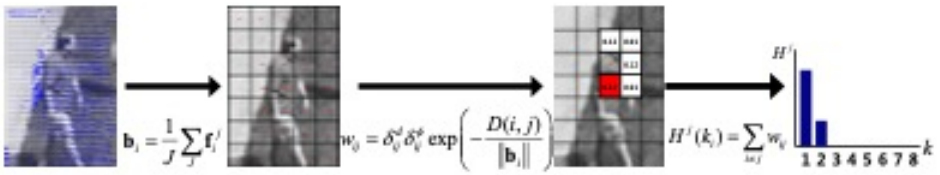
The quantized orientation index f of block I herein, j 1, 2, , M N and Ki, is most widely known as the part index of block j. The output specifies a goal block on which to measure the effect of the motion in the red and numbers depicted in the lines, which specifically de- notes the impact weigh of specified objects. The output shows the goal block on which the effect of motion is measured in Red. The histograms underneath the maps demonstrate primarily how the movement effect of the block portion is calculated. The bin index k is then the movement vector orientation of block i.

The scalar-value representation of the motion effect matrix, which is primarily an array of eight components since there are more than cinq blocks influencing the goal point, is therefore seen by the significance of the motion impact map in clear graphics. Noted the large number of blocks is weighed

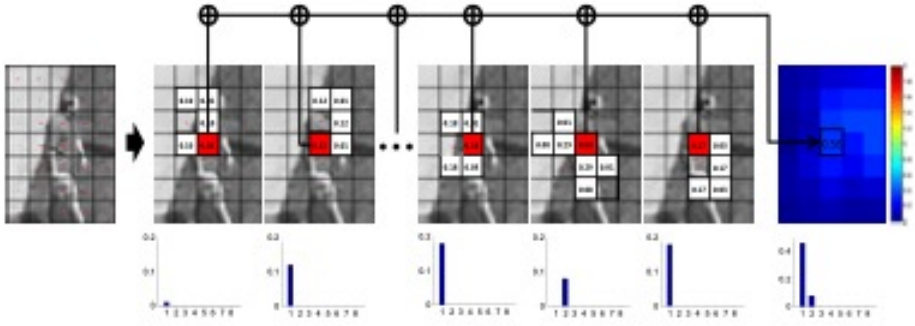
when measuring the impact weight as opposed to the other cases because of the fast moving pace of the subject. It is also noted that the proposed motion affects the map, primarily taking into account the motion speed , distance, body measurements and interactions of the neighboring objects.

Actually, with the rapid travel gradually around moving objects or objects, and then a vast amount of neighboring blocks are influenced by measuring the weights of impact, which which result in high values for a motion effect map due to the greater scale of motion fluxes for a topic. With regard to the fixed component, e.g. the cart or the vehicle, motions of the component are fairly steady, repetitive and constant over time, similar to those of the human person, whereas activity differs greatly from non-stiff body sections, i.e. hands, head, etc .. to complicated motion directions. This is why in times of direction d magnitude the rigid structures appear to have stable movement patterns, resulting in heavy weights and thus high vectors in the respective motion controlling map.

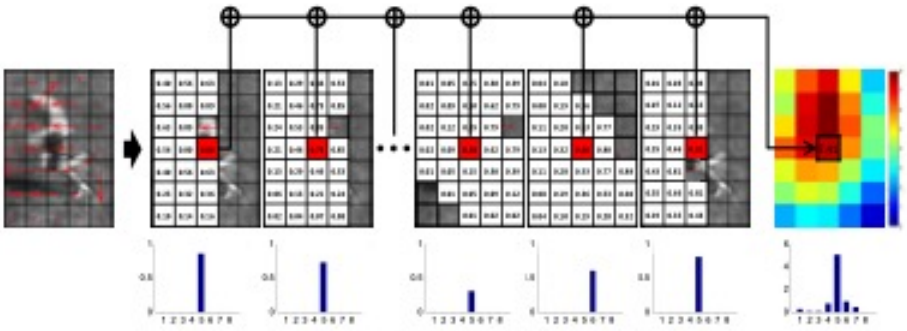
Whereas, since the map of the motion effect is constructed by combining the impact weights relative to the target point, reflecting reciprocal interactions between objects. For example, there are two cyclists coming together and the weights of the motion for this case are much higher than for a cyclist approaching the pedestrian than the opposite directions and appear in the block.



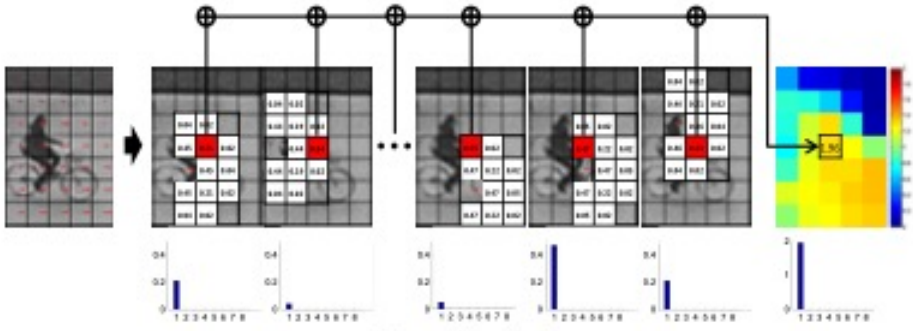
(a) A global view of constructing a motion influence map: (first) optical flow in a pixel-level, (second) motion vector in a block-level, (third and fourth) computing a motion influence weight and the corresponding a motion influence vector for red-colored block.



(b) A walking person



(c) A running person



(d) A person riding a bicycle

Fig. 4. An illustration of constructing a motion influence map and exemplar maps for different scenarios.

CHAPTER 5

CODING

5.1 Python

Python is a generic programming language of comprehension, high-level. The design philosophy of Python was developed by Guido van Rossum and first published in 1991. It stresses the readability of code and its prominent usage of essential space. The programmers aspire to compose simple and functional code for small and large scales projects with its language structures and the object oriented method.

Question that arises in mind is WHY Python? Python is a great platform to work with large datasets in machine learning or AI which make it easy for researchers to find the relations and predictions through these datasets. We have also used python as our coding platform as we had to use our video clips as datasets. With the help of inbuilt libraries and built in functions of python, it was easy for us to train and calculate the predictability of the model.

5.2 DATA TRAINING CODE

Steps for training:

- Import numPy

- Import Optical Flow of Blocks
- Import motion influence generator
- Import Create Mega Blocks
- Implementing function reject outliers
- Implementing function train$_{f}rom_{v}ideos$

5.3 Optical Flow of Blocks

Input and Pre-processing The video record is given as an reference for the pre-preparing system. A video is viewed as a set of artifacts that are called contours and these contours are handled consecutively. At the beginning an RGB outline is modified to white. A gray scaled image consists of the elevated image details rather than specific colours. RGB is 3-dimensional (because RGB's rubber, green and blue color values) while a single-dimensional scaled gray vector is usable.

Optical Stream For increasing video contour optical flow for each pixel is measured in a FarneBack approximation contour after the pre-processing step. Optical streaming is intended to display clearly the motions of objects, surfaces and boundaries in a visual environment induced by the relative movement between a observer and the image.Optical flow can be a frame vector (r, total), where r refers to each pixel's scale and the meaning of iv to reflect the context under which each pixel has passed under comparison to the previous outlines of the comparative pixel. Within openCV, the calcOpticalFlowFarneback() func-

tion measures a dense optical stream using the estimate of Gunnar Farneback.

Optical-Flow component Cutting the outline into squares They must parcel the outline into M by N united bits without misfortune of simplification after measuring the optical streams for each pixel within the outline with B1, B2, etc. , BMN [1]. An description of 240 x 320 in 48 circles, each of which has 20 x 20 circles. Optical-flux calculations on each piece Once contours have been separated into squares, optical-flow measurement is carried out on a square by measuring the usual optical-flows for all the pixels which constitute a square. In this situation bi denotes the I th grid's optical source, J is the amount of pixels in a rectangle and F ji represents the j th pixel in the I th square's optical source. Optical movement of a square may be a vector (r, a total) that corresponds to the degree of which each segment passed in contrast with a similar square in the past outlines.

5.4 MOTION INFLUENCE GENERATOR

The development of an individual in a swarm on foot can be affected by various components including road deterrents, adjacent people on foot and moving carts. They relate to this activity as the effect of movement. We expect the underlying squares to be determined by two factors for the effect of a moving question: a)the motion direction

b)the motion speed.

The faster an item travels, the more surrounding barriers the entity is affected

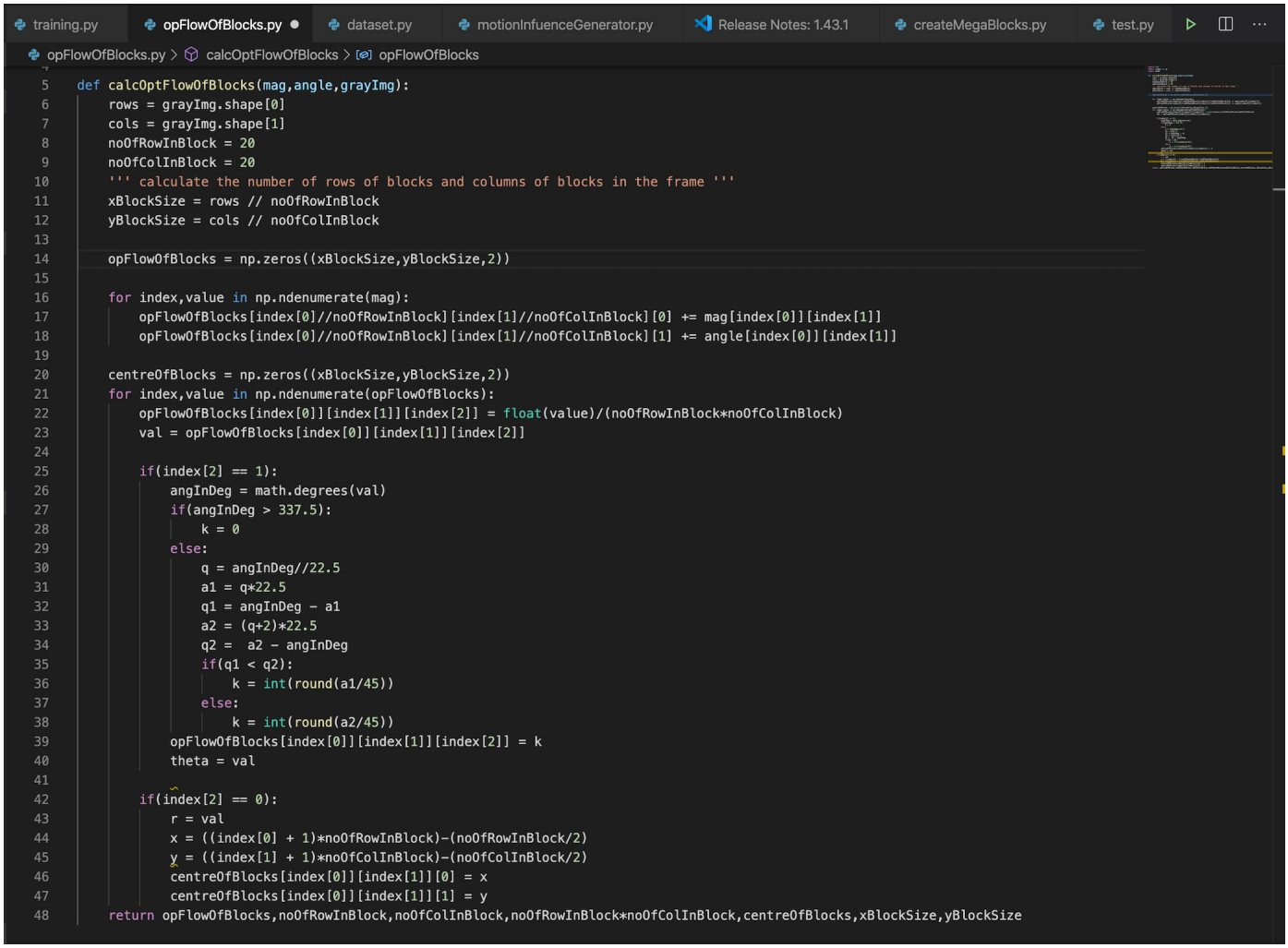


Figure 5.1: Calculating optical flow

by. Blocks adjacent have a far greater impact than remote ones.

Algorithm for creating a motion influence map

INPUT: B ← motion vector set, S ← block size, K ← a set of blocks in a frame

OUTPUT: H ← motion influence map H j (j K) is set to zero at the beginning of each frame

for all i K do Td = bi × S;

Fi/2 = bi + ? 2 ;

Fi/2 = bi ? 2 ;

for all j K do if i = j

Then Calculate the Euclidean distance D(i, j) between bi and bj if D(i, j) < Td

Then Calculate the angle ?ij between bi and bj if Fi 2 < ?ij < Fi 2 then H j (bi) = H j (bi) + exp D(i,j)bi end if end if end if end for end for

Highlight Selection A section in which an irregular operation happens, along with its accompanying parts, has a kind of movement effect vector within the field of travel. In addition, when a movement is identified by various sequential contours, over the most later periods we are extracting a highlight vector from a cuboid formed by n to n pieces.

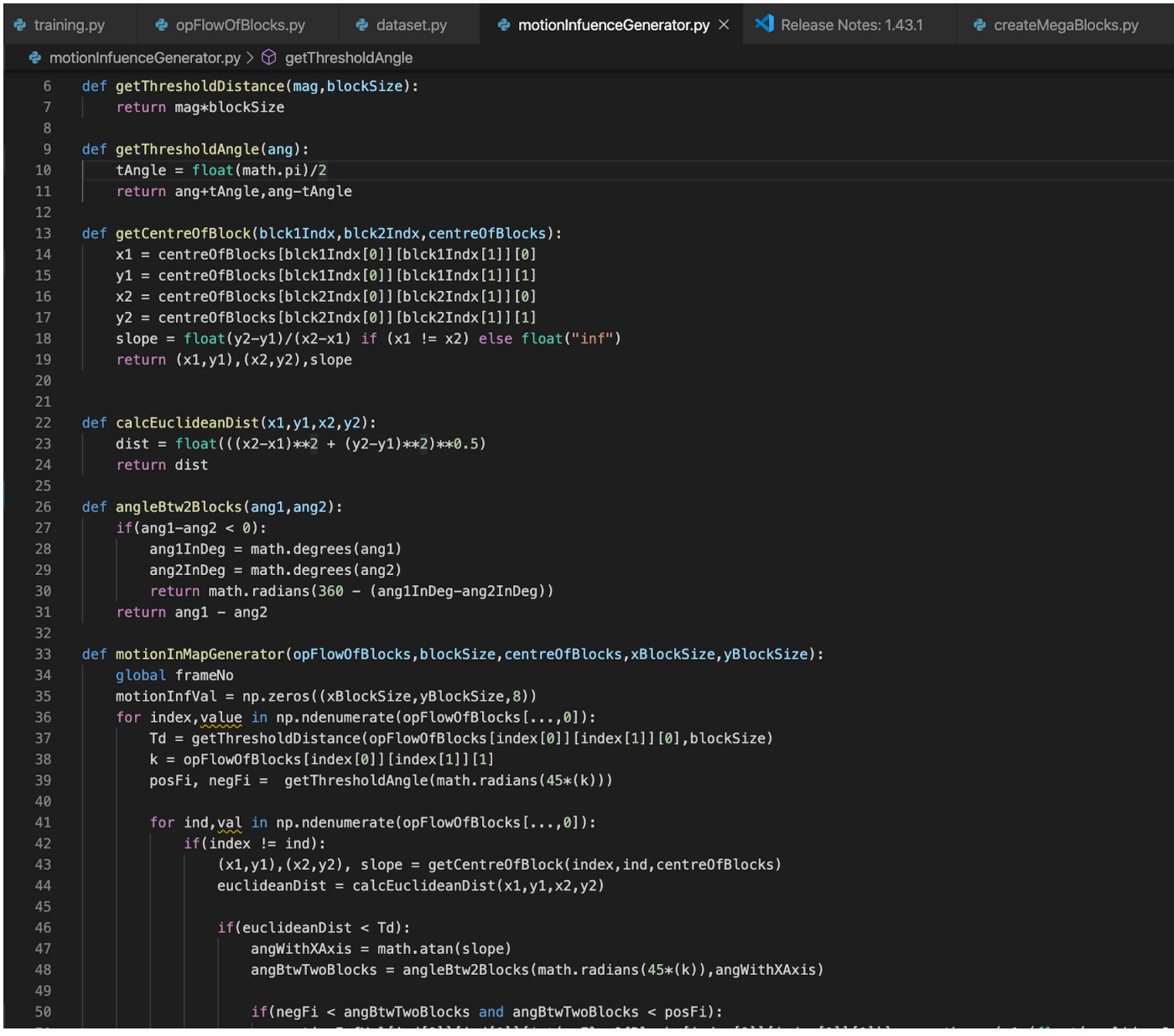


Figure 5.2: Motion influence generation initialization

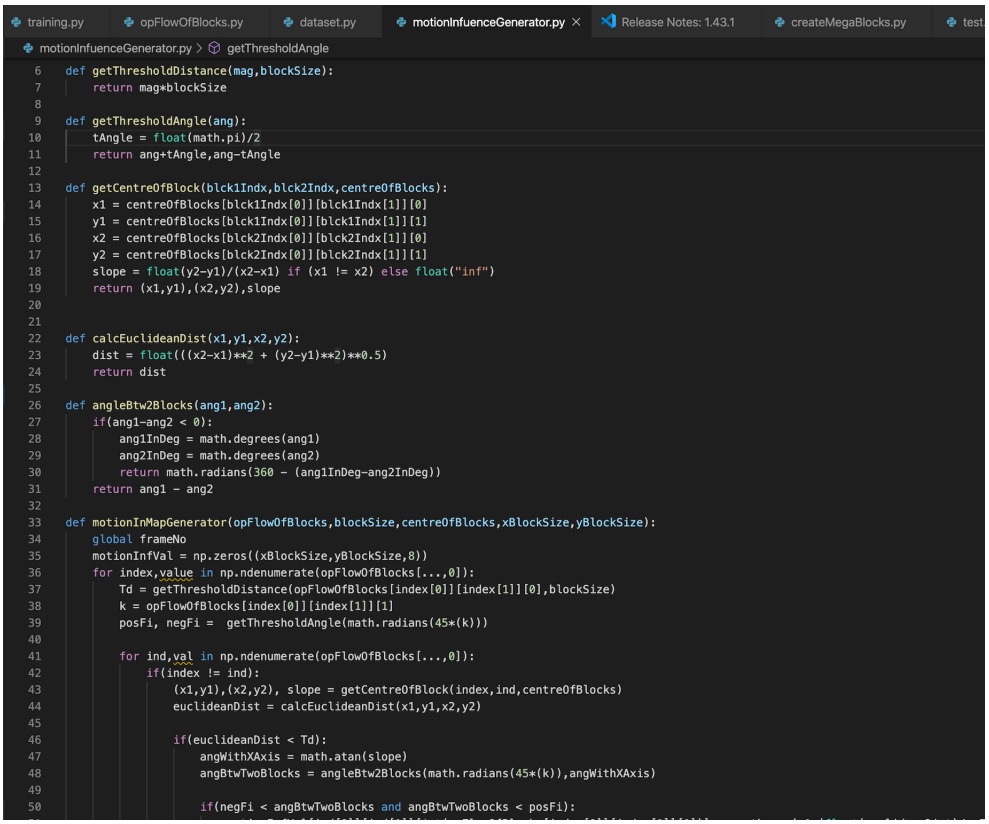


Figure 5.3: Get motion influence map

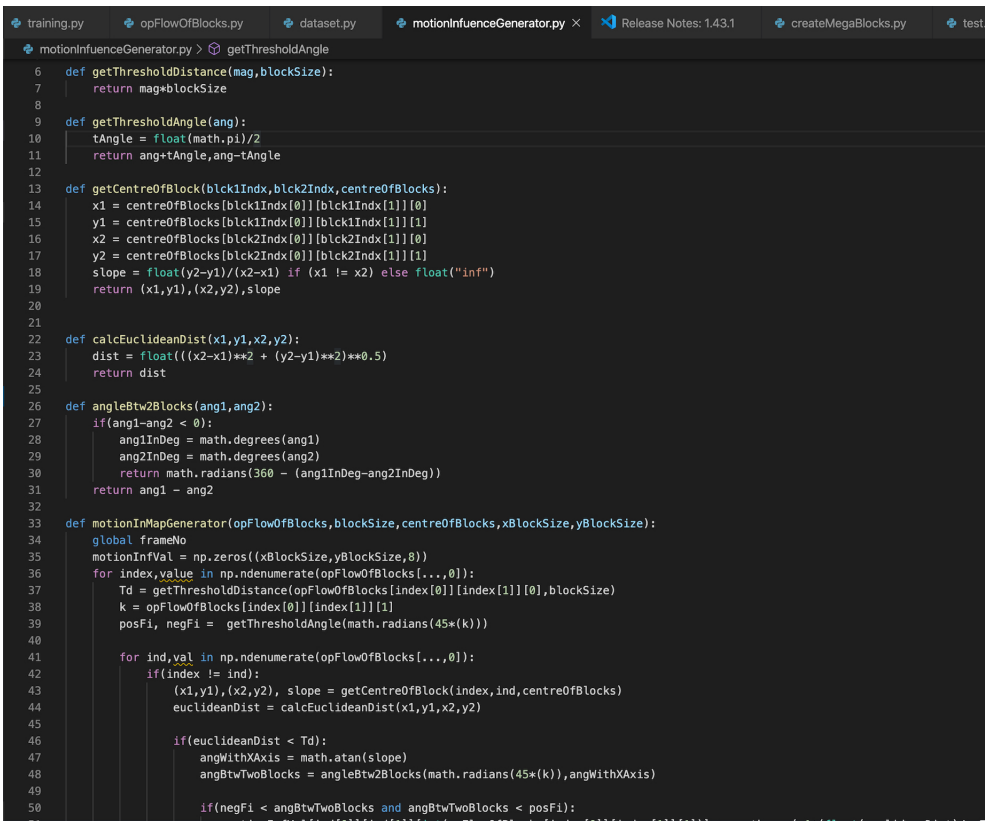


Figure 5.4: Calculating motion

5.5 Create Mega Blocks

Megablocks are categorized into megablocks, and may be a mixture of several activity effect pieces, which are not overlapping. The calculation of the effect of a movement of a Megablock sums up the impact values of all the smaller parts that make up a larger block. Since the following 't' numbers are separated into megablocks, an 8 l t-dimensioned highlight vector is collected from all outlines for each megablock. We use mega-square (1.1) outlines (not number of frames) to demonstrate and concatenate their vectors, to create a concatenated highlight matrix (1.1). Clusters We carry out clusters using the spatio-time highlights for each mega piece and set the centers as codewords. That's, we got K Codewords, w(i, j)k K = 1, for the I j)th Mega squares. Here, we should note that we use video clips of typical exercises in our preparation. The codes of a mega-square therefore display the designs of standard exercises in the defined area.

5.6 Training

Training of a Dataset

5.7 Testing

Test stage: It is time to check the generated study with a research dataset, including uncommon events, as the codewords for typical exercises have been created. Last Independent Network In the state of the study created smaller la-

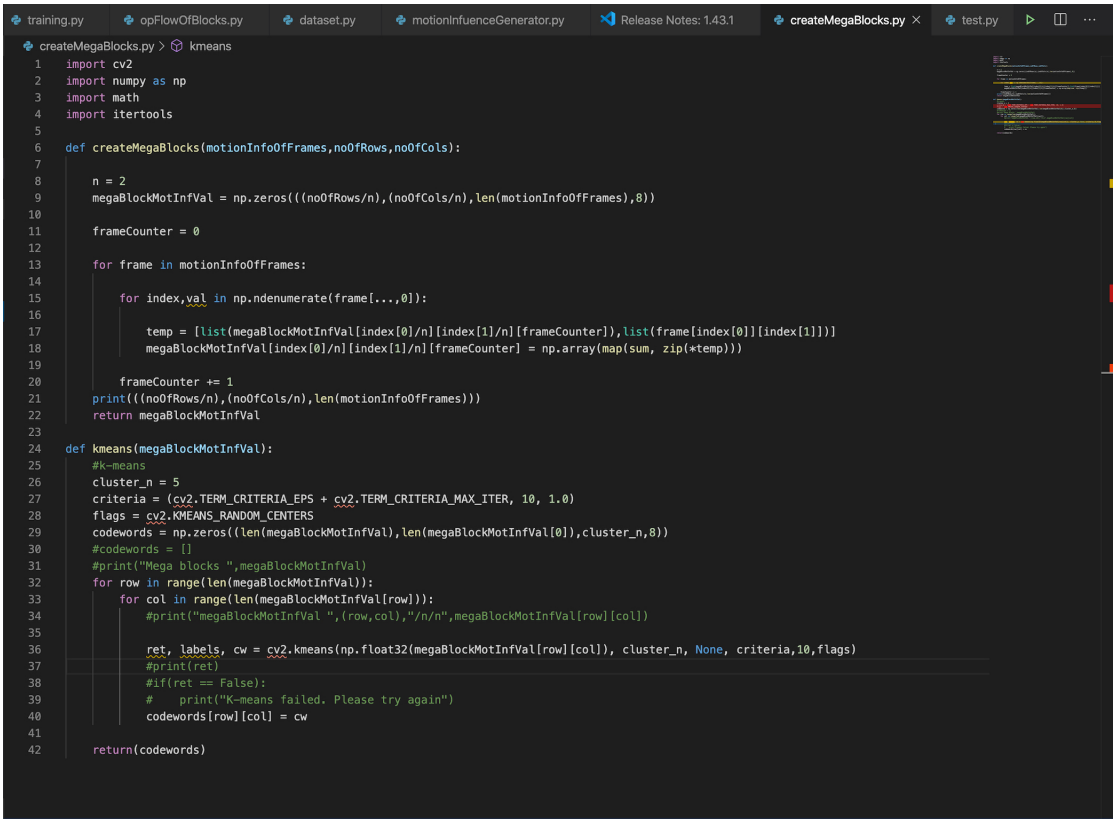


Figure 5.5: Create Mega Blocks

trines, in which a substantial amount of component is distinguished by the least Euclidean differentiate between a highlight vector for the current test frame and coding words inside a Mega-Block relative to one dimension, after eliminating space time highlight vectors for all mega squares. Description degree of odd exercise The less possible a strange motion is inside the individual piece in a minimal distance lattice, the greater the component's estimation. On the other hand, I can say that in t succeeding contours there are abnormal exercises that the next appreciation exists within the minimum distance grill. Thus, within the minimum distance network it discovered the most remarkable value because the contours agent is valuable. Should the most extraordinary importance of the smallest network be greater than the boundary, the present outline is graded as odd.

training.py | opFlowOfBlocks.py | dataset.py | motionInfuenceGenerator.py | Release Notes: 1.43.1 | createMegaBlocks.py

training.py > ...

```python
import numpy as np
import motionInfuenceGenerator as mig
import createMegaBlocks as cmb
def reject_outliers(data, m=2):
    return data[abs(data - np.mean(data)) < m * np.std(data)]
def train_from_video(vid):
    '''
        calls all methods to train from the given video
        May return codewords or store them.
    '''
    print ("Training From ", vid)
    MotionInfOfFrames, rows, cols = mig.getMotionInfuenceMap(vid)
    print ("Motion Inf Map", len(MotionInfOfFrames))
    #numpy.save("MotionInfluenceMaps", np.array(MotionInfOfFrames), allow_pickle=True, fix_imports=True)
    megaBlockMotInfVal = cmb.createMegaBlocks(MotionInfOfFrames, rows, cols)
    np.save("videos/scene1/megaBlockMotInfVal_set1_p1_train_40-40_k5.npy",megaBlockMotInfVal)
    print(np.amax(megaBlockMotInfVal))
    print(np.amax(reject_outliers(megaBlockMotInfVal)))

    codewords = cmb.kmeans(megaBlockMotInfVal)
    np.save("videos/scene1/codewords_set1_p1_train_40-40_k5.npy",codewords)
    print(codewords)
    return

if __name__ == '__main__':
    '''
        defines training set and calls trainFromVideo for every vid
    '''
    trainingSet = [r"videos/scene1/train1.avi"]
    for video in trainingSet:
        train_from_video(video)
    print("Done")
```

Figure 5.6: Training

If an outline is known as irregular we measure the importance of the less distinct network of each megablock and edge recognition. Pixel level positioning of odd exercises. If the affection is greater than the bottom, we label it as unusual.

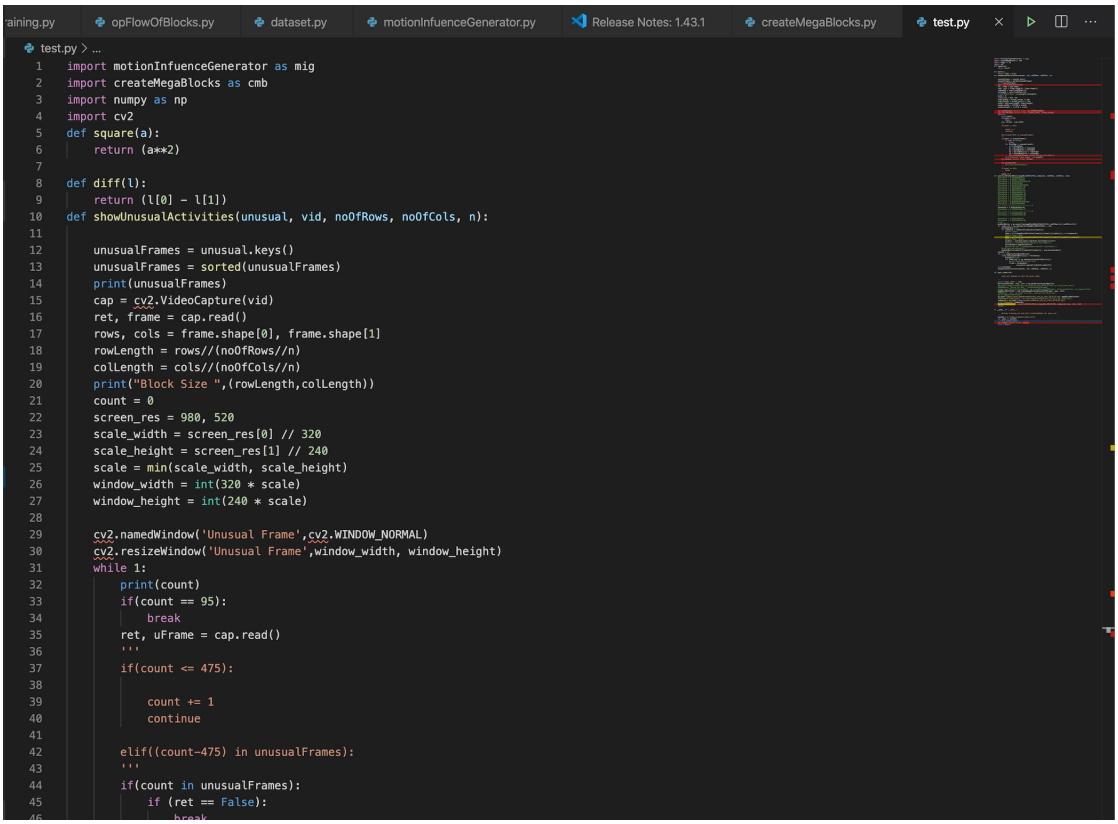
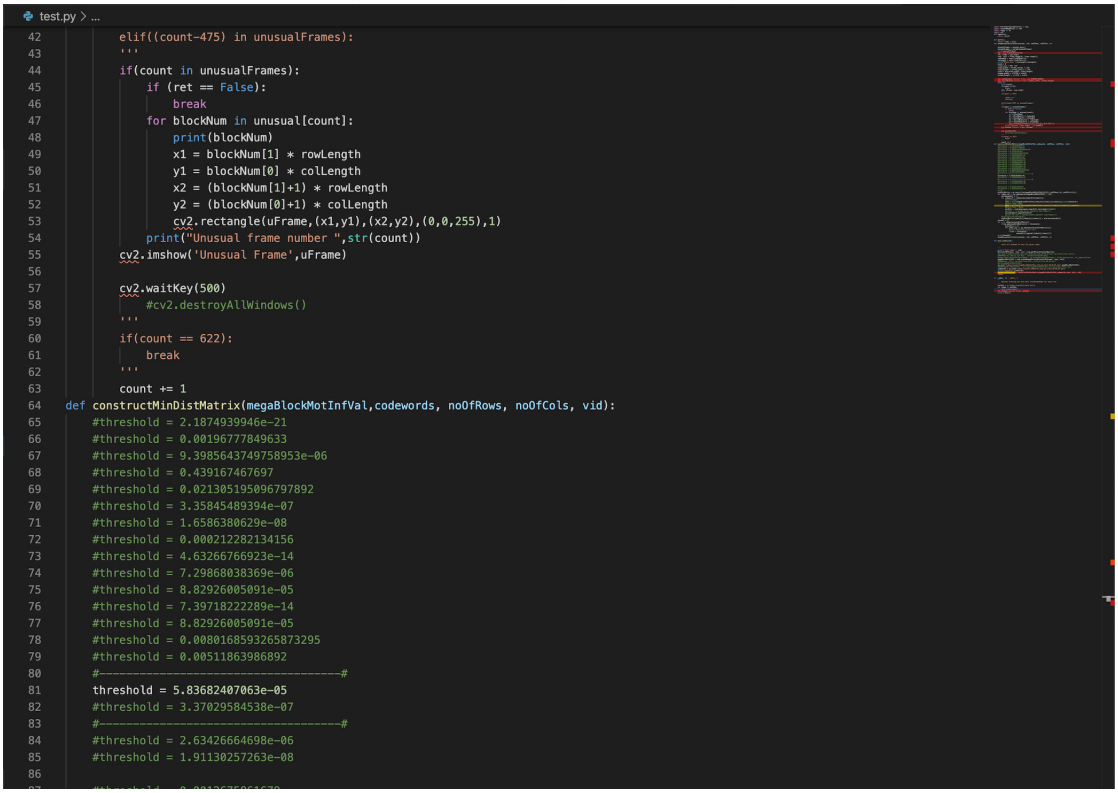
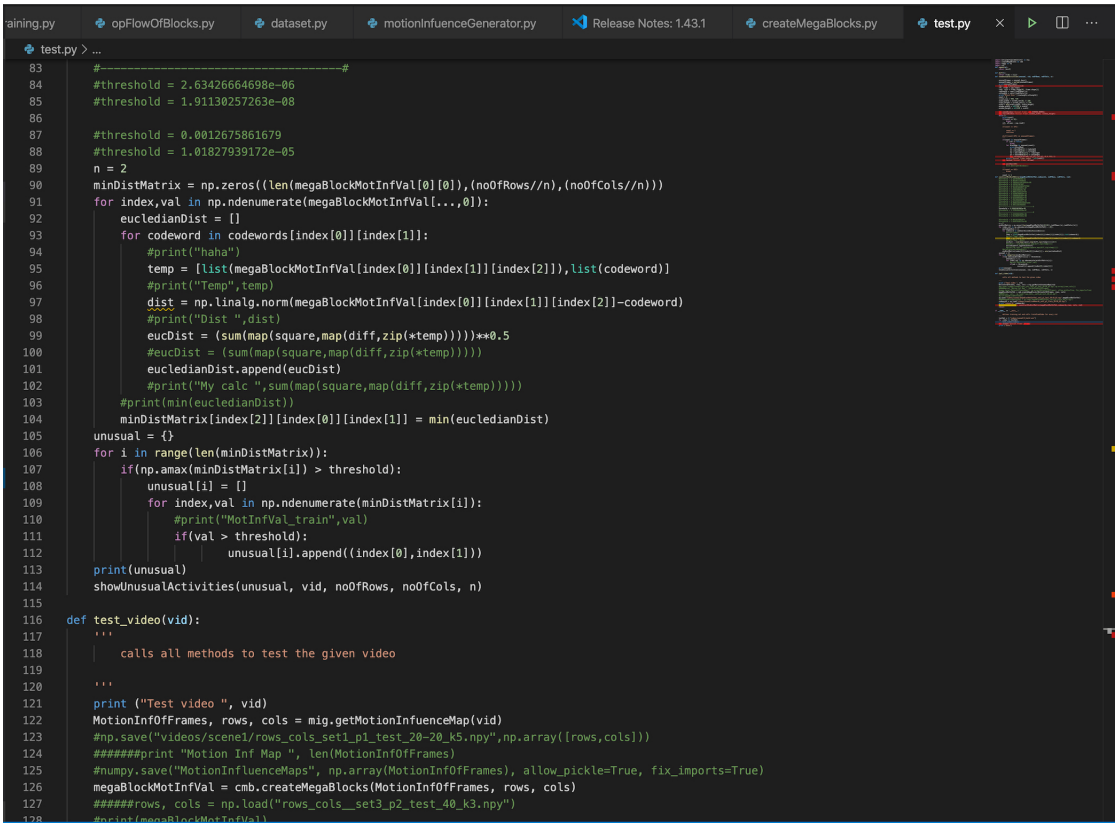


Figure 5.7: Testing code



```
test.py > ...
42          elif((count-475) in unusualFrames):
43          '''
44          if(count in unusualFrames):
45              if (ret == False):
46                  break
47              for blockNum in unusual[count]:
48                  print(blockNum)
49                  x1 = blockNum[1] * rowLength
50                  y1 = blockNum[0] * colLength
51                  x2 = (blockNum[1]+1) * rowLength
52                  y2 = (blockNum[0]+1) * colLength
53                  cv2.rectangle(uFrame,(x1,y1),(x2,y2),(0,0,255),1)
54              print("Unusual frame number ",str(count))
55          cv2.imshow('Unusual Frame',uFrame)
56
57          cv2.waitKey(500)
58              #cv2.destroyAllWindows()
59          '''
60          if(count == 622):
61              break
62          '''
63          count += 1
64  def constructMinDistMatrix(megaBlockMotInfVal,codewords, noOfRows, noOfCols, vid):
65      #threshold = 2.1874939946e-21
66      #threshold = 0.00196777849633
67      #threshold = 9.3985643749758953e-06
68      #threshold = 0.439167467697
69      #threshold = 0.021305195096797892
70      #threshold = 3.35845489394e-07
71      #threshold = 1.6586380629e-08
72      #threshold = 0.000212282134156
73      #threshold = 4.63266766923e-14
74      #threshold = 7.29868038369e-06
75      #threshold = 8.82926005091e-05
76      #threshold = 7.39718222289e-14
77      #threshold = 8.82926005091e-05
78      #threshold = 0.00801685932658732 95
79      #threshold = 0.00511863986892
80      #-----------------------------------#
81      threshold = 5.83682407063e-05
82      #threshold = 3.37029584538e-07
83      #-----------------------------------#
84      #threshold = 2.63426664698e-06
85      #threshold = 1.91130257263e-08
86
```

Figure 5.8: Testing Code



```
aining.py | opFlowOfBlocks.py | dataset.py | motionInfuenceGenerator.py | Release Notes: 1.43.1 | createMegaBlocks.py | test.py
test.py > ...
83      #-----------------------------------#
84      #threshold = 2.63426664698e-06
85      #threshold = 1.91130257263e-08
86
87      #threshold = 0.0012675861679
88      #threshold = 1.01827939172e-05
89      n = 2
90      minDistMatrix = np.zeros((len(megaBlockMotInfVal[0][0]),(noOfRows//n),(noOfCols//n)))
91      for index,val in np.ndenumerate(megaBlockMotInfVal[...,0]):
92          eucledianDist = []
93          for codeword in codewords[index[0]][index[1]]:
94              #print("haha")
95              temp = [list(megaBlockMotInfVal[index[0]][index[1]][index[2]]),list(codeword)]
96              #print("Temp",temp)
97              dist = np.linalg.norm(megaBlockMotInfVal[index[0]][index[1]][index[2]]-codeword)
98              #print("Dist ",dist)
99              eucDist = (sum(map(square,map(diff,zip(*temp)))))**0.5
100             #eucDist = (sum(map(square,map(diff,zip(*temp)))))
101             eucledianDist.append(eucDist)
102             #print("My calc ",sum(map(square,map(diff,zip(*temp)))))
103         #print(min(eucledianDist))
104         minDistMatrix[index[2]][index[0]][index[1]] = min(eucledianDist)
105     unusual = {}
106     for i in range(len(minDistMatrix)):
107         if(np.amax(minDistMatrix[i]) > threshold):
108             unusual[i] = []
109             for index,val in np.ndenumerate(minDistMatrix[i]):
110                 #print("MotInfVal_train",val)
111                 if(val > threshold):
112                     unusual[i].append((index[0],index[1]))
113     print(unusual)
114     showUnusualActivities(unusual, vid, noOfRows, noOfCols, n)
115
116 def test_video(vid):
117     '''
118         calls all methods to test the given video
119
120     '''
121     print ("Test video ", vid)
122     MotionInfOfFrames, rows, cols = mig.getMotionInfuenceMap(vid)
123     #np.save("videos/scene1/rows_cols_set1_p1_test_20-20_k5.npy",np.array([rows,cols]))
124     #######print "Motion Inf Map ", len(MotionInfOfFrames)
125     #numpy.save("MotionInfluenceMaps", np.array(MotionInfOfFrames), allow_pickle=True, fix_imports=True)
126     megaBlockMotInfVal = cmb.createMegaBlocks(MotionInfOfFrames, rows, cols)
127     ######rows, cols = np.load("rows_cols__set3_p2_test_40_k3.npy")
128     #print(megaBlockMotInfVal)
```

Figure 5.9: Testing code

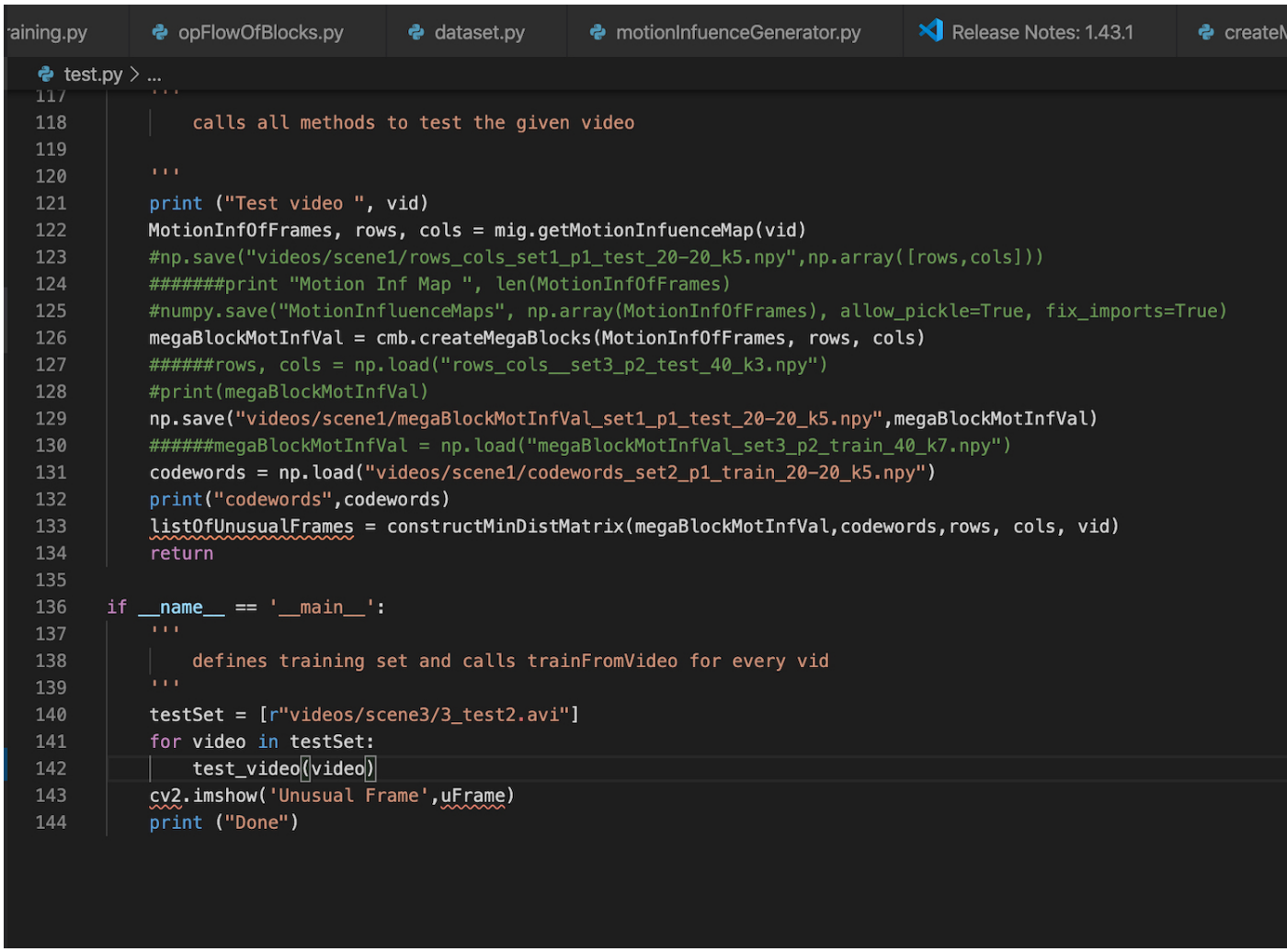


Figure 5.10: Testing Code

CHAPTER 6

TRAINING OF DATASET

6.1 Training

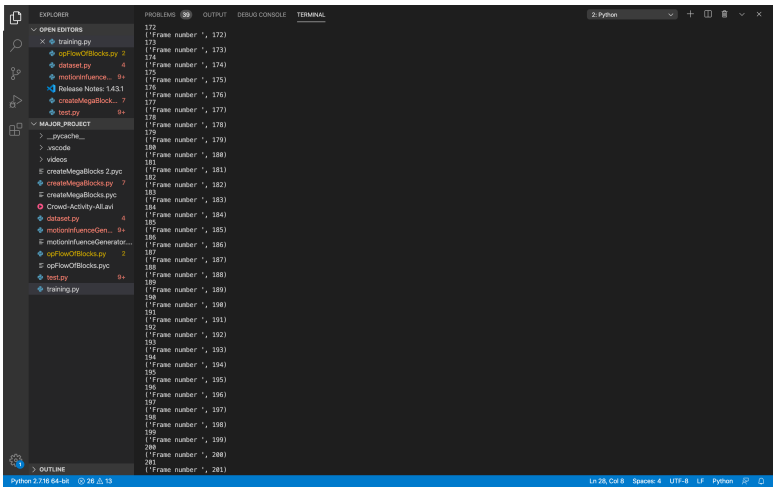


Figure 6.1: Creating Frames

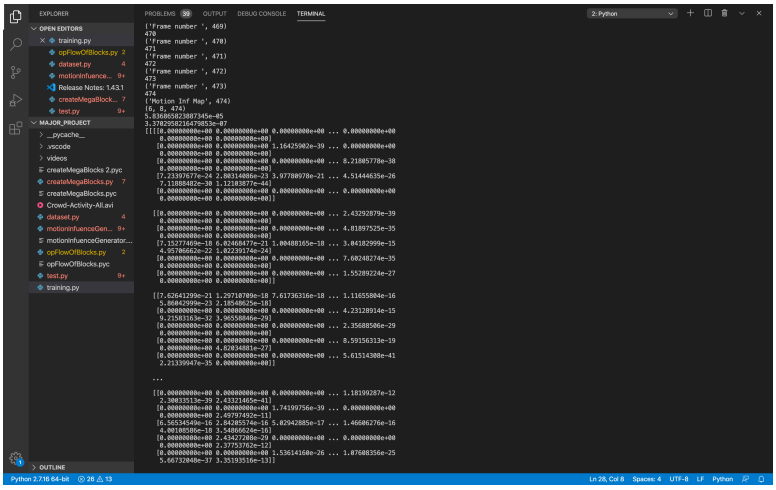


Figure 6.2: Training Frames

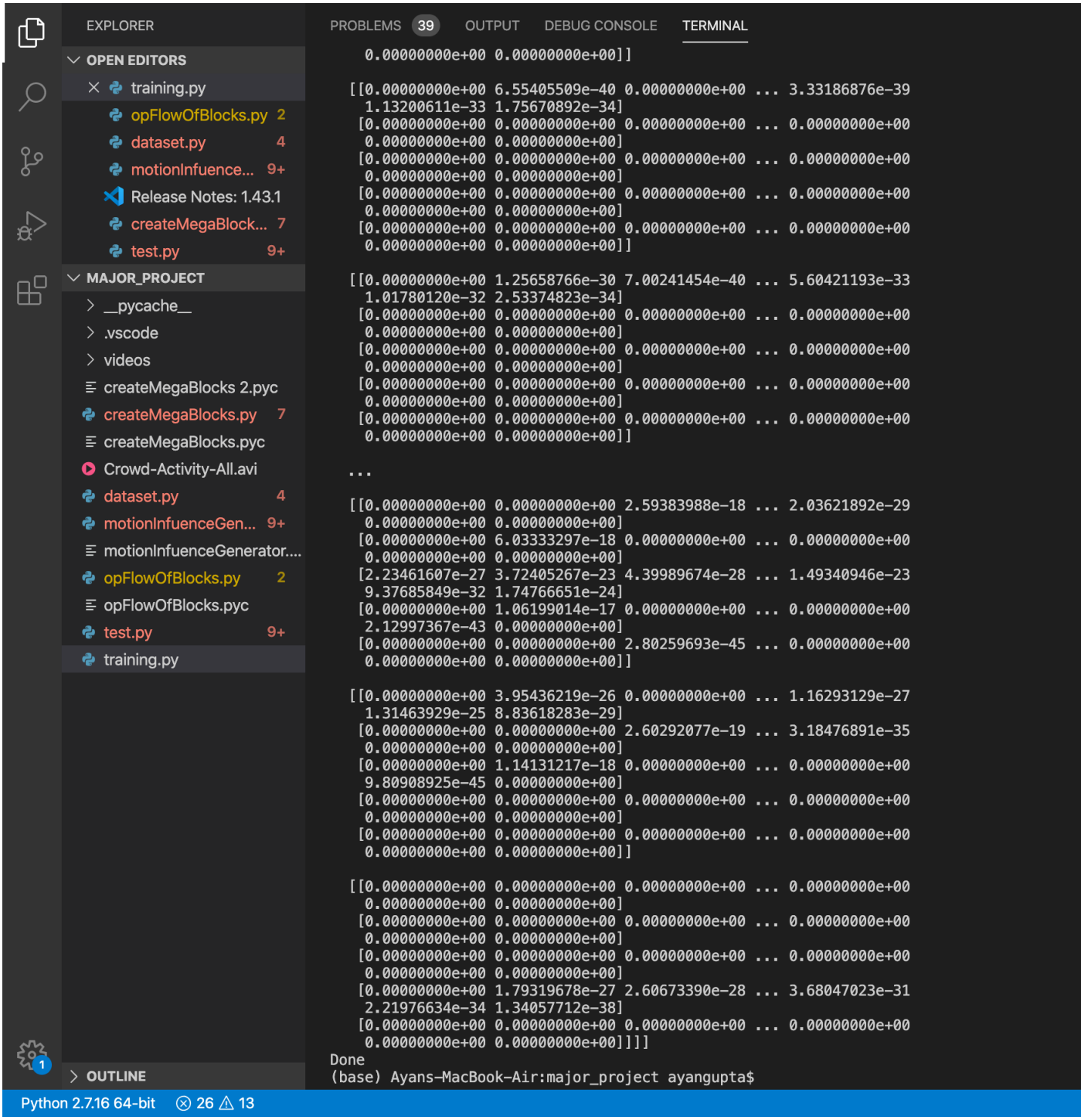


Figure 6.3: Combining frames and training model

CHAPTER 7

TESTING OF DATASET

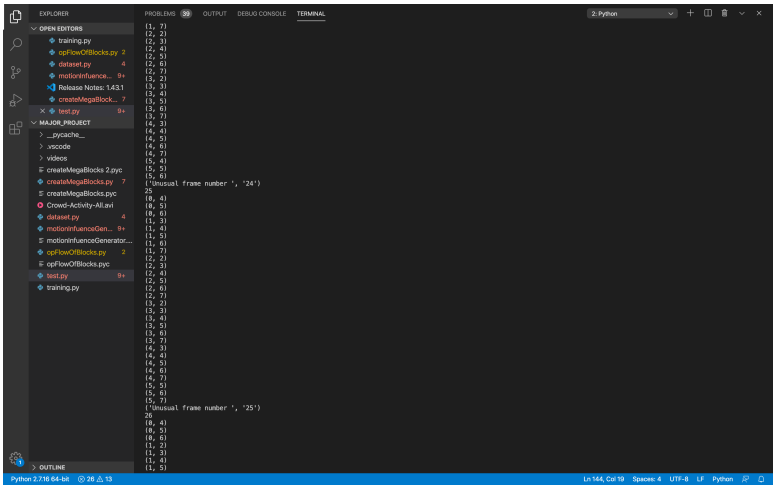


Figure 7.1: Creating Frames

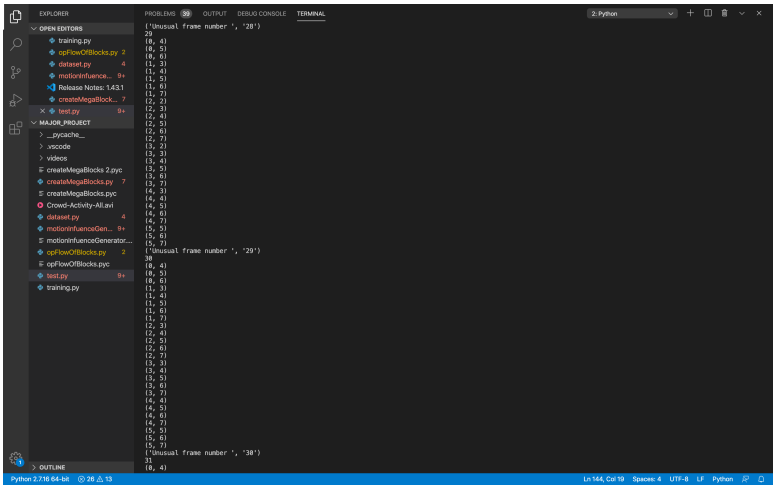


Figure 7.2: Testing Frames

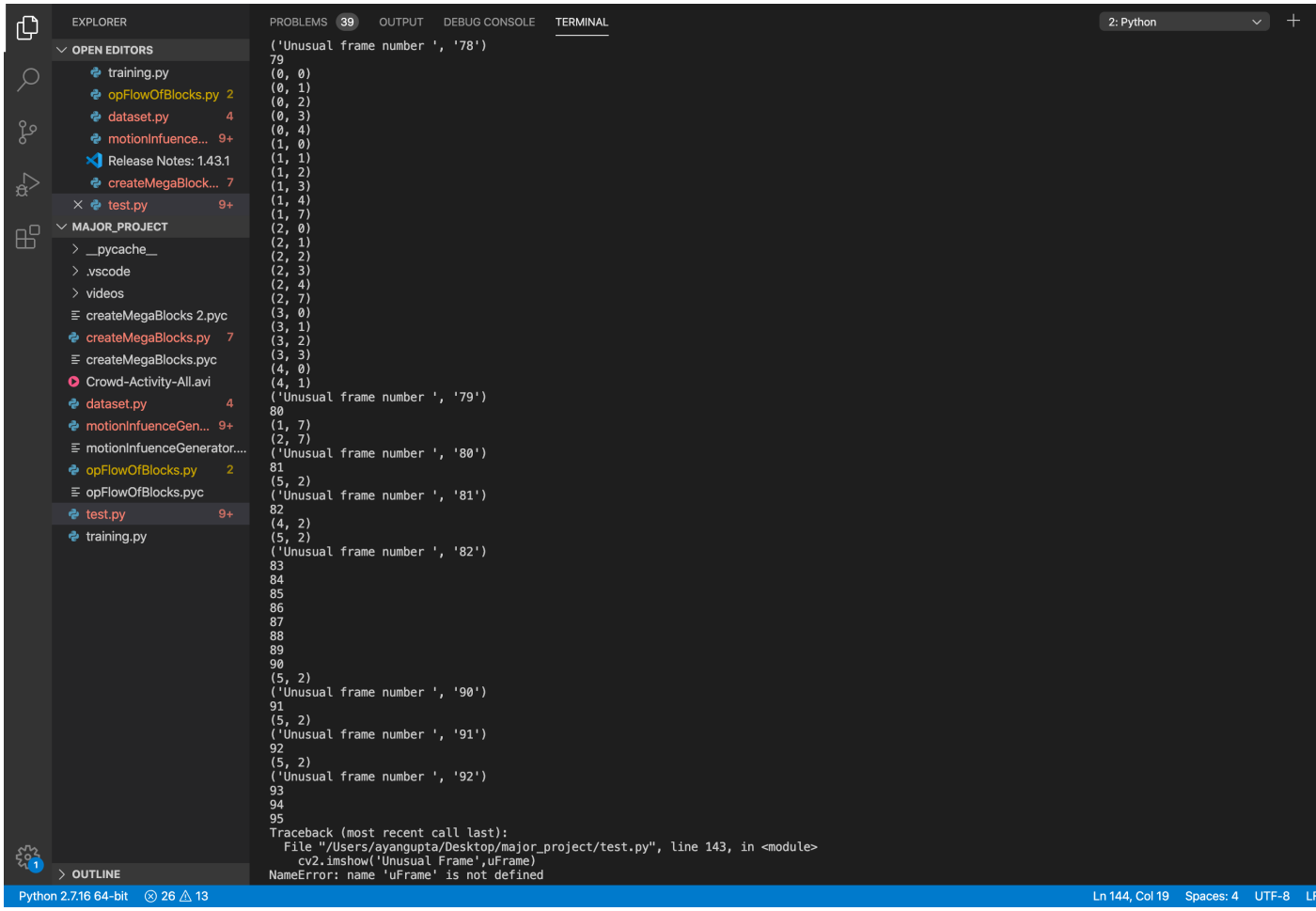


Figure 7.3: Combining frames and testing model

CHAPTER 8

EXPERIMENT RESULT/ OUTPUT

The outcomes and findings produced by this model will be discussed in this portion. The training of the model with identified algorithms gave the satisfaction of the test results because the unusual behavior occurring in the real-time camera has been detected successfully. Because the team has not been equipped with huge data sets or a broad variety of unusual events, a common form of unusual behavior may only be observed, in fact during a big meeting with a daylight and strong camera quality.

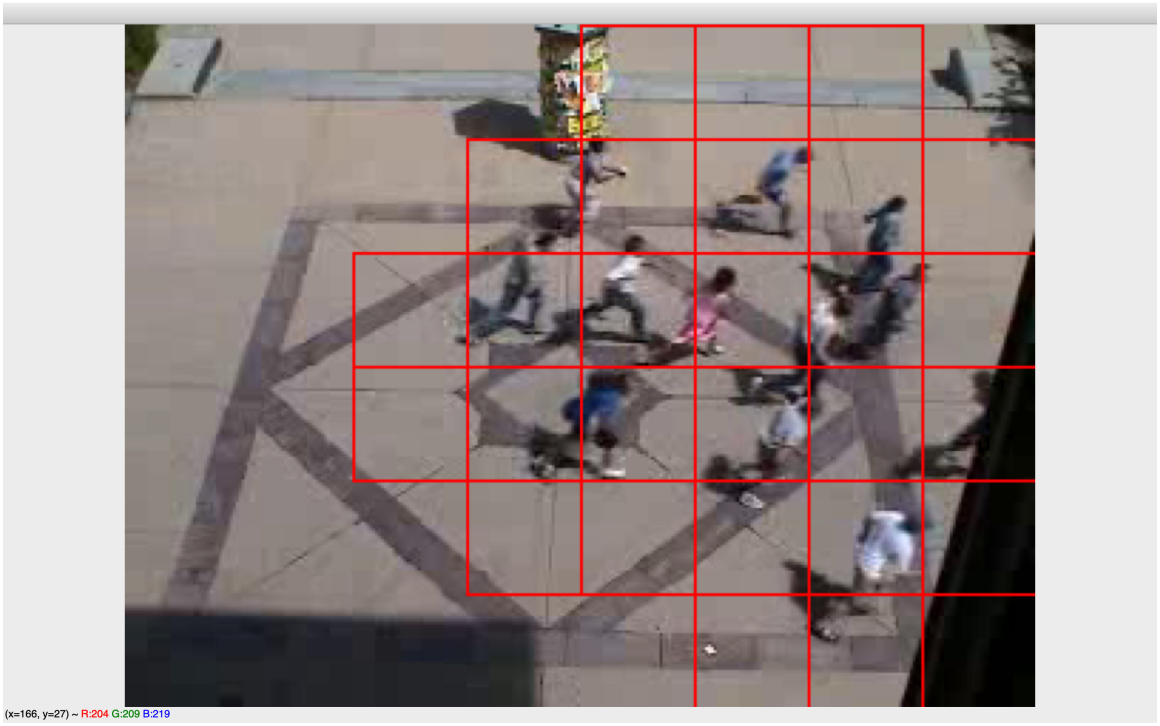


Figure 8.1: Output

CHAPTER 9

CONCLUSION

With the growing amount of police cameras mounted in private and public locations, the automatic and insightful study of victimization computers is needed. In a extremely jam-panicked environment, unusual incident or behavior identification was of pleasant concern recently in vision-based inquiries, mostly by police.

Unlike in the literature, which focussed on identification of unusual behaviors by natives or the environment, it appears to display a way of portraying motion features within a sight frame and identifying unusual human behavior in a extremely panicled setting. The method classifies a environment as normal or not ordinary and locates the areas of odd behavior at intervals, as a consequence of a practical control of the suggested motion effect chart for each house and period. For a genuine application, a wise CCTV should have a uniform framework at intervals, with the efficiency of each indigenous and world unusual activity. The method aims to test the effectiveness of the proposed methodology, which has various comparative ways out of literature, in laboratory experiments on 2 Public Data Sets, i.e. UMN and USCD data structures. The U-turn dataset analysis validates the methodology designed and operates in several specific conditions.

The proposed methodology provides a restriction where the input video has

a strong distortion, since the motion effect chart supports the direction of motion and the scale of the moving objects. Of example, the method has some failure events. Image. Fig. Fifteen showed a single failure case in which Associate produced the expected motion effect map due to distortion of perspective in Associate in nursing input picture. Wrong detection In the chart, the bike is gradually going in unnecessarily diagonal direction at the right bottom (marked with a red box). Our procedure, in these situations, does not differentiate it from the other side of the foot. The most famous aspects of this film, though, are uncommon movements in the crowded environment, which often create a good location for the cameras and render tiny items a present in the background, but they do not vitally change perspective. Furthermore, our experiments were limited to a fixed point of view and the relevance of the approach for police investigation cameras with pan, zoom or tilt functionality is limited. The proposed equipment currently only covers static cameras. The effects of position service can, however, easily be generalized to PTZ cameras. In that respect, the device appears to believe that major shifts or scaling, inclination, or zooms, which may be a potential weakness of our methodology, are impossible in an overly situation. The management of such functions is an future research neighborhood and can be carried out by further increasing the procedure expected.

CHAPTER 10

FUTURE ENHANCEMENT

Future research could enhance the accuracy of this existing model. As this model is trained only with such dataset where people start running abnormally and can only be tested in a public place only. This can be enhanced by developing a common model that can detect unusual activities at different types of places like country boarders, Atm machine rooms, malls etc.

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6	Training Of Our Dataset	0	0	0
7	Testing Of Dataset	1	0	0
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