HUMAN ACTIVITY RECOGNITION USING MACHINE LEARNING PROCESS

Submitted in partial fulfillment of the requirements for the award of

Bachelor of Engineering degree in Computer Science and Engineering

By

SOMISETTI NAVEEN (Reg.No - 39110957)
THOLUCHURI GANGADHAR (Reg.No – 39111030)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHOOL OF COMPUTING

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC
JEPPIAAR NAGAR, RAJIV GANDHISALAI,
CHENNAI - 600119

APRIL- 2023

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with ―A‖ grade by NAAC

Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600 119

www.sathyabama.ac.in

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Somisetti Naveen(39110957) and Tholuchuri Gangadhar(39111030)** who carried out the Project Phase-2 entitled **"HUMAN ACTIVITY RECOGNITION USING MACHINE LEARNING PROCESS "** under my supervision from January 2023 to April 2023.

Internal Guide

Dr. S. DHAMODARAN M.E., Ph.D.

Head of the Department

Dr. L. LAKSHMANAN, M.E., Ph.D.

Submitted for Viva voce Examination held on 20.04.2023

InternalExaminer **ExternalExaminer**

DECLARATION

I, **Somisetti Naveen (Reg.No- 39110957),** hereby declare that the Project Phase-2 Report entitled **"HUMAN ACTIVITY RECOGNITION USING MACHINE LEARNING PROCESS"** done by me under the guidance of **Dr. S. Dhamodaran, M.E.,Ph.D** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in **Computer Science and Engineering**.

DATE: 20-04-2023

SOMISETTI NAVEEN

PLACE:Chennai **SIGNATURE OF THE CANDIDATE**

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to **Board of Management** of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr. T.Sasikala M.E., Ph. D**, **Dean**, School of Computing, **Dr. L. Lakshmanan M.E., Ph.D.,** Head of the Department of Computer Science and Engineering for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Project Guide **Dr.S.Dhamodaran M.E.,Ph.D,**for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of my phase-1 project work.

I wish to express my thanks toall Teaching and Non-teaching staff members of the **Department of Computer Science and Engineering** who were helpful in many ways for the completion of the project.

ABSTRACT

Human activity recognition requires to predict the action of a person based on sensor-generated data. It has attracted major interest in the past few years, thanks to the large number of applications enabled by modern ubiquitous computing devicesThe analysis of dataset by supervised machine learning technique(SMLT) to capture several information's like, variable identification, uni-variate analysis, bi-variate and multi-variate analysis, missing value treatments and analyze the data validation, data cleaning/preparing and data visualization will be done on the entire given dataset. To propose a machine learning-based method to accurately predict the stock price Index value by prediction results in the form of stock price increase or stable state best accuracy from comparing supervise classification machine learning algorithms. Additionally, to compare and discuss the performance of various machine learning algorithms from the given transport traffic department dataset with evaluation. dataset with evaluation classification report, identify the confusion matrix and to categorizing data from priority and the result shows that the effectiveness of the proposed machine learning algorithm technique can be compared with best accuracy with precision, Recall and F1 Score.

CHAPTER 1

INTRODUCTION

Human activity recognition requires to predict the action of a person based on sensor-generated data. It has attracted major interest in the past few years, thanks to the large number of applications enabled by modern ubiquitous computing devices. It classify data into activity like Walking, walking up stairs, walking down stairs, sitting, standing, laying are recognized. Sensor data generated using its accelerometer and gyroscope, the sensor signals (accelerometer and gyroscope) were pre-processed by applying noise filters. The sensor acceleration signal, which has gravitational and body motion components, was separated using a Butterworth low-pass filter into body acceleration and gravity. The gravitational force is assumed to have only low frequency components. a vector of features was obtained by calculating variables from the time and frequency domain. The aim is to predict machine learning based techniques for Human Activity Recognition results in best accuracy. The analysis of dataset by supervised machine learning technique(SMLT) to capture several information's like, variable identification, uni-variate analysis, bi-variate and multi-variate analysis, missing value treatments and analyze the data validation, data cleaning/preparing and data visualization will be done on the entire given dataset. To propose a machine learning-based method to accurately predict the stock price Index value by prediction results in the form of stock price increase or stable state best accuracy from comparing supervise classification machine learning algorithms. Additionally, to compare and discuss the performance of various machine learning algorithms from the given transport traffic department dataset with evaluation. dataset with evaluation classification report, identify the confusion matrix and to categorizing data from priority and the result shows that the effectiveness of the proposed machine learning algorithm technique can be compared with best accuracy with precision, Recall and F1 Score.

CHAPTER 2

LITERATURE SURVEY

Title : A review of human activity Recognition methods

Author Michalis Vrigkas1, Christophoros Nikou1 and Ioannis A. Kakadiaris

Year **:** 16- November- 2016

Recognizing human activities from video sequences or still images is a challenging task due to problems, such as background clutter, partial occlusion, changes in scale, view point, lighting, and appearance. Many applications, including video surveillance systems, human-computer interaction, and robotics for human behavior characterization, require a multiple activity recognition system. In this work, we provide a detailed review of recent and state-of-the-art research advances in the field of human activity classification. We propose a categorization of human activity methodologies and discuss their advantages and limitations. In particular, we divide human activity classification methods in to two large categories according to whether they use data from different modalities or not. Then each of these categories is further analyzed into sub-categories, which reflect how they model human activities and what type of activities they are interested in. Moreover, we provide a comprehensive analysis of the existing, publicly available human activity classification datasets and examine the requirements for an ideal human activity recognition dataset .A comprehensive review of existing human activity classification benchmarks was also presented and we examined the challenges of data acquisition to the problem of understanding human activity. Finally, we provided the characteristics of building an ideal human activity recognition system.

Title : A Survey on Activity Recognition and Behavior Understanding in Video Surveillance

Author : Sarvesh Vishwakarma· ,Anupam Agrawal

Year : · October 2012

This paper provides a comprehensive survey for activity recognition in video surveillance. It starts with a description of simple and complex human activity, and

various applications. The applications of activity recognition are manifold, ranging from visual surveillance through content based retrieval to human computer interaction. The organization of this paper covers all aspects of the general framework of human activity recognition. Then it summarizes and categorizes recent-published research progresses under a general framework.

In this survey, a brief overview of all preprocessing (i.e., detection, classification, and tracking) steps has been included. There are many limitations and open challenges, which we have highlighted by providing the comparison. Motion detection in dynamic scenes is a difficult task in the presence of illumination and weather changes, detection of a shadow, self-occlusion, and complete occlusion. Fast and accurate methods Ares till needed for segmentation techniques to affect the performance of latter stages. Description based approaches are doing well to recognize high level activities whose sub events are organized concurrently and occurring in a sequential manner in comparison to the statistical or syntactic approaches. The statistical and syntactic approaches can effectively handle the activity video polluted with noise.

Title : Trends over 5 Decades in U.S. Occupation-Related Physical Activity and Their Associations with Obesity

Author: P Timothy S. Church, Diana M. Thomas , Catrine Tudor-Locke , Peter T. Katzmarzyk, Conrad P. Earnest , Ruben Q. Rodarte , Corby K. Martin , Steven N. Blair , Claude Bouchard

Year : May 2011

The true causes of the obesity epidemic are not well understood and there are few longitudinal population based data published examining this issue. The objective of this analysis was to examine trends in occupational physical activity during the past 5 decades and explore how these trends relate to concurrent changes in body weight in the U.S. : Analysis of energy expenditure for occupations in U.S. private industry since 1960 using data from the U.S. Bureau of Labor Statistics. Mean body weight was derived from the U.S. National Health and Nutrition Examination Surveys (NHANES). In the early 1960’s almost half the jobs in private industry in the U.S. required at least moderate intensity physical activity whereas now less than 20% demand this level of energy expenditure. Since 1960 the estimated mean daily energy expenditure due to work related physical activity has dropped by more than 100 calories in both women and men. Energy balance model predicted weights

based on change in occupation-related daily energy expenditure since 1960. Given a baseline weight of 76.9 kg in 1960–02, we estimated that a 142 calories reduction would result in an increase in mean weight to 89.7 kg, which closely matched the mean NHANES weight of 91.8 kg in 2003–06. The results were similar for women. Over the last 50 years in the U.S. we estimate that daily occupation-related energy expenditure has decreased by more than 100 calories, and this reduction in energy expenditure accounts for a significant portion of the increase in mean U.S. body weights for women and men.

Title **:** Human detection in surveillance videos and its applications - a review
Author **:** **Sarvesh Vishwakarma·Anupam Agrawal**
Year **:** May 2011

Detecting human beings accurately in a visual surveillance system is crucial for diverse application areas including abnormal event detection, human gait characterization, congestion analysis, person identification, gender classification and fall detection for elderly people. The first step of the detection process is to detect an object which is in motion. Object detection could be performed using background subtraction, optical flow and spatio-temporal filtering techniques. Once detected, a moving object could be classified as a human being using shape-based, texture-based or motion-based features. A comprehensive review with comparisons on available techniques for detecting human beings in surveillance videos is presented in this paper At the end of this paper, a discussion is made to point the future work needed to improve the human detection process in surveillance videos. These include exploiting a multi-view approach and adopting an improved model based on localized parts of the image.

Title **:** A Study of Vision based Human Motion Recognition and Analysis.
Author **:** Geetanjali Vinayak Kale, Varsha Hemant Patil
Year **:** 2 - July-December 2016
Vision based human motion recognition has fascinated many researchers due to its critical challenges and a variety of applications. The applications range from simple gesture recognition to complicated behavior understanding in surveillance system. This leads to major development in the techniques related to human motion

representation and recognition. This paper discusses applications, general framework of human motion recognition, and the details of each of its components. The paper emphasizes on human motion representation and the recognition methods along with their advantages and disadvantages. This study also discusses the selected literature, popular datasets, and concludes with the challenges in the domain along with a future direction. Hierarchical approaches have shown great success for the recognition of complicated actions and interactions. Techniques like bag-of-words, and HMM that have shown success in speech and text recognition are successfully applied for action recognition. Advances in fields like Artificial Intelligence and Machine Learning needs to be applied for human motion recognition. Now, with efforts of research community in human motion recognition, products with intelligent camera systems for social and commercial applications should be made available in market.

2.1 INFERENCES FROM LITREATURE SURVEY

Recognizing human activities from video sequences or still images is a challenging task due to problems, such as background clutter, partial occlusion, changes in scale, view point, lighting, and appearance. Many applications, including video surveillance systems, human-computer interaction, and robotics for human behavior characterization, require a multiple activity recognition system. In this work, we provide a detailed review of recent and state-of-the-art research advances in the field of human activity classification. We propose a categorization of human activity methodologies and discuss their advantages and limitations. In particular, we divide human activity classification methods in to two large categories according to whether they use data from different modalities or not. Then each of these categories is further analyzed into sub-categories, which reflect how they model human activities and what type of activities they are interested in. Moreover, we provide a comprehensive analysis of the existing, publicly available human activity classification datasets and examine the requirements for an ideal human activity recognition dataset .A comprehensive review of existing human activity classification benchmarks was also presented and we examined the challenges of data acquisition to the problem of understanding human activity. Finally, we provided the characteristics of building an ideal human activity recognition system.

2,2 OPEN PROBLEMS IN EXISTING SYSTEM

This paper proposes and develops a cascaded deep neural network (CDNN) to analyze data, collected using the sensors of smart-phones, to accurately localize an object in an indoor environment. There are many existing studies that have attempted to identify the location of an inhabitant in a room through the analysis of the radio signal strength (RSS), with varying success. The strength of the RSS varies with distance and the presence of obstacles within the line of sight. As a result, an automated system using RSS signal in one environment might not work in another one. In this paper therefore places. The proposed CDNN suffers from space and computational complexities, specially for training each of the DNNs in the CDNN. plan to improve the CDNN structure such that the number of DNNs can be reduced localization accuracy.

CHAPTER 3
REQUIREMENT ANALYSIS

3.1 FEASIBILITY STUDIES/RISK ANALYSIS OF THE PROJECT

Data Wrangling

In this section of the report will load in the data, check for cleanliness, and then trim and clean given dataset for analysis. Make sure that the document steps carefully and justify for cleaning decisions.

Data collection

The data set collected for predicting given data is split into Training set and Test set. Generally, 7:3 ratios are applied to split the Training set and Test set. The Data Model which was created using Random Forest, logistic, Decision tree algorithms and Support vector classifier (SVC) are applied on the Training set and based on the test result accuracy, Test set prediction is done.

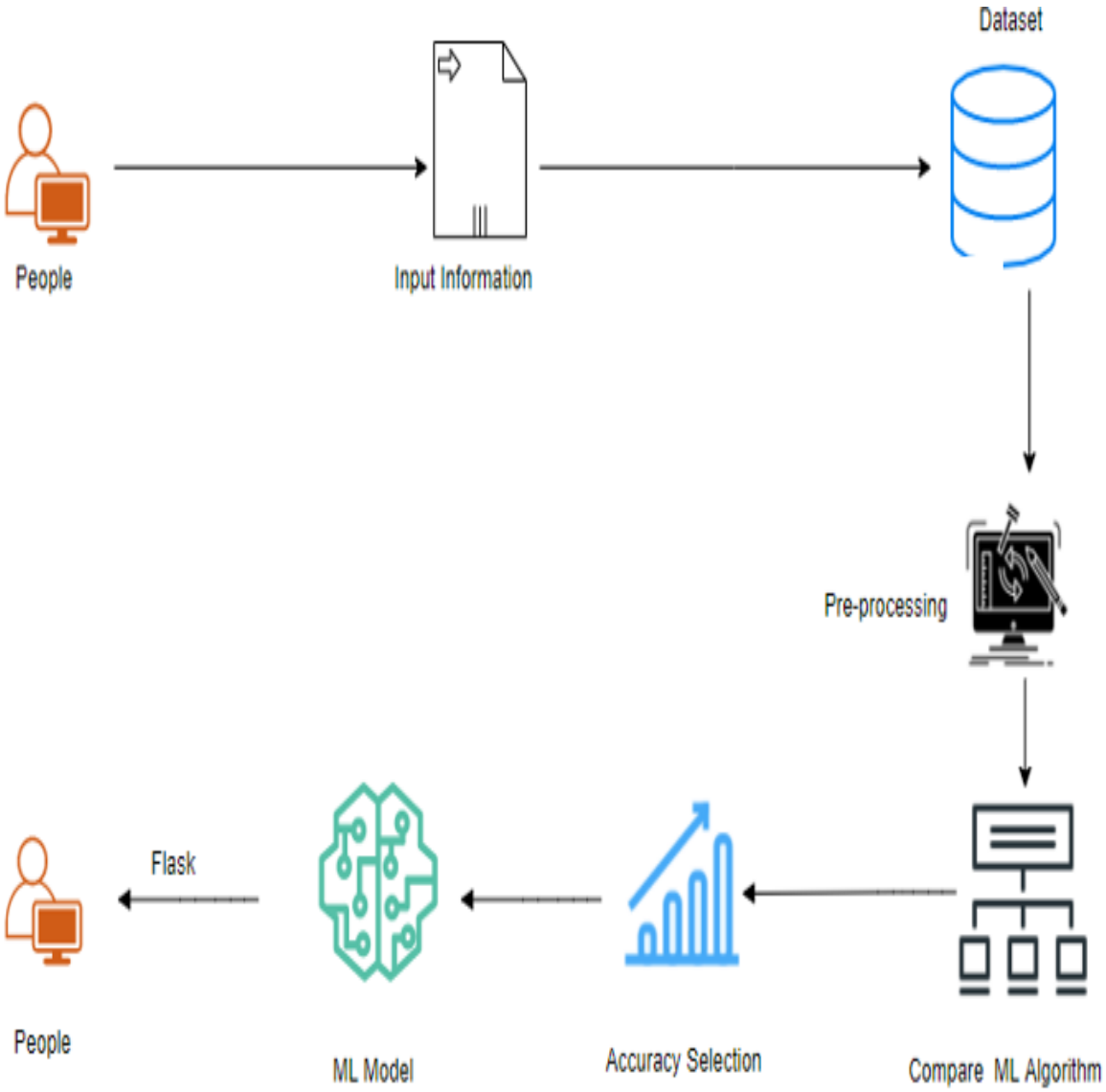
Preprocessing

The data which was collected might contain missing values that may lead to inconsistency. To gain better results data need to be preprocessed so as to improve the efficiency of the algorithm. The outliers have to be removed and also variable conversion need to be done.

Building the classification model

The predicting the Human activity recognition, decision tree algorithm prediction model is effective because of the following reasons: It provides better results in classification problem.Recognizing human activities from video sequences or still images is a challenging task due to problems, such as background clutter, partial occlusion, changes in scale, view point, lighting, and appearance. Many applications, including video surveillance systems, human-computer interaction, and robotics for human behavior characterization, require a multiple activity recognition system. In this work, we provide a detailed review of recent and state-of-the-art research advances in the field of human activity classification. We propose a categorization of human activity methodologies and discuss their advantages and limitations. In particular, we divide human activity classification methods in to two large categories

according to whether they use data from different modalities or not. Then each of these categories is further analyzed into sub-categories, which reflect how they model human activities and what type of activities they are interested in. Moreover, we provide a comprehensive analysis of the existing, publicly available human activity classification datasets and examine the requirements for an ideal human activity recognition dataset .A comprehensive review of existing human activity classification benchmarks was also presented and we examined the challenges of data acquisition to the problem of understanding human activity. Finally, we provided the characteristics of building an ideal human activity recognition system.



Figure(4.1)

- It proposes a soft attention based model for action recognition. The model learns to focus selectively on the important parts of the video.

3.2 SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT

Requirements are the basic constrains that are required to develop a system. Requirements are collected while designing the system. The following are the requirements that are to be discussed.

1. Functional requirements
2. Non-Functional requirements
3. Environment requirements

A. Hardware requirements

B. software requirements

Functional requirements:

The software requirements specification is a technical specification of requirements for the software product. It is the first step in the requirements analysis process. It lists requirements of a particular software system. The following details to follow the special libraries like sk-learn, pandas, numpy, matplotlib and seaborn.

Non-Functional Requirements:

Process of functional steps,

1. Problem define
2. Preparing data
3. Evaluating algorithms
4. Improving results
5. Prediction the result

Environmental Requirements:

1. Software Requirements:

Operating System : Windows

Tool : Anaconda with Jupyter Notebook

2. Hardware requirements:

Processor : Pentium IV/III

Hard disk : minimum 80 GB

RAM : minimum 2 GB

List of Modules:

- Data Preprocessing Technique
- Data analysis of visualization
- Comparing Algorithm with prediction in the form of best accuracy result

Deployment using Flask

Machine learning needs data gathering have lot of past data's. Data gathering have sufficient historical data and raw data. Before data pre-processing, raw data can't be used directly. It's used to preprocess then, what kind of algorithm with model. Training and testing this model working and predicting correctly with minimum errors. Tuned model involved by tuned time to time with accuracy

Given a set of training examples, each marked as belonging to one or the other of two categories, an SVM training algorithm builds a model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier.
The objective of applying SVMs is to find the best line in two dimensions or the best hyperplane in more than two dimensions in order to help us separate our space into classes. The hyperplane (line) is found through the **maximum margin,** i.e., the maximum distance between data points of both classes.
Don't you think the definition and idea of SVM look a bit abstract? No worries, let me explain in details.

Support Vector, Hyperplane, and Margin

The vector points closest to the hyperplane are known as the **support vector points** because only these two points are contributing to the result of the algorithm, and other points are not. If a data point is not a support vector, removing it has no effect on the model. On the other hand, deleting the support vectors will then change the position of the hyperplane.
The dimension of the hyperplane depends upon the number of features. If the number of input features is 2, then the hyperplane is just a line. If the number of input features is 3, then the hyperplane becomes a two-dimensional plane. It becomes difficult to imagine when the number of features exceeds 3.

The distance of the vectors from the hyperplane is called the **margin,** which is a separation of a line to the closest class points. We would like to choose a hyperplane that maximises the margin between classes. The graph below shows what good margin and bad margin are.

Hard Margin

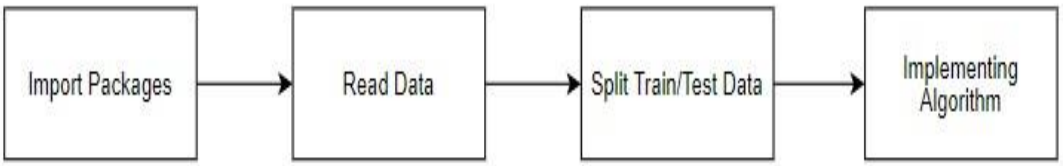
If the training data is linearly separable, we can select two parallel hyperplanes that separate the two classes of data, so that the distance between them is as large as possible.

Soft Margin

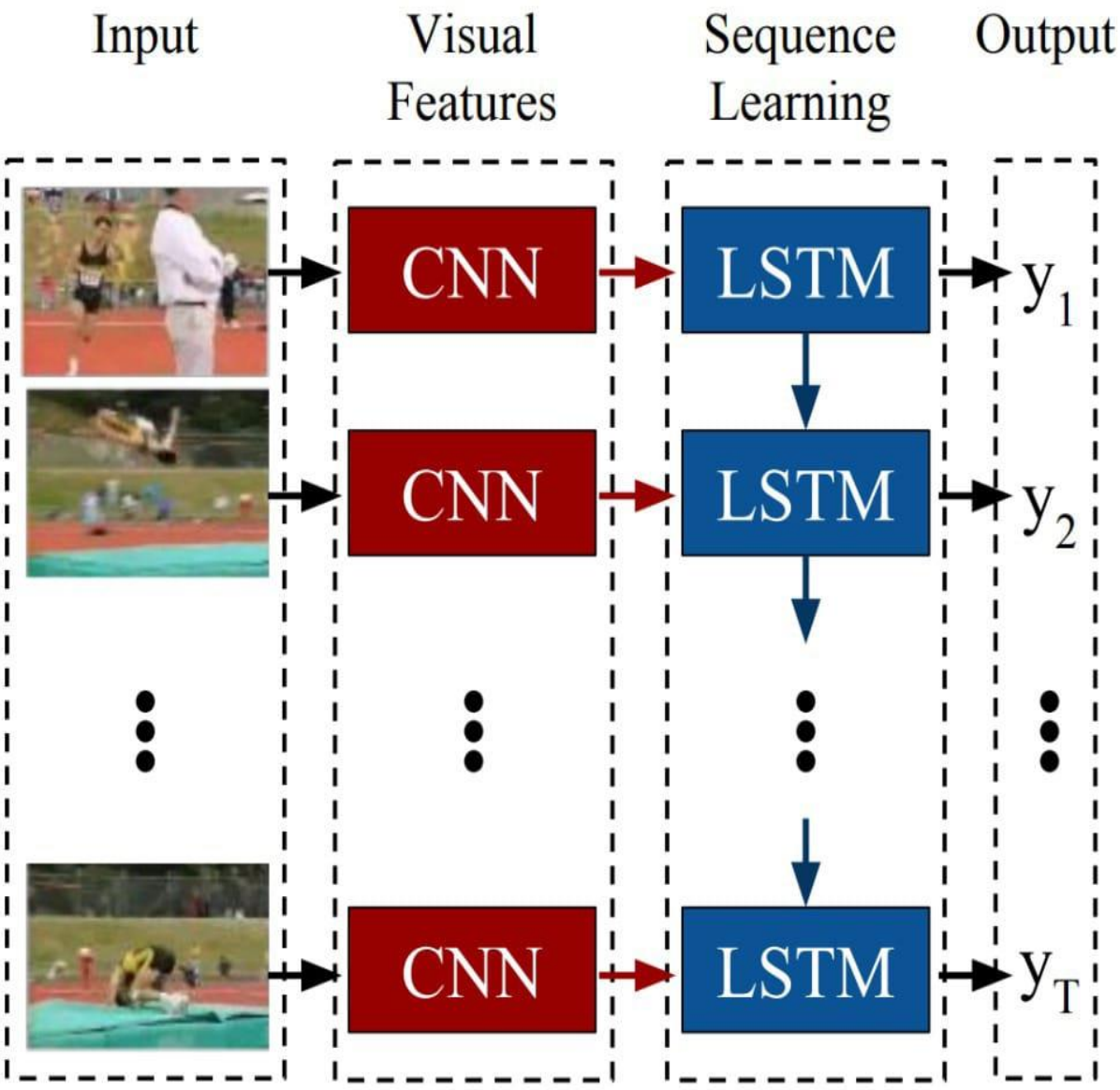
As most of the real-world data are not fully linearly separable, we will allow some margin violation to occur, which is called soft margin classification. It is better to have a large margin, even though some constraints are violated. Margin violation means choosing a hyperplane, which can allow some data points to stay in either the incorrect side of the hyperplane and between the margin and the correct side of the hyperplane.

In order to find the **maximal margin**, we need to maximize the margin between the data points and the hyperplane. In the following session, I will share the mathematical concepts behind this algorithm.

MODULE DIAGRAM

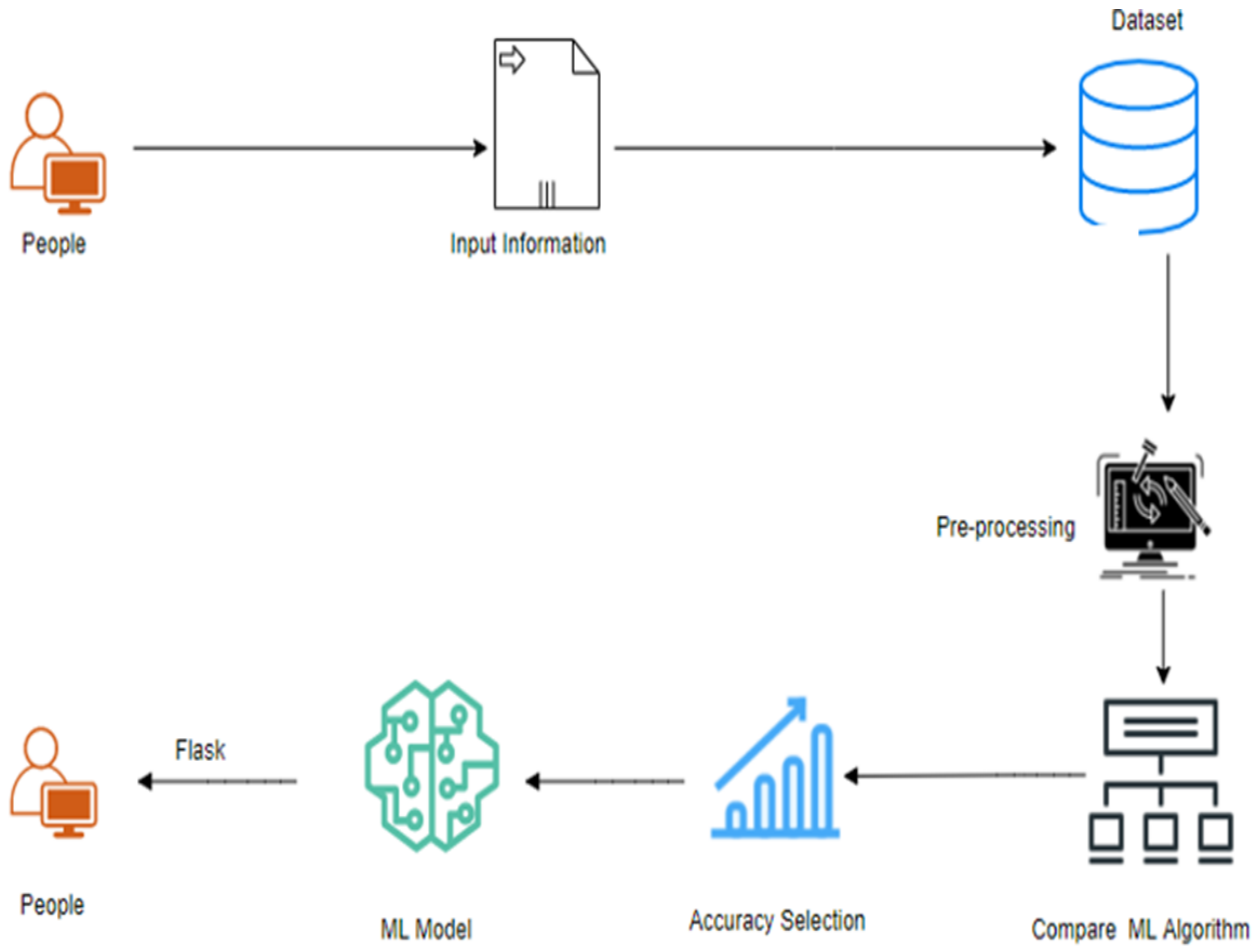


4,1 **SELECTED METHODOLOGY OR PROCESS MODEL**



Figure(4.2)

4,2 ARCHITECTURE / OVERALL DESIGN OF PROPOSED SYSTEM



Figure(4.3)

Fig 4.2: System Architecture for Drowsiness Judgment

The block diagram of the proposed system has been shown in the above figures. The camera captures the image of the person inside the car and sends that to the HOG model to train and it detects each feature from the face using facial landmark technique in the system. The next step in the process would be as it starts to find the position and condition of each feature to analyze, it should detect whether the person is sleeping or not. If any of the features especially the eye and the head pose/state of the person are detected to be abnormal then automatically the systems

starts to produce the siren sound. This is where we will get the final judgment of the state of the driver, whether he is concentrated or distracted.

4.3 DESCRIPTION OF SOFTWARE FOR IMPLEMENTATION AND TESTING PLAN OF THE PROPOSED MODEL/SYSTEM

- Data validation process (Module-01)
- To train a model by given dataset using sklearn package (Module-02)
- Accuracy results of Logistic Regression algorithms (Module-03)
- Accuracy results of decision tree algorithms (Module-04)
- Accuracy results of Random Forest algorithms (Module-05)
- Accuracy results of SVC algorithms (Module-06)
- GUI based prediction results of air quality (Flask)

Figure(4.4)

4.4 PROJECT MANAGEMENT PLAN

Depending on the situation, the literature review may evaluate the sources and advise the reader on the most pertinent or relevant of them. Loan default trends have been long studied from a socio-economic stand point. Most economics surveys believe in empirical modelling of these complex systems in order to be able to predict the loan default rate for a particular individual. The use of machine learning for such tasks is a trend which it is observing now. Some of the survey's to understand the past and present perspective of loan approval or not.

4.5 FINANCIAL REPORT ON ESTIMATED COSTING

The true causes of the obesity epidemic are not well understood and there are few longitudinal population based data published examining this issue. The objective of this analysis was to examine trends in occupational physical activity during the past 5 decades and explore how these trends relate to concurrent changes in body weight in the U.S. .

Mean body weight was derived from the U.S. National Health and Nutrition Examination Surveys (NHANES). In the early 1960's almost half the jobs in private industry in the U.S. required at least moderate intensity physical activity whereas now less than 20% demand this level of energy expenditure. Since 1960 the estimated mean daily energy expenditure due to work related physical activity has dropped by more than 100 calories in both women and men. Energy balance model predicted weights based on change in occupation-related daily energy expenditure since 1960. Given a baseline weight of 76.9 kg in 1960–02, we estimated that a 142 calories reduction would result in an

increase in mean weight to 89.7 kg, which closely matched the mean NHANES weight of 91.8 kg in 2003–06. The results were similar for women. Over the last 50 years in the U.S. we estimate that daily occupation-related energy expenditure has decreased by more than 100 calories, and this reduction in energy expenditure accounts for a significant portion of the increase in mean U.S. body weights for women and men

4.6 TRANSITION/ SOFTWARE TO OPERATIONS PLAN

Now a days maximum of peoples are using smart phones, with the help of smartphone sensors like accelerometer and gyro, we can find the activities of the human, which is help to find out how The Activity people is in active like walking, running, sitting .Some people are not active in real life, those peoples are have obesity and some other health issues .We can use this also some security purpose and Transportation.

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