

```

operator {(R p) const {return tie(x, y
.v, z+p.z); } P operator -(R p) const
met { return x*p.x + y*p.y + z*p.z;
} double dist() const { return
return #this/(T)dist(); } P normal
+ (#this)*c - cross(u)*s;
t[a][b] = r.mat[b][a] - (mod
il = r.mat[i][i] = (mod - r
fi = i; goto done; } assert(0); done
ll[i][i] = a % mod; rep(3,0,M-A);
), per(N, -1), siz(N, 1), depth[N
n[u] = depth[v] + 1; dfsz(u); siz
u] = (u == adj[v][0] ? rt[v] : u & d
[rt[v]]) swap(u, v); op(pos[rt[v]
return res;} int querySubtree (int
q, S, old
auto a, auto b) { return a.d > b.d
S[lev - 1];

```



ASANSOL ENGINEERING COLLEGE

ABOUT US

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Acknowledgement

I take this opportunity to express my profound gratitude and deep regards to my faculty (fill in your Professor / Mentor / Faculty Name) for his exemplary guidance, monitoring and constant encouragement throughout the course of this project. The blessing, help and guidance given by him/her time to time shall carry me a long way in the journey of life on which I am about to embark.

I am obliged to my project team members for the valuable information provided by them in their respective fields. I am grateful for their cooperation during the period of my assignment.



OBJECTIVES

The objective of human activity recognition is to automatically identify and classify the actions or activities being performed by a person using sensor data.

This is typically done using machine learning techniques that are trained on labeled sensor data collected from sensors such as accelerometers, gyroscopes, and other sensors that can capture the motion and orientation of the body.

Human activity recognition has a wide range of applications, including health and wellness monitoring, sports and fitness tracking, human-computer interaction, robotics, and more. By accurately identifying and classifying human activities, these applications can provide valuable insights into human behavior and enable more personalized and effective interventions and services.

PROJECT SCOPE

The project scope of HAR includes the development of algorithms and techniques that can accurately identify and classify human activities. The project also involves the collection of data from various sensors such as accelerometers, gyroscopes, and magnetometers. The data collected needs to be processed, analyzed, and interpreted using machine learning and data analysis techniques.

The project scope of HAR also includes the development of applications that can use the data collected from the sensors to provide real-time feedback to users. These applications can be used in various domains, including healthcare, sports, and security.

DATA DESCRIPTION

DATASET LINK



<https://www.crcv.ucf.edu/data/UCF50.rar>

The Dataset contains:

- 50 Action Categories
- 25 Groups of Videos per Action Category
- 133 avg. videos per action category
- 199 avg. number of frames per video
- 320 avg. frames width per video
- 240 avg. frames height per video
- 26 avg. frames per seconds per video

MODEL BUILDING

MODEL USED:

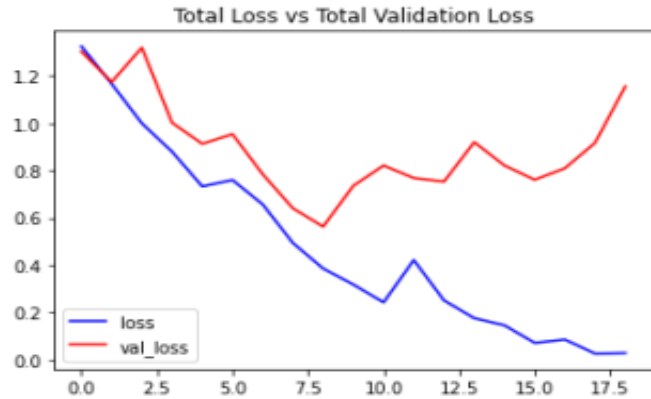
CONVLMST

- ConvLSTM is a type of neural network architecture that combines the convolutional neural network (CNN) and long short-term memory (LSTM) models.
- CNNs are typically used for image processing tasks such as object detection, image classification, and segmentation. They work by applying convolutional filters to input data, which are then pooled to create increasingly abstract representations of the input.

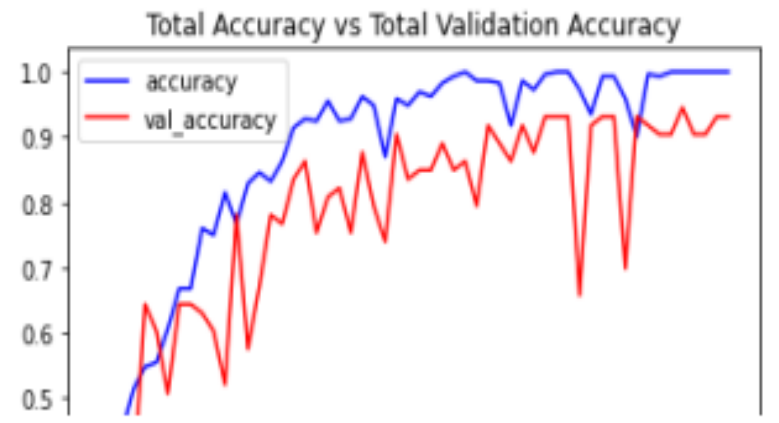
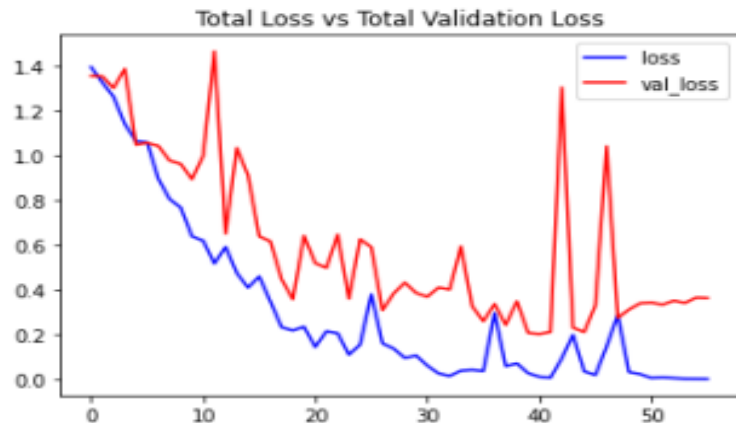
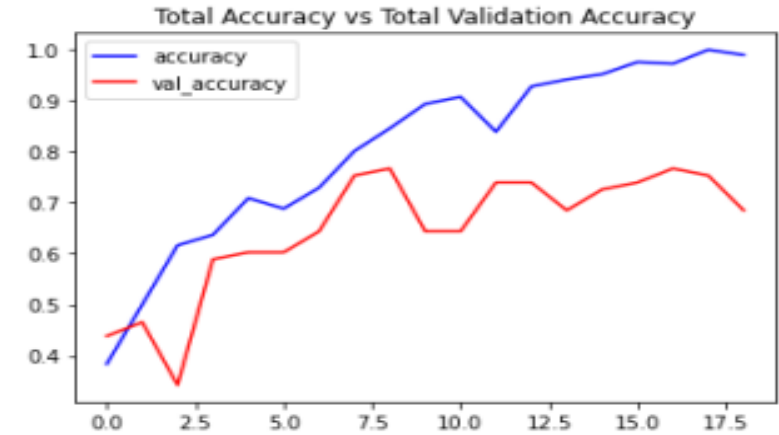
LRCN

- LRCN stands for Long-term Recurrent Convolutional Networks. It is a type of neural network architecture that combines both Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) to process spatiotemporal data such as videos.
- The LRCN model typically consists of two main parts: a CNN to extract spatial features from each frame of a video, and an RNN to capture the temporal dynamics across the sequence of frames.

ConvLSTM Approach



LRCN Approach



We are using LRCN model instead of convLSTM to predict the action in the sample video as LRCN gives better accuracy than convLSTM.

CODE

OPTIMIZE THE MODEL ARCHITECTURE

Developers can experiment with different model architectures and hyperparameters to improve the performance of the model.

INCREASE THE SIZE AND QUALITY OF THE DATASET

A larger and diverse dataset can help the model to learn and recognize activities more accurately.

IMPLEMENT ADVANCED PREPROCESSING TECHNIQUES

Preprocessing techniques like normalization, data augmentation, and feature extraction can help in reducing noise and extracting relevant features from the dataset.

USE ADVANCED DEEP LEARNING TECHNIQUES

Advanced deep learning techniques like attention models, multi-task learning, and transfer learning can be implemented to improve the model's accuracy.

APPLY REAL-TIME ACTIVITY RECOGNITION

Instead of offline processing, developers can focus on real-time activity recognition, which can be more useful in practical applications.

CONDUCT A COMPREHENSIVE EVALUATION OF THE MODEL

Developers should evaluate the model on various metrics like accuracy, precision, recall, and F1-score, and analyze the results to identify the areas of improvement.

FUTURE SCOPE OF IMPROVEMENTS



HEALTHCARE

Human Activity Recognition can be used to monitor and analyze patients' daily activities, helping doctors and caregivers detect early signs of illness or deterioration in health.



SECURITY

Human Activity Recognition can be used to detect suspicious behavior and prevent crime by analyzing the movements of people in public spaces.



ROBOTICS

Human Activity Recognition can be used to enable robots to interact with humans more effectively, by understanding their movements and gestures.



ENTERTAINMENT

Human Activity Recognition can be used to create interactive games and virtual reality experiences that respond to the user's movements and actions.

CERTIFICATE

This is to certify that Mr./Ms. [fill in your name] of [fill in the name of the institution where you are studying], registration number: [fill in your university registration number], has successfully completed a project on [fill your project title] using [mention the technology on which your project was developed i.e., JEE/.NET/Java/Oracle Forms/ PHP/ Android/ Networking/Machine Learning/ Deep Learning] under the guidance of Mr./Ms./Mrs. [mention your faculty's name].

[Name of your faculty]

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THANK YOU

