Human Activity Recognition

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Abstract— **In this paper, we are focusing on a machine learning model of human activity recognition. Human activities like walking, talking, jogging & more. In this project we also learn about how accelometer data are used to make model live and How AWS technology are used to make this model more real time.**

i.   Introduction

Human Activity Recognition model is a machine learning model which uses real time accelometer data to make such prediction on human activity. And also in this paper we will see how AWS technology used to deploy a machine learning model on that platform and make easy work for all machine learning models.

ii.   About the Project

Now are days, we can see human are dependent on technology. Human activity recognition model is used for find human activity recognize such like using this model we can find what human do is they walk, talk, run and many more. So, these model is used many fields in real life. Human Activity Recognition is a machine learning model which is predict activity of human as per there accelerometer reading's such like vibration, motion, force, direction.

Here, in this project we have dataset of accelometer. Accelometer is a sensor which detect motion and movement of object's. This sensor get data about any object direction into space which can be 2D or 3D.

This all data statically used for this model for prediction. After successfully making this model we deploy our model on AWS Sage maker which is one of the model of AWS for machine learning deployment and other management things.

Technology Used for project
- Machine Learning
- AWS
- Android

iii.   Methodology

In this project we are going to use accelerometer data to train the model so that it can predict the human activity. Accelerometer is a electronic sensor which measures force, motion, vibration, direction of objects, in order to position in space and monitor object's movement.

We already know that neural networks perform very well for image recognition. In particular, a specific type of neural networks called Convolutional Neural Networks (CNNs) is best suited for the task of image recognition. I will now explain how the approach of convolutional neural networks differs from that of traditional neural networks.

So, we are going to use 2D CNN model to build the model. First of all, as we discussed that we used accelometer dataset for get data about human activity such like walking, sitting, running, talking & more.
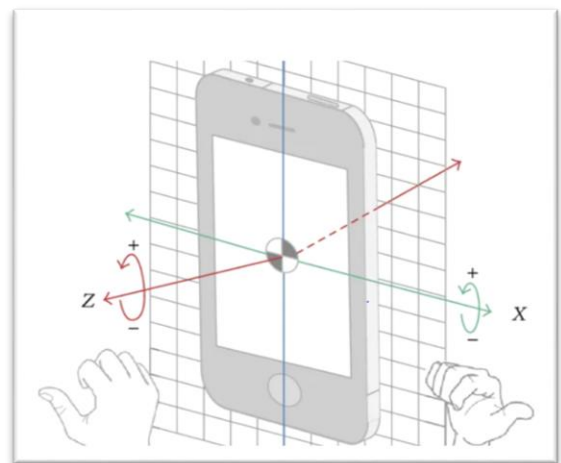
How Accelometer get data using movement of smart
phone using X,Y axis

iv. Machine Model Development


Dataset of accelometer

This is piece of dataset. In dataset there are 32234 rows and 6 columns are there. After preprocessing data we got pure dataset to work with.

Here, we have some plot which shows motions of object's. Below screenshot shows details about standing activity from dataset in X, Y, Z Axes.
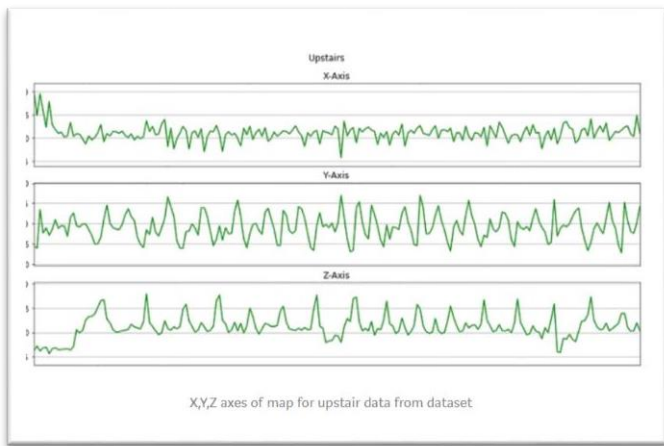

X,Y,Z axes of map for upstairs data from dataset

For preparing model for Human activity recognition we have to use CNN. So, A Sequential model is appropriate for a plain stack of layers where each layer has exactly one input tensor and one output tensor.
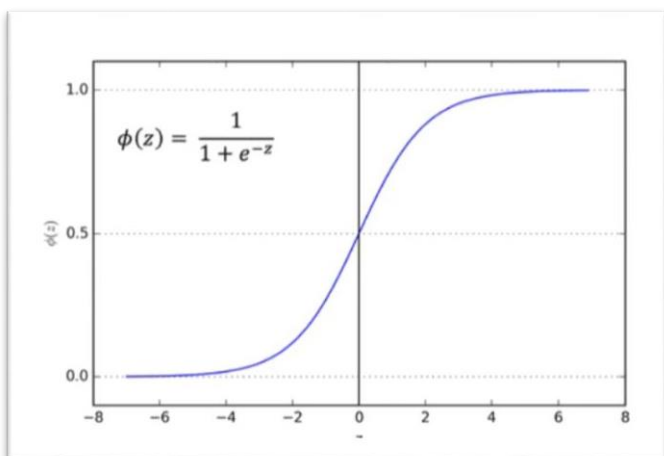
Sigmoid Graph

After making model,

We will now plot the model accuracy and model loss. In model accuracy we will plot the training accuracy and validation accuracy and in model loss we will plot the training loss and validation loss.
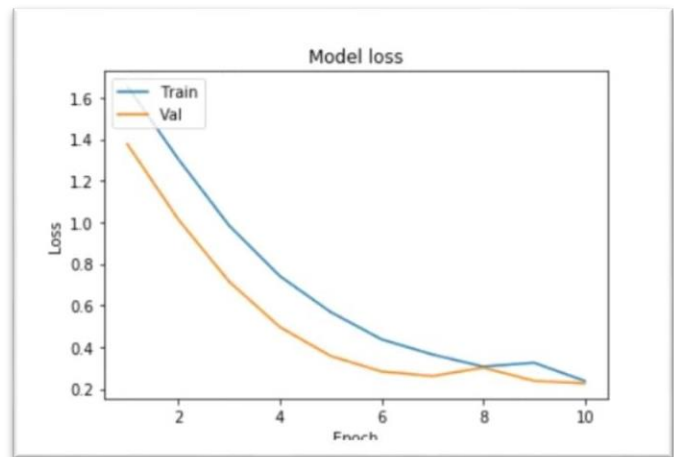
Graph for model dara loss

So, these above graph shows how model accurate and validate for our data model.

Now, lastly we have confusion matrix for our data model.

v. AWS Cloud implementation

Now, Begins with AWS deployment of our model. Here, we talk about one of the way how to get data from accelometer using android studio, and some technology of AWS cloud.
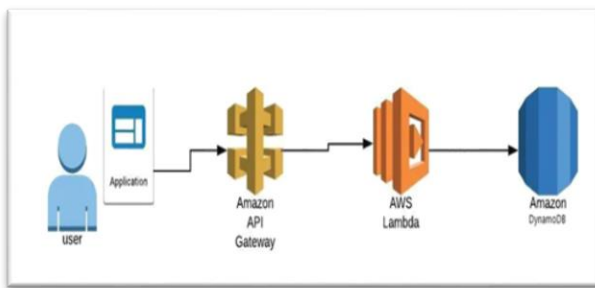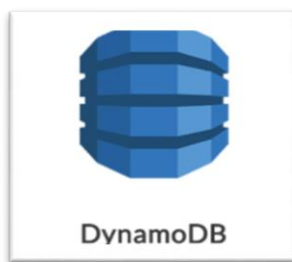
Diagram for AWS Cloud technology usage

AWS API Gateway

So, now we implemented next step which is deployment of machine learning model on AWS. So, here is diagram which shows that there is some feature or technology is combined and makes model complete.

Here, we use AWS API Gateway, AWS Lambda and AWS Dynamodb.

An API gateway is an API management tool that sits between a client and a collection of backend services. An API gateway acts as a reverse proxy to accept all application programming interface (API) calls, aggregate the various services required to fulfill them, and return the appropriate result.

Amazon API Gateway is an AWS service for creating, publishing, maintaining, monitoring, and securing REST, HTTP, and Web Socket APIs at any scale. API developers can create APIs that access AWS or other web services, as well as data stored in the AWS Cloud.

AWS Dynamodb

So, first of all there are AWS Dynamodb comes in the picture, Dynamodb is one of AWS technology, which is used for storage. Amazon Dynamodb is a key-value and document database that delivers single-digit millisecond performance at any scale. It's a fully managed, multiregion, multimaster, durable database with built-in security, backup and restore, and in-memory caching for internet-scale applications.

Output of accelometer into website

This is output of diagram which shows website. Which we make using AWS to get data from smart phone. So, using this data we try to make prediction that what activity human is performing.

vi.   Future Work

- Recognition using Video Streaming.
- Some Cloud implementations

vii.   References

1. **https://www.hackster.io/circ_93/human-activity-recognition-with-accelerometer-aws-lambda-320bf3**

AWS Lambda Function

AWS Lambda is a server less compute service that runs your code in response to events and automatically manages the underlying compute resources for you. You can use AWS Lambda to extend other AWS services with custom logic, or create your own back-end services that operate at AWS scale, performance, and security.