

## INTRODUCTION

- Multi-class classification from time series sensory measurement of smart device
- Utilized Neural Network (NN), Boosting, and LSTM to segment time series to meaning behavioral events
- The testing accuracy of NN, Boosting, and LSTM is 49%, 49%, and 53%, respectively.

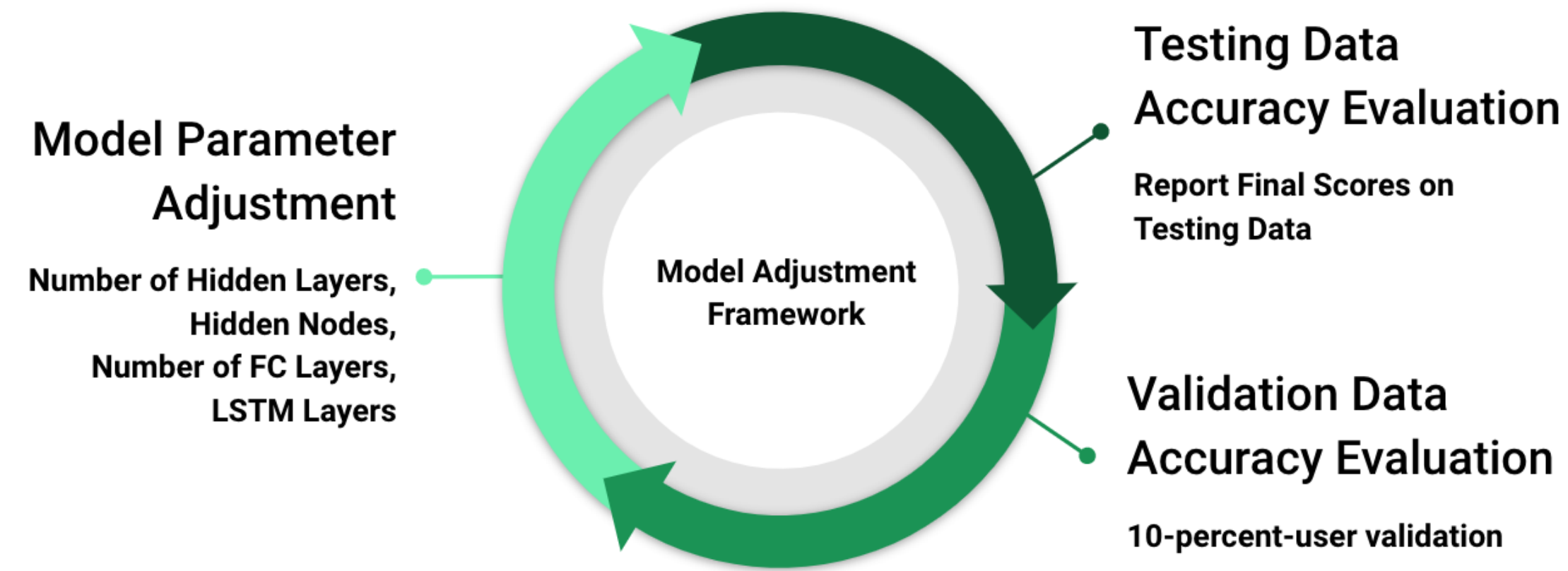
## DATA

- The **ExtraSensory** Dataset
- Over 370k samples from 60 users
- Including data from diverse sensors, such as accelerometer and gyroscope from smart phone or smartwatch
- Descriptive labels

## FEATURES

- Phone: Gyro, GPS Location Data, Magnet, Audio Properties, Battery state, Volume, Silent mode, Brightness...
- Watch: Acceleration, Heading
- Label: Main, Secondary

## TRAINING FRAMEWORK



## MODELS

Models	Architecture
NN	2 Fully Connected layers with ReLU as activation function
Ensemble	Train different models for groups of feature then combine them with ensemble method
LSTM	1 Long Short-Term Memory Unit followed by standard neural network setup

## RESULT

Models	Training accuracy	Testing accuracy
NN	0.742	<b>0.450</b>
Ensemble	0.707	<b>0.454</b>
LSTM	0.7719	<b>0.540</b>

## DISCUSSION

- Environment noise during data collection
- Information loss due to sample rate compression
- Missing labels issue
- Various user behavior

## FUTURE WORK

- **Data processing** using raw data and feature selecting method rather than minute-to-minutes date to see if we can obtain better results
- **Ensemble methods** to ensemble LSTM with LDA or other models
- **LSTM** processing the data group which is more than 3 minutes dependency to improve the model

## REFERENCE

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