

EYE-READER

BRAIN 4

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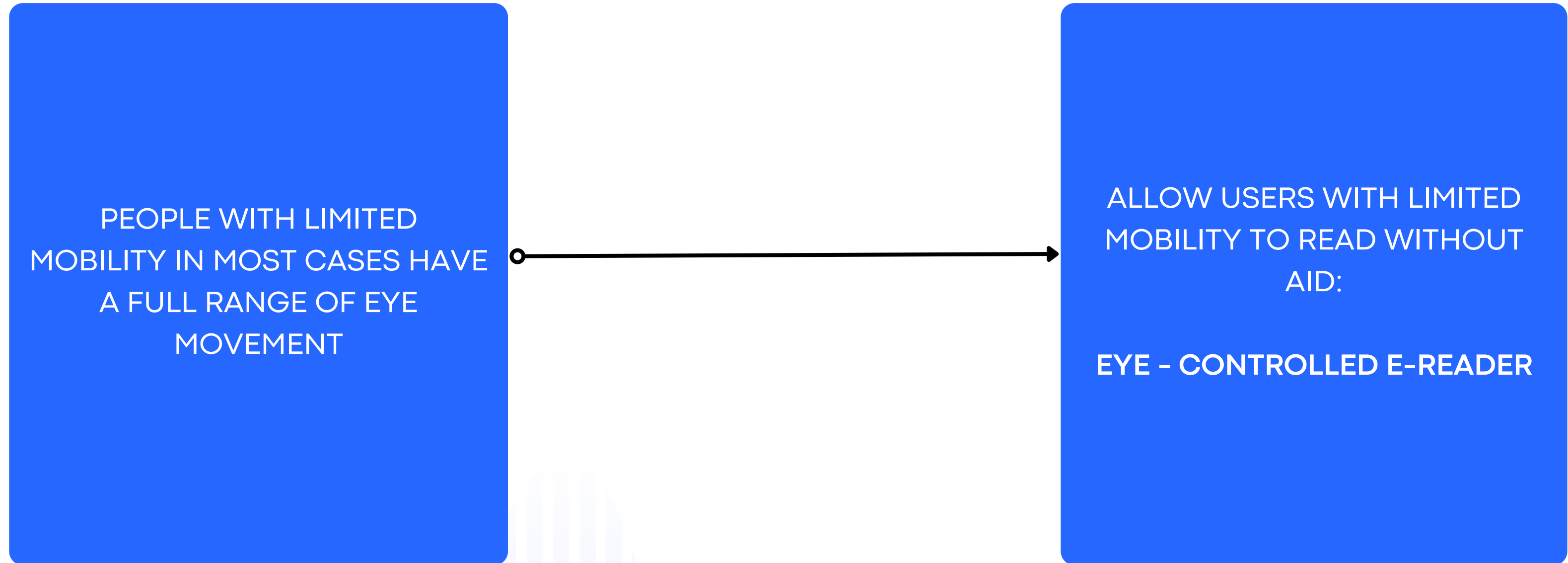
WHAT IS THE PROBLEM?

PROBLEM: PEOPLE WITH
LIMITED MOBILITY NEED
HELP TO DO BASIC TASKS
SUCH AS READING



GOAL: ENHANCE THE
READING EXPERIENCE FOR A
BROAD RANGE OF USERS,
MAKING IT MORE
ACCESSIBLE, CONVENIENT,
AND ENJOYABLE.

WHAT IS THE SOLUTION?



OUR PRODUCT

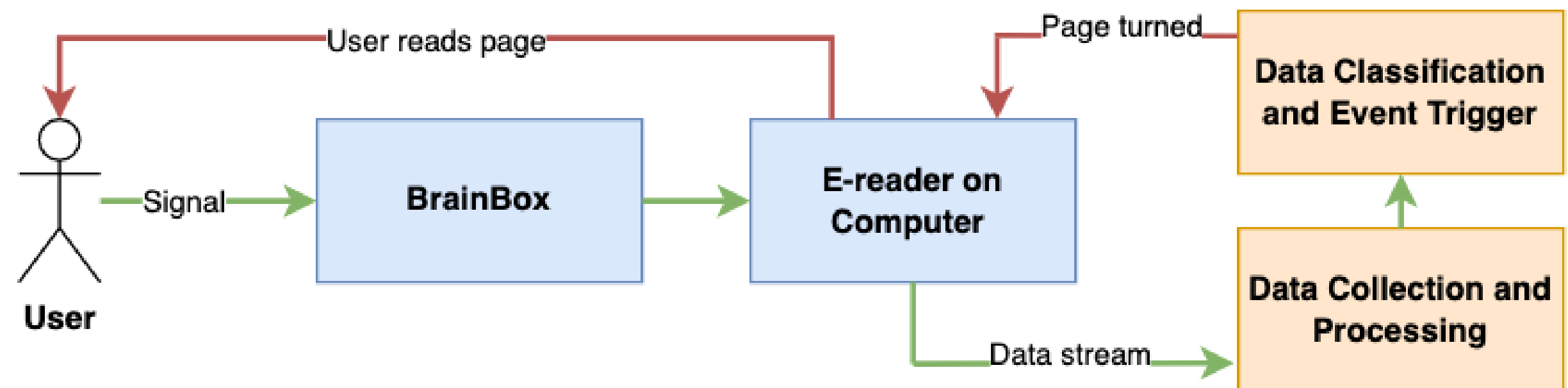


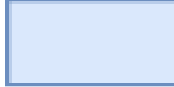



Figure 1-Product Schematic

Key	
	Data Output
	Data Input
	Device
	Software Module

DATA COLLECTION AND PROCESSING

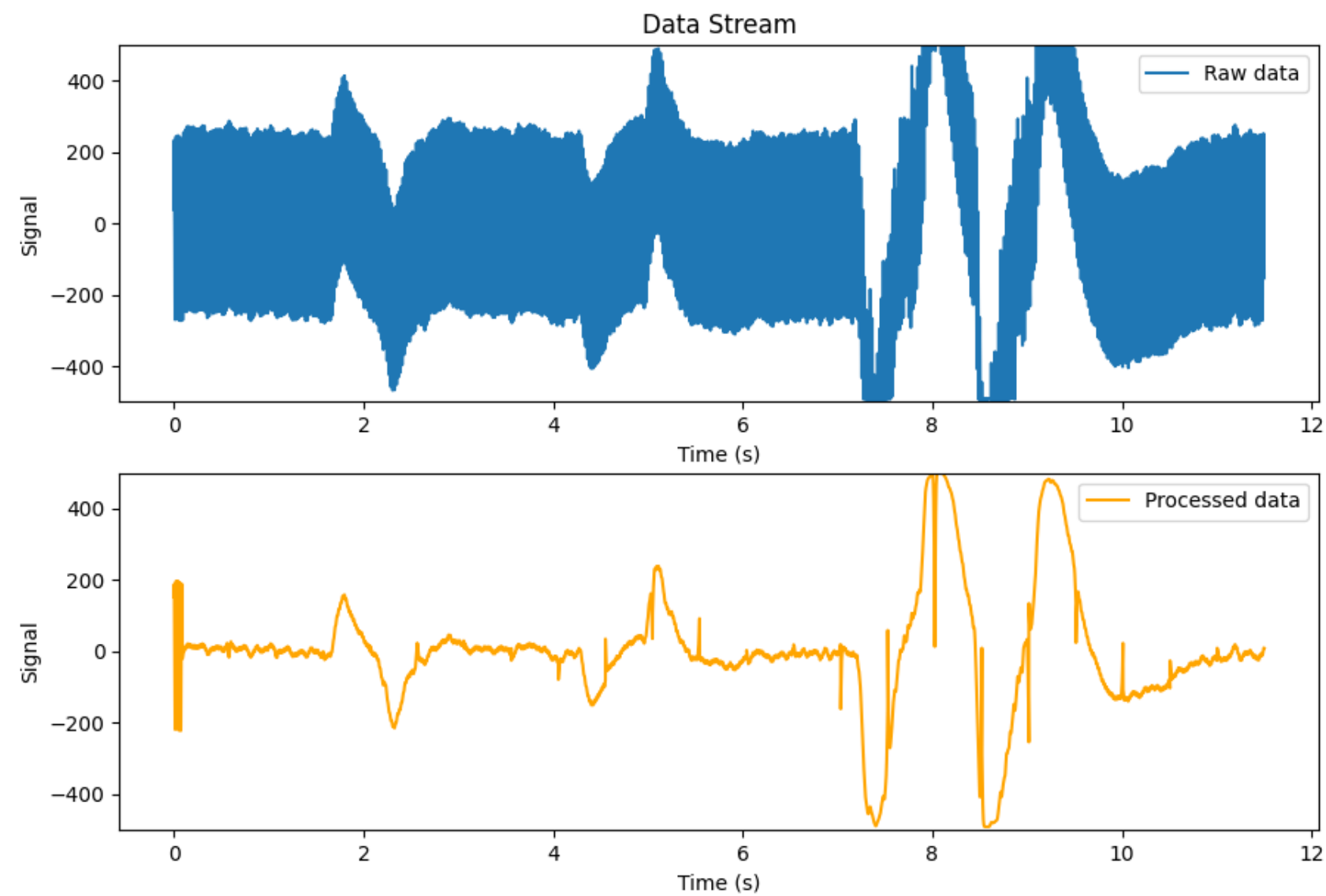


Figure 2-Example Data Stream

DATA COLLECTION

DATA PROCESSING

- Low pass band filter - 20Hz

CLASSIFICATION

METHODOLOGY OF PREDICTING LABEL

DATA LABELLING

Label all the signals for events and non-event

FEATURE MATRIX

Conduct a feature matrix using signals and labels

FEATURE SELECTION

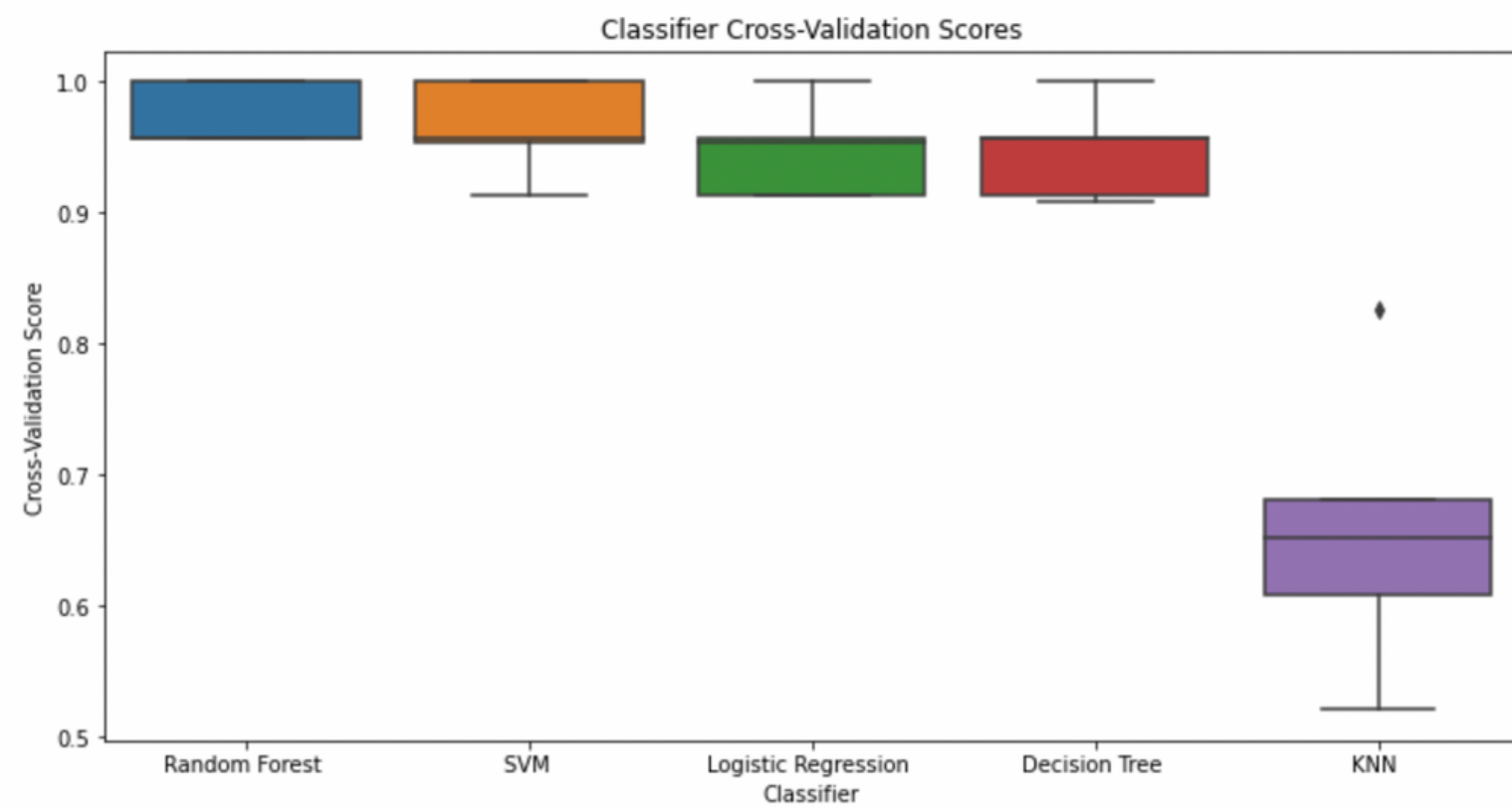
Select significant features

CLASSIFIERS

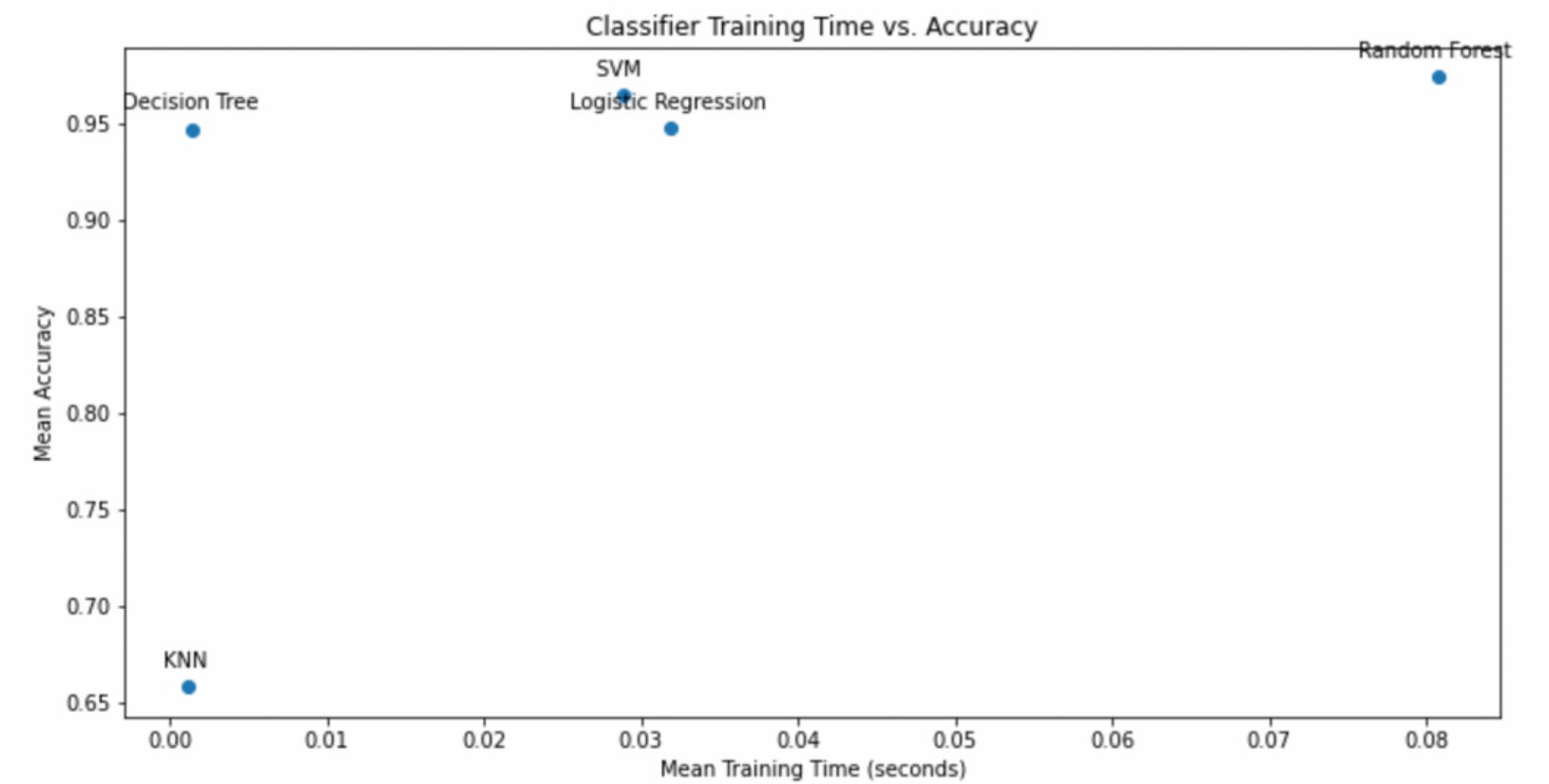
Fit the feature matrix to different classifiers

EVALUATION

CROSS VALIDATION



ACCURACY VS LATENCY



SUMMARY OF RESULTS

PAGE TURN ACCURACY = 91%

START/STOP ACCURACY = 80%

LIMITATIONS

- Time latency
 - Left/Right ~ 1-1.5 s
 - Blink ~ 1.5-2s
- Electrode positioning on temples
- Blink start/stop low robustness

IMPROVEMENTS

- Second brain box with muscular electrode positioning to improve blink accuracy
- More data collection to improve accuracy

A1: GROUP PRESENTATION ROLES

AFRIN: PRODUCING SLIDES, Q&A PREP

FERGUS: PRESENTING, PRODUCING SLIDES

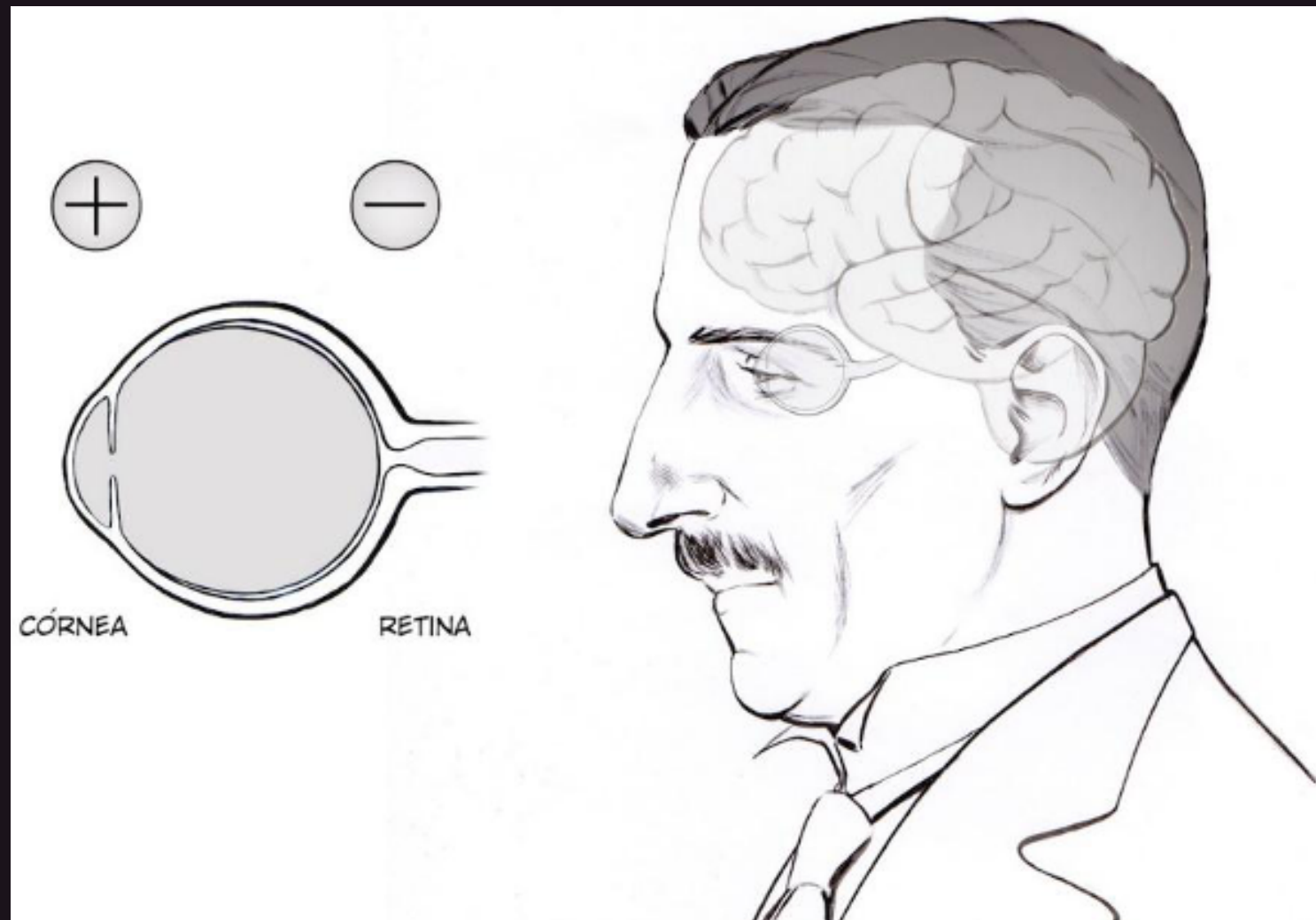
YUSHANG: PRESENTING DEMO, SCRIPT

POOJA: PRESENTING, PRODUCING SLIDES

SHOAJI: PRODUCING SLIDES/SCRIPT

WANCHENG: PRODUCING SLIDES/SCRIPT

A2: UNDERSTANDING THE PHYSICS

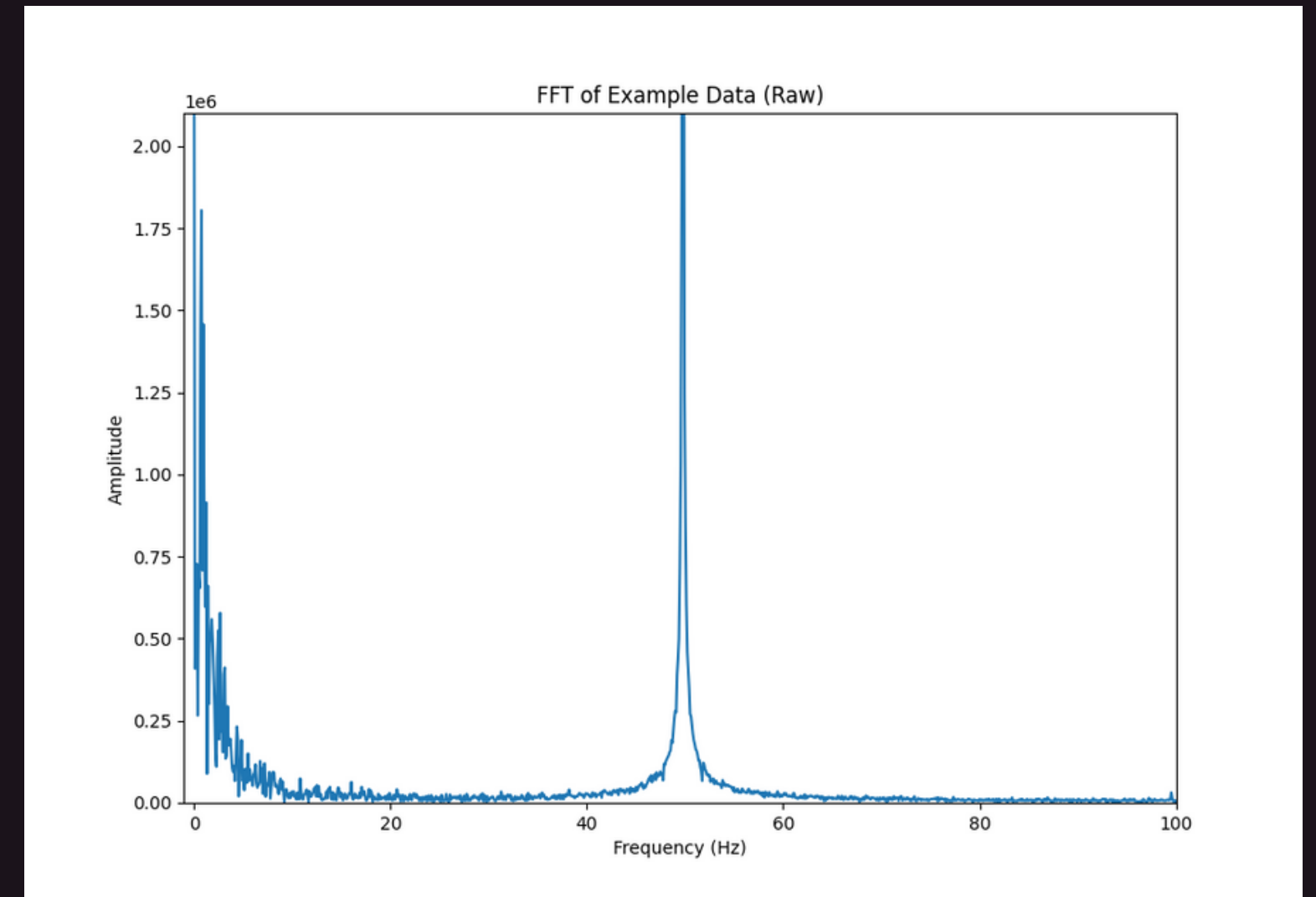
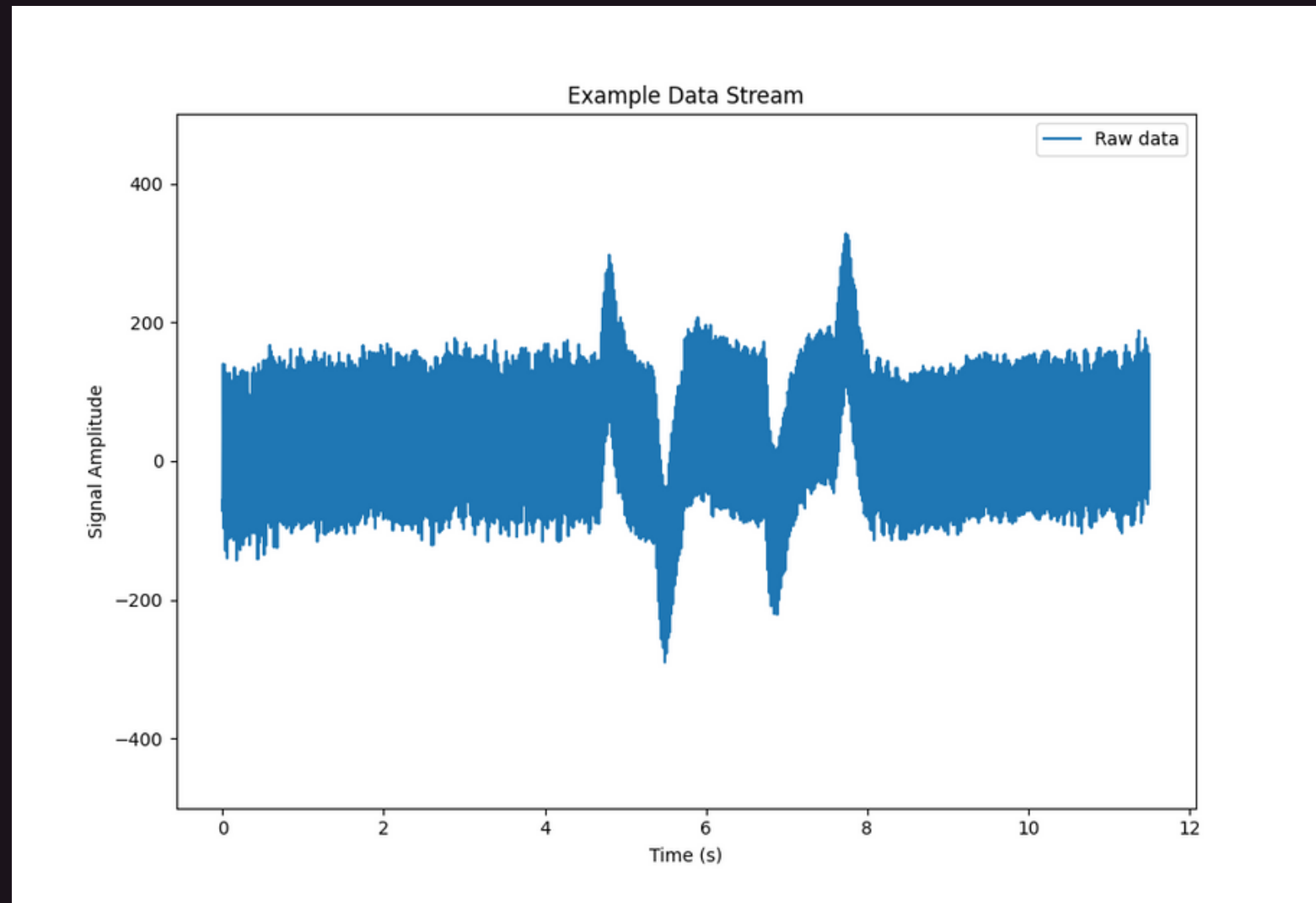


EACH EYE IS AN
ELECTRIC DIPOLE

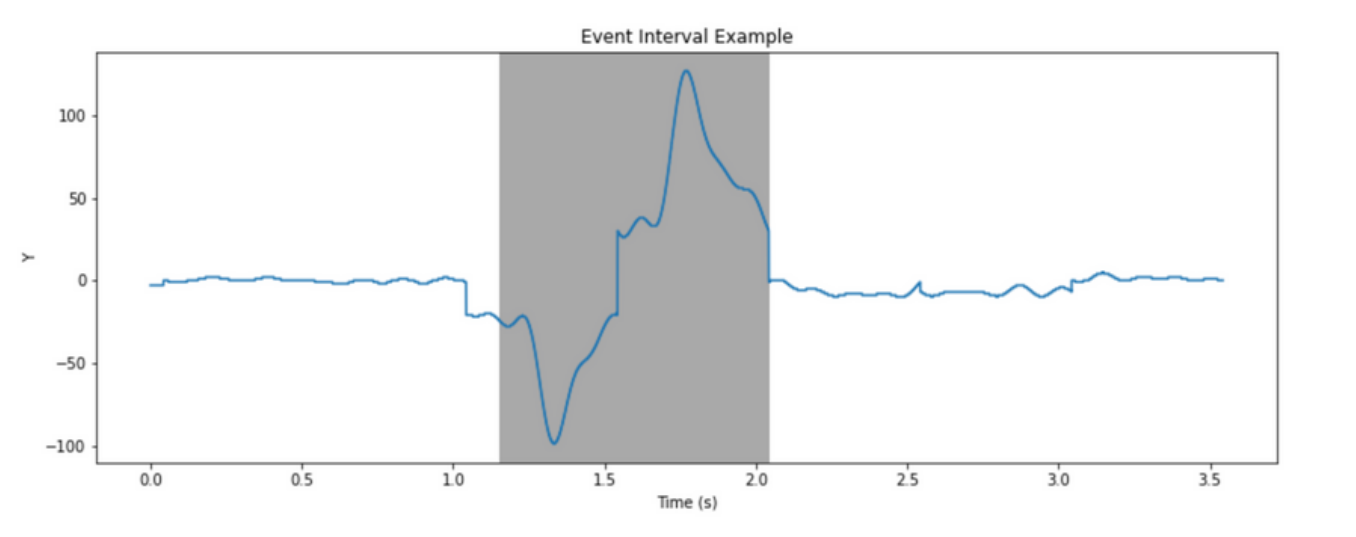
MOVEMENT OF A
DIPOLE CAUSES A
CHANGING
ELECTRIC FIELD

ELECTRODES
PLACED CLOSE TO
EYE PICK UP
CHANGING
ELECTRIC FIELD

A3: COM PORT NOISE REDUCTION



A4: CLASSIFICATION



Data Labelling

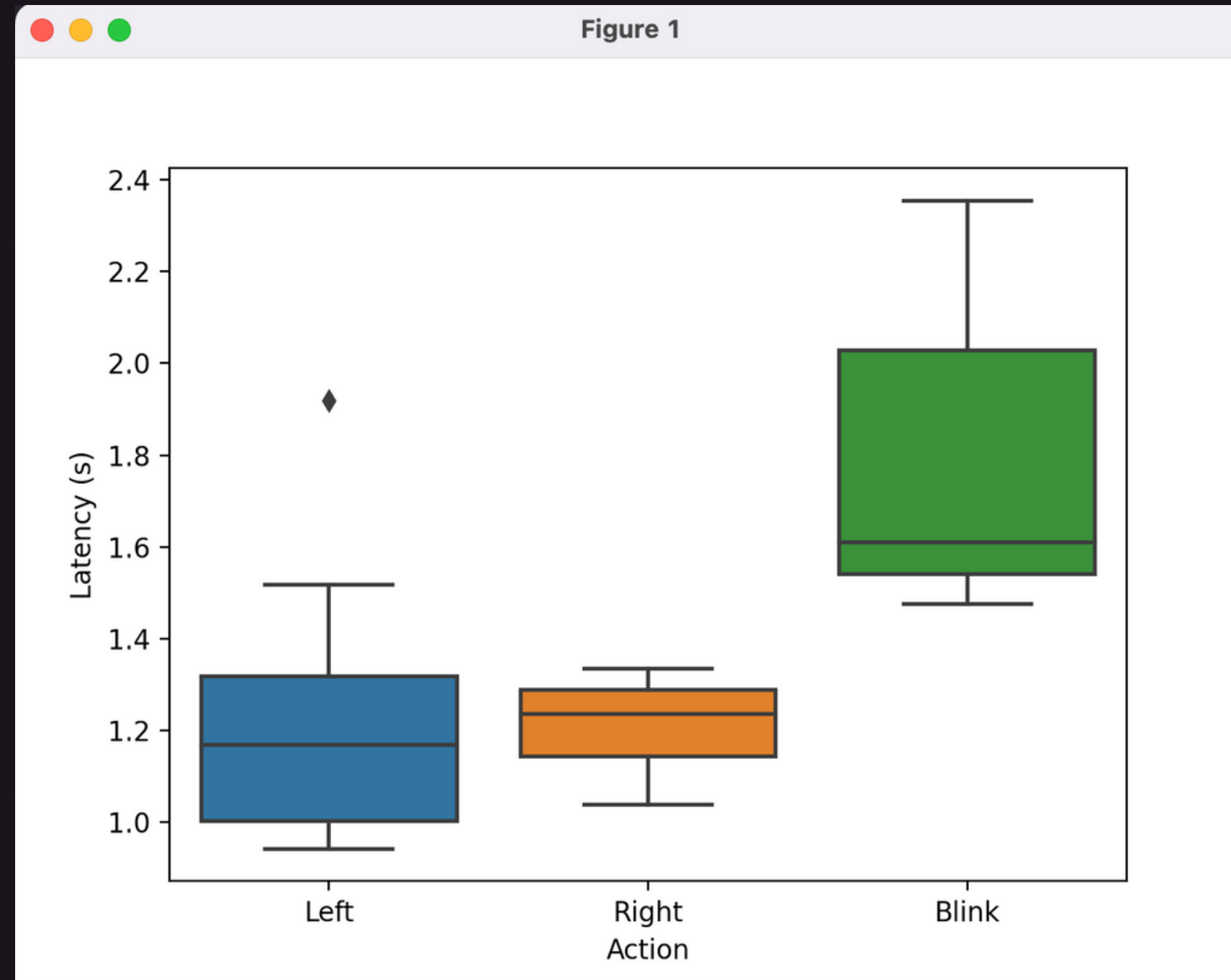
No.	
1	<input type="checkbox"/> value_mean
2	<input type="checkbox"/> value_median
3	<input type="checkbox"/> value_standard_deviation
4	<input type="checkbox"/> value_variance
5	<input type="checkbox"/> value_skewness
6	<input type="checkbox"/> value_kurtosis
7	<input type="checkbox"/> value_maximum
8	<input type="checkbox"/> value_minimum
9	<input type="checkbox"/> value_mean_abs_change
10	<input type="checkbox"/> value_mean_change
11	<input type="checkbox"/> value_autocorrelation_lag_1
12	<input type="checkbox"/> value_quantile_q_0.25
13	<input type="checkbox"/> value_quantile_q_0.75
14	<input type="checkbox"/> value_longest_strike_above_mean
15	<input type="checkbox"/> value_longest_strike_below_mean
16	<input type="checkbox"/> value_count_above_mean
17	<input type="checkbox"/> value_count_below_mean
18	<input type="checkbox"/> value_cid_ce_normalize_True
19	<input type="checkbox"/> value_first_location_of_maximum
20	<input type="checkbox"/> value_first_location_of_minimum
21	<input type="checkbox"/> Label

Conducting a feature matrix

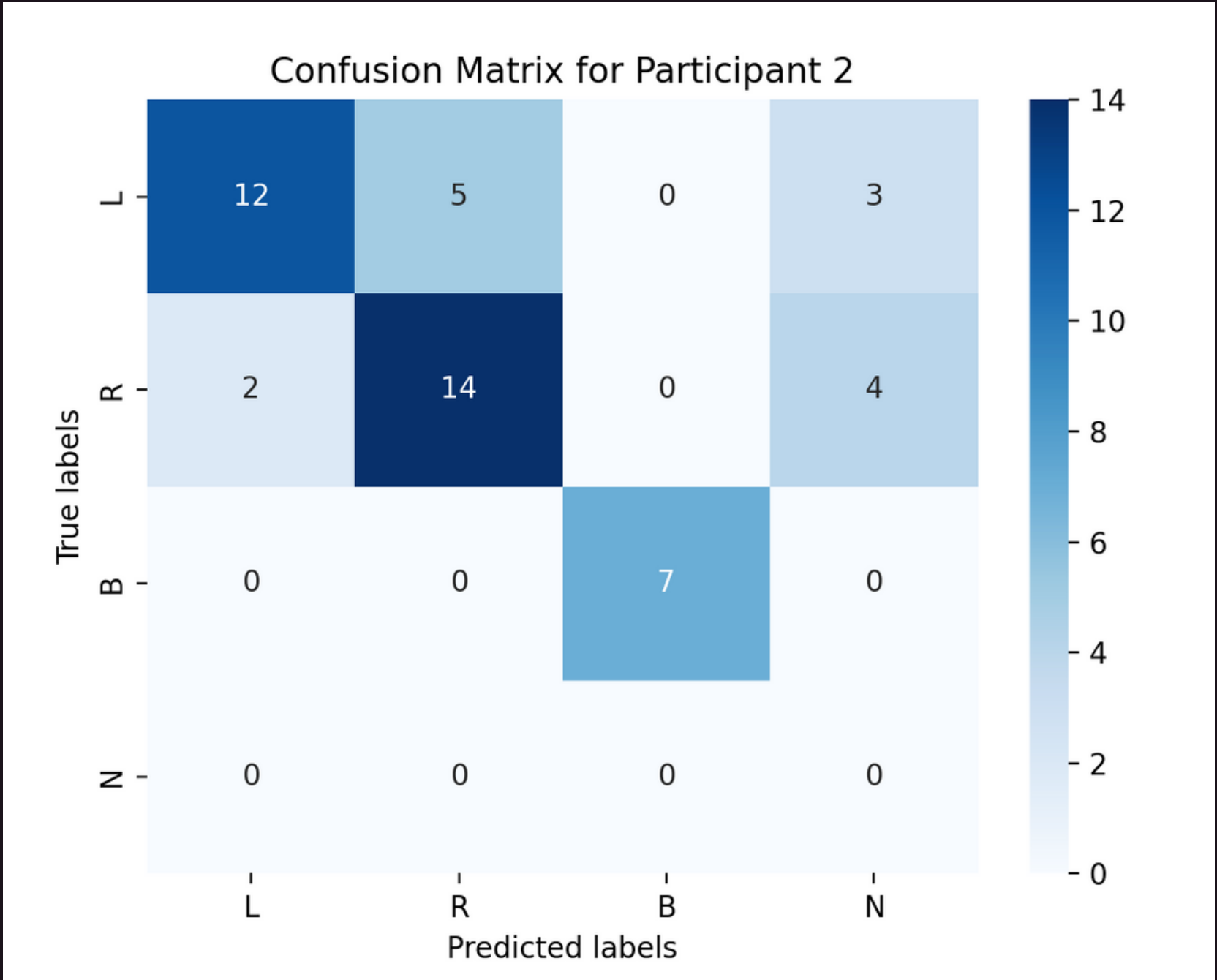
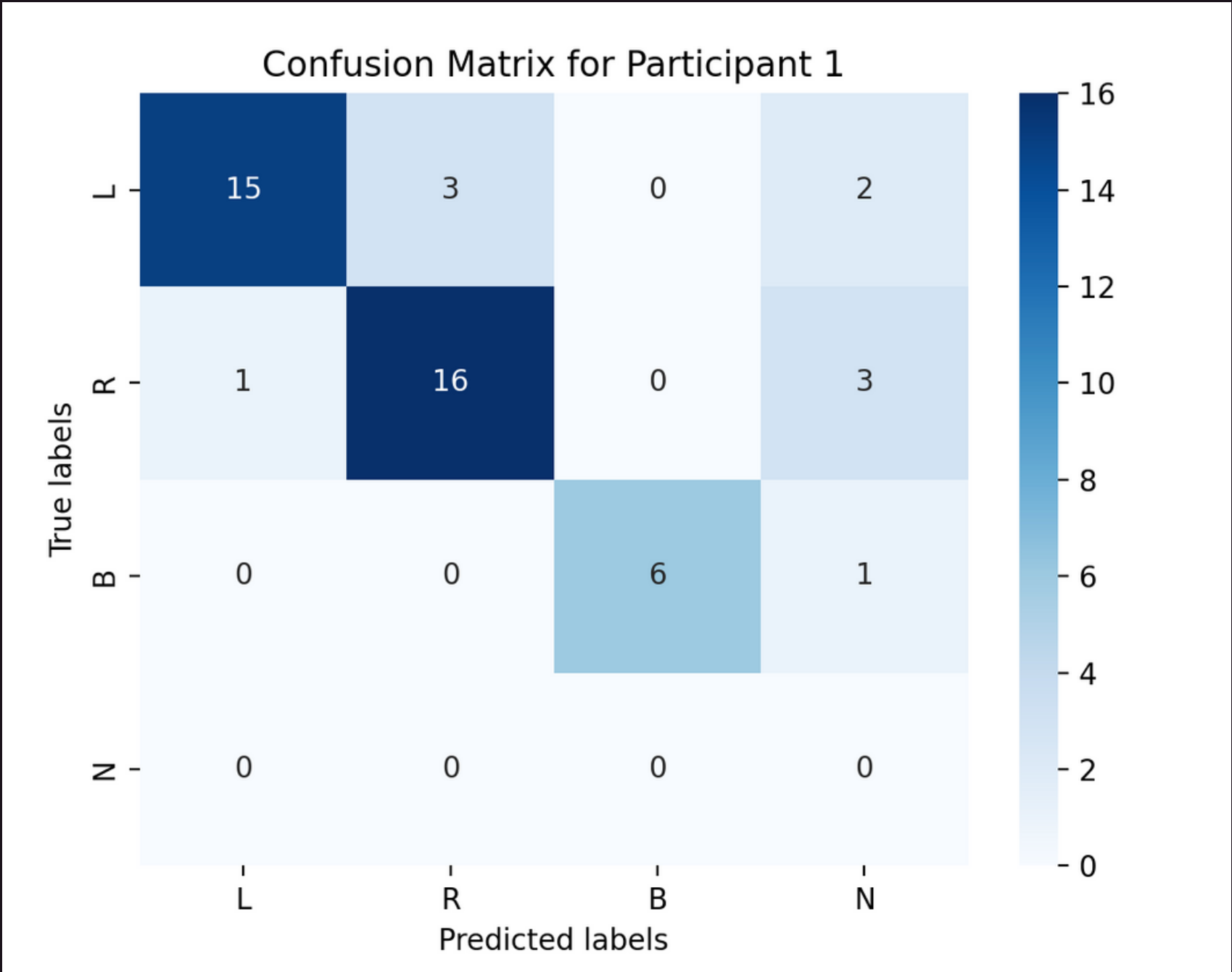
No.	
1	<input type="checkbox"/> value_mean
2	<input type="checkbox"/> value_median
3	<input type="checkbox"/> value_standard_deviation
4	<input type="checkbox"/> value_kurtosis
5	<input type="checkbox"/> value_maximum
6	<input type="checkbox"/> value_minimum
7	<input type="checkbox"/> value_mean_abs_change
8	<input type="checkbox"/> value_quantile_q_0.25
9	<input type="checkbox"/> value_quantile_q_0.75
10	<input type="checkbox"/> value_count_above_mean
11	<input type="checkbox"/> value_count_below_mean
12	<input type="checkbox"/> value_cid_ce_normalize_True
13	<input type="checkbox"/> Label

Selecting significant features

A5: LIVE LATENCY EVALUATION



A6: LIVE ROBUSTNESS EVALUATION



A7: OUR MULTIDISCIPLINARY APPROACH

