Texas Instruments

DisTracker

GROUP 19 :

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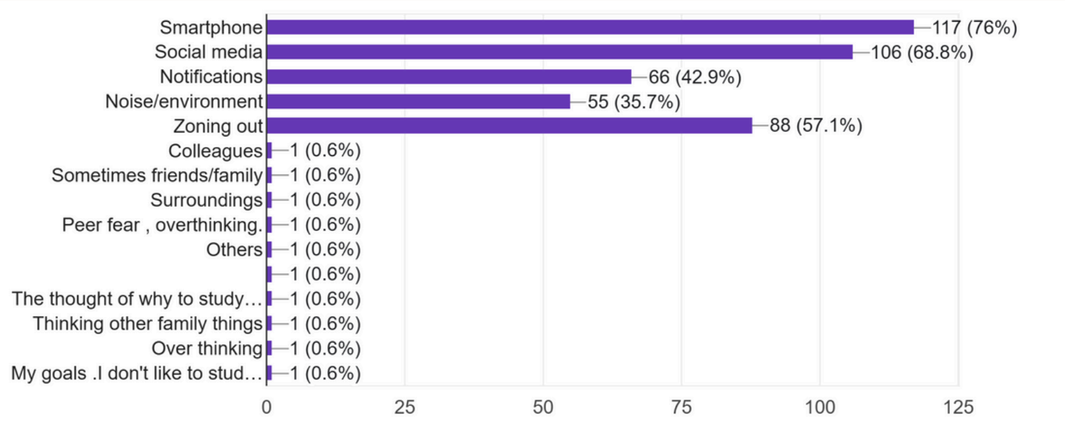
UNDERSTAND THE REAL NEED !!!

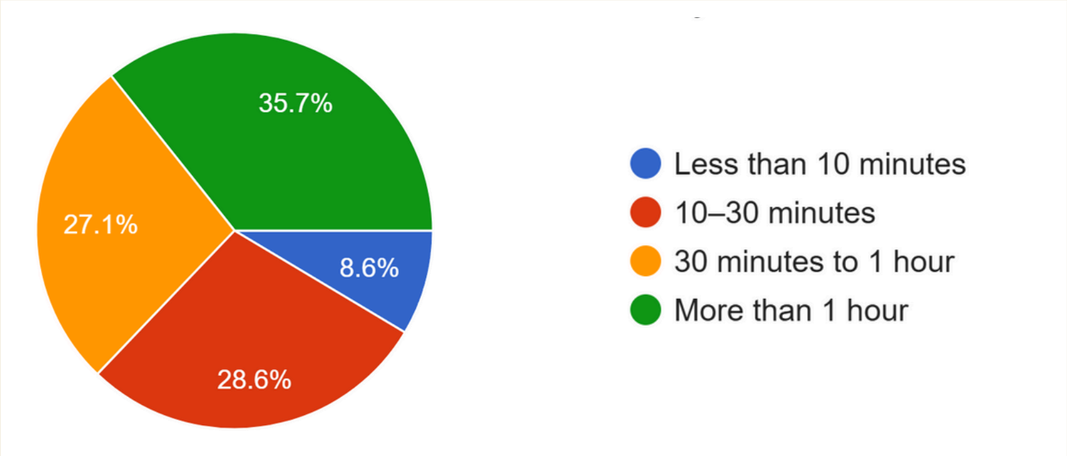
EMPHATIZE

- **Shared GOOGLE FORM survey with 150+ responses**

➤ What usually distracts you the most while studying while Studying/Working ?



➤ What is the time spent on phone during a typical study/work session



WHO ARE YOUR USERS? (TARGET AUDIENCE)
Students, especially high school and college students, who struggle to maintain focus during study/work sessions.

WHAT CAUSING DISTRACTION?
Smart phones (social media, notifications)are the major cause distractions, making it hard to maintain focus.

USER PAIN POINTS
Frequent distractions, Difficulty staying focused for long hours, decreased productivity, stress, and poor academic/work performance.

FIND THE WHY BEFORE THE HOW !!!

DEFINE

EMPATHY TAKEAWAY

Students' attention naturally peaks in adolescence but is frequently broken by digital distractions. The significant delay in refocusing after interruptions underscores the need for a real-time, wearable nudge to help maintain and regain focus.

REFINED PROBLEM STATEMENT

How do we help students fight smartphone and social media distractions without disrupting their environment?
The solution is **DISTRACTION MONITORING WRISTBAND** .

USER NEEDS

- Need a non-intrusive way to **monitor focus** and alert them during distractions.
- Need a **real-time, subtle feedback** system without disturbing others.
- Need a **personalized focus tracker** that adapts to their working style and environment.

INSIGHTS

- Users often **fail to realize** when they get distracted, especially during mentally exhausting sessions.
- Users prefer **discreet feedback mechanisms** over public or disruptive alerts.
- Continuous distractions affect not just productivity but also **increase stress** and **mental fatigue** over time.

IDEATE

- **EDA: ELECTRODERMAL ACTIVITY**

Measures changes in the skin's electrical conductance, which varies with sweat gland activity

- **PPG: PHOTOPLETHYSMOGRAPHY**

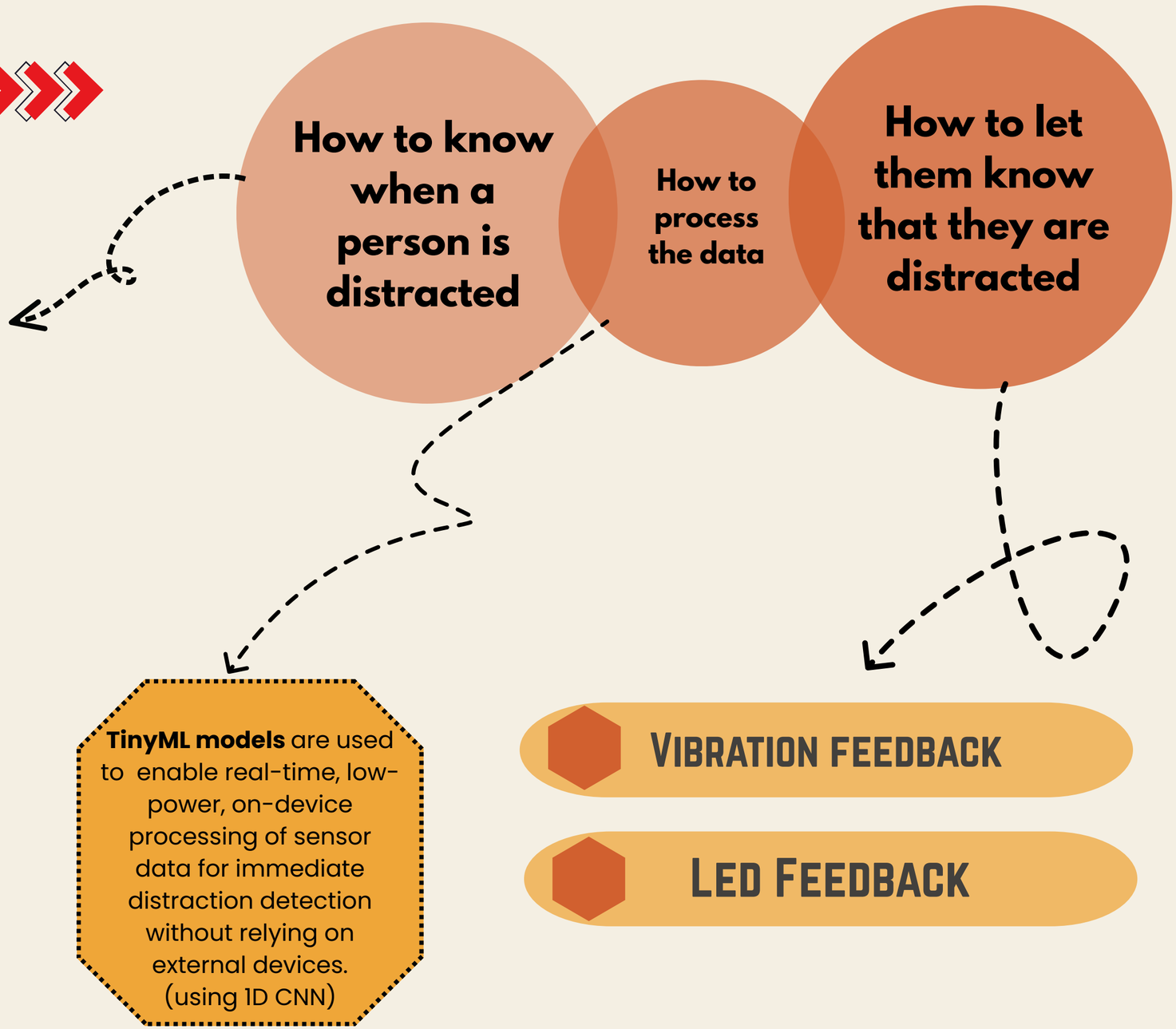
A non-invasive optical technique that measures blood volume changes in the microvascular bed of tissue, typically used to monitor heart rate and related metrics.

- **3-AXIS ACCELEROMETER + GYROSCOPE**

Combining both allows for motion tracking, gesture recognition, and orientation detection

- **SCREEN MONITORING(ONLY IN ANDROID)**

Can create an app that uses ML to monitor the screen and differentiate if an app is the cause of distraction



REALISTIC DETECTION SCENARIOS

1 Studying with focus

LIKELY FOCUSED

Accelerometer: minimal movement
EDA: stable, mid-high
PPG: steady
HR: low HRV

2 Getting distracted

LIKELY DISTRACTED

Accelerometer: sudden wrist motion
EDA: sharp rise (attention/stress)
PPG: HR jump

3 Bored/Zoning Out

POSSIBLY DISENGAGED

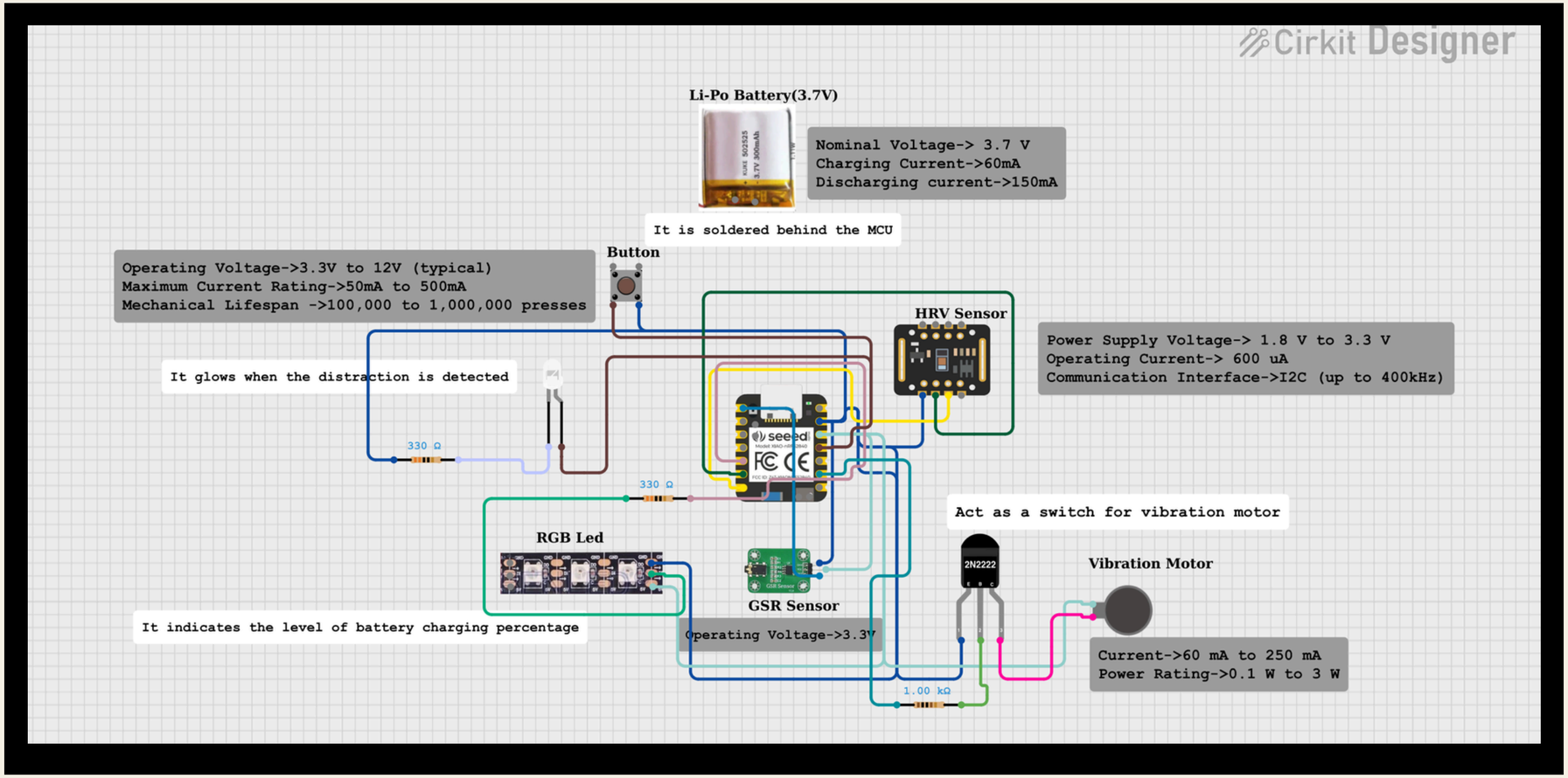
Accelerometer: very low motion
EDA: very low
PPG: low HR

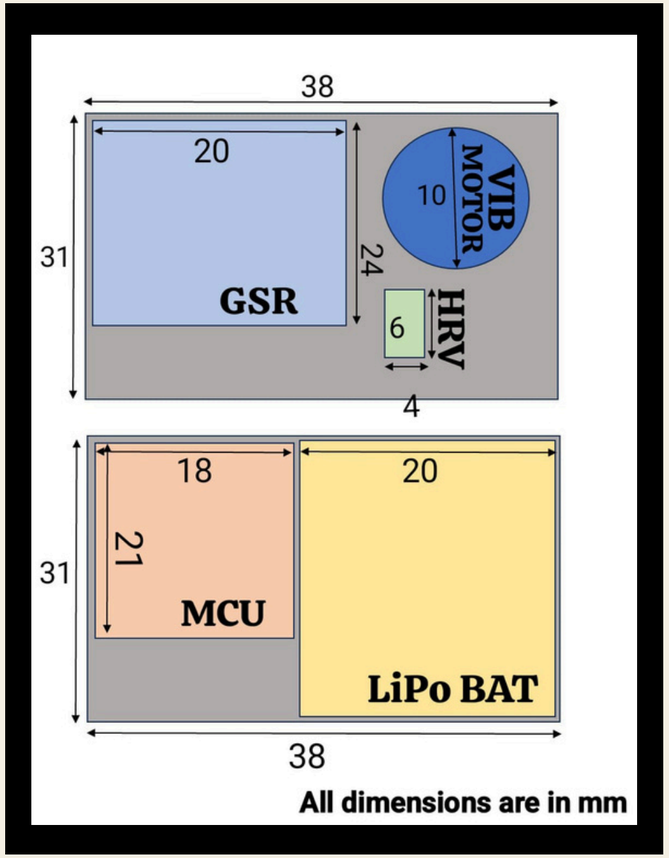
4 Anxious or stressed

MENTALLY DISTRACTED/STRESSED

Accelerometer: tapping/fidgeting
EDA: high
PPG: irregular HR

PROTOTYPE - HARDWARE





"This prototype integrates health sensing (GSR, HRV), feedback (vibration motor, Led), and processing (MCU, LiPo) in a compact, wearable form factor. Each component is modularly placed to optimize skin contact, ventilation, and accessibility."

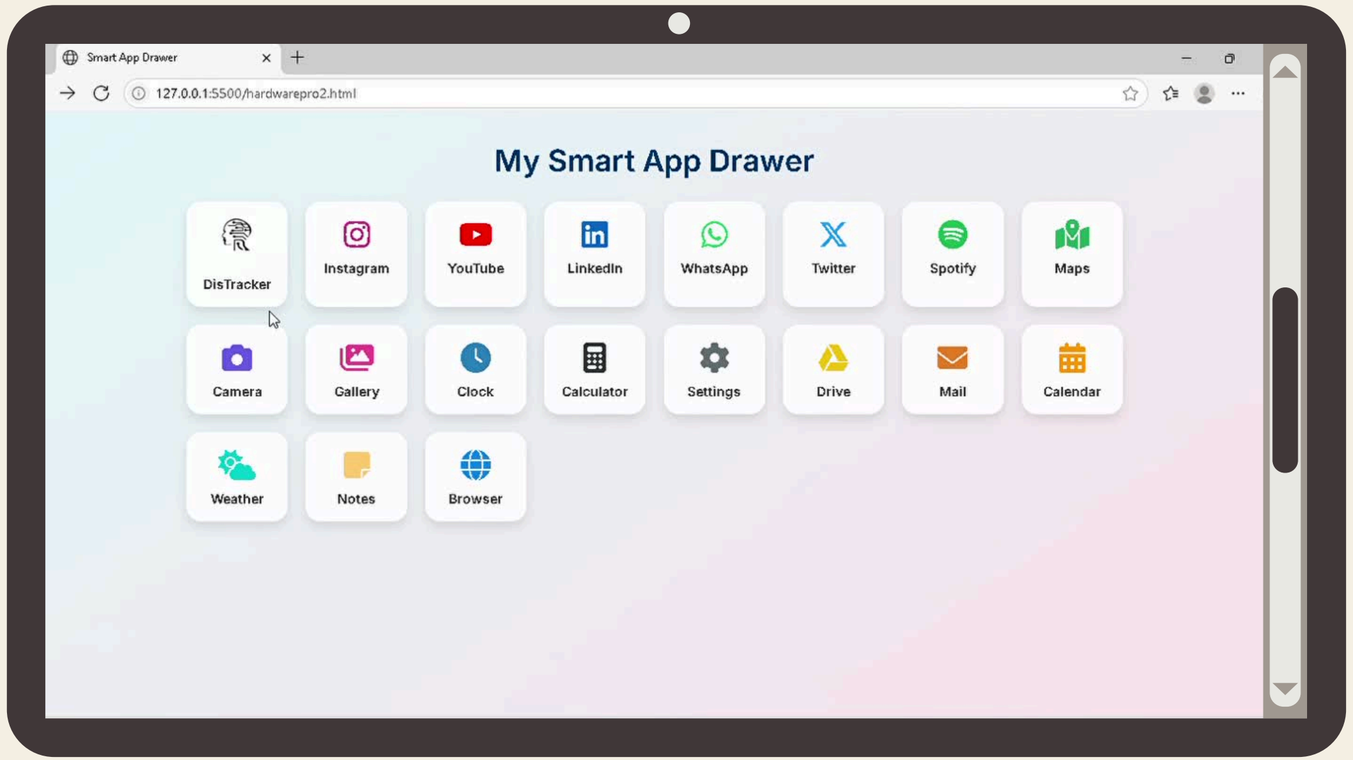
PROTOTYPE - SOFTWARE

Sensors

MCU+BLE

BLE

Mobile App



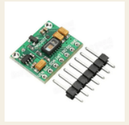
COLLECT MOBILE USAGE FROM MOBILE PHONE

IF ENTERTAINMENT APP>10 MIN PER HR---> VIBRATION FEEDBACK

COLLECT DATA FROM SENSORS

ANALYSE TO SHOW VARIOUS GRAPH AND INFO IN THE APPLICATION

Estimated Cost Analysis

	Components	Description	Price
	Seeed nRF52840 Sense	BLE enabled microcontroller, compatible for tinyML models	1400-1900
	Ohmite Grove GSR	Galvanic Skin response sensor, measures conductivity of skin	400-700
	HRV Sensor	Measures variability in heart rate and pulse waveform, outputs digital data	100-300
	Lipo Battery	Rechargeable 300mAh	150-400
₹	Passive Components	Resistors,wires, LEDs, vibratory motor	150-300
	Net Gross		2200-3900

TEST

1. If we monitor screen continuously then it consumes more power
2. HRV and EDA signals exhibit high inter-person variability
3. Cost of the device its around 3k
4. HRV and EDA sensors are highly temperature variant, Humid classrooms causes false alarms.
5. Debouncing in manual push button

PROBLEMS

SOLUTION

1. We first filter apps using user stats and then monitor screen incase of apps which serve dual purposes
2. We collect baseline data from each individual at the start and use this personalized data and continuous data collected to train our tiny MLmodels
3. Instead of making use of all separate components like GSR and HRV sensors separately if we have all of them in same chip we could reduce cost of packaging and area too
4. We introduce a temperature compensation sensor (150rs) it takes temperature as input and we give it to ML models to analyze for patterns
5. Implementing simple schmitt trigger circuit to set a certain range of thresholds

TEST

EDA

1. Dry vs Wet skin
2. Meditation
3. Stress test
4. Integration with mcu - Connect with analog input pin in mcu and a basic test code

HRV

1. Exercise
2. Deep breathing
3. Integration with mcu - Install SparkFun MAX3010x library (works for both MAX30102/03)
4. Run Example code

ONBOARD 3 AXIS ACCELEROMETER

1. Still Test
2. Tilting Test
3. Tap or Shake Test

MCU

1. Blink Test (Arduino IDE)
2. BLE Test
3. I2C Test for Onboard Sensors (IMU)
4. MPU6886 IMU Sensor Test
5. UART/Serial
6. Storage/Upload

MOTOR

1. Testing the Vibratory Motor Separately
2. Testing Sensor-to-Motor Integration via code

TINYML MODEL

1. Input feature validation
2. Distraction classification test
3. False positive rate

ENVIRONMENTAL ROBUSTNESS

1. Temperature variation
2. Sweat simulation

LINK FOR TESTING CODES

https://docs.google.com/document/d/16yhCMC3rUK1BajkGnp0COPW4I09iADXiPK6Dr1_ApEE/edit?usp=sharing

REFERENCES

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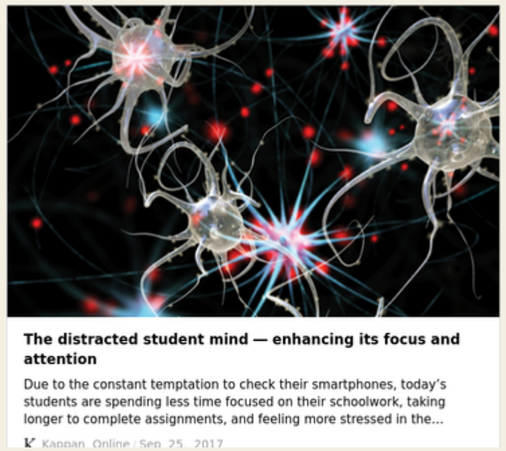

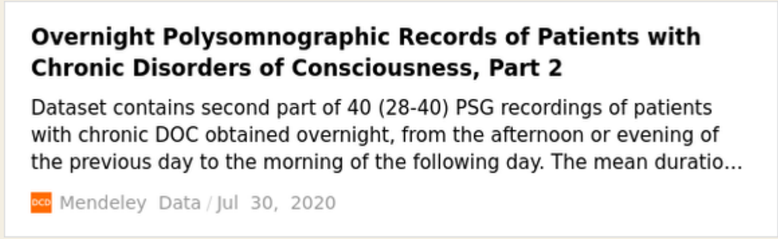


Thank You