



Carnegie Mellon University

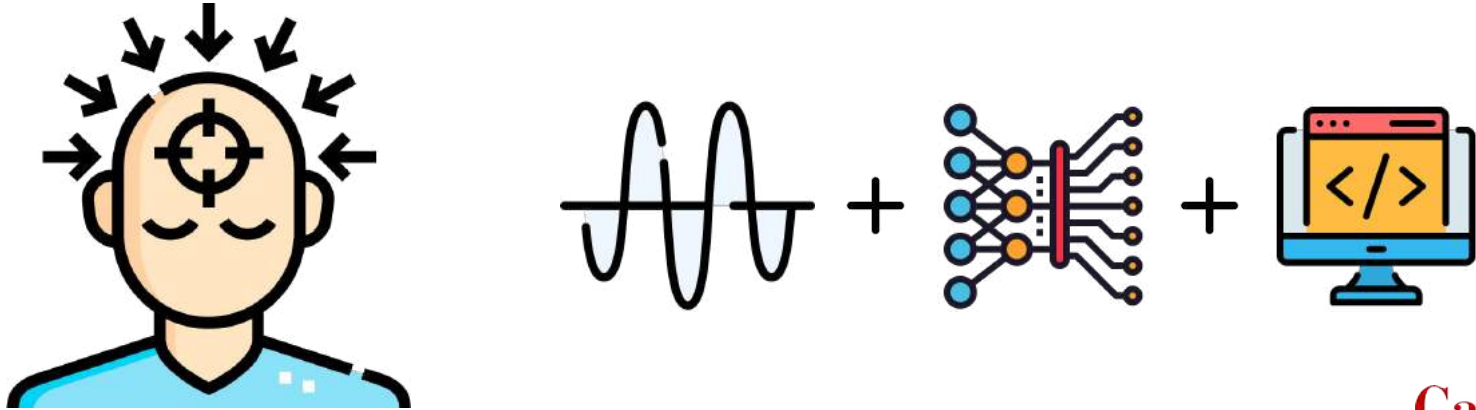
# Team E0: Focus Tracker App

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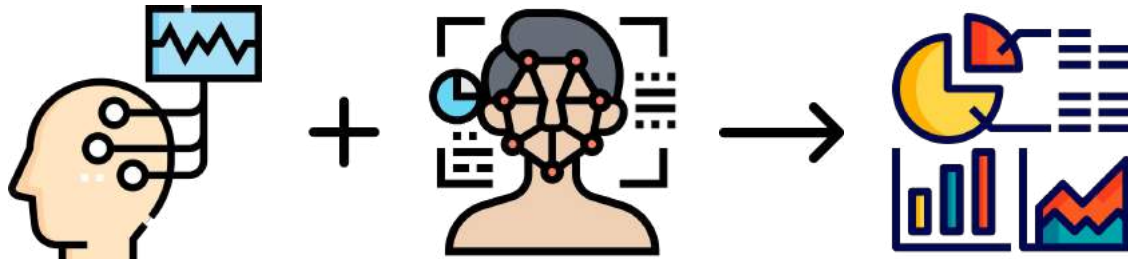
# The Problem and Solution

The Focus Tracker App helps users **measure their focus levels and associated distractions** during work sessions and **provides feedback and data** to users. We will **inform users**, allowing them to understand how their focus varies over time and what is holding them back. This **empowers users to take actionable steps to improve their focus**.



# Solution Approach

- **Real-time monitoring** of focus levels, distracted behaviors, and environmental distractions
- Measure focus levels using **EEG headset**, and distractions using **camera**
- Identify **distracted behaviors and environmental distractions**
  - Yawning, microsleeps, off-screen gazing, background motion, phone pick-ups, disruptions from others, room lighting
- Dashboard to visualize focus level and distractions over **historical work sessions**
- Summarize **productivity score, top distractions, and behaviors** for a given work session



# Use-Case Requirements



<b>Focus State and Productivity Score Accuracy</b>	≥90% of users find the Focus State/Productivity Score match personal assessment [1]
<b>Usability and Usefulness</b>	≥90% of users find the user experience to be seamless and easy to use
<b>Distraction and Distracted Behavior Detection</b>	F-score ≥ 0.7 (industry standard) Recall ≥ 0.9
<b>Real-time Monitoring</b>	≤ 3s delay between data capture and analysis (some latency is acceptable)

# Technical Challenges

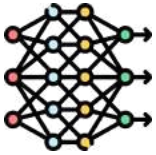


<b>EEG-based Focus State Detection</b>	<ul style="list-style-type: none"><li>• Emotiv performance metrics (stress, relax, interest, etc.)</li><li>• Collab w/ focus-detection professional Prof. Jocelyn Dueck</li><li>• Risk mitigation<ul style="list-style-type: none"><li>○ Microphone-based distraction detection</li><li>○ LLM-based suggestions for focus improvement</li></ul></li></ul>
<b>Distraction and Behavior Detection</b>	<ul style="list-style-type: none"><li>• Achieving an F-score <math>\geq 0.7</math>, recall <math>\geq 0.9</math> for classifiers</li><li>• Creating a diverse and high-quality dataset</li></ul>
<b>Data Capture and Analysis Latency</b>	<ul style="list-style-type: none"><li>• <math>\leq 3</math> latency between data capture and analysis</li><li>• Optimize neural network for simplicity while maintaining high accuracy</li></ul>
<b>Defining a Holistic Productivity Score</b>	<ul style="list-style-type: none"><li>• Incorporate multiple signals</li><li>• Higher score for better productivity</li></ul>

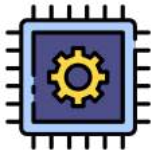
# Implementation



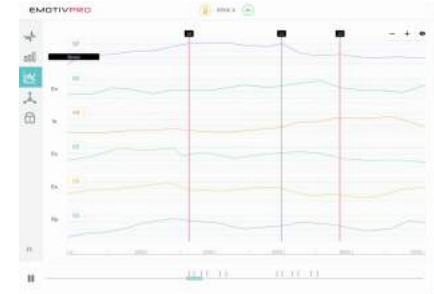
- **Software Systems**
  - React (Frontend)
  - Django, PostgreSQL (Backend)



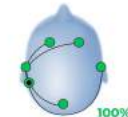
- **Machine Learning and Signal Processing**
  - Python, NumPy, TensorFlow
  - OpenCV
  - MediaPipe
  - EmotivPRO EEG headset SDK/API



- **Hardware Systems**
  - Emotiv EEG headset
  - Camera

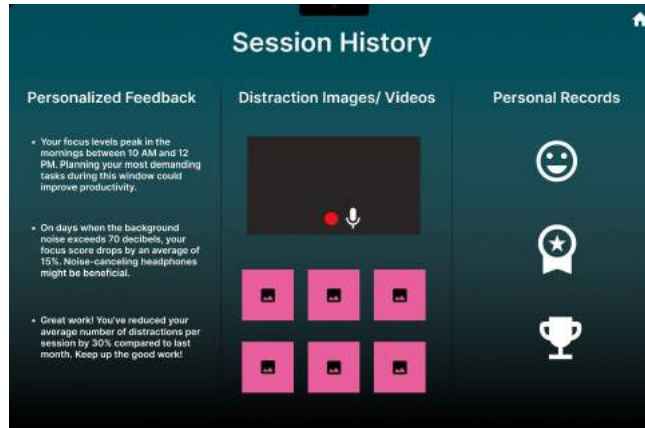
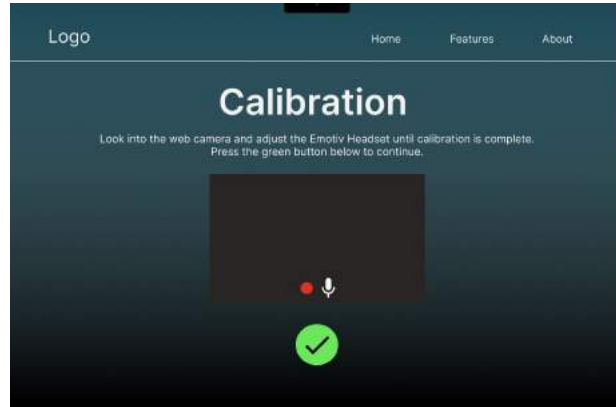


EMOTIVPRO



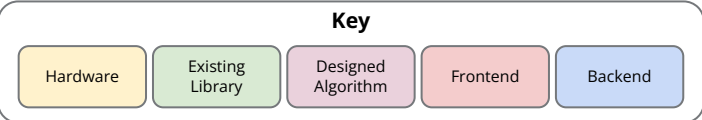
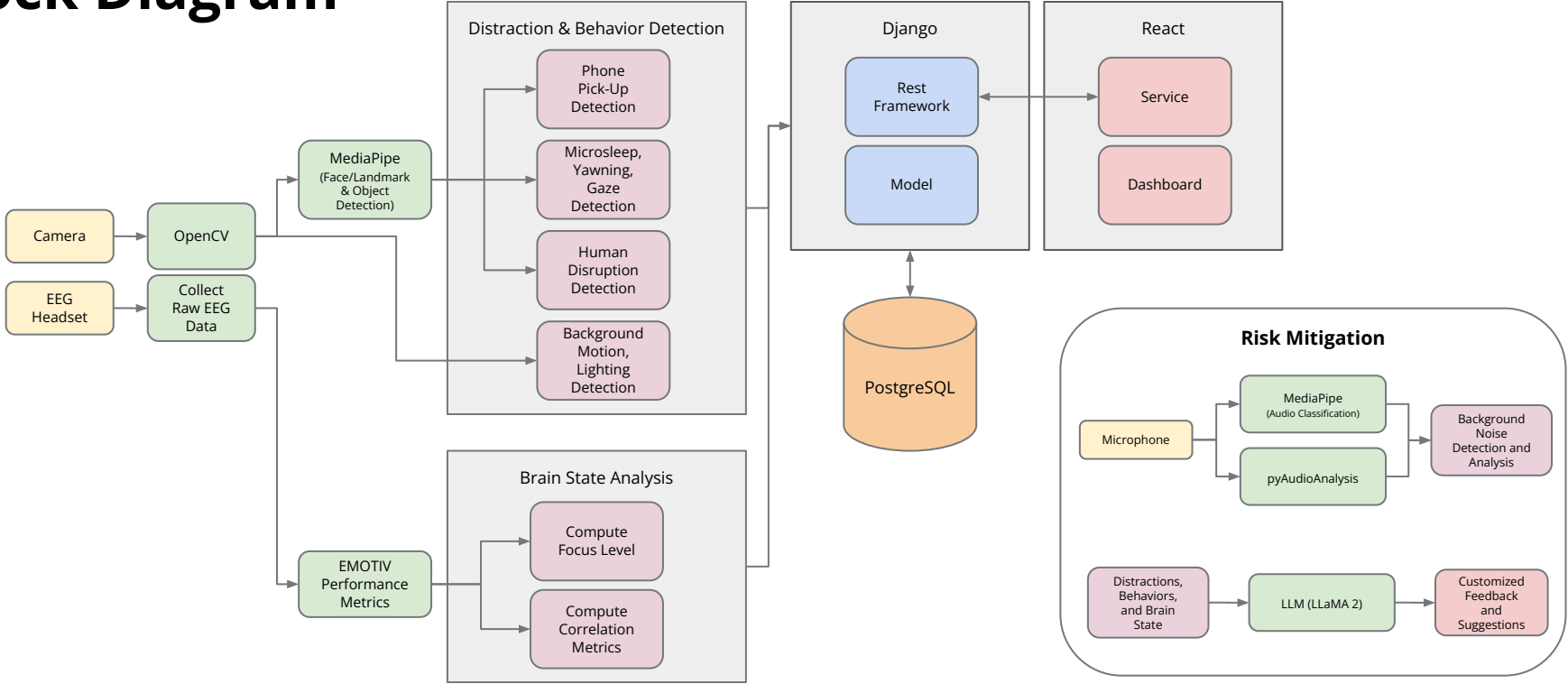
How to ensure good Contact Quality?

Make sure your contact is positioned  
over the contact on top with the  
edge of the electrode on top. Do not  
add any additional pressure to the  
skin under the contact and be aware  
behind the left side of the top they are  
glued and there is a gel under the  
electrode.



UI

# Block Diagram





# Testing, Verification, & Metrics

Requirement	Validation Method	Metric
Focus Level and Productivity Score Accuracy	Survey users [1] User study	$\geq 90\%$ of users find the Focus Level/Productivity Score match personal assessment [1]  Measure focus levels in distracting and non-distracting environments
Usability and Usefulness	Survey users	$\geq 90\%$ of users report little to no issues with the setup $\geq 90\%$ of users find the user experience to be seamless and easy to use



# Testing, Verification, & Metrics

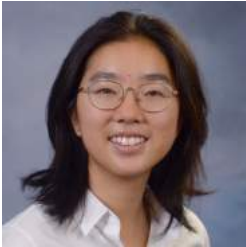
Requirement	Validation Method	Metric
Distraction and Distracted Behavior Detection	Check for correct classification of distractions and behaviors by binary classifiers	F-score $\geq 0.7$ Recall $\geq 0.9$
Real-time Monitoring	Measure latency between data capture and data analysis (record timestamps)	$\leq 3$ second latency



# Tasks and Division of Labor



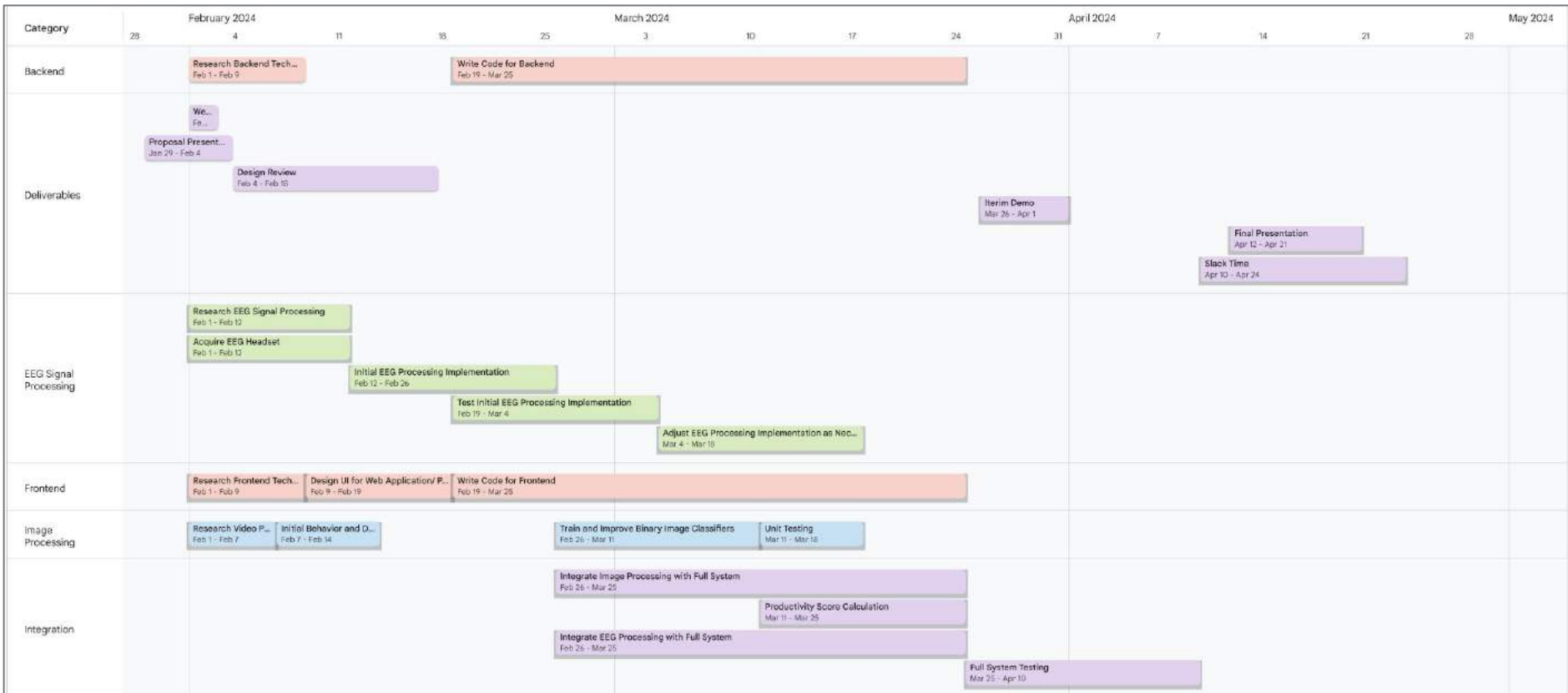
- Frontend and UI Design
- Backend Integration



- **Camera-based Detection, Identify & Classify:**
  - Distracted Behavior
  - Environmental Distractions



- **EEG Headset-based Signal Processing:**
  - Process EEG Input Signals to Detect Focus State
  - Compute Time spent in Focused State



# Schedule