



Carnegie Mellon University

Team E0: Focus Tracker App

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The Problem

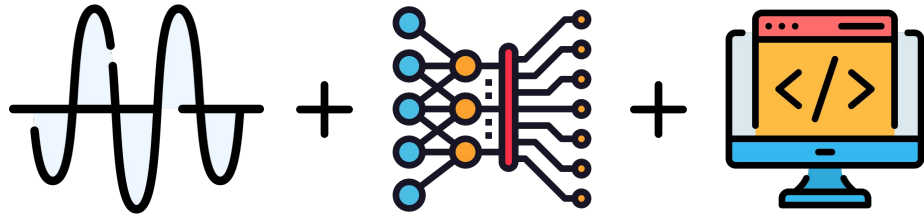
Do you find yourself distracted and unable to stay focused for long periods of time?

The typical student is **distracted for at least five out of every 15 minutes** they set aside to study [1].



The Solution

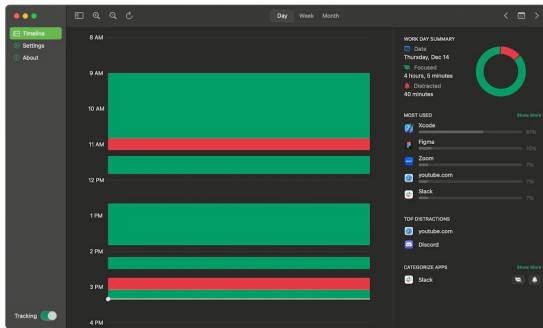
The Focus Tracker App helps users **measure their focus levels and associated distractions** during work sessions and **provides feedback and data** to users. We will **inform users**, allowing them to understand how their focus varies over time and what is holding them back. This **empowers users to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



Existing Solutions

Focus Time Tracker

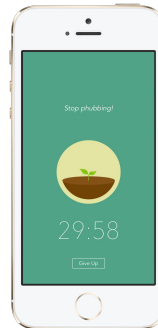
- Tracks time spent in certain apps
- No focus level or distraction metrics
- Exclusive to Mac



<https://www.focustrackerapp.com>

Forest

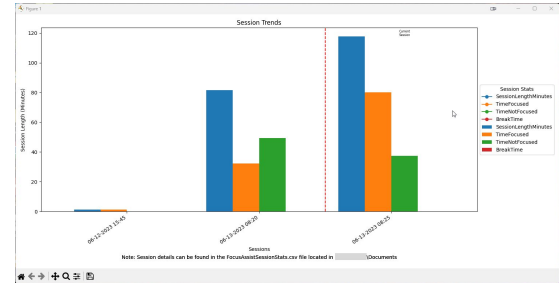
- Locks user out of phone during session
- Track session length
- No focus level or distraction metrics



<https://www.forestapp.cc>

Focus Assist

- Detects distractions and focus time
- Unintuitive UI
- Exclusive to Windows



<https://focusassist.net>

Use-Case Requirements

- **Focus Level and Productivity Score Accuracy**
 - $\geq 90\%$ of users find the Focus Level/Productivity Score match personal assessment
- **Usability and Usefulness**
 - $\geq 90\%$ of users find the user experience to be seamless and easy to use
- **Distraction and Distracted Behavior Detection**
 - F-score ≥ 0.7 (industry standard)
- **Real-time Monitoring**
 - $\leq 3s$ delay between data capture and analysis (some latency is acceptable)

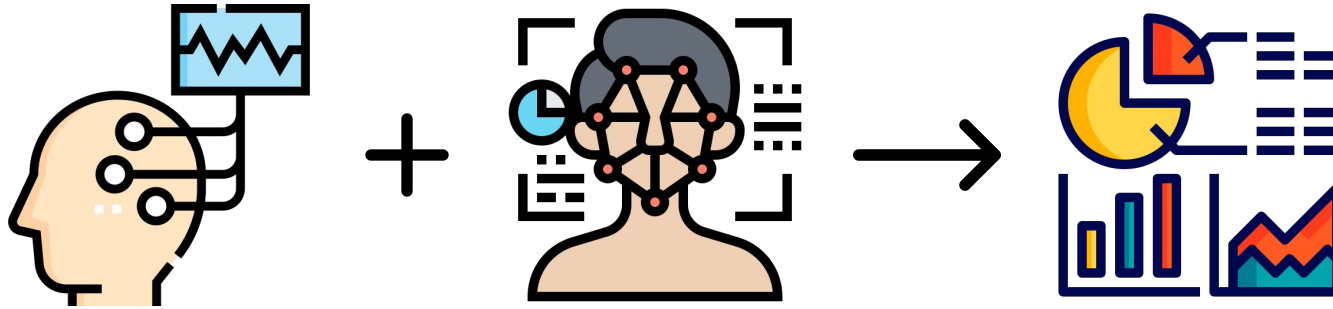


Technical Challenges

- **Defining a Holistic Productivity Score**
 - Desirable Properties
 - *incorporate multiple signals*
 - *higher score for better focus*
 - *value between 0 and 100*
- **Achieving an F-score ≥ 0.7 for Binary Classifiers**
 - Creating a diverse and high-quality dataset
 - Precision - "Of all the instances the model labeled as positive, how many are actually positive?"
 - Recall - "Of all the positive instances in the data, how many did the model correctly identify?"
- **Achieving $\leq 3s$ Latency between Data Capture and Analysis**
 - Optimize neural network for simplicity while maintaining high accuracy
 - Efficiently combine inputs from camera and EEG
- **Risk Mitigation**
 - Alternative formats to convey work session metrics

Solution Approach

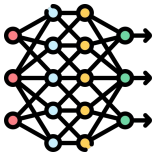
- **Real-time monitoring** of focus levels, distracted behaviors, and environmental distractions
- Measure focus levels using **EEG headset**, and distractions using **camera**
- Identify **distracted behaviors and environmental distractions**
 - Phone pick-ups, off-screen gazing, yawning, interactions with others, and visual distractions
- Dashboard to visualize focus level and distractions over **historical work sessions**
- Summarize **productivity score, top distractions, and behaviors** for a given work session



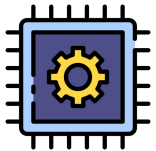
Solution Approach (cont.)



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

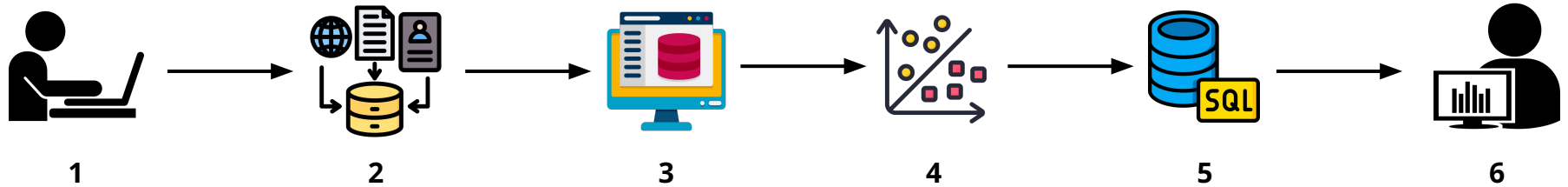


- **Machine Learning and Signal processing**
 - Python, Pandas, NumPy, TensorFlow (Feature Engineering & Model Training)
 - Google Cloud AI Platform (Model Deployment)
 - WebGazer.js, PyGaze (Eye-Tracking)
 - EEG headset SDK/API



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

Flow Chart



1. User accesses web application
2. Data collection (from hardware components)
3. Data sent to backend
4. Model classification
5. Update database + send real-time updates to frontend
6. User interacts with dashboards

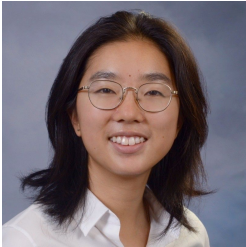
Testing, Verification, & Metrics

| Requirement | Validation Method | Metric |
|---|--|--|
| Focus Level and Productivity Score Accuracy | Survey users [1] | ≥90% of users find the Focus Level/Productivity Score match personal assessment |
| Usability and Usefulness | Survey users | ≥90% of users report little to no issues with the setup ≥90% of users find the user experience to be seamless and easy to use |
| Distraction and Distracted Behavior Detection | Check for correct classification of distractions and behaviors by binary classifiers | F-score ≥ 0.7 |
| Real-time Monitoring | Measure latency between data capture and data analysis | ≤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

