WorkMindfully

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Problem Description/Motivation

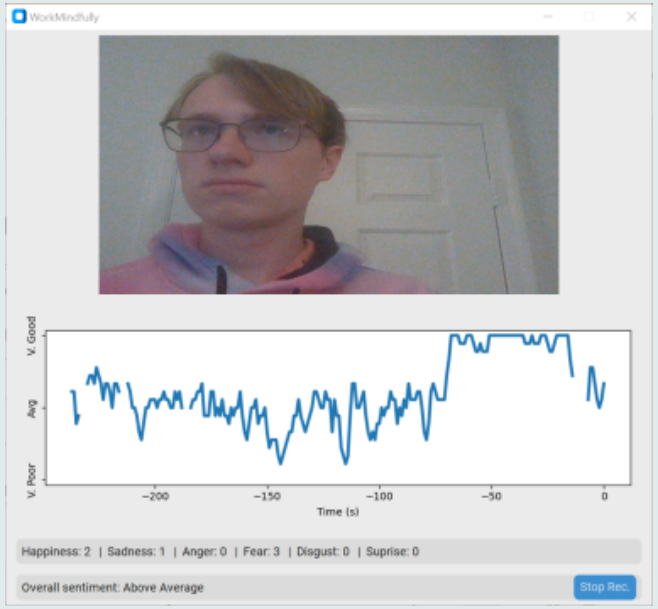
- Computers now play a prominent role in people's worklife. Most white-collar work is entirely computer-based, as is academic work
- Research demonstrates that prolonged sessions on a computer are correlated with mental health complications, especially when completing cognitively-demanding tasks
  - This problem is partly caused by the lack of emotional mindfulness needed to develop a healthy relationship with computer-focused work
- WorkMindfully hopes to promote necessary mindfulness and foster healthy, balanced routines for people who must use computers for extended periods of time

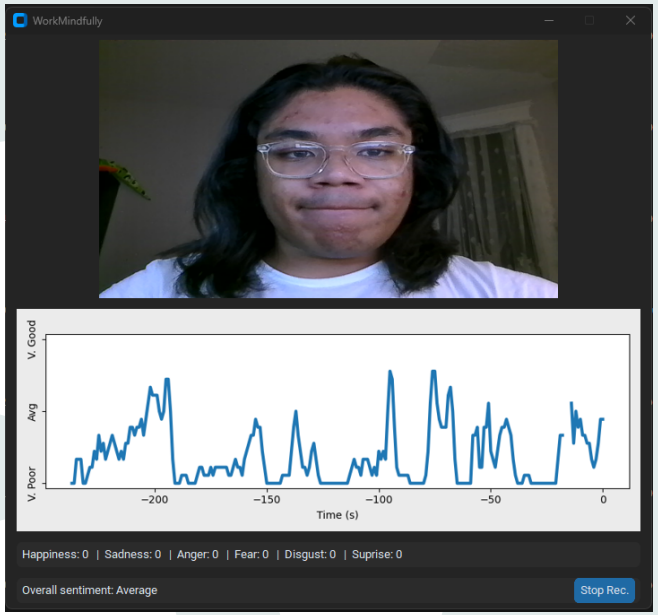
WorkMindfully at a high level

- WorkMindfully is a simple and easy-to-use application that helps users be mindful of their emotions as they work
- WorkMindfully is a program that you install on your computer and it runs seamlessly in the background
  - Efficiency: It works on any modern computer, without the need for specialized hardware
- With WorkMindfully, users can monitor their emotions in real time and analyze them after they are finished with a task

Current Features

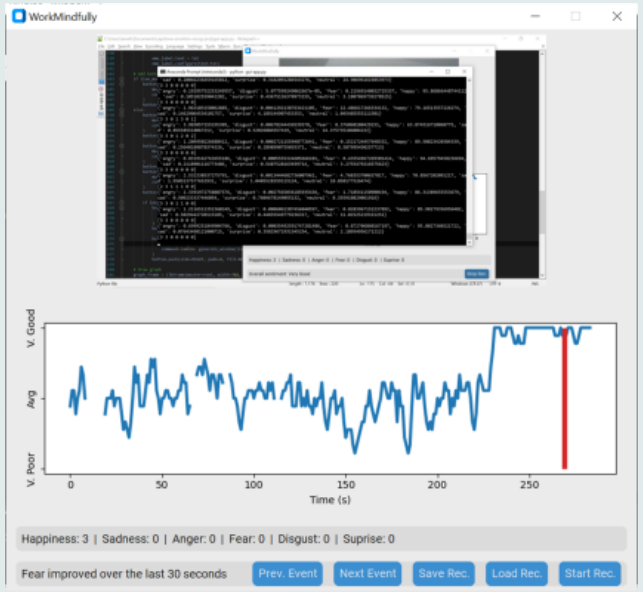
- WorkMindfully uses the front-facing camera and machine learning to detect the user's emotions
- As it records, it displays the last 2 minutes of the user's emotions and a live feed of the camera
- WorkMindfuly currently estimates the user's level of happiness, sadness, anger, fear, disgust and surprise

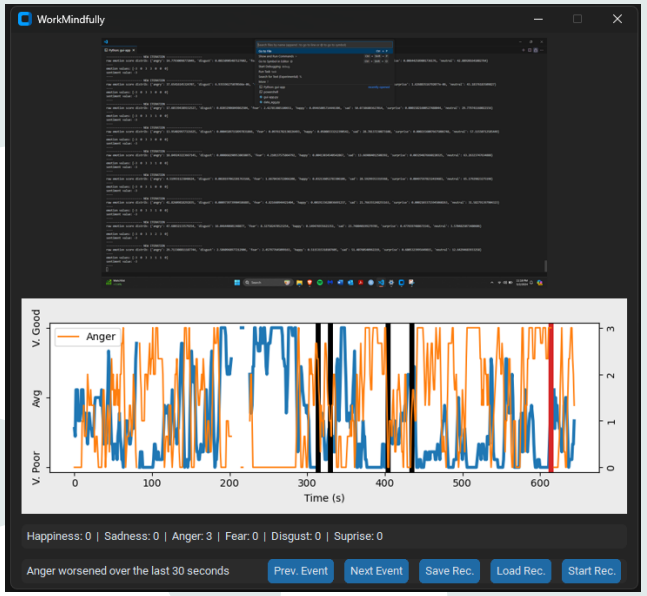




Current Features

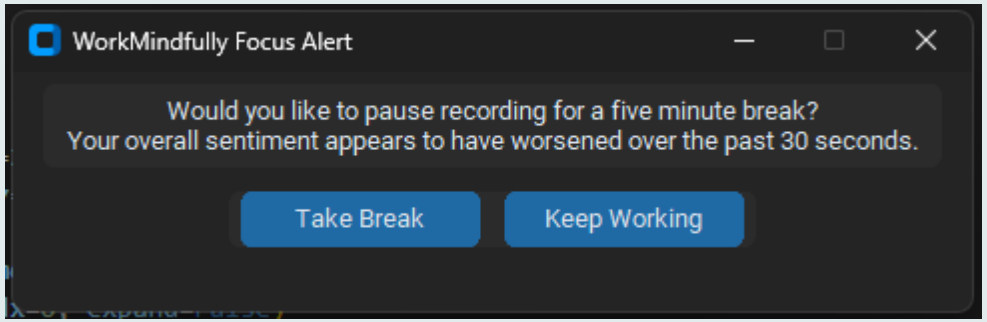
- After completing a work session, WorkMindfully helps users analyze their focus and emotional state
- It automatically detects and labels drastic shifts in emotions. It also captures a screenshot of the user's current task for analysis
- The user can choose to resume recording when they are ready, or save the recording to be analyzed at another time

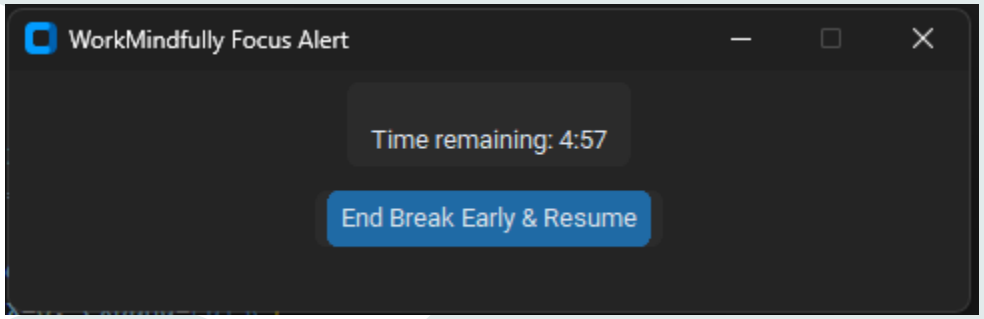




Current Features

- While recording, if WorkMindfully detects a large change in the user's mental state, it will prompt users to take a break to refocus
- We are also analyzing other ways to engage the user, including auditory stimuli (like white noise or calming music) or visual stimuli (such as photos of serene landscapes or animals)

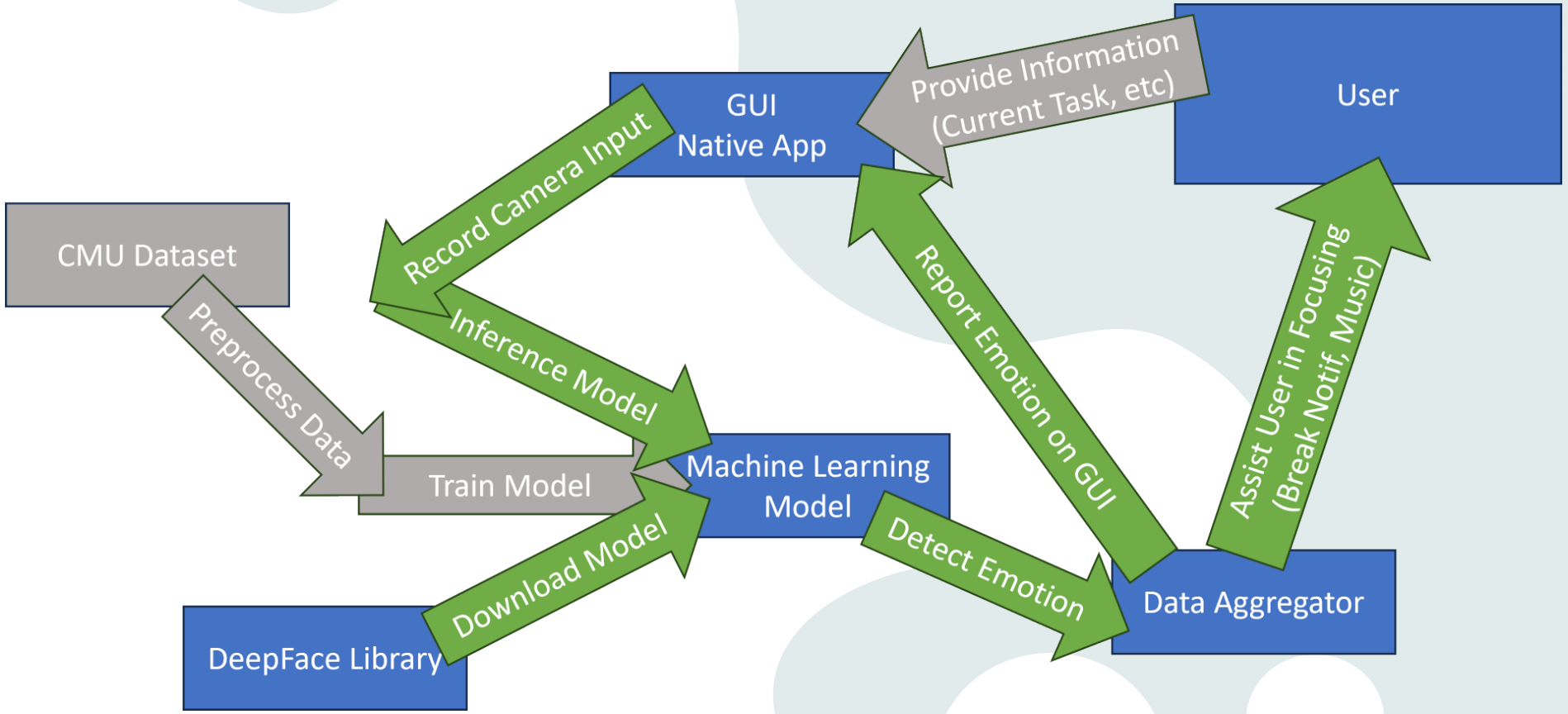




Final Implementation & Obstacles

- WorkMindfully uses convolutional neural network (CNN) machine learning algorithms within DeepFace to estimate a user's current emotion in real-time
- Python was the primary language used, with necessary libraries for GUI app development, machine learning, and data management (e.g. Tensorflow, Tkinter, Numpy, OpenCV, Matplotlib, DeepFace)
- Developing an original and reliable learning framework was challenging, due to imbalanced data, perpetual overfitting, data scarcity
- The team found challenges in developing the GUI as well, with understanding how Tkinter can best be leveraged to implement unique, desirable features

Final Implementation Data Flow Diagram



Lessons Learned

- The team learned much about the capabilities of deep learning architectures in the task of facial recognition/emotion scoring, as well as limitations that should be stressed to prospective users
- The team learned the critical implications of developing a reliable wellness application through trial and error, understanding application shortcomings
- The team learned the importance of graphical design when designing user-focused applications

Moving forward

- There are several avenues for improvement:
  - The machine learning backend can be fine-tuned or replaced to garner further improvements and resiliency to idiosyncratic image circumstances (corrective maintainability)
  - Introduction of further moderation tools/features not currently implemented (corrective)
  - The application can endure further testing on various platforms, with consideration of universality and more diverse hardware optimization (adaptive)
  - We believe that user feedback would be central to further development
  - Further test scalability – potential for increased computational cost when extensive data is processed/stored?

Conclusions

- With this project, our goal was to create a simple, easy to use application to help students focus and be mindful of their emotions while working
- Our solution, WorkMindfully, achieves this and could become an important tool for people struggling with their workload

Questions?

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https://github.com/ianjwhitehouse/capstone-emotion-recog-proj