EMPROVE

AN EMPLOYEE PRODUCTIVITY SYSTEM USING MACHINE LEARNING

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INTRODUCTION

- Increase in employee productivity can lead to greater profits for the company.
- It would also result in increased employee satisfaction.
- Efficient productivity techniques would help employees to perform well without burning out.
- As a result, the quality of the software product would improve tremendously.

PROBLEM STATEMENT

- As the software industry is constantly evolving and as more and more companies are going remote, there is a need for a modern and reliable system that ensures the productivity of employees.

OBJECTIVE

- To create a software system that would maximize employee productivity in the software industry by incorporating features such as task management, Pomodoro technique, drowsiness detection and work stress assessment.

SCOPE

- Set tasks and deadlines.
- Provide timely breaks after 25 minutes of work (Pomodoro technique).
- Detects how lively is the person (active/drowsy).
- Play concentration music.
- Evaluate work stress using WS Assessment.
- Generate productivity report.

RELATED WORKS

| EXISTING WORK	ADVANTAGES	DISADVANTAGES
Driver Drowsiness Detection Using Machine Learning Algorithm [1]	• Utilizes the computation of MAR and EAR in real–time. • Focuses on real–time detection and alerts.	• Limitations in certain conditions such as low lighting or driver obstruction. • Does not mention specific validation studies or accuracy rates about the system.
Real–time Facial Surface Geometry from Monocular Video on Mobile GPUs [2]	• End to end approach. • Custom residual neural network architecture. • Predicts 468 facial landmarks.	• Dependency on GPU support. • Limited evaluation dataset. • Temporal jitter in landmark trajectories.
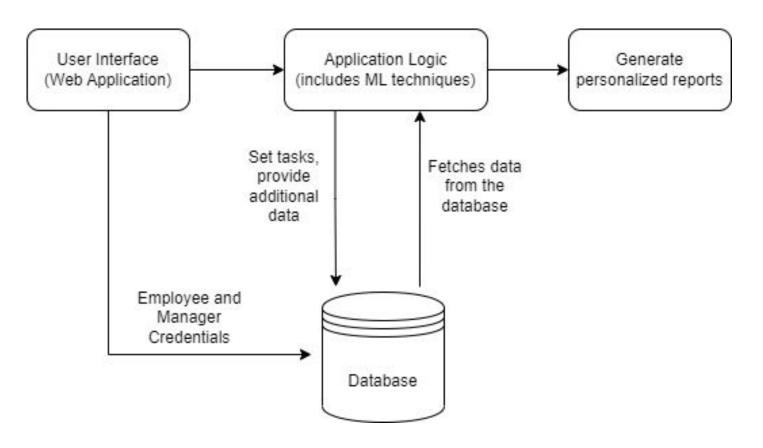
|		
Framework for Preventing Procrastination and Increasing Productivity [3]	- Comprehensive understanding of gamification. - Introduction to Pomodoro technique - Proposal of ProScore framework.	- Practical implementation challenges. - Absence of comparison with existing solutions. - Limited scope.
The Power of Music – How environment variables can disrupt or enable productivity [4]	- Comprehensive exploration of effects of music on productivity. - Triangulation of data. - Addressing previous limitations.	- Lack of specific methodology details. - Limited focus on software development. - Limited generalizability.

PROPOSED SYSTEM
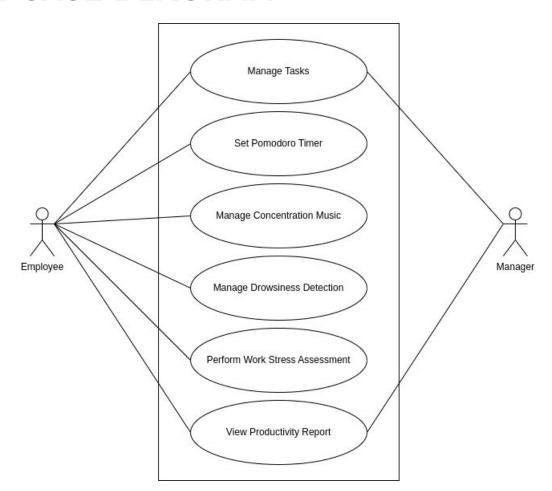
- Emprove is a software tool that aims to help employees improve their workplace productivity.
- Task management system to manage tasks assigned to the employees.
- Pomodoro timer for employees to track their work intervals and breaks, thereby improving their focus and productivity.
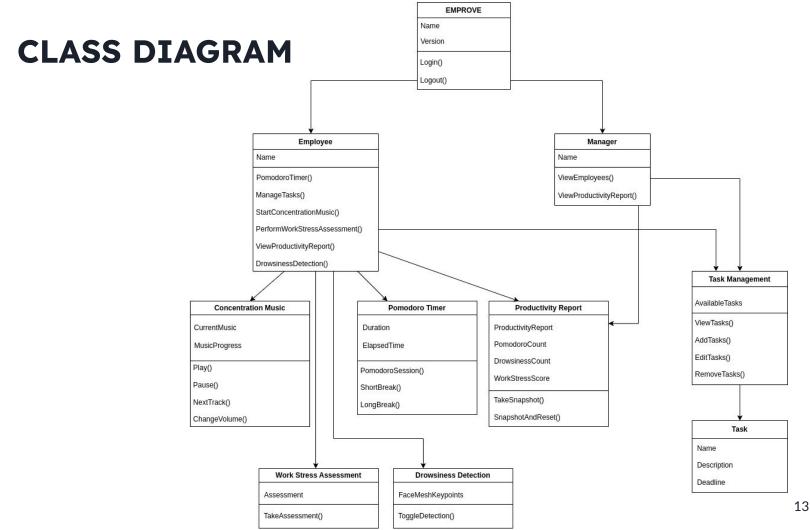
- Drowsiness detection will warn the user when they feel drowsy and help them to stay alert.
- Concentration music feature allows employees to listen to music while working. The music will be selected based on its ability to improve focus and concentration.
- Work Stress Assessment, proposed by the American Institute of Stress is used to evaluate the stress at workplace.
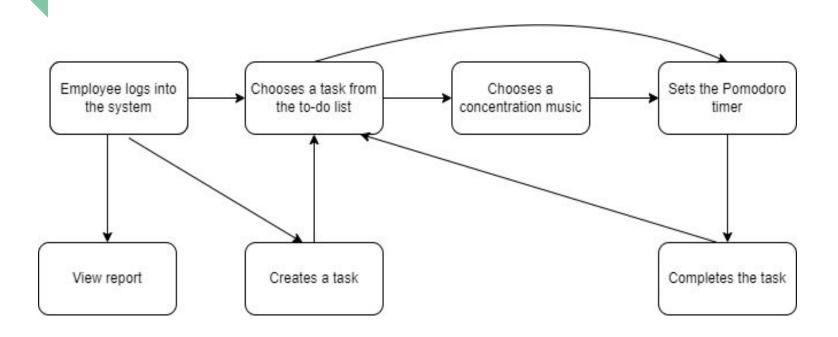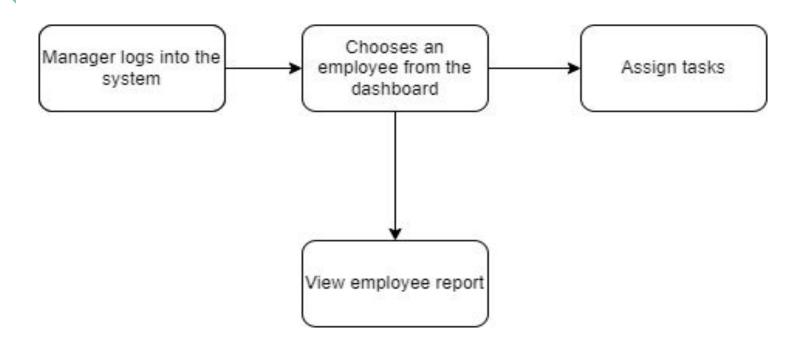
ARCHITECTURE DIAGRAM

USE CASE DIAGRAM

CLASS DIAGRAM

EMPROVE

Name

Version

Login()

Logout()

Employee

Name

PomodoroTimer()

ManageTasks()

StartConcentrationMusic()

PerformWorkStressAssessment()

ViewProductivityReport()

DrowsinessDetection()

Manager

Name

ViewEmployees()

ViewProductivityReport()

Concentration Music

CurrentMusic

MusicProgress

Play()

Pause()

NextTrack()

ChangeVolume()

Pomodoro Timer

Duration

ElapsedTime

PomodoroSession()

ShortBreak()

LongBreak()

Productivity Report

ProductivityReport

PomodoroCount

DrowsinessCount

WorkStressScore

TakeSnapshot()

SnapshotAndReset()

Task Management

AvailableTasks

ViewTasks()

AddTasks()

EditTasks()

RemoveTasks()

Task

Name

Description

Deadline

Work Stress Assessment

Assessment

TakeAssessment()

Drowsiness Detection

FaceMeshKeypoints

ToggleDetection()

PROCESS FLOW DIAGRAM - EMPLOYEE
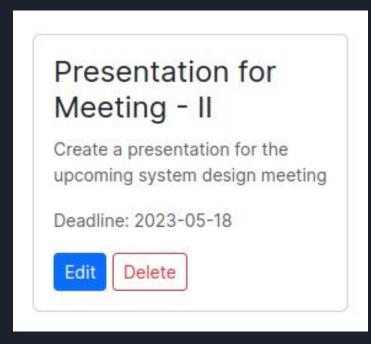
PROCESS FLOW DIAGRAM - MANAGER

Manager logs into the system → Chooses an employee from the dashboard → Assign tasks

Chooses an employee from the dashboard → View employee report
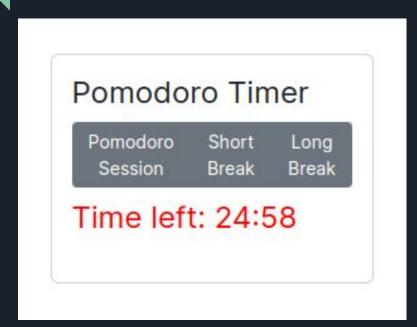
IMPLEMENTATION DETAILS

- Used React and EJS for the frontend with Bootstrap as the CSS framework.
- Used Node and Express for the backend with MongoDB as the database.
- Implemented the following key modules:
    - Task Management
    - Pomodoro Timer
    - Concentration Music
    - Drowsiness Detection
    - Work Stress Assessment
    - Productivity Report

TASK MANAGEMENT MODULE

Presentation for Meeting - II

Create a presentation for the upcoming system design meeting

Deadline: 2023-05-18

Edit Delete

- Can create tasks and set deadlines.
- Interface includes several features such as
  - Adding new tasks
  - Editing existing tasks
  - Removing tasks

POMODORO TIMER MODULE
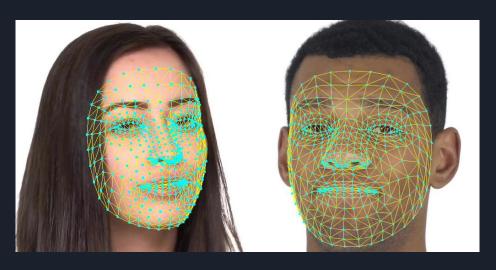
Pomodoro Timer

| Pomodoro Session | Short Break | Long Break |

Time left: 24:58

- Pomodoro technique prevents burnout and promotes focus.
- Has the following 3 modes
  - Pomodoro Session – 25 minutes
  - Short Break – 5 minutes
  - Long Break – 15 minutes

CONCENTRATION MUSIC MODULE

- Employees can listen to concentration music to help them relax and focus.
- The interface includes several features such as
  - Selection of music
  - Adjust the volume
  - Play and pause the music

DROWSINESS DETECTION MODULE

- Employee drowsiness is detected based on facial keypoints.
- If drowsy, it will alert the employee and will suggest to take a break.
- Would help the employees to stay alert and avoid mistakes.

- EAR is obtained by detecting a face from an image and finding the Euclidean distance of the corresponding key points of the eye.
- Similarly, MAR is also calculated.

Open eye will have more EAR

Closed eye will have less EAR
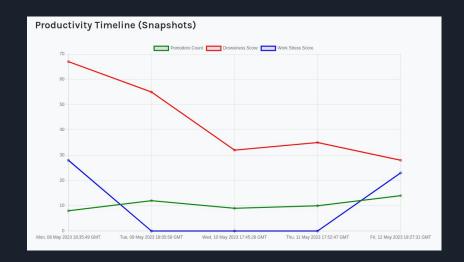
$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

WORK STRESS ASSESSMENT MODULE

- Proposed by the American Institute of Stress and the Marlin Company.
- Has 8 statements with scores from 1 to 5.
- The work stress score classifies stress into 5 categories.

WS Score	Stress Category
08 – 15	Calm
16 – 20	Fairly Low
21 – 25	Moderate Stress
26 – 30	Severe
31 – 40	Dangerous

PRODUCTIVITY REPORT MODULE

- Provides a detailed report on employee productivity.
- Shows Pomodoro count, drowsiness count and work stress score.
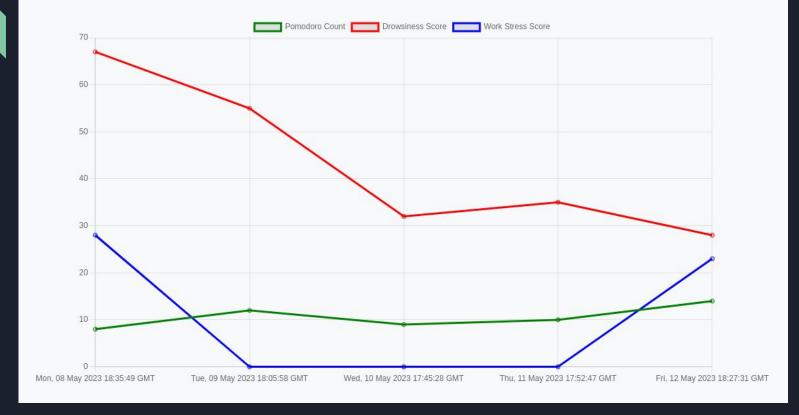- Productivity metrics are visualised using a multi line plot.

Productivity Timeline (Snapshots)

RESULTS AND DISCUSSION

- Conducted a case study to evaluate the effectiveness of EMPROVE.
- System was used by a software engineer based on Kochi, Kerala (Working from Home).
- One week trial period, during regular working hours – 9 am to 6 pm, Monday to Friday.
- Productivity metrics were carefully observed and analysed.

Sl. No.	Timestamp	Pomodoro Count	Drowsiness Count	Work Stress Score
1	Mon, 08 May 2023 18:35:49 GMT	8	67	28
2	Tue, 09 May 2023 18:05:58 GMT	12	55	–
3	Wed, 10 May 2023 17:45:28 GMT	9	32	–
4	Thu, 11 May 2023 17:52:47 GMT	10	35	–
5	Fri, 12 May 2023 18:27:31 GMT	14	28	23

Productivity Timeline (Snapshots)

Legend: Pomodoro Count (green), Drowsiness Score (red), Work Stress Score (blue)

X-axis: Mon, 08 May 2023 18:35:49 GMT · Tue, 09 May 2023 18:05:58 GMT · Wed, 10 May 2023 17:45:28 GMT · Thu, 11 May 2023 17:52:47 GMT · Fri, 12 May 2023 18:27:31 GMT

CONCLUSION

- Emprove is a powerful tool to track tasks, manage time and stay focused and productive throughout the workday.
- The software offers a range of benefits for both employees and managers.
- Companies can achieve higher levels of productivity, better task management and provide a healthier work–life balance for their employees.

REFERENCES

[1] Prasath N, Sreemathy J, Vigneshwaran P, "Driver Drowsiness Detection Using Machine Learning Algorithm", 2022 8th International Conference on Advanced Computing and Communication Systems (ICACCS), Jun 2022.

[2] Yury Kartynnik, Artsiom Ablavatski, Ivan Grishchenko, Matthias Grundmann, "Real–time Facial Surface Geometry from Monocular Video on Mobile GPUs", arXiv preprint arXiv:1907.06724v1, Jul 2019.

[3] Amit A J, Gautam Shankararam S R, Pradeep P , Perumalraja R, Kamalesh S, "Framework for Preventing Procrastination and Increasing Productivity", 2021 3rd International Conference on Signal Processing and Communication (ICPSC), May 2021.

[4] Sean Jentz, Victor Winkelmann, "The Power of Music – How environmental variables can disrupt or enable productivity".

DEMO (SCREENSHOTS)

Please sign up
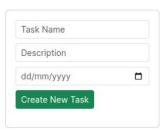
Name

Email Address

Password

Sign up

Work Stress Assessment
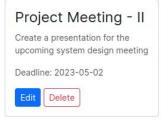
Directions: Thinking about your current job, how often does each of the following statements describe how you feel?

A. Conditions at work are unpleasant or sometimes even unsafe.

○ Never   ○ Rarely   ○ Sometimes   ○ Often   ○ Very Often

B. I feel that my job is negatively affecting my physical or emotional well being.

○ Never   ○ Rarely   ○ Sometimes   ○ Often   ○ Very Often

C. I have too much work to do and/or too many unreasonable deadlines.

○ Never   ○ Rarely   ○ Sometimes   ○ Often   ○ Very Often

D. I find it difficult to express my opinions or feelings about my job conditions to my superiors.

○ Never   ○ Rarely   ○ Sometimes   ○ Often   ○ Very Often

E. I feel that job pressures interfere with my family or personal life.

Employee Details

Name: **San Baby Francis**
Email ID: **san@gmail.com**
Number of assigned tasks: **1**

Productivity Metrics

0

Pomodoro Count

Pomodoro Count shows the number of your successful Pomodoro sessions.

47

Drowsiness Count

Drowsiness Count shows the number of times our system detected drowsiness.

19

Work Stress Score

Work Stress Score is an indicator of your workplace stress.

Take a Snapshot   Snapshot and Reset

THANK YOU