Human Technology Interaction | Professor Siddharth

IMPACT OF SHORT VIDEOS ON MEMORY

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PROBLEM STATEMENT

The rapid context switching in short-form videos, such as those on YouTube Shorts, TikTok, and Instagram Reels, may impair memory retention. Existing studies highlight a correlation between digital media use and lower memory retention, especially among youth, but these studies often rely on static tests and lack integration of real-time physiological data.

POTENTIAL APPLICATIONS

1. Educational Strategies: Insights from this study can inform the design of educational content to optimize memory retention.

2. Content Creation: Platforms and creators can use findings to produce content that is engaging without compromising cognitive well-being.

3. Media Consumption Guidelines: Guidelines can be developed to promote healthier media habits.

POTENTIAL IMPACT

The solution could lead to improved cognitive health, better educational outcomes, and responsible media consumption practices, benefiting individuals and society by fostering a more informed and productive population.

LITERATURE REVIEW

Effects of Social Media on Memory Consolidation in Adolescents

Hypothesis and Methodology:

The study tested whether short-form social media content (visual-acoustic and visual-speech stimuli) impacts auditory-speech and visual memory in adolescents (ages 11-17) using Luria's memory tasks immediately and after a 40-minute delay.

Results:

Younger adolescents (11-12) had a significant memory impairment, especially after visual-acoustic stimuli, thus indicating the negative impact of social media on the consolidation of memory.

Petrash, E., Nikishina, V., Razuvaeva, T., Sokolyskaya, M., Kuznetsova, A., & Zapesotskaya, I. (2022). Effects of the social media interference factor on memory consolidation in adolescents. Medicine of Extreme Situations, 2022(4). https://doi.org/10.47183/mes.2022.039

LITERATURE REVIEW

Impact of Short-Form Videos on Memory Retention

Hypothesis and Methodology:

A between-subjects experiment with 60 participants examined the impact of TikTok, Twitter, and YouTube on Prospective Memory (PM) using a Lexical Decision Task (LD) and a PM task, with platform exposure or a Rest condition during the break.

Results:

TikTok caused a 40% drop in PM performance due to rapid context-switching and engaging short-form content, while Twitter and YouTube showed no significant impact on memory retention.

Chiossi, F., Haliburton, L., Ou, C., Butz, A., & Schmidt, A. (2023). Short-Form Videos Degrade Our Capacity to Retain Intentions: Effect of Context Switching On Prospective Memory. In Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (CHI '23), April 23–28, 2023, Hamburg, Germany. ACM, New York, NY, USA. https://doi.org/10.1145/3544548.3580778

LITERATURE REVIEW

Working Memory Span Tasks

Hypothesis and Methodology:

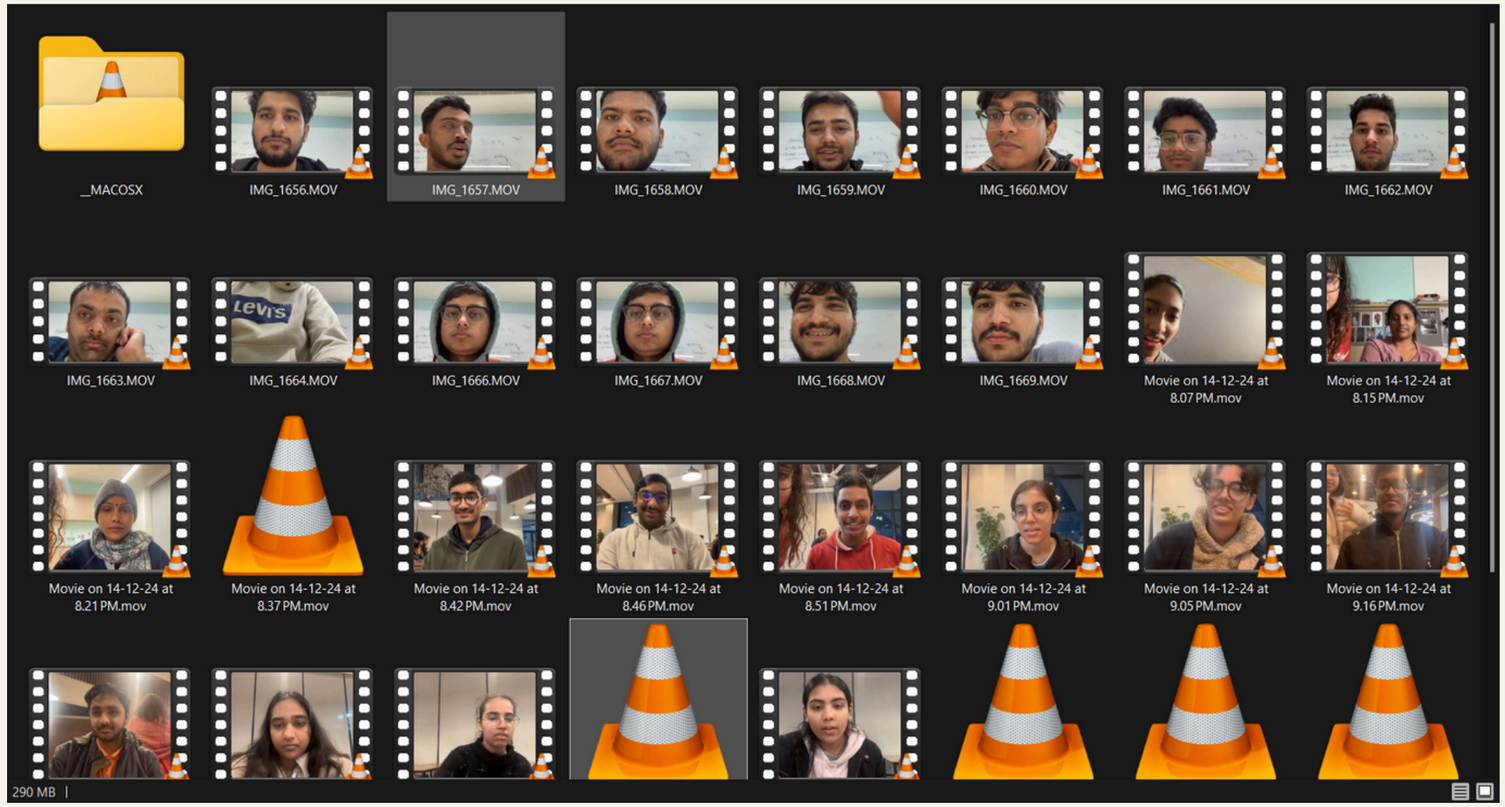
The authors hypothesize that WM span tasks are effective in measuring working memory capacity under dual-task conditions. They review task reliability and validity, offering guidelines on how to best use these tasks for cognitive research.

Results:

WM span tasks are shown to be reliable and valid for measuring WMC. They predict cognitive performance and are suited for experiments involving memory and cognitive load, which aligns with our project on video consumption and memory retention.

Conway, A. R. A., Kane, M. J., Bunting, M. F., Hambrick, D. Z., Wilhelm, O., & Engle, R. W. (2005). Working memory span tasks: A methodological review and user's guide. Psychonomic Bulletin & Review, 12(5), 769-786. https://link.springer.com/content/pdf/10.3758/BF03196772.pdf

DATA COLLECTION



- 32 individuals
1. (2nd, 3rd, 4th year UG students)
2. (Housekeeping Didi's)
- 3 types of experiments
- Conducted 3 times
- Total 288 datapoints

EXPERIMENT DESIGN

Phases of Experimentation:

> Baseline/Resting - User sits idle to refresh their mind before the next phase.

> Stimulus - User scrolls through Instagram Reels or YouTube Shorts.

> Testing - User performs memory tasks; main data for analysis is collected.

Types of Memory Tasks:

> Operation Span Task - Solve a math problem then remember a word. Recall words in order after several rounds.

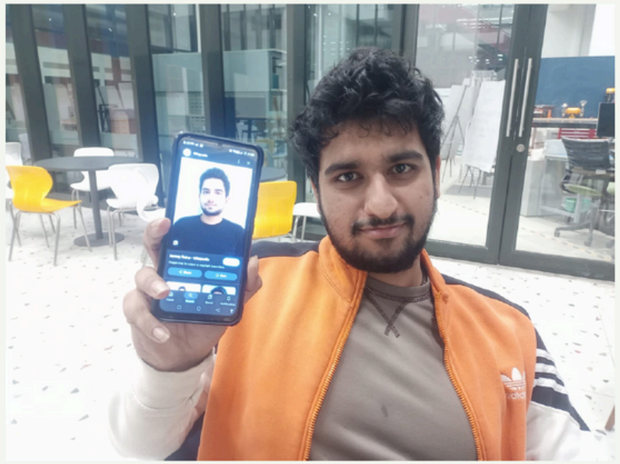
> Reading Span Task - Read a sentence then remember its last word. Recall all last words in order after several sentences.

> Counting Span Task - Count items in images. Recall item counts in order.

Operation Span Task

Number of Chocolates ??

Number of Faces ??



Counting Span Task

Math Problems : Hti experiment

1. Add the following two-digit numbers:

$$45 + 67$$

2. Find the value of:

$$\tan 45^\circ + \sec 30^\circ$$

3. Multiply the following numbers:

$$121 \times 9$$

4. Add the following two-digit numbers:

$$56 + 43 + 19$$

1. Operation task:

   Words :

   1. Coffee,
   2. Shayari
   3. Deepika,
   4. Cards,
   5. Jacket
   6. Shushi
   7. Money
   8. Law
   9. Nuclear
   10. PC

Reading Span Task

Tom Hansen met Summer Finn and instantly felt a strong connection, believing she could be his perfect **match**. They bonded over their love for music, books, and quirky interests, sharing countless unforgettable **laughs**. Despite Summer's clear statement that she didn't believe in true **love**, Tom couldn't stop himself from falling deeply for her. Their relationship blossomed with beautiful moments that Tom treasured with all his **heart**. However, things started to change as Summer became emotionally distant and unexpectedly **cold**. Tom, feeling lost and heartbroken, struggled to understand what had gone **wrong**. After much reflection, he realized he had built an idealized version of their **story**, seeing what he wanted instead of what truly was. His world shattered when he learned that Summer had married someone else, leaving him feeling utterly **shocked**. In the end, Tom accepted reality, using the experience to grow and pursue his architectural **dreams**, finally finding new **hope**.

Consent Forms

Consent Form for Participation in our Research Study

Title: Investigating the Impact of Short Videos on Working Memory

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Purpose of the Study:

We are conducting a study to understand how watching short videos affects memory and physiological responses such as facial expression, eye tracking, pupil dilation and blinking.

During this study:

- You will watch a series of short videos and complete memory tests afterward. We will record your facial expressions and eye movements using a camera while you participate. This experiment will be conducted multiple times on various occasions.
- **Duration:** The study will take approximately 20 minutes/session.

Your privacy is our privacy:

Your data will be anonymized and stored securely. Only the research team will have access to the data. The results may be published, but individual identities will never be disclosed.

By signing below, you confirm that you understand the purpose of this study and agree to participate voluntarily. You may withdraw at any time without any consequences.

Let's explore the connection between media and memory together!

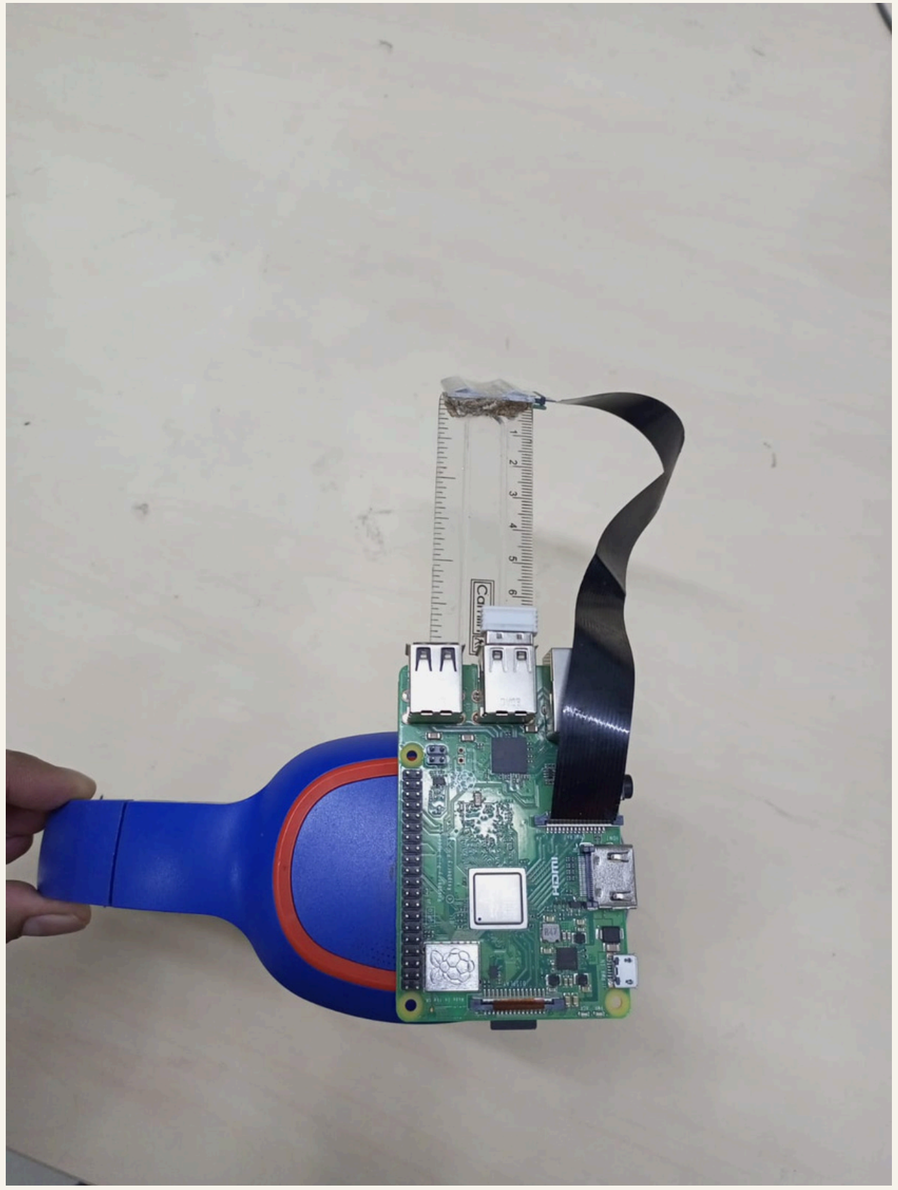
Name: Tejasvi **Date:** 12 Dec 2024

Signature: Tejasvi

Researcher Contact Information:

{noyonica.chatterjee, shivam.kumar, surabhi.tannu, tejasvi.birdh} at plaksha.edu.in

Our Device



TRACKING DATA

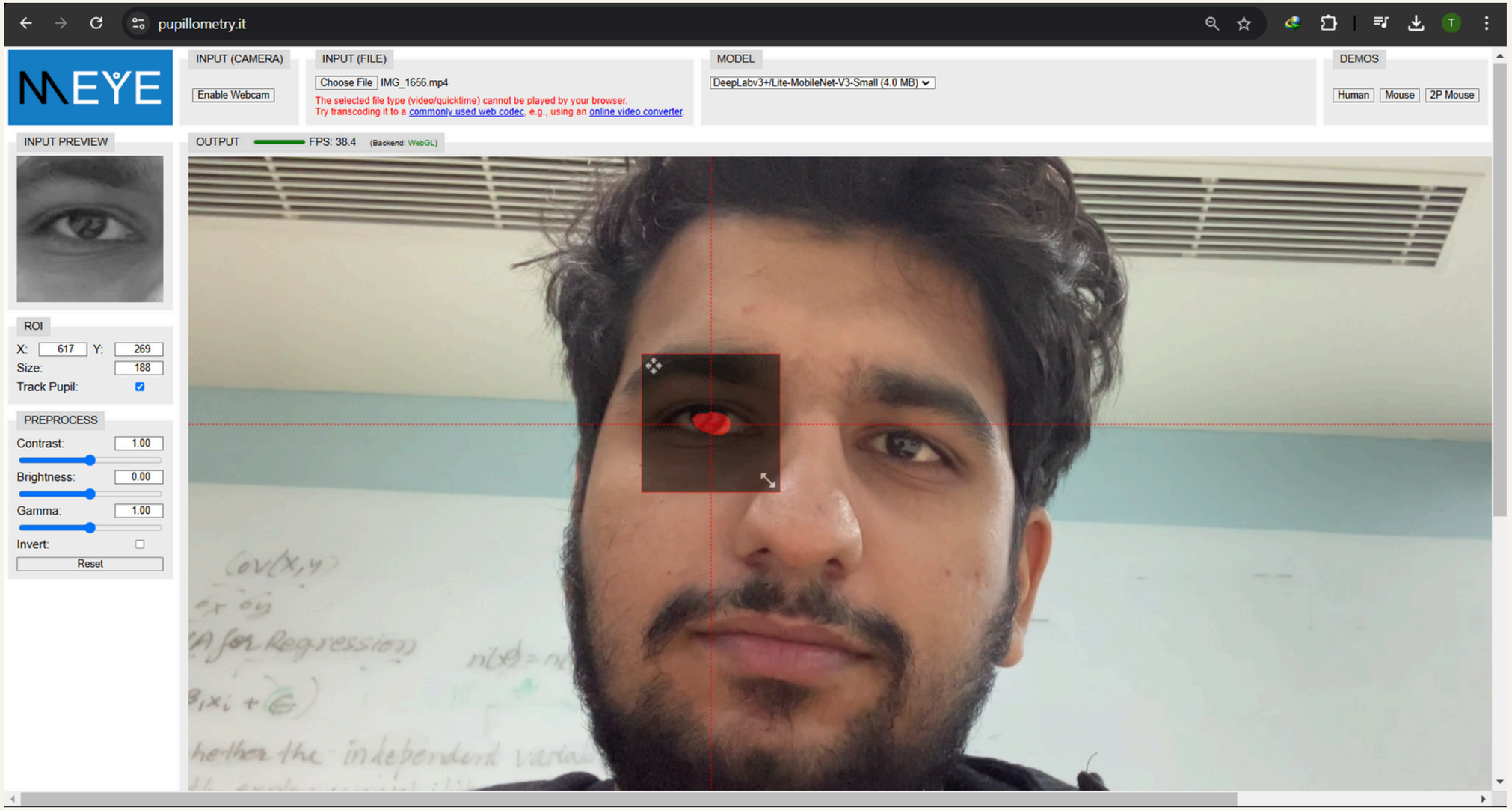
Eye Gaze

Pupil Dilation

Facial Expression

Blinking

Eye Gaze per frame

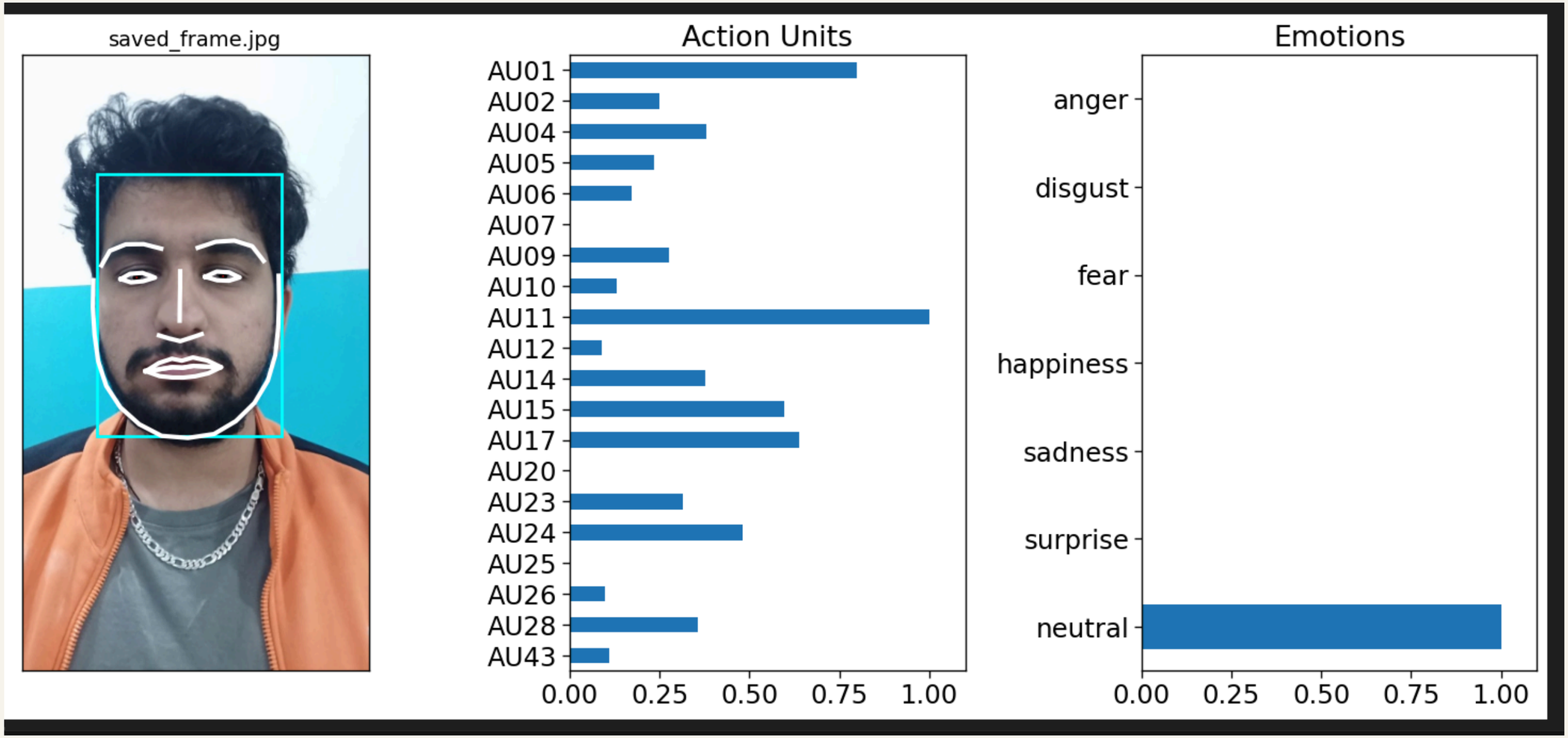


Pupil Dilation

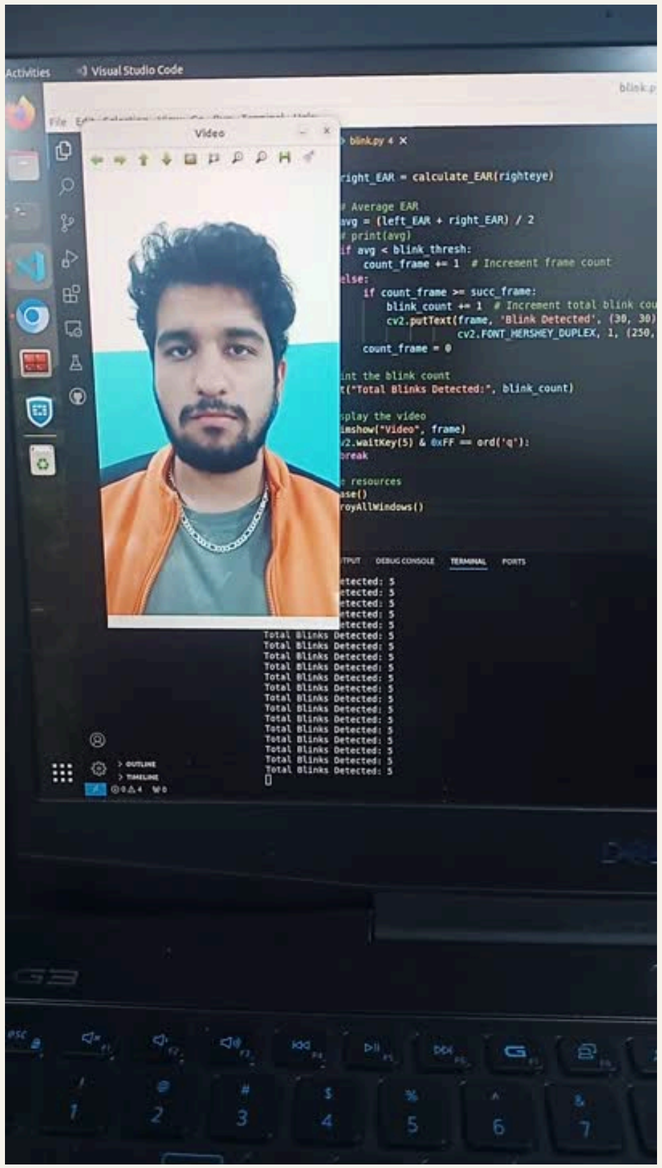
https://github.com/ihrke/pypillometry

Our data

Facial Expression



Blinking

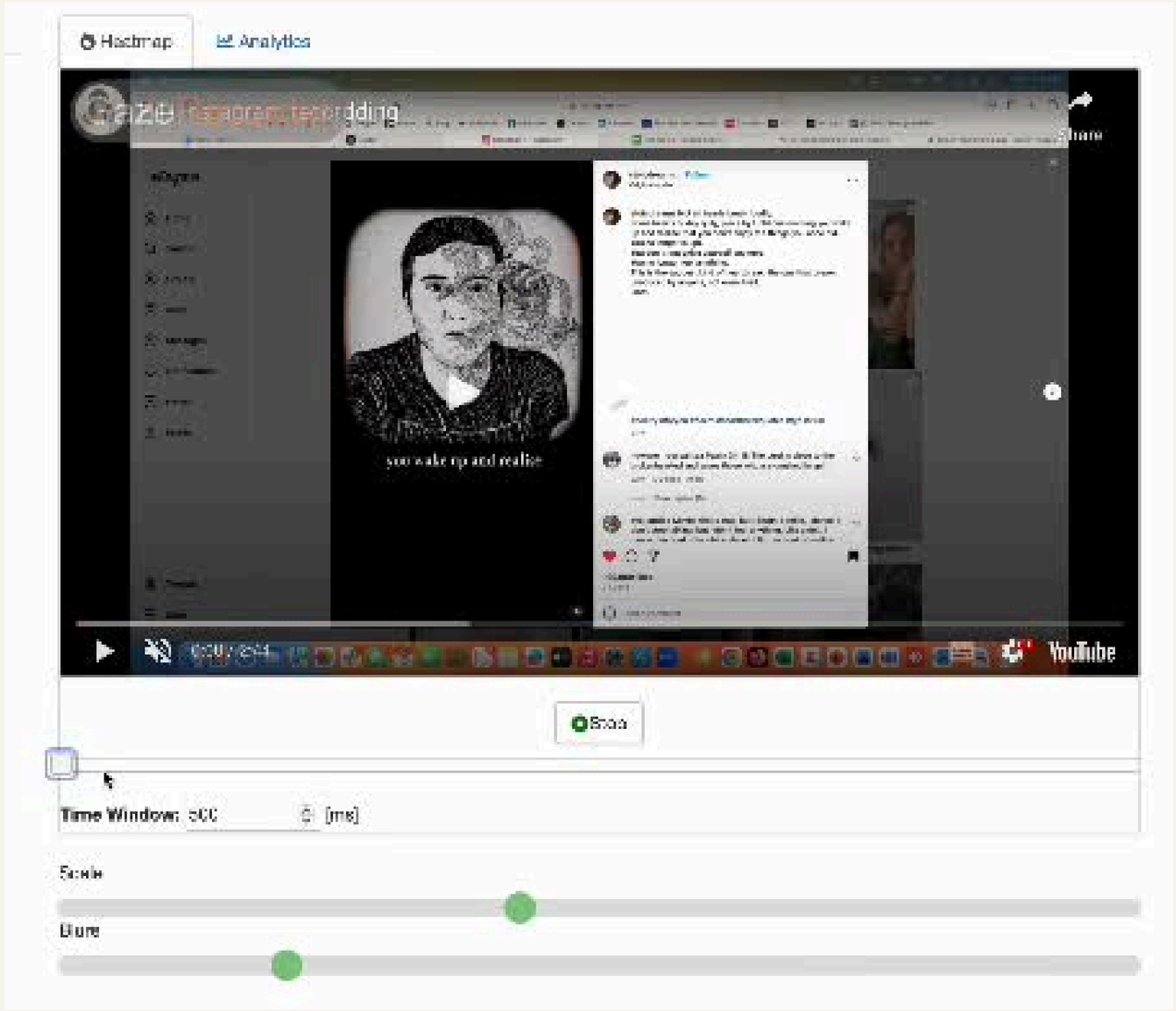

Activities
Visual Studio Code
Video
blink.py 4
right_EAR = calculate_EAR(righteye)
# Average EAR
avg = (left_EAR + right_EAR) / 2
# print(avg)
if avg < blink_thresh:
count_frame += 1 # Increment frame count
else:
if count_frame >= succ_frame:
blink_count += 1 # Increment total blink cou
cv2.putText(frame, 'Blink Detected', (30, 30)
cv2.FONT_HERSHEY_DUPLEX, 1, (250,
count_frame = 0
int the blink count
t("Total Blinks Detected:", blink_count)
splay the video
imshow("Video", frame)
/2.waitKey(5) & 0xFF == ord('q'):
break
resources
ase()
royAllWindows()
TERMINAL
PORTS
Total Blinks Detected: 5

We will display the analysis on one Video first

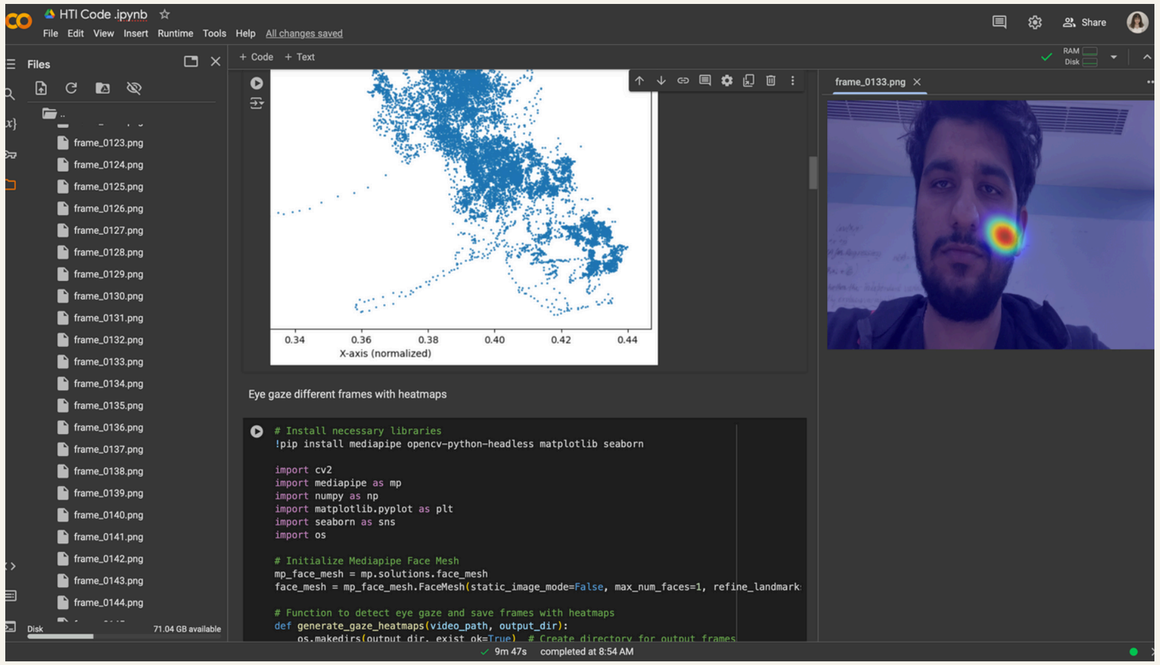
USER 1

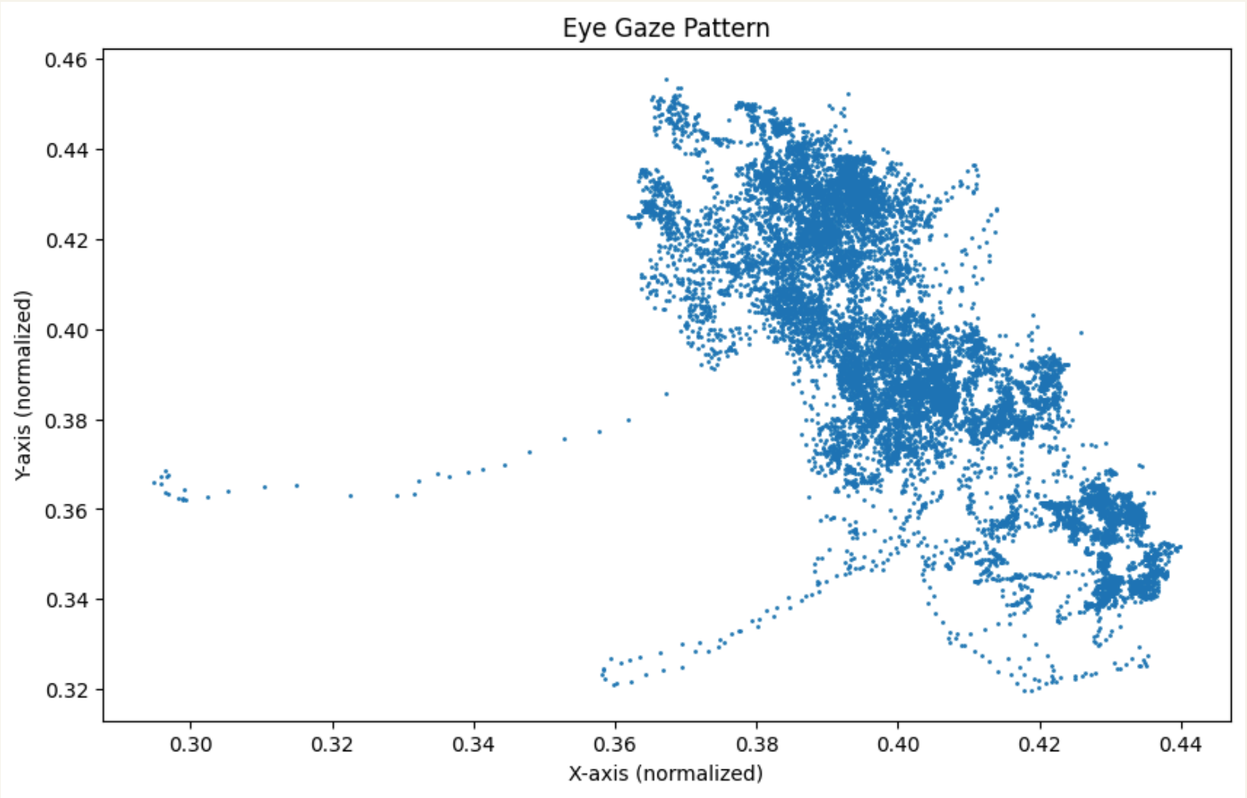
NAME- Tejasvi Birdh
VIDEO DURATION- 8:06 minutes
VIDEOS-Context switching reels on Instagram

Eye Gaze on the SHORT REEL COLLECTION that we formed

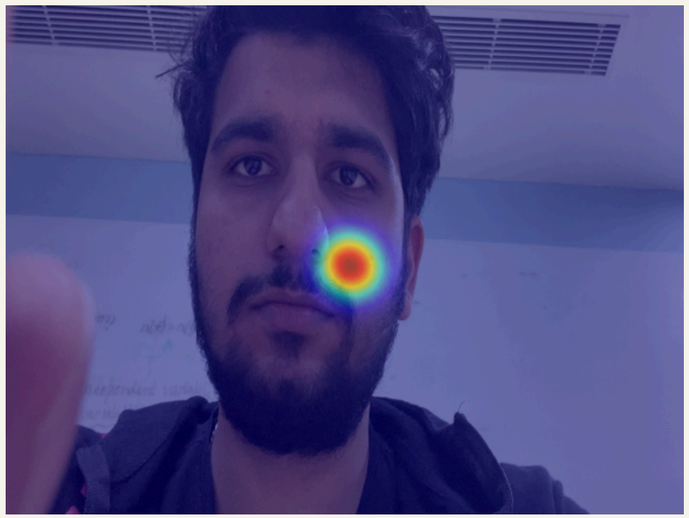


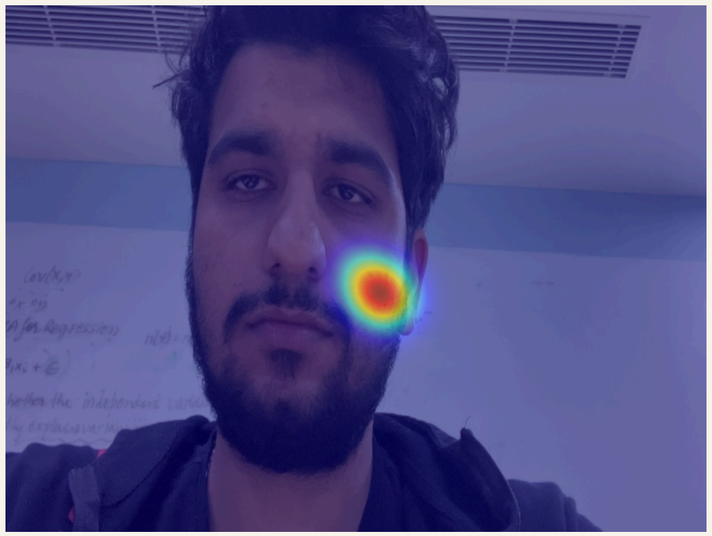
Our Code and Sample Plots

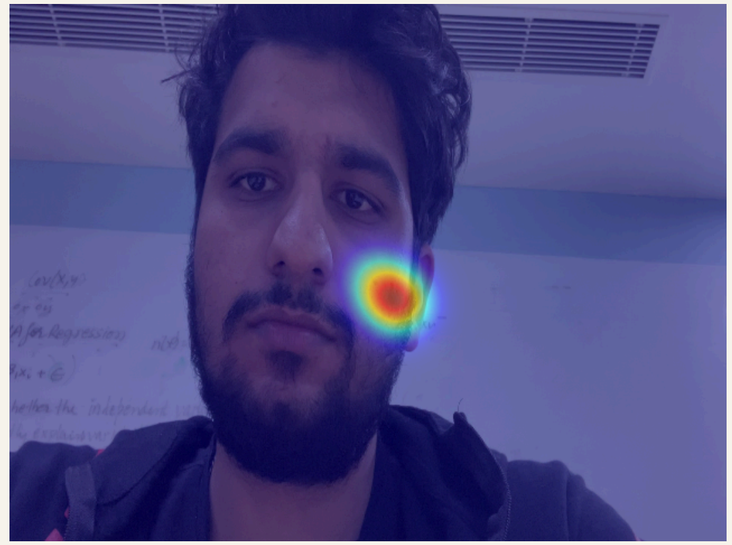


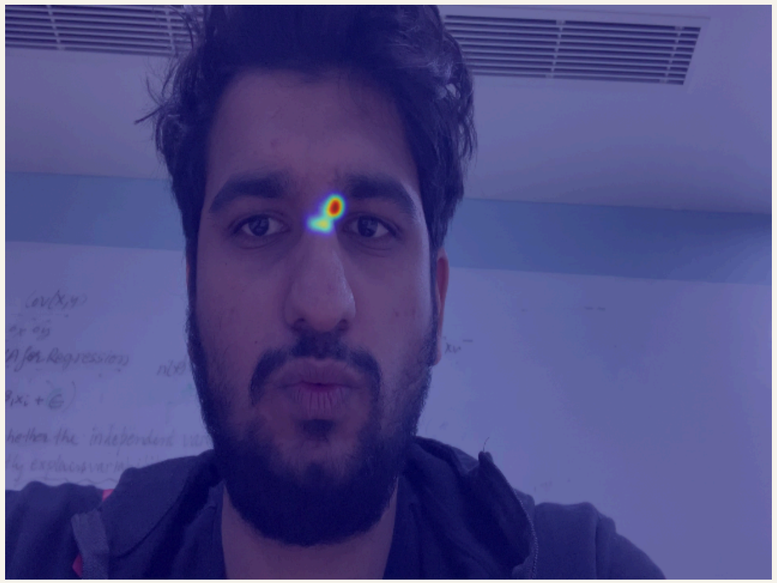


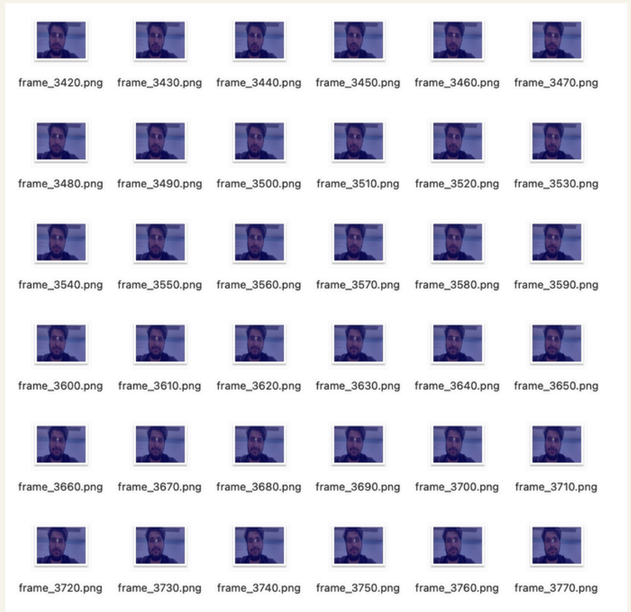
Eye gaze different frames with heatmaps









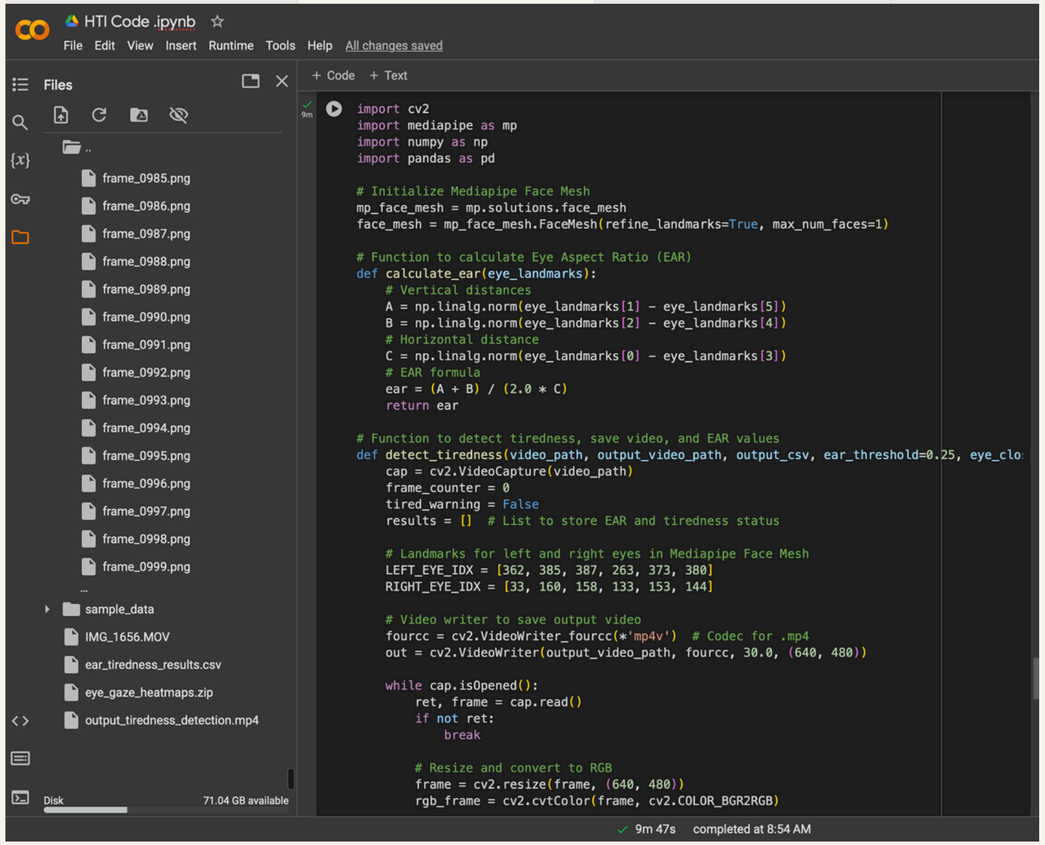


Tiredness detection

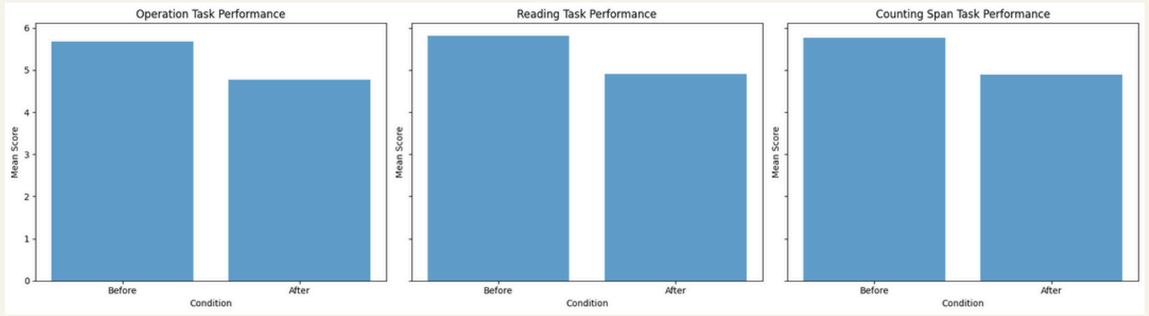
D2097

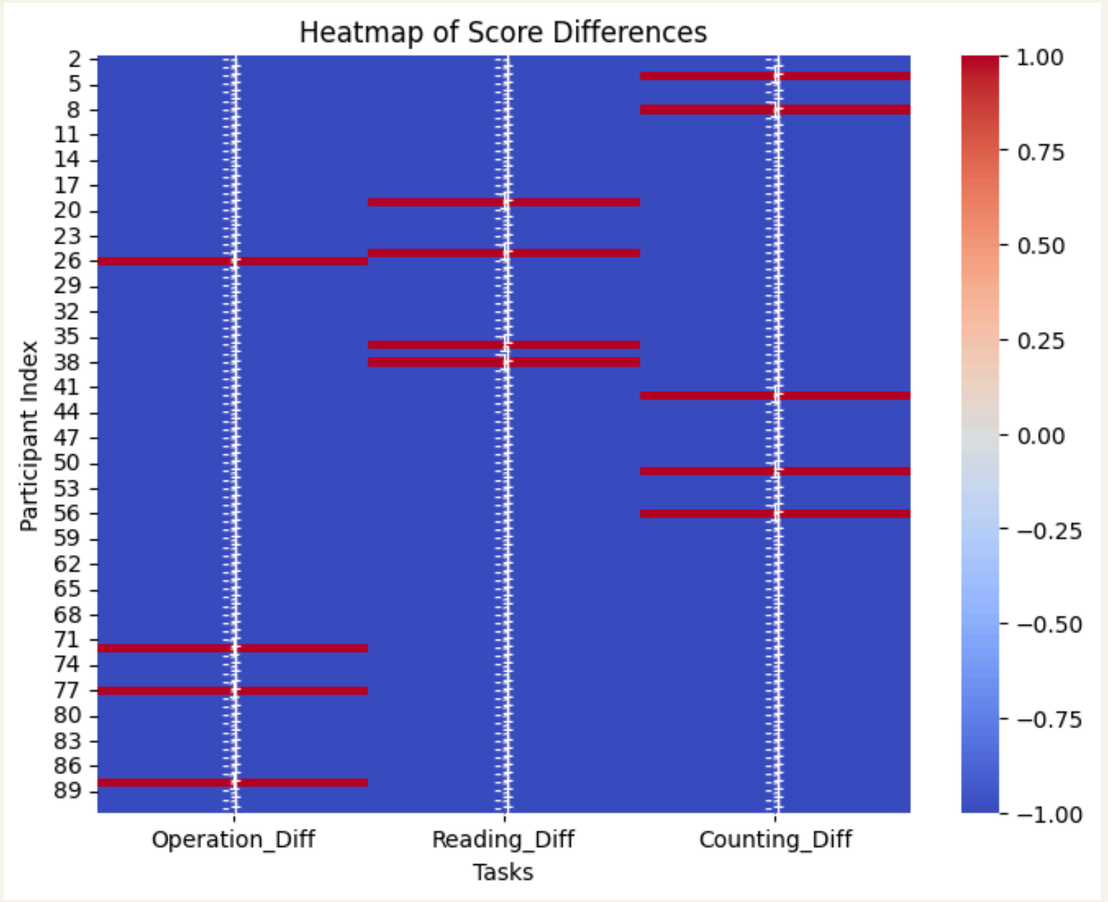
	A	B	C	D
1	Frame	EAR	Tired	
2	1	0.3609193	FALSE	
3	2	0.34949928	FALSE	
4	3	0.3296874	FALSE	
5	4	0.33811368	FALSE	
6	5	0.34996389	FALSE	
7	6	0.34499162	FALSE	
8	7	0.36283607	FALSE	
9	8	0.3499646	FALSE	
10	9	0.3613427	FALSE	
11	10	0.35210095	FALSE	
12	11	0.36376325	FALSE	
13	12	0.35676583	FALSE	
14	13	0.27563628	FALSE	
15	14	0	FALSE	
16	15	0.35025865	FALSE	
17	16	0.34476406	FALSE	
18	17	0.34792042	FALSE	
19	18	0.33930308	FALSE	
20	19	0.35275405	FALSE	
21	20	0.33951179	FALSE	
22	21	0.33822241	FALSE	
23	22	0.34187146	FALSE	
24	23	0.34304611	FALSE	
25	24	0.33942535	FALSE	

	A	B	C	D
1	Frame	EAR	Tired	
2	1	0.3609193	FALSE	
3	2	0.3494993	FALSE	
4	3	0.3296874	FALSE	
5	4	0.3381137	FALSE	
6	5	0.3499639	FALSE	
7	6	0.3449916	FALSE	
8	7	0.3628361	FALSE	
9	8	0.3499646	FALSE	
10	9	0.3613427	FALSE	
11	10	0.3521009	FALSE	
12	11	0.3637633	FALSE	
13	12	0.3567658	FALSE	
14	13	0.2756363	FALSE	
15	14	0	FALSE	
16	15	0.3502586	FALSE	
17	16	0.3447641	FALSE	
18	17	0.3479204	FALSE	
19	18	0.3393031	FALSE	
20	19	0.3527541	FALSE	
21	20	0.3395118	FALSE	
22	21	0.3382224	FALSE	
23	22	0.3418715	FALSE	
24	23	0.3430461	FALSE	
25	24	0.3394254	FALSE	
26	25	0.3395658	FALSE	
27	26	0.3394429	FALSE	
28	27	0.3452156	FALSE	
29	28	0.3403656	FALSE	
30	29	0.349299	FALSE	
31	30	0.328617	FALSE	
32	31	0.3329406	FALSE	
33	32	0.3438834	FALSE	
34	33	0.3495465	FALSE	
35	34	0.3430174	FALSE	
36	35	0.3404993	FALSE	
37	36	0.3438101	FALSE	
38	37	0.3525612	FALSE	
39	38	0.3504038	FALSE	
40	39	0.3521514	FALSE	
41	40	0.3685939	FALSE	
42	41	0.3632317	FALSE	
43	42	0.356584	FALSE	
44	43	0.3579905	FALSE	
45	44	0.3537245	FALSE	
46	45	0.3608305	FALSE	
47	46	0.3539566	FALSE	
48	47	0.3597514	FALSE	
49	48	0.3531978	FALSE	
50	49	0.3540842	FALSE	
51	50	0.356386	FALSE	



MEMORY SCORE RETENTION RESULTS





MACHINE LEARNING MODELS

- **Features:**
  - **Blinking data**
  - **Heatmap for eye gaze**
  - **Facial expressions data**

- **Random Forest**
  - **Accuracy = 56%**

- **LSTM**
  - **Accuracy = 65%**

PERFORMANCE METRICS

Accuracy of ML Models

- Random Forest
  - Accuracy = 56%
- LSTM
  - Accuracy = 65%

REAL-WORLD DEPLOYMENT FEASIBILITY

- Applications:
  - Design memory-friendly educational materials.
  - Develop social media guidelines promoting healthy consumption.
  - Add parental controls in apps to limit content exposure for children.
- Example: Platforms can implement break prompts or limit rapid context-switching.

CHALLENGES FOR SCALING

User Adoption

Resistance to healthier content habits.

Commercial Impact

Potential conflict with platform revenue goals.

Cultural Variability

Adapting solutions across demographics.

Tech Integration

High resource requirements for adaptive tools.

IMPACT

Educational Advancement

By optimizing the structure and delivery methods, educators can create engaging material that enhances memory retention rather than diminishing it.

Responsible Content Creation

Platforms and creators can utilize these findings to design content that balances engagement with cognitive health.

Healthier Media Consumption Habits

The research paves the way for evidence-based media consumption guidelines. This fosters awareness among users, especially adolescents and parents, to mitigate potential cognitive drawbacks of consuming short-form media excessively.

SOCIAL AND COGNITIVE BENEFITS

Implementing these findings can improve cognitive health, especially in younger individuals, by promoting balanced digital media use. This fosters an informed population, enhancing productivity and societal well-being. Addressing the cognitive challenges of short-form content is vital for healthier human-technology interactions in a digitally dependent world.

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THANK YOU