

TEAMRGE EVENT 2024 WHERE FUTURE OF END USER COMPUTING MEETS REALITY

10+ community sessions around GPUs, VDI,
DaaS, DEX, Remoting Protocols and AI



15th February 2024

16:00 CEST / 10:00AM EDT / 07:00AM PDT

Register Now

www.teamrge.com/events

This FREE community event is made possible with support of:

DIZZION

itq

EUC Score



Dr. Benny Tritsch
Managing Director at
Dr. Tritsch IT Consulting



Bram Wolfs
Consultant at
Wolfs IT Solutions



Eitjo van Gulik
Principal Product Manager
for HDX Graphics & Seamless
at Citrix



Esther Barthel
Solutions Architect
at Cognition IT



Joe DaSilva
PMTS, Solutions Architect, Cloud
Graphics at AMD



Johan van Amersfoort
Technologist EUC & AI
at ITQ



Magnar Johnson
Manager | Solution Architect
Sopra Steria



Rody Kossen
Senior Principal Quality
Engineer at Citrix



Ruben Spruijt
Field CTO
at Dizzion



Ryan Ververs-Bijkerk
Technical Evangelist
at GO-INIT



Shawn Bass
Start-up advisor and
former EUC CTO of Desktop
Technologies at VMware



Thomas Poppelgaard
Independent Consultant and
Technology Evangelist at
Poppelgaard.com



TeamRGE
Remoting Graphics Experts



TeamRGE
Remoting Graphics Experts

Unravelling the user experience puzzle

Eltjo van Gulik & Ryan Ververs-Bijkerk





Ryan Ververs-Bijkerk

Technologist
GO-INIT



ryan@go-euc.com



[@Logitblog](https://twitter.com/Logitblog)



[/in/ryanbijkerk](https://in.linkedin.com/in/ryanbijkerk)



www.go-init.com



Eltjo van Gulik

Principal Product Manager
HDX Graphics & Seamless
Citrix



eltjo@go-euc.com



[@eltjovg](https://twitter.com/eltjovg)



[/in/eltjovangulik](https://in.linkedin.com/in/eltjovangulik)



www.go-euc.com





A silhouette of a person sitting on a rocky ledge, looking out over a vast landscape at sunset. The sky is dark with a faint orange glow on the horizon. The text 'GO-EUC' is overlaid in the center.

GO-EUC

A silhouette of a person sitting on a rock, looking out over a vast, hazy landscape under a dark sky. The person is positioned on the left side of the frame, facing right. The background shows a horizon line with a faint glow, suggesting a sunset or sunrise. The overall mood is contemplative and serene.

“

**Doing research is
creating new
knowledge**



“

**Research new technologies,
to inspire and serve the
community by providing
new knowledge.**



LOADGEN ///

46 min read Sep 20, 2023

A deep dive into the quality difference of VMware Blast Global Quality Levels

 Ryan Ververs-Bijkerk

27 min read Jul 7, 2023

Analyzing Image Quality in Windows 365 Cloud PC: HTML5 Webclient vs. Remote Desktop Client

 Etjo van Gulik

18 min read May 10, 2023

Measuring Latency with Adafruit QT Py: A CircuitPython Approach

 Etjo van Gulik

22 min read Apr 26, 2023

Measuring Input Latency in Virtual Desktops: Citrix HDX

 Ryan Ververs-Bijkerk  Etjo van Gulik

20 min read Apr 4, 2023

Measuring Input Latency in Virtual Desktops: VMware Blast

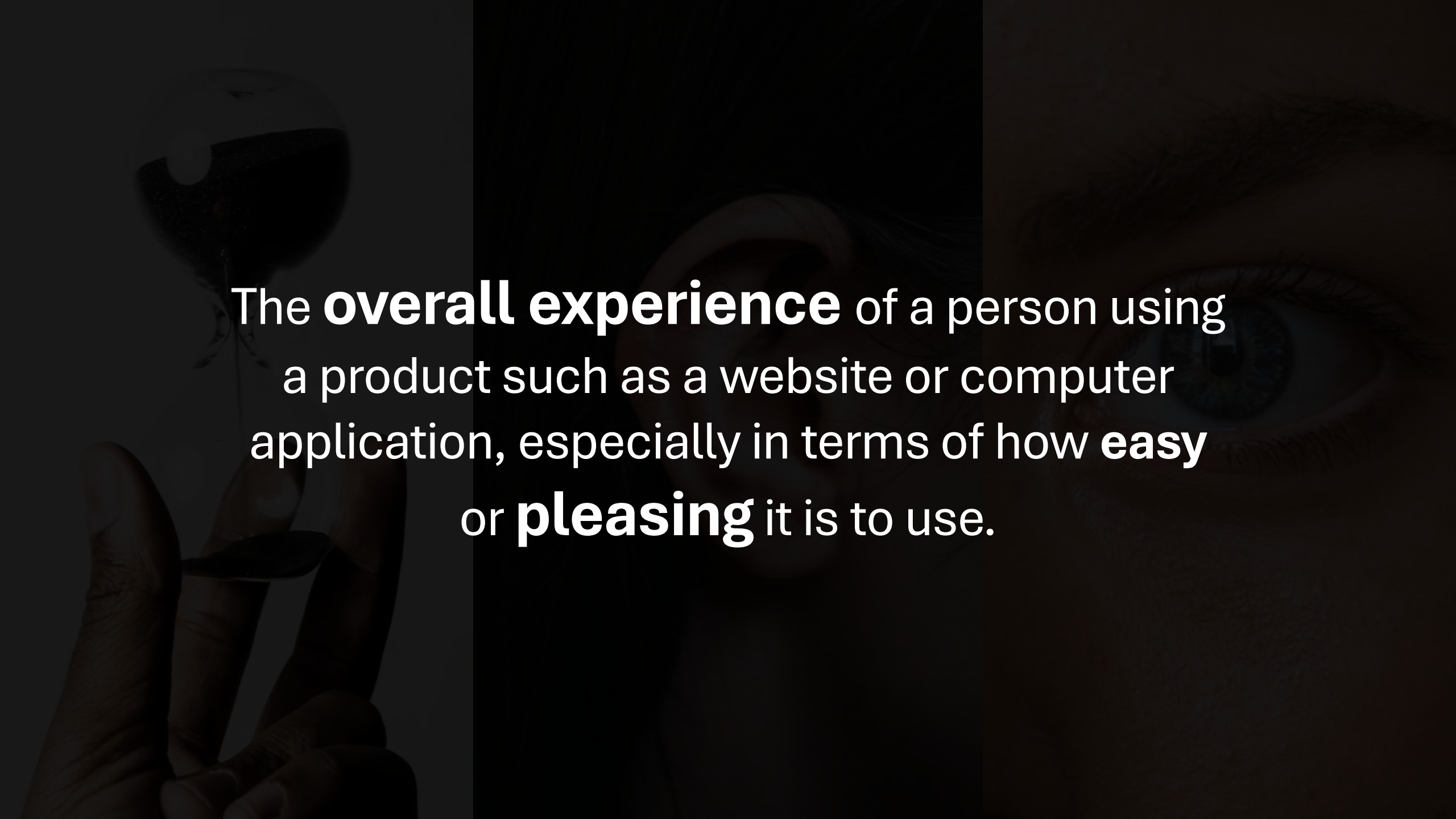
 Etjo van Gulik  Ryan Ververs-Bijkerk

18 min read May 17, 2023

Measuring Input Latency in Virtual Desktops: Introduction and Baselines of the NVIDIA LDAT Research

 Ryan Ververs-Bijkerk  Etjo van Gulik

3 min read Dec 30, 2022



The **overall experience** of a person using a product such as a website or computer application, especially in terms of how **easy** or **pleasing** it is to use.



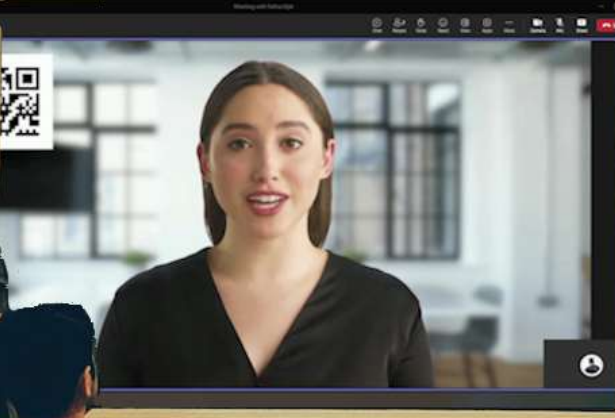
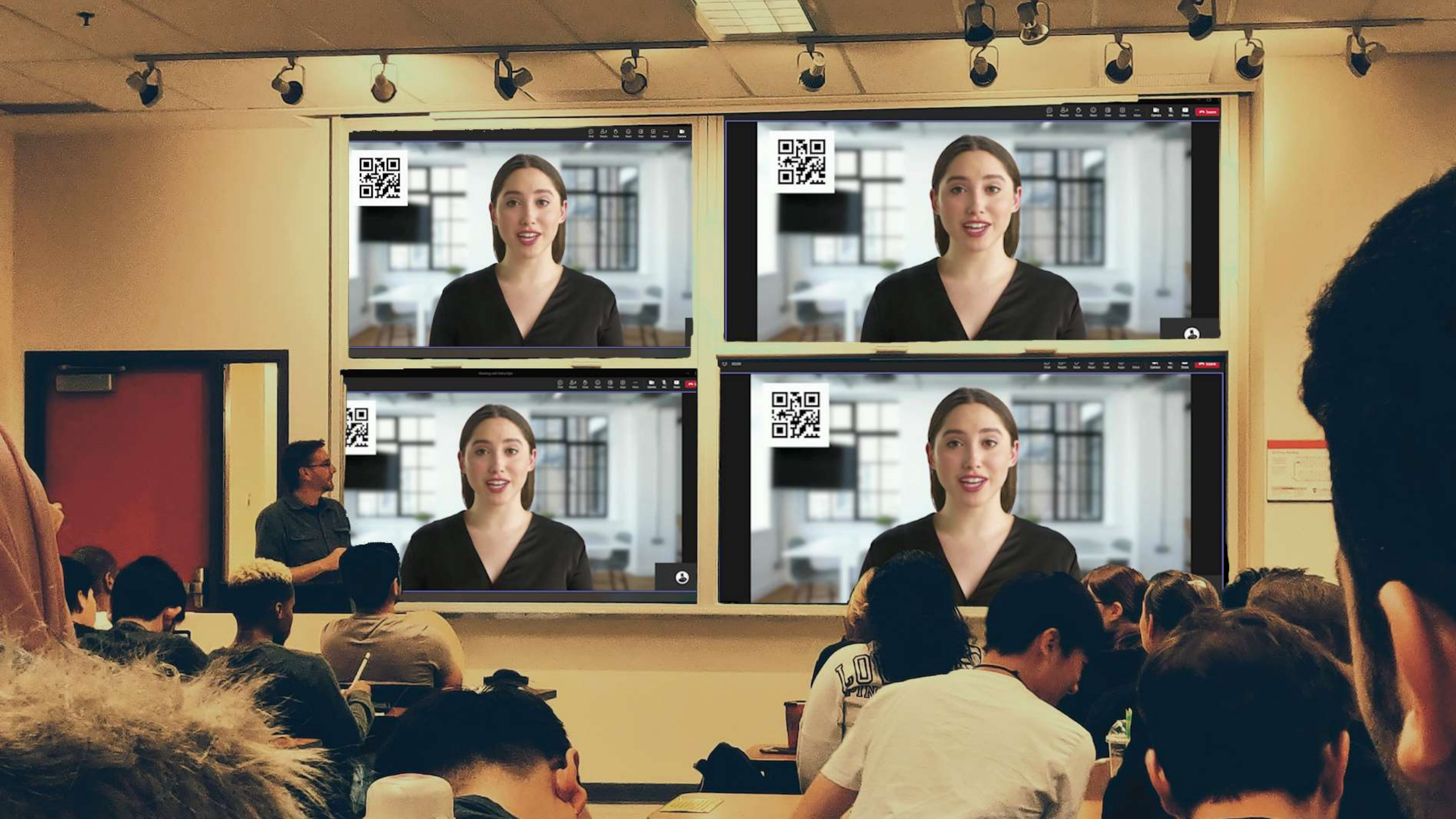


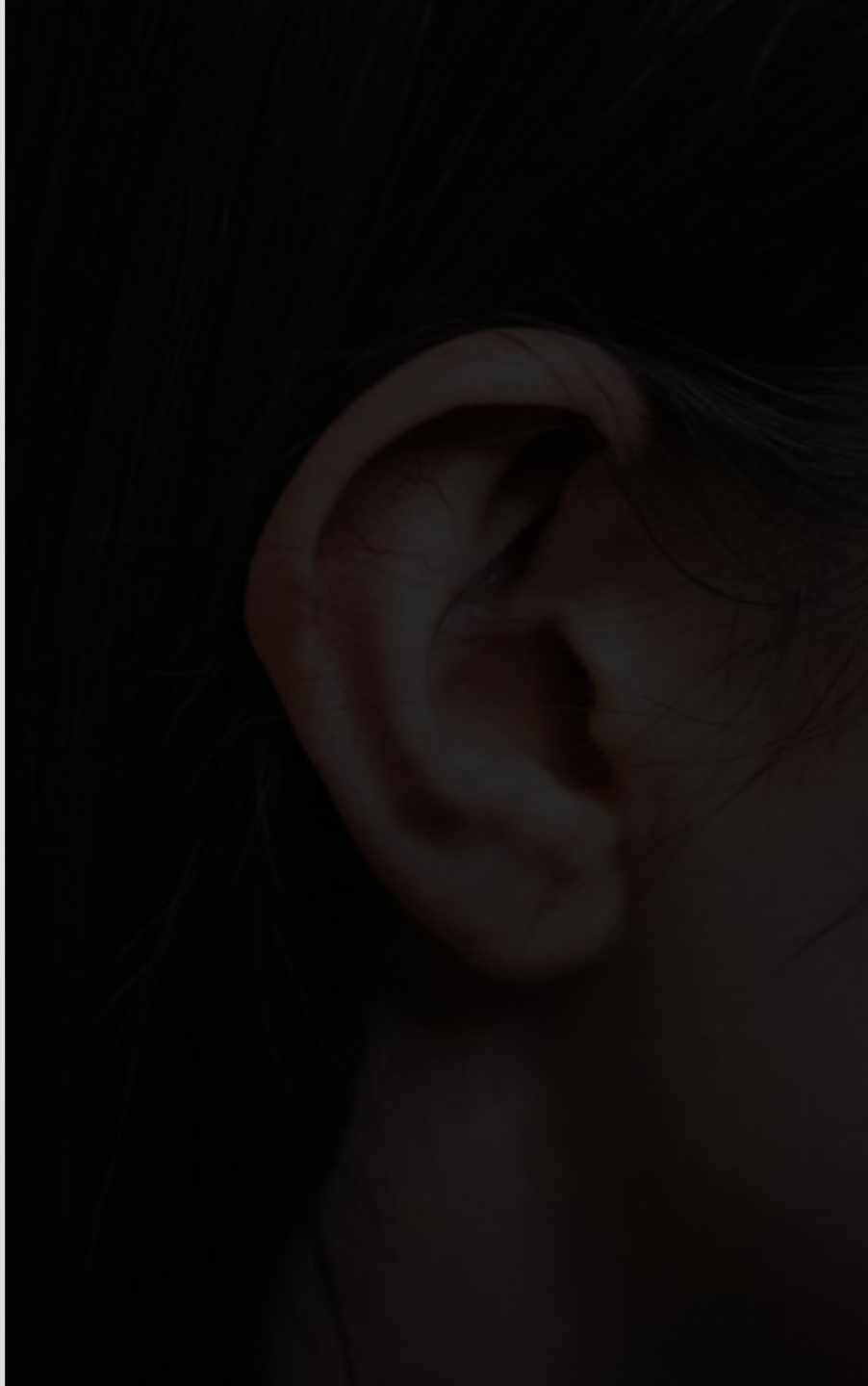


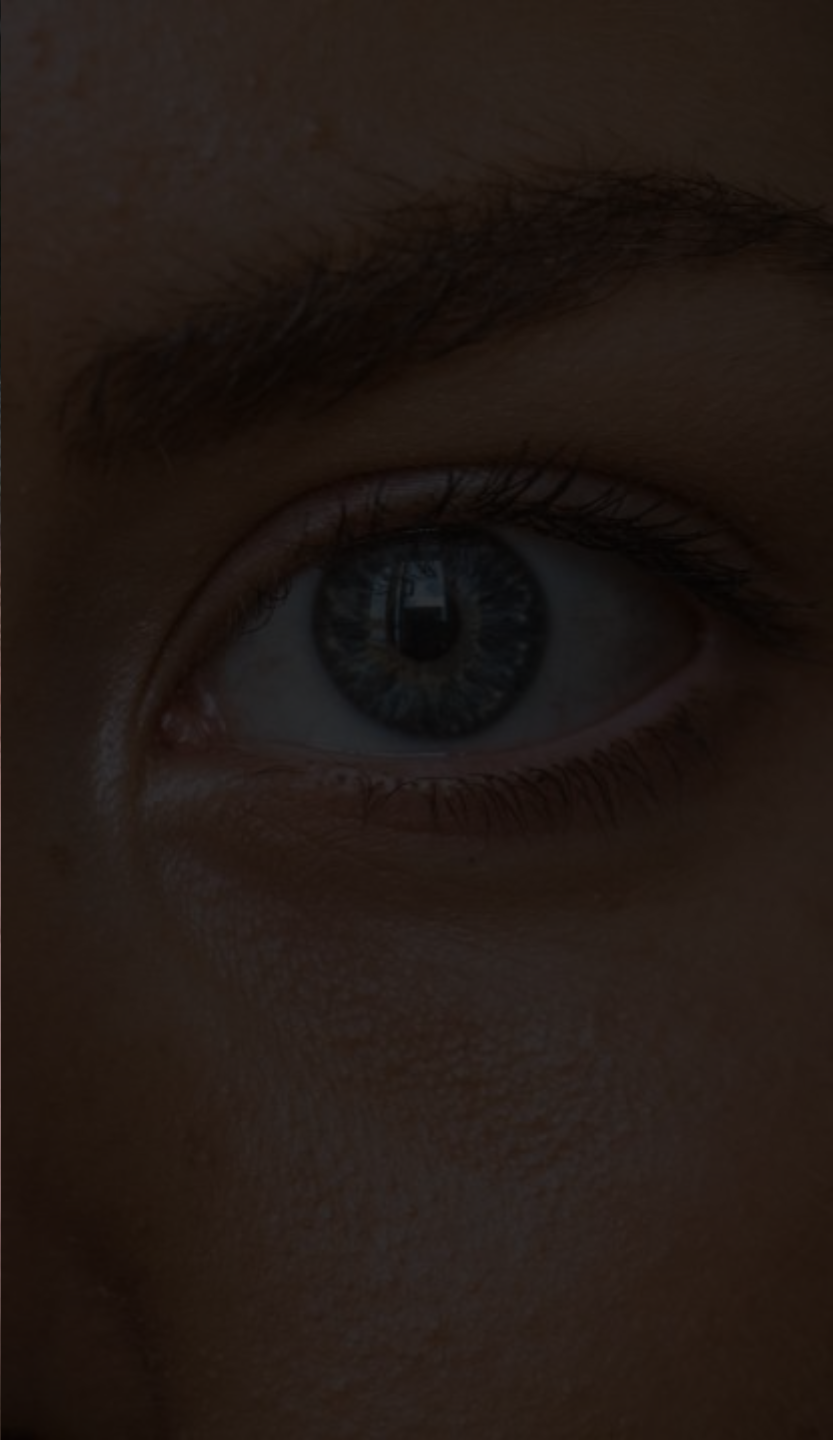
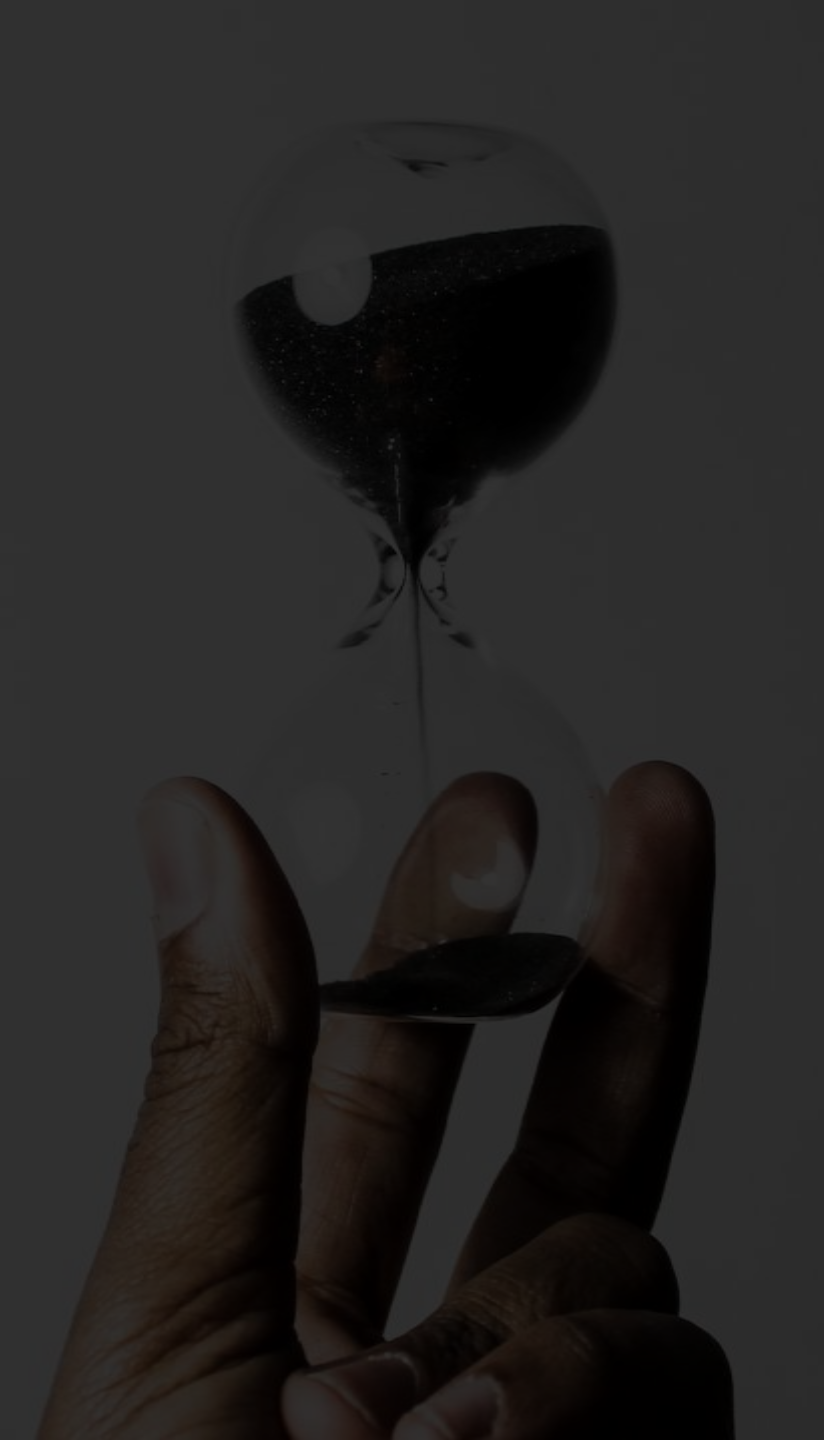
OK, THAT'S NOT HELPING

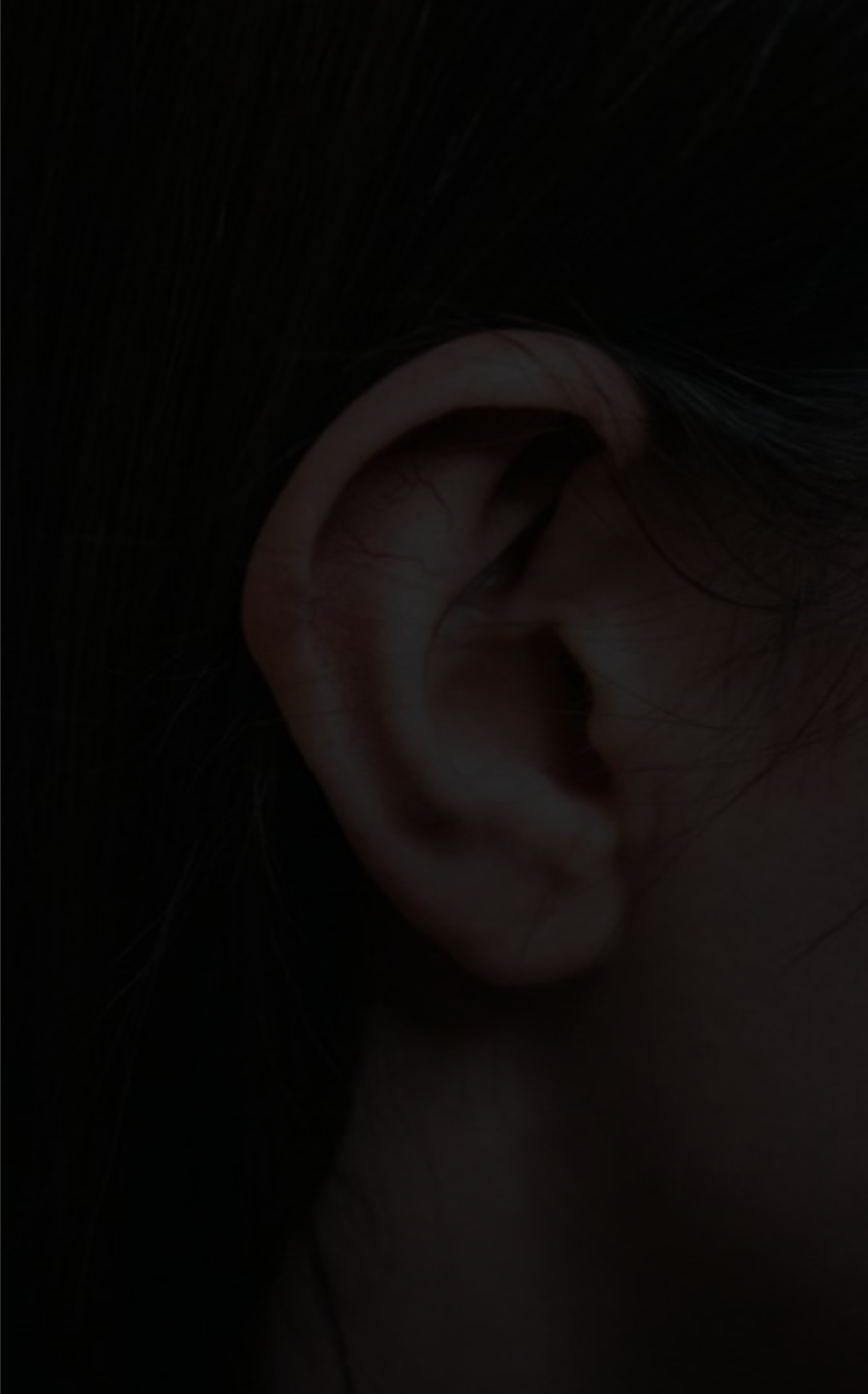
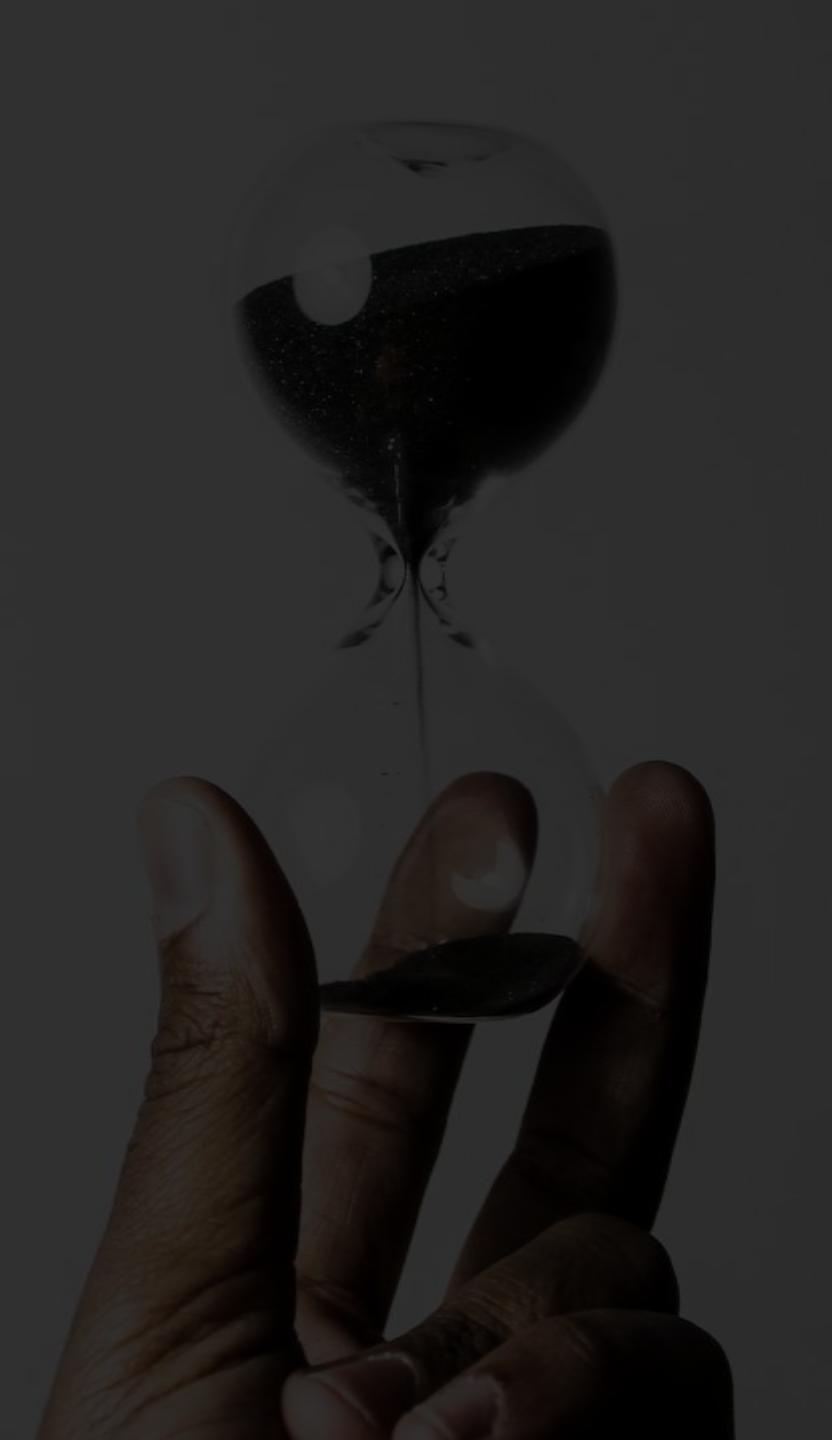


Quantification



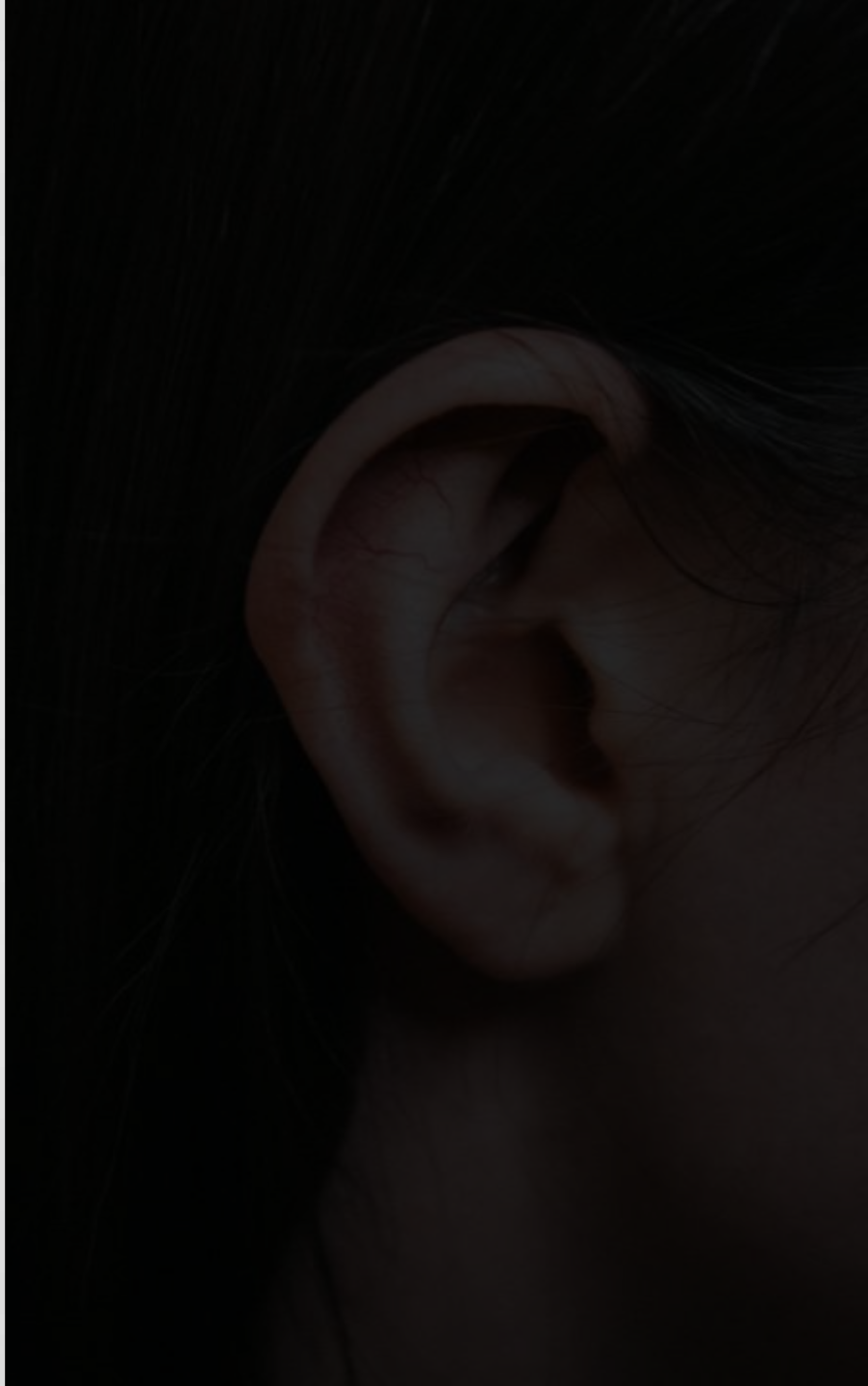


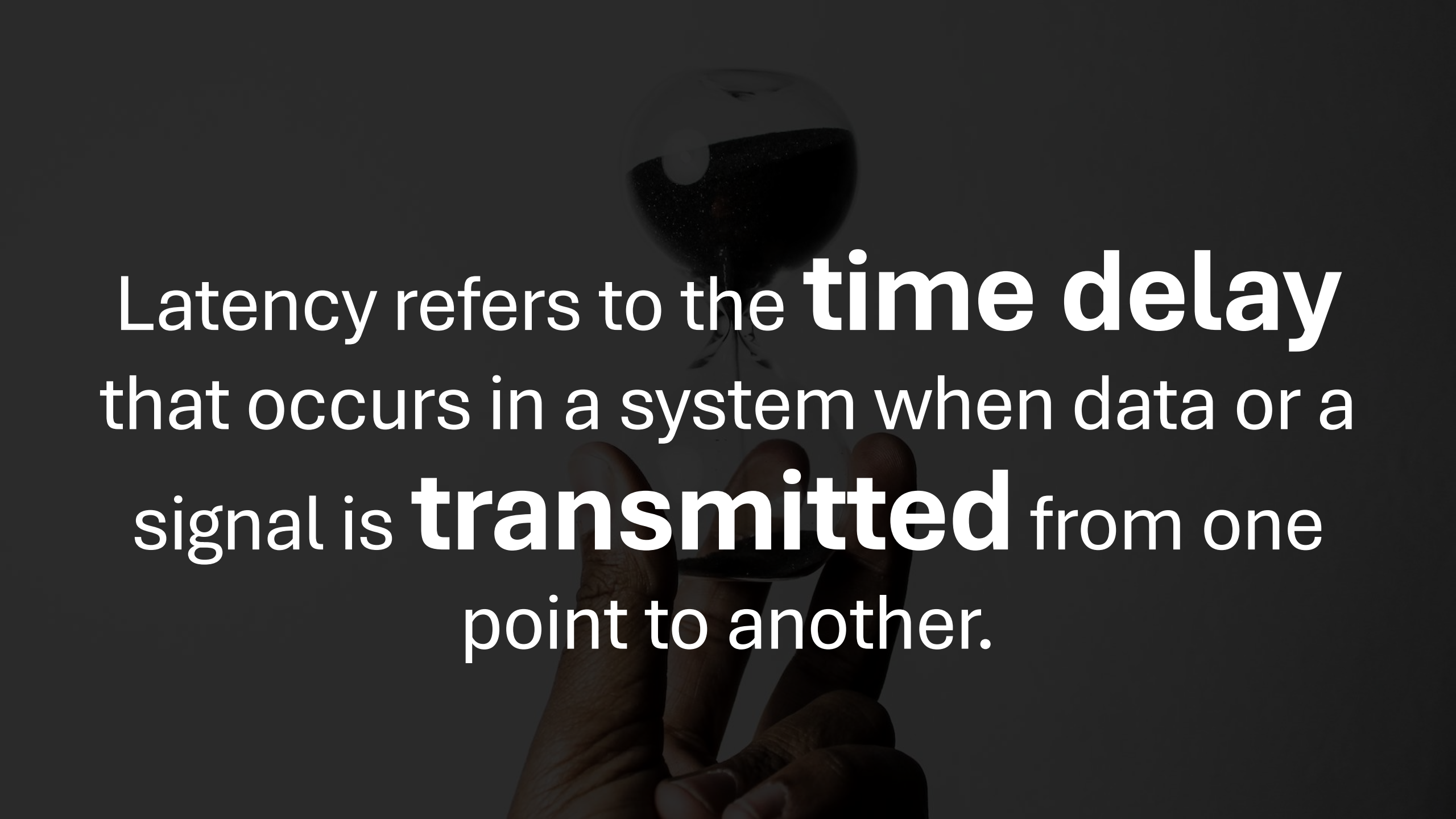




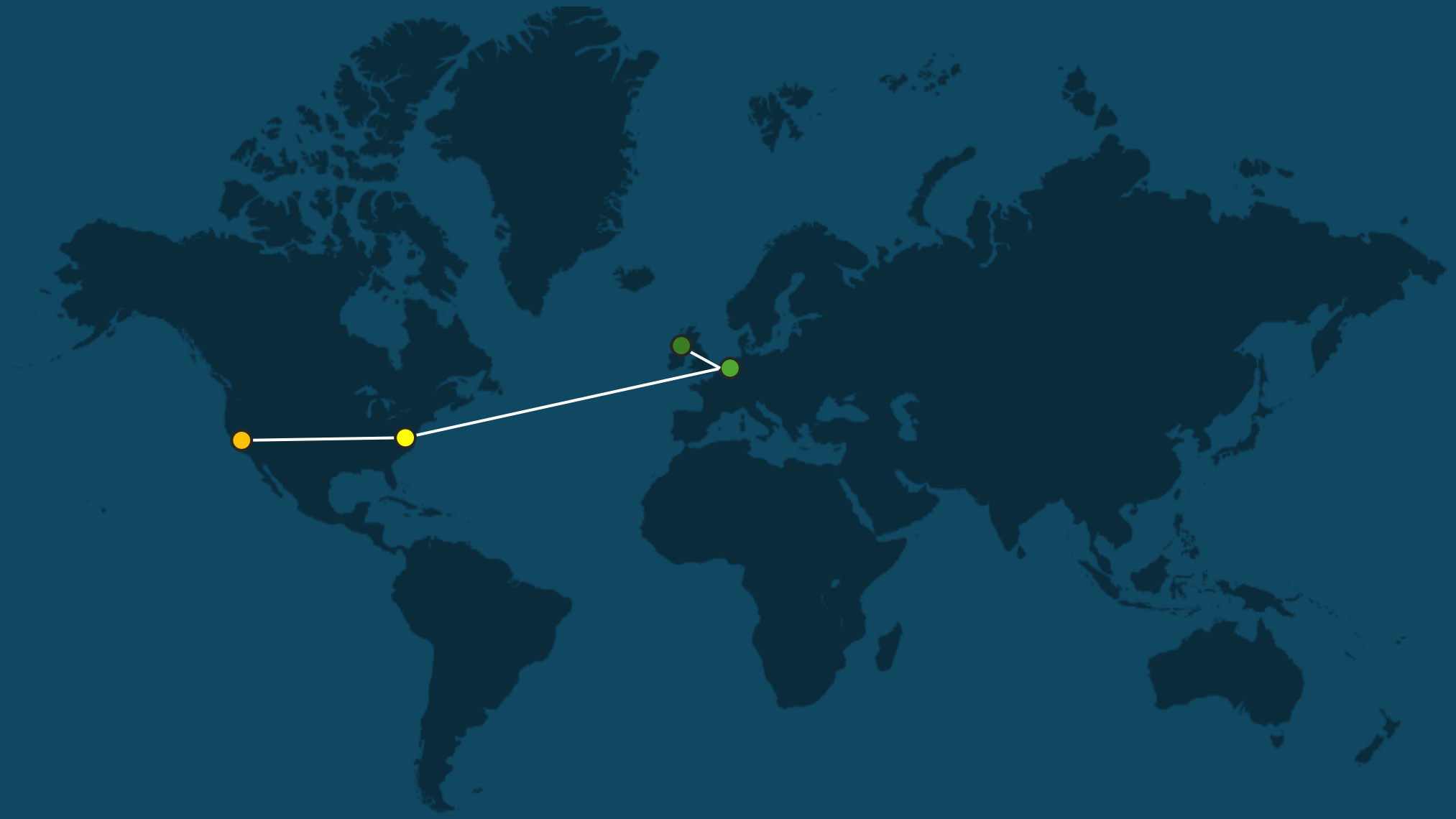


These three key metrics will be the basis of
User Experience in our context



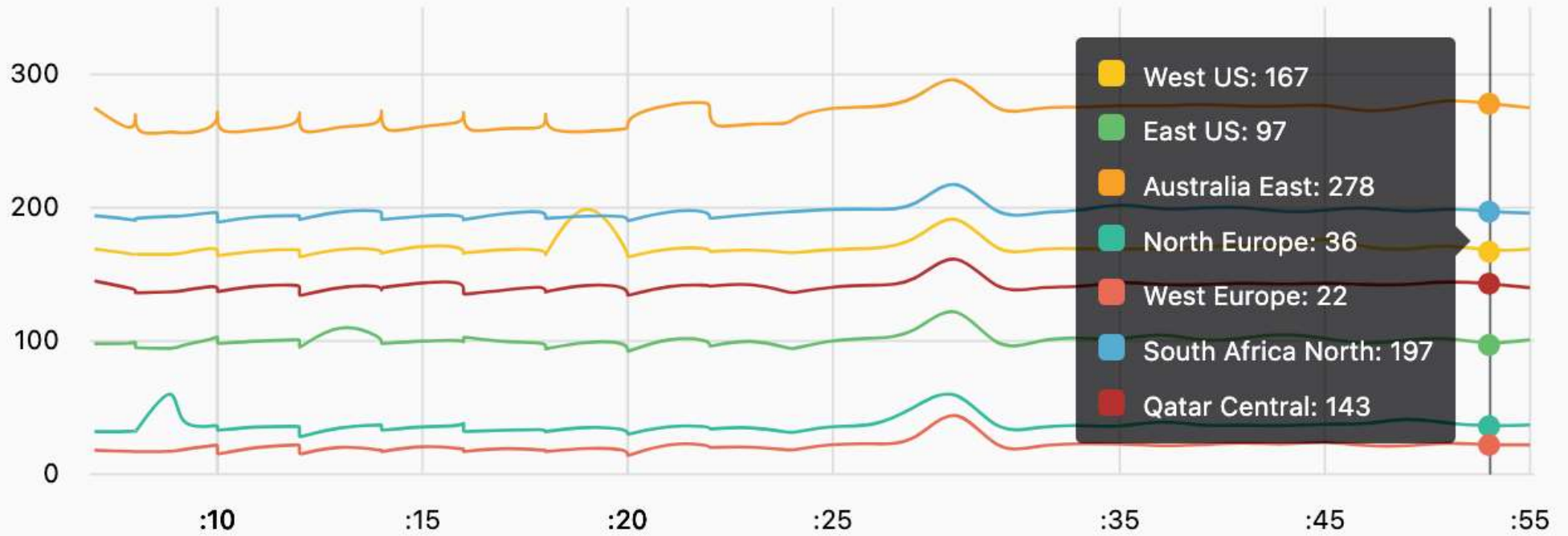
A hand holding a wine glass with a dark liquid inside, set against a dark background. The text is overlaid on the image.

Latency refers to the **time delay** that occurs in a system when data or a signal is **transmitted** from one point to another.









A hand holding a glass of red wine, with the text "Latency is workload dependant" overlaid in white. The background is dark, and the text is centered. At the bottom of the image, there are four colored rounded rectangles: purple, green, orange, and grey.

Latency is
workload
dependant

100-300 ms



50-100 ms



100 ms



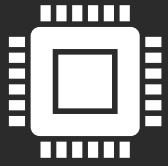
0.001 ms



Input



MOUSE



CPU



RENDER QUEUE



DISPLAY

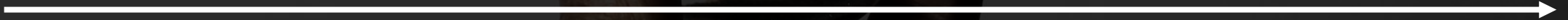


INTERNET



REMOTE

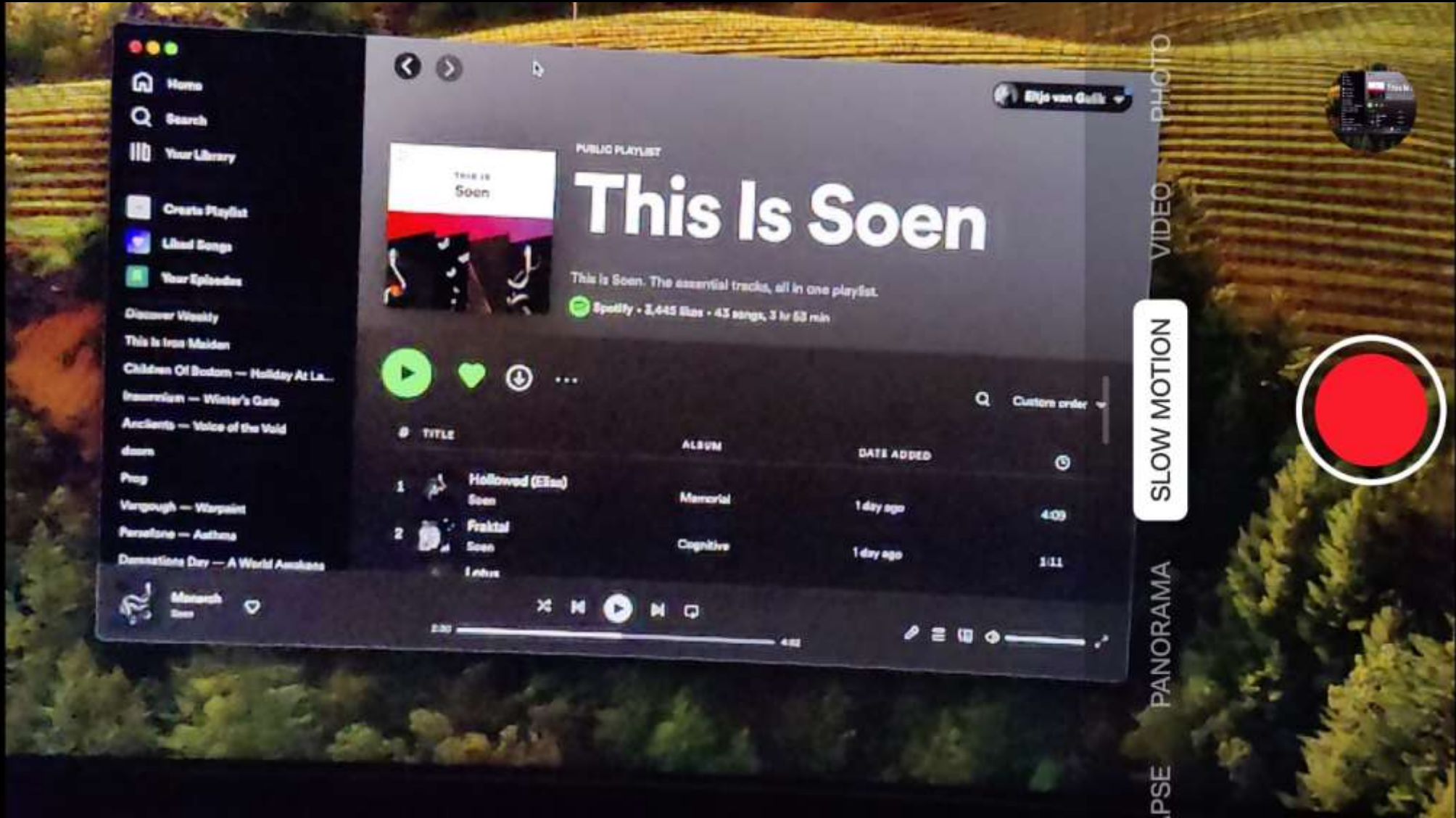
Time







720P
480FPS





Home

Search

Your Library

Create Playlist

Liked Songs

Your Episodes

Discover Weekly

This Is Iron Maiden

Children Of Bodom — Holiday At La...

Interpolum — Mike's Date

Ancients — Voice of the Void

down

Pop

Wingswept — Wireside

Pendulum — Antenna

Downside Up — A World Awake



Manage

100



Edge van Gogh



LIBRARY PLAYLIST

This Is Soen

This is Soen. The essential tracks, all in one playlist.

Quality • 3,445 files • 43 songs, 5 hr 53 min



Custom order

#	TITLE	ALBUM	DATE ADDED	
1	Hallowed (EP) Soen	Morbid	1 day ago	4:05
2	Fractal Soen	Cognitive	1 day ago	3:11
	Index			



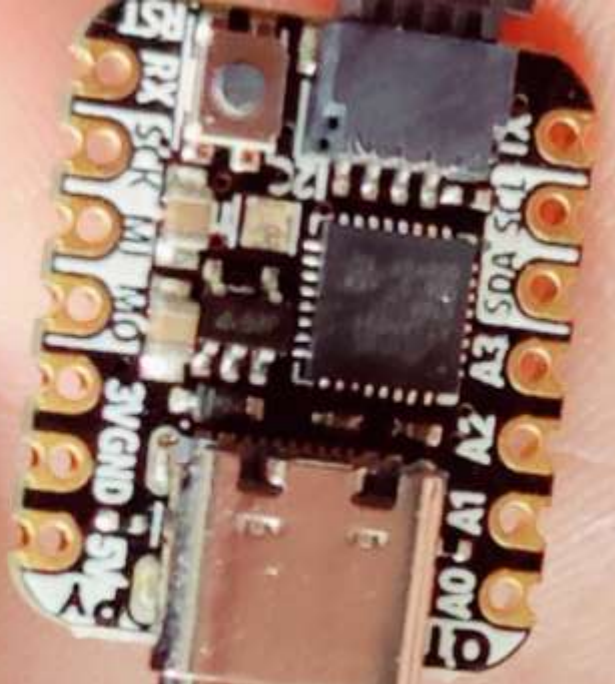
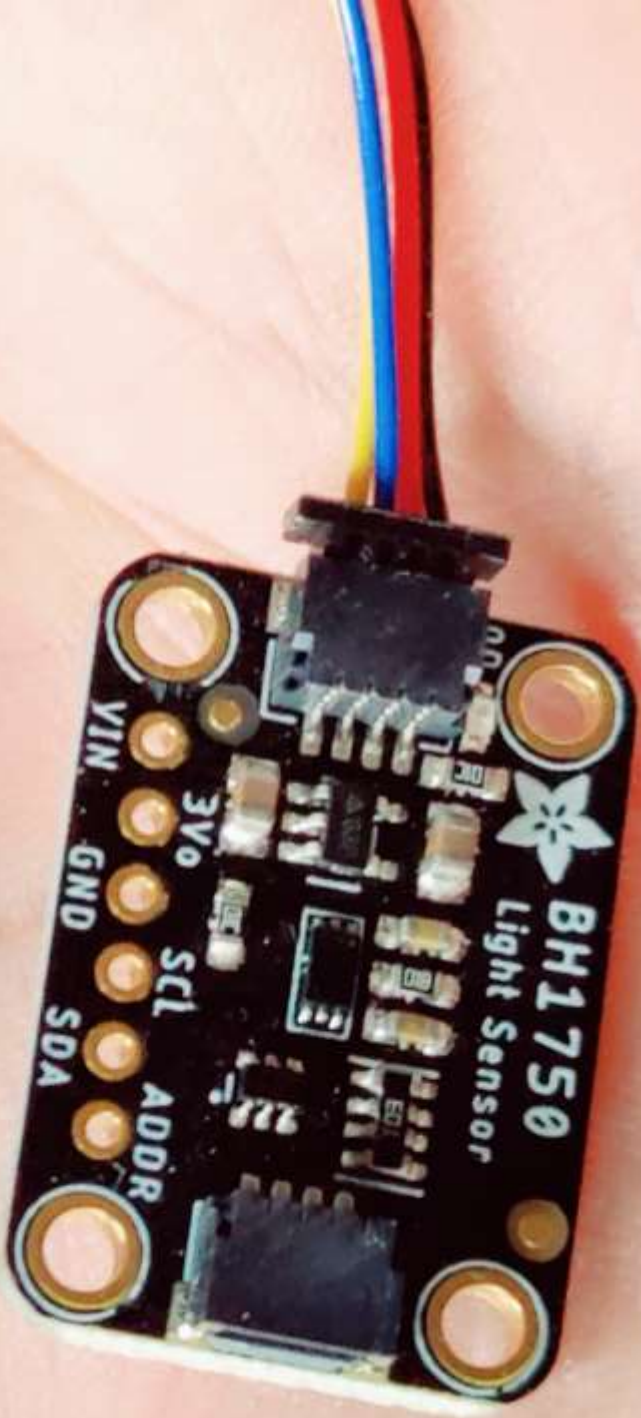
0:00

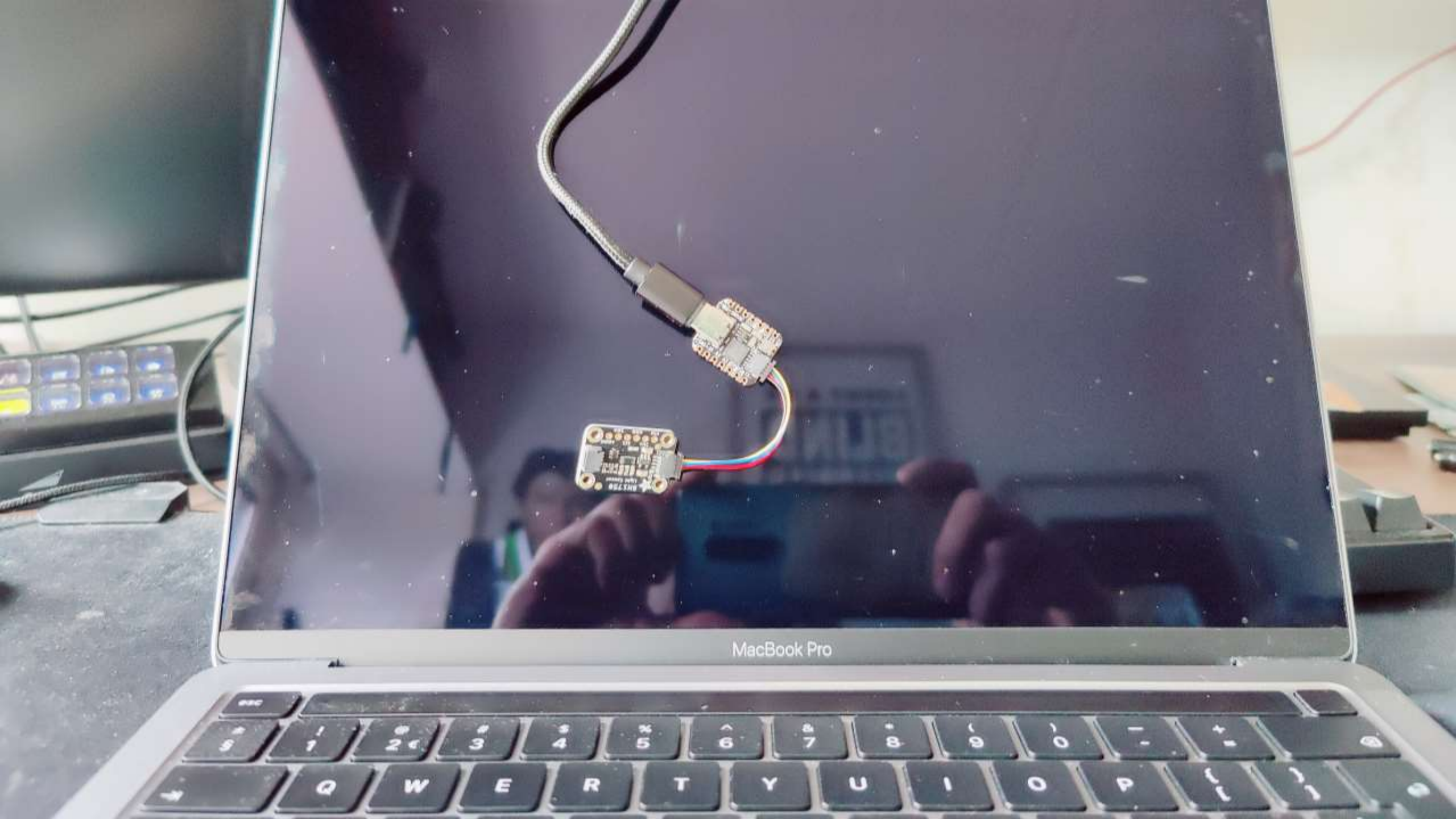
4:05











MacBook Pro

Comparison Click to Photon in ms





Audio refers to the representation, transmission, or reproduction of sound through electrical, digital, or analog signals. It encompasses the capture, storage, processing, and playback of **sound waves**, which are variations in air pressure that the **human ear** can perceive as sound.

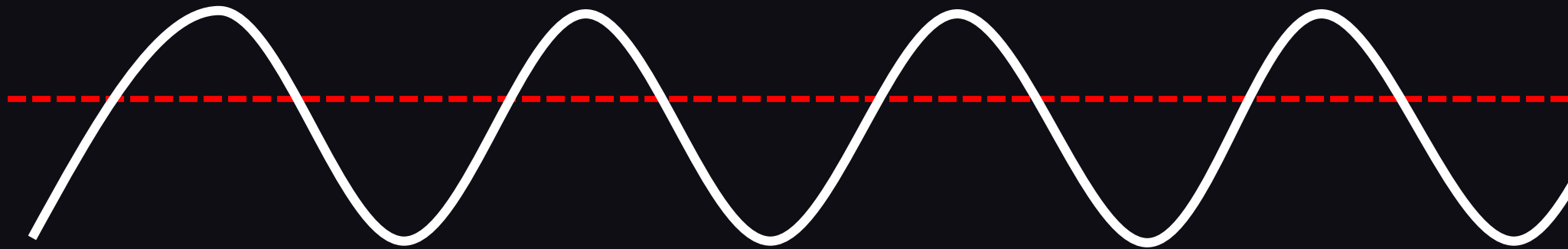
HERTZ (Hz)

Slow
vibrations
(lower pitched)

Rapid
vibrations
(higher pitched)

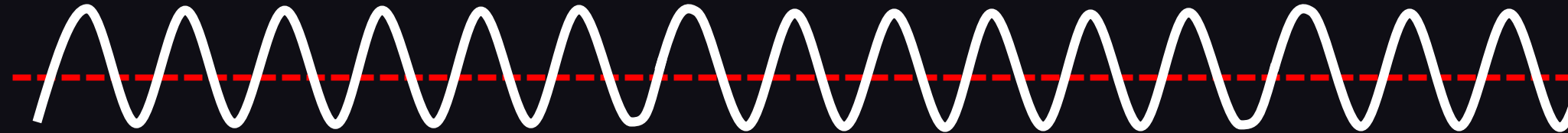


Slow
vibrations
(lower pitched)

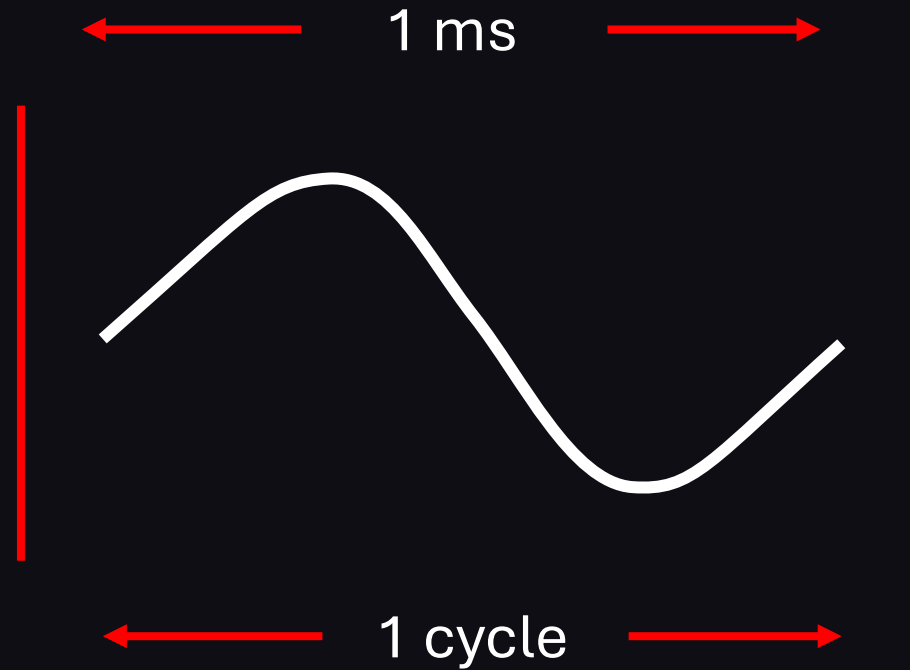


HERTZ (Hz)

Rapid
vibrations
(higher pitched)



HERTZ (Hz)



1000 Hz tone



In a few moments a tone will begin playing.

Listen to the tone and press pause as soon as you can no longer hear it.



HOLLYWOOD

PRODUCTION CUCG Norway

DIRECTOR Eltjo & Ryan

CAMERA 1337

DATE

SCENE

TAKE

25-10-22

1

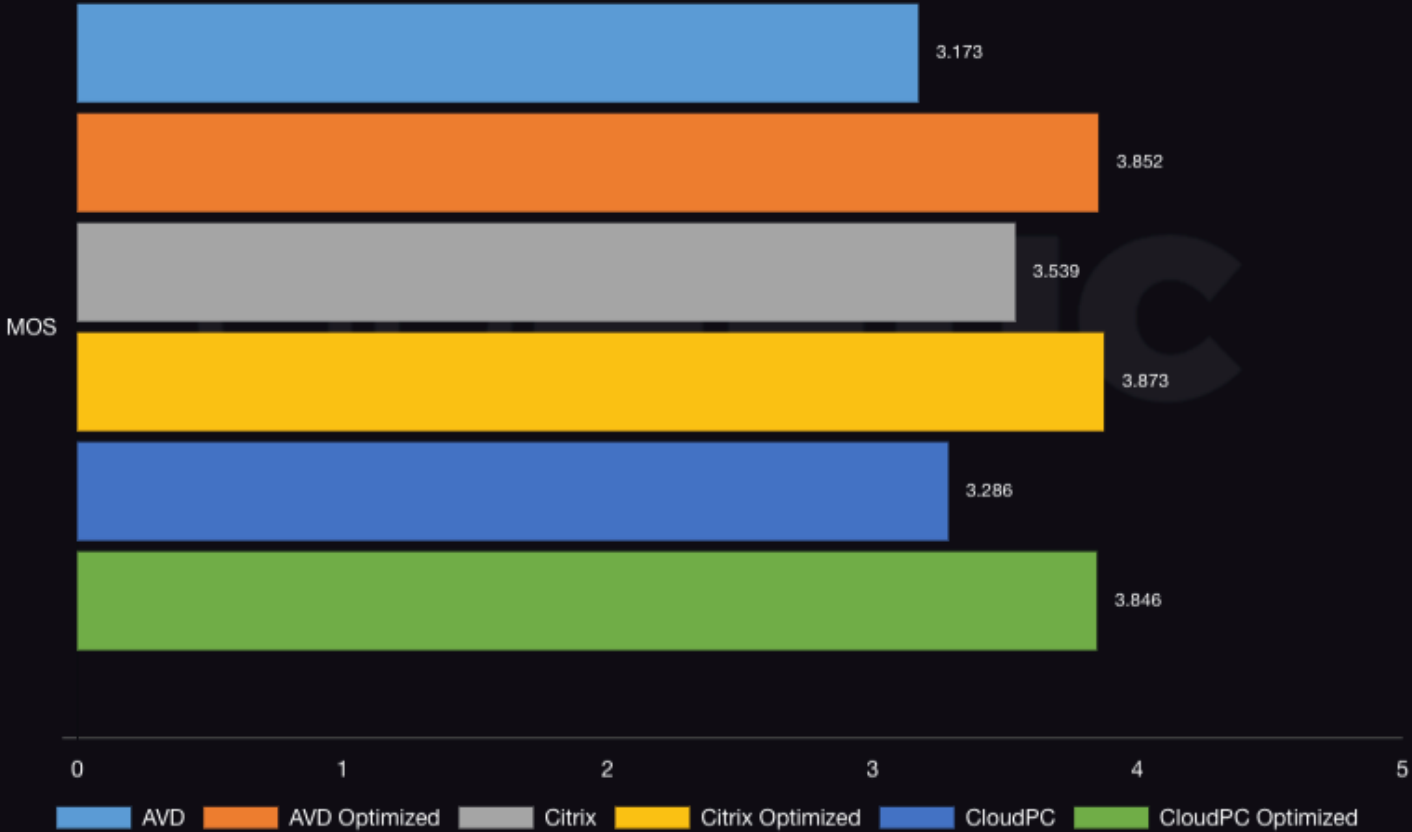
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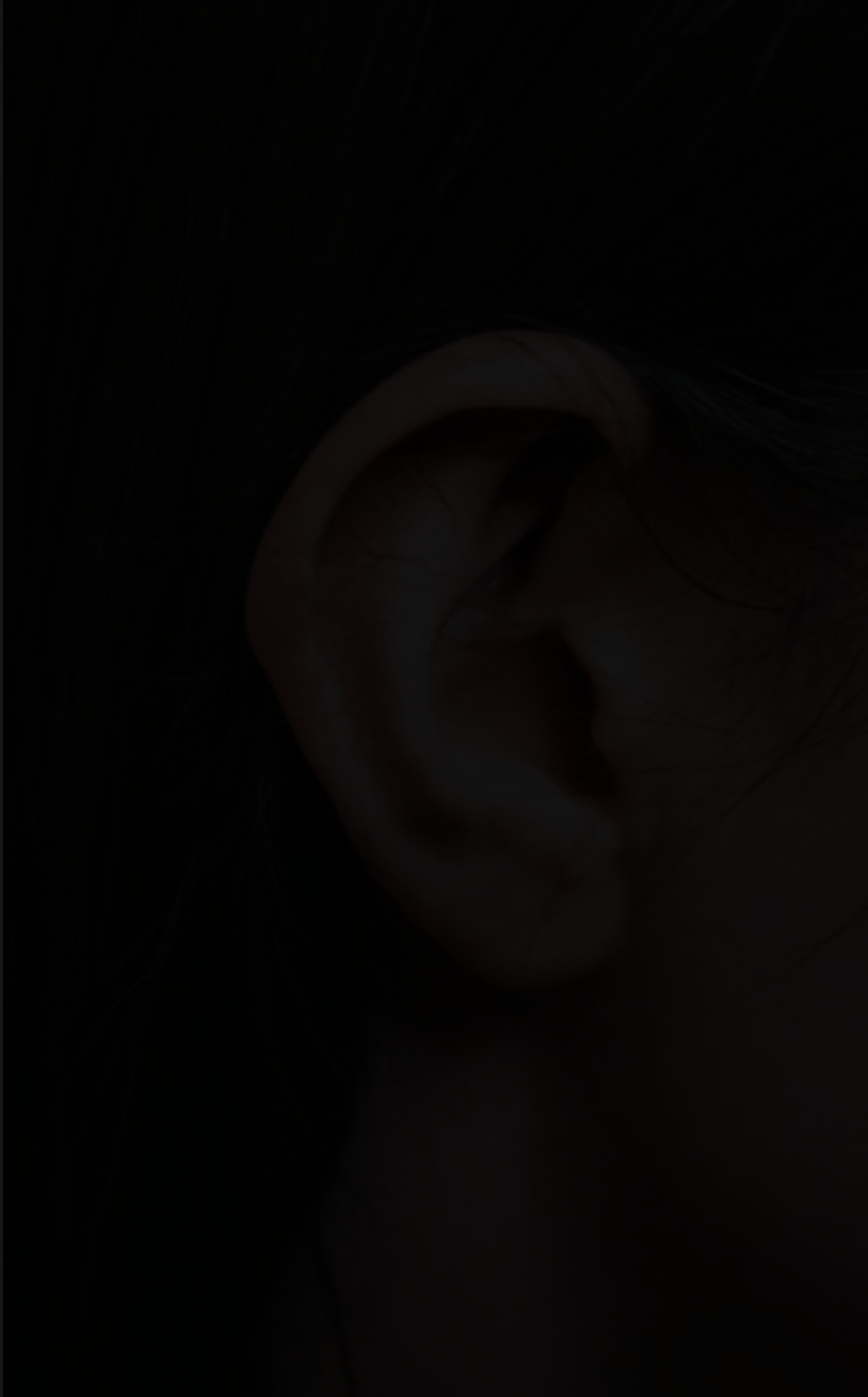


Virtual Speech Quality
Objective Listener

VisQOL Mean Opinion Score (MOS)



Higher is better



6

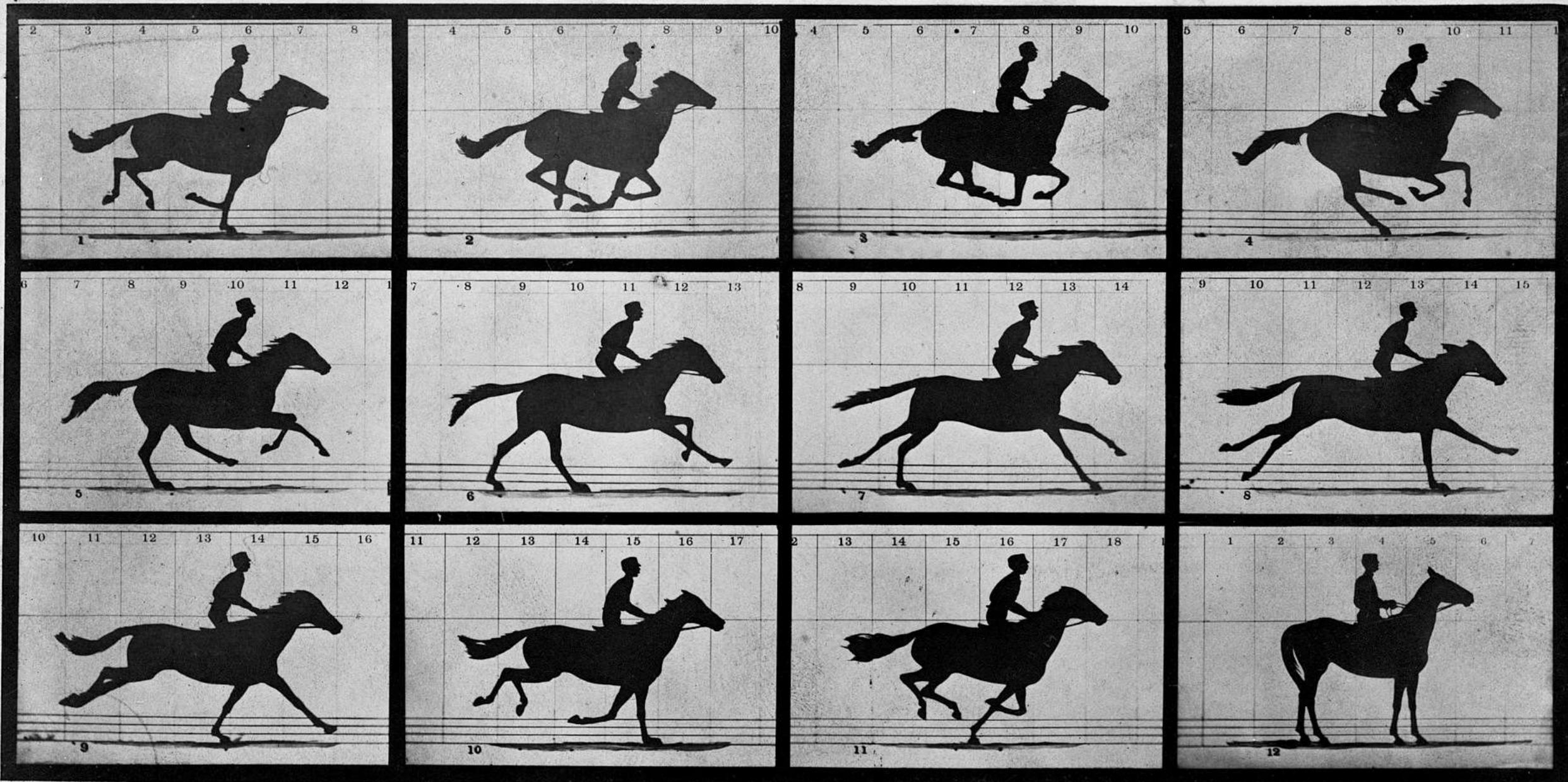
KODAK PORTRA 400



6

6A

0



Copyright, 1878, by MUYBRIDGE.

MORSE'S Gallery, 417 Montgomery St., San Francisco.

THE HORSE IN MOTION.

Illustrated by



A close-up photograph of a human eye with a vibrant blue iris. The eye is looking directly at the camera, and a reflection of a camera lens is visible in the pupil. The text "24 fps" is overlaid in white, bold font across the center of the eye.

24 fps

A close-up photograph of a human eye with a vibrant blue iris. The eye is looking directly at the camera, and a reflection of a camera lens is visible in the center of the pupil. The surrounding skin and eyelashes are visible, and the overall lighting is soft and focused on the eye.

30 fps

A close-up photograph of a human eye with a vibrant blue iris. A white contact lens is visible on the eye. The image is darkened, and the text '33,33 ms' is overlaid in the center.

33,33 ms

A close-up photograph of a human eye with a vibrant blue iris. The eye is looking directly at the camera, and a reflection of the camera lens is visible in the center of the pupil. The surrounding skin and eyelashes are visible, and the overall lighting is soft and focused on the eye.

100 ms

A close-up photograph of a human eye with a striking blue iris. The eye is looking directly at the camera. The text '25MB' is superimposed in the center of the eye in a large, white, bold, sans-serif font. The background is dark and out of focus, emphasizing the eye and the text.

25MB

A close-up, high-resolution photograph of a human eye. The iris is a vibrant, multi-toned blue with intricate patterns. The pupil is dark and contains a clear reflection of a building with a prominent tower. The eye is surrounded by natural-looking eyelashes and skin. The overall lighting is soft, highlighting the texture of the eye and the surrounding skin.

750MB

A close-up photograph of a human eye with a striking blue-green iris and a dark pupil. The eye is looking directly at the camera. The surrounding skin and eyelashes are visible. Overlaid on the center of the eye is the text "1500MB" in a bold, white, sans-serif font.

1500MB



Video codecs



codec

encode decode

A dark, atmospheric city street at night. The scene is dominated by deep blues and blacks, punctuated by vibrant red light trails that streak across the frame from the top left towards the bottom right. In the background, several multi-story buildings are visible, some with windows that appear to be glowing or displaying faint patterns. The overall mood is mysterious and futuristic.

encodec

decode

A dark, atmospheric city street at night. The scene is filled with tall buildings and streetlights. A prominent feature is a series of bright red, glowing lines that sweep across the sky and street, creating a sense of motion and digital energy. The overall color palette is dark, with deep blues and blacks, punctuated by the vibrant red of the light trails and the white of the text.

encodecode



codec



NETFLIX



citrix™

HDX



Video codecs are used to reduce the bandwidth and size of moving images





AV1



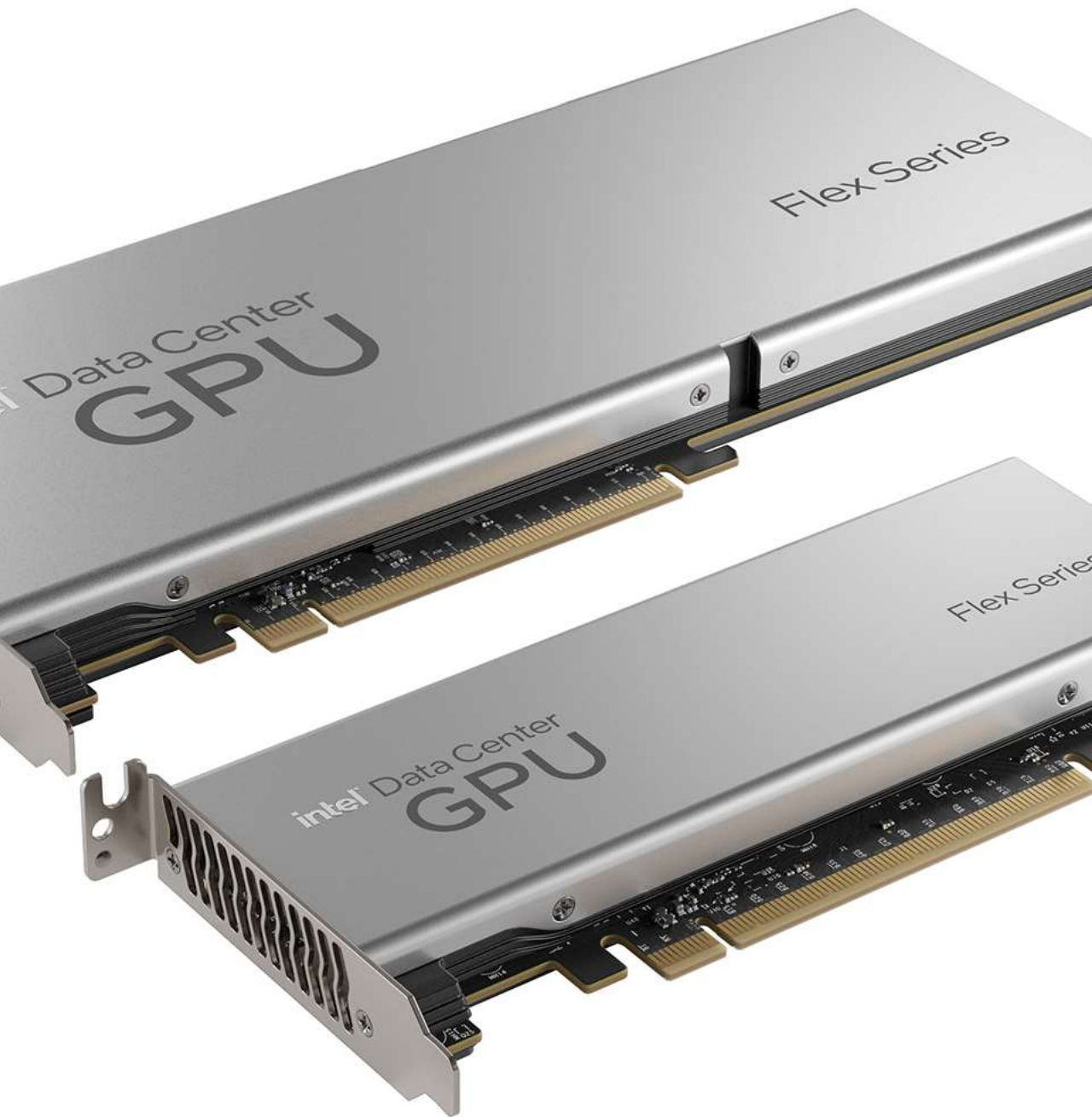
**H.265
HEVC**

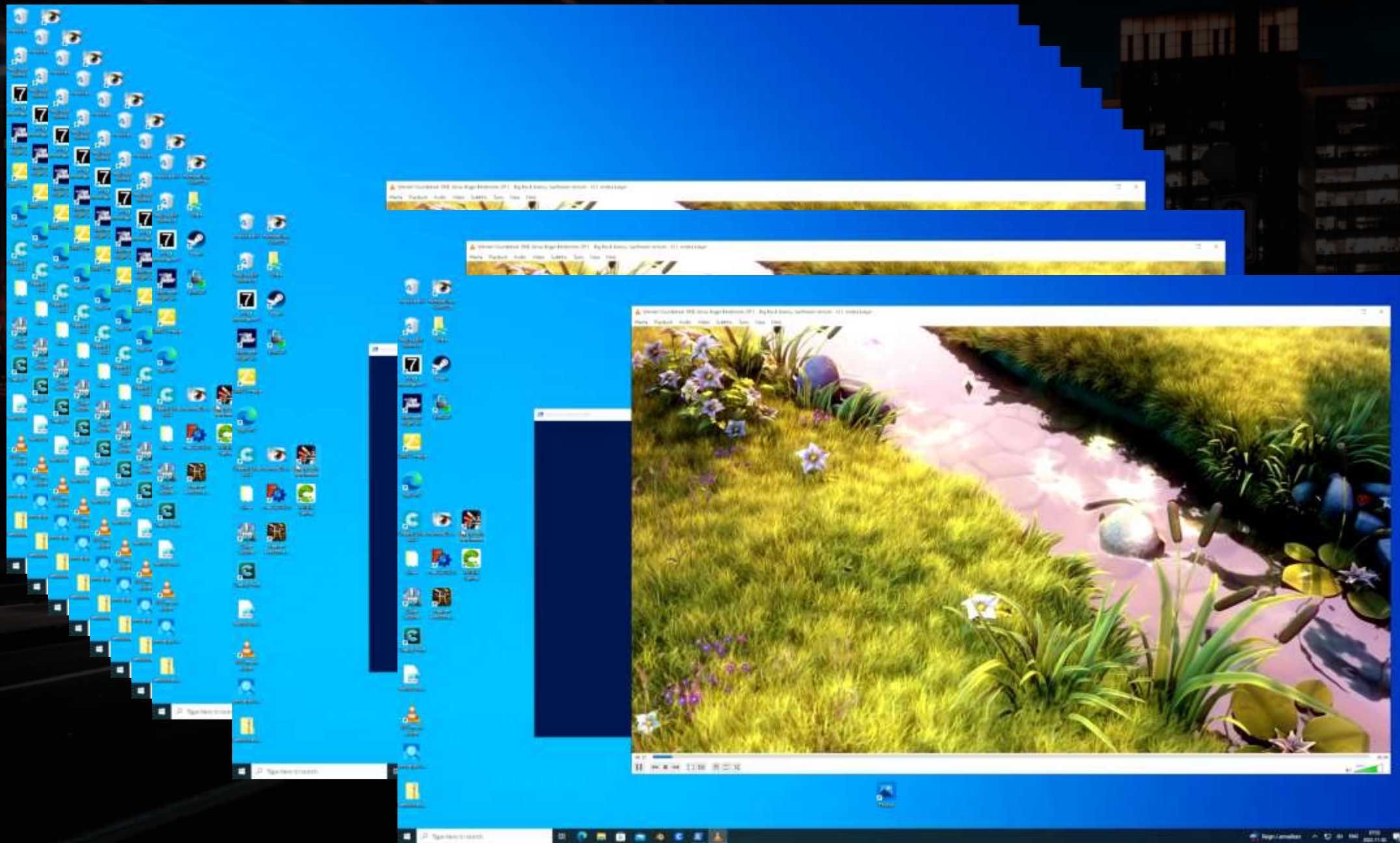


**H.264
MPEG-4/AVC**

AV







The DCT for a sequence of N numbers $x(n)$, for $n = 0, 1, \dots, N - 1$ is given by:

$$X(k) = \alpha(k) \sum_{n=0}^{N-1} x(n) \cos \left(\frac{\pi(2n+1)k}{2N} \right)$$

Where:

$$\alpha(k) = \begin{cases} \sqrt{\frac{1}{N}} & \text{if } k = 0 \\ \sqrt{\frac{2}{N}} & \text{otherwise} \end{cases}$$

Given a source with a set of symbols $S = \{s_1, s_2, \dots, s_n\}$ and a corresponding set of probabilities $P = \{p_1, p_2, \dots, p_n\}$, where p_i is the probability of symbol s_i , the entropy H is defined as:

$$H(S) = - \sum_{i=1}^n p_i \log_2(p_i)$$

InPrivate

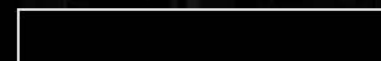


+360° - Car Visualizer -



https://carvisualizer.plus360degrees.com/threejs/

CAR VISUALIZER





InPrivate



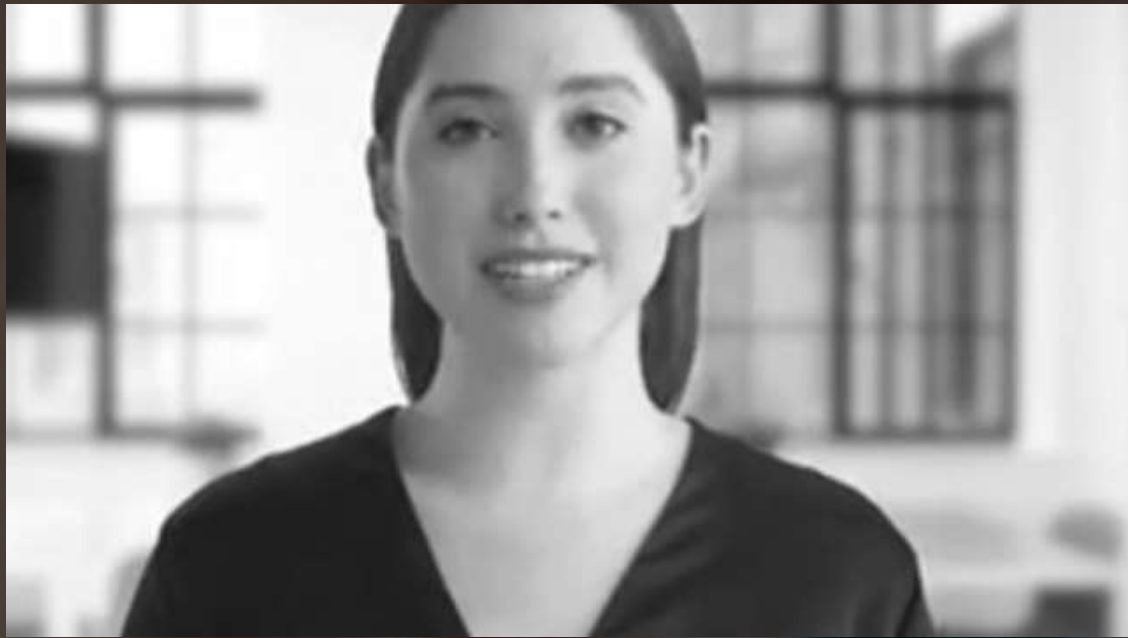
+360° - Car Visualizer - Three.js



https://carvisualizer.plus360degrees.com/threejs/

CAR VISUALIZER

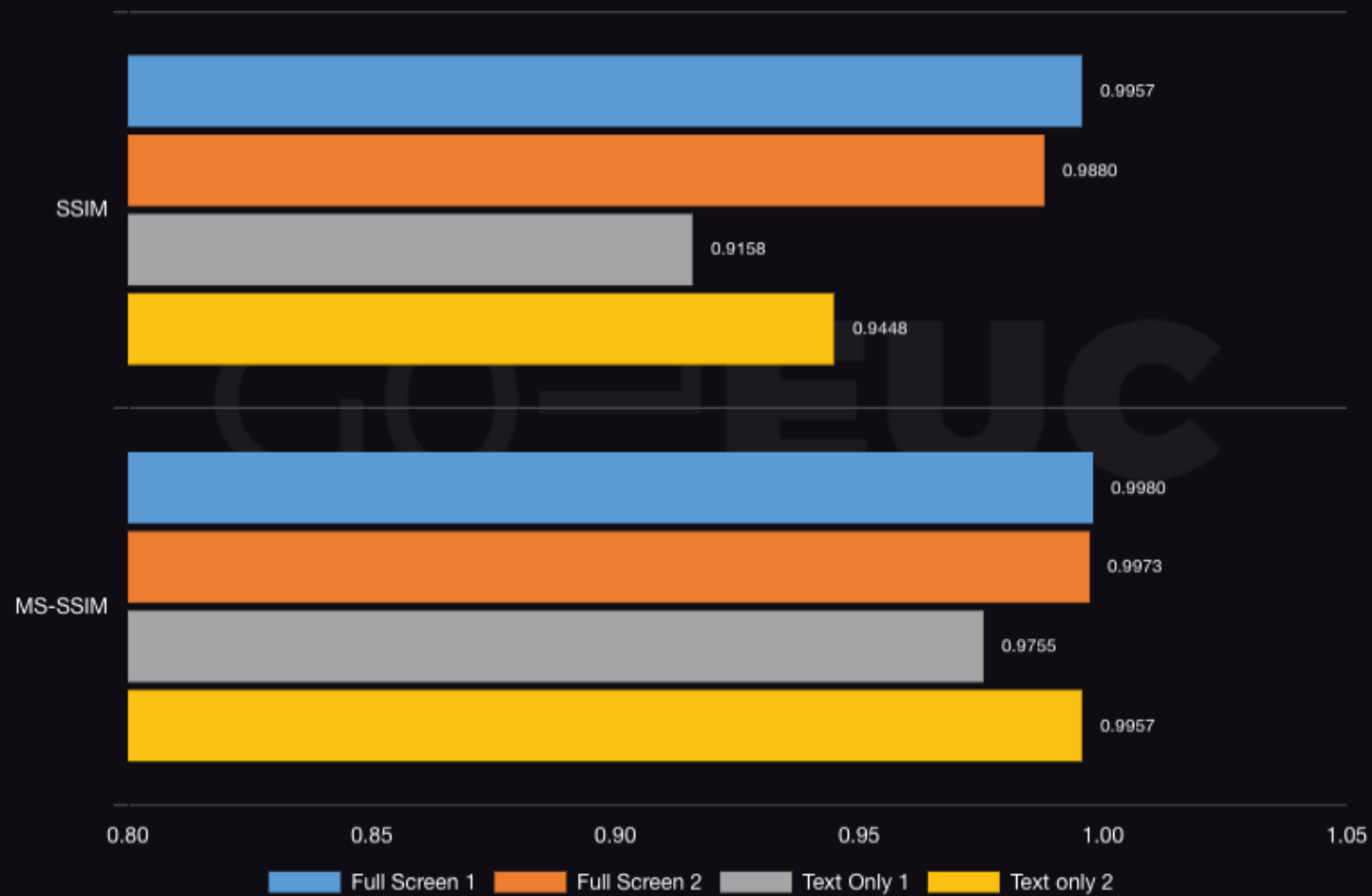




SSIM is a metric used to measure the **similarity** between two images. SSIM provides **perceptual assessment** of image quality, often aligning better with **human visual judgment** compared to simple error summation methods.



Perceived Image quality - Word

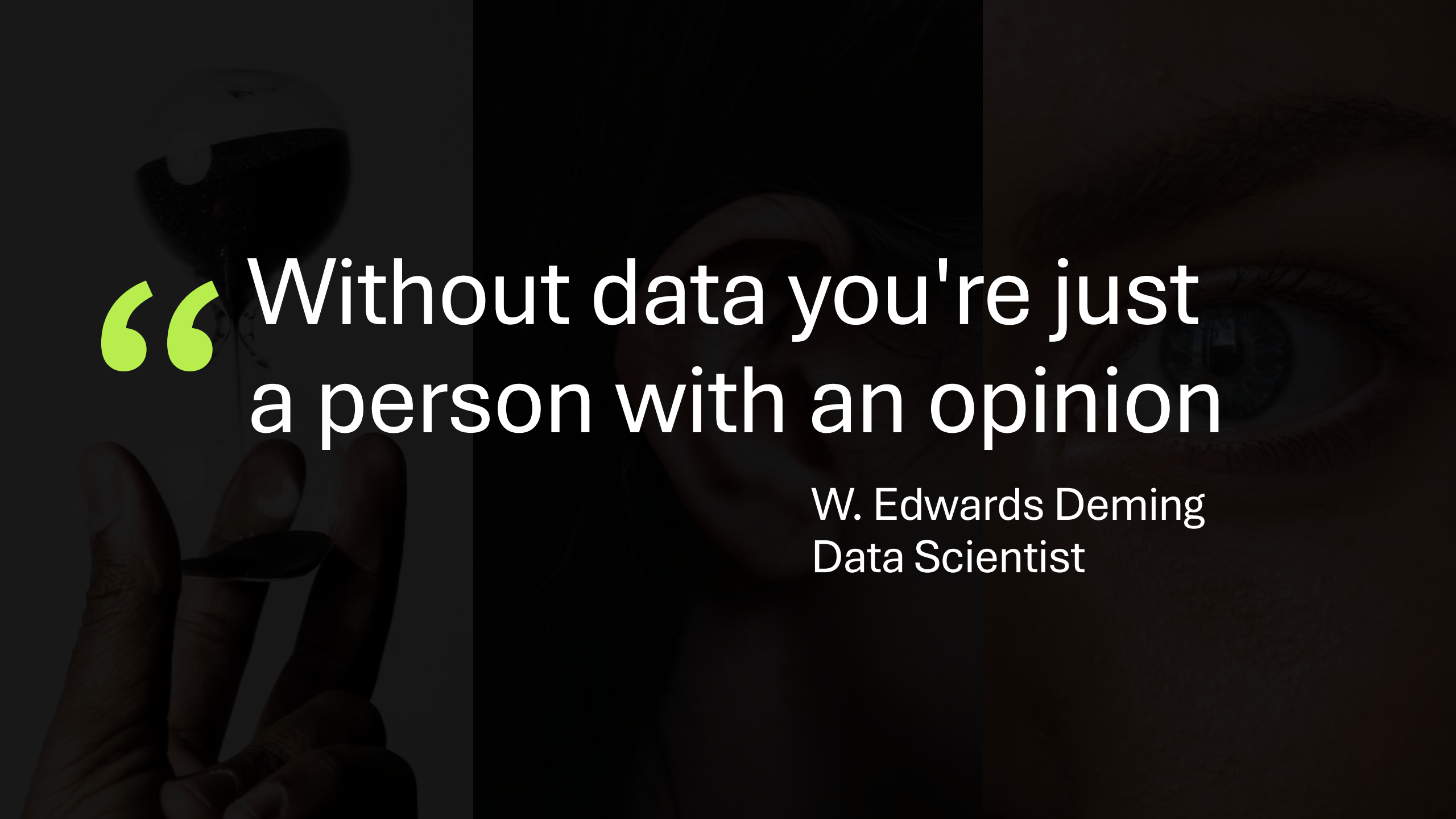


Higher is better



Key takeaways

- “ Understand the workload of the user
- “ Tweak the protocol based on the workload
- “ Reduce latency by select the correct datacenter
- “ Consider content redirection to improve audio sync



“ Without data you're just
a person with an opinion

W. Edwards Deming
Data Scientist



“ Thank you!