The future is 3D: How XR technology is revolutionizing the automotive and motorsport ecosystems

Osku Torro

Doctoral Researcher

NOVI Research Center

Tampere University

My background

- Finalizing PhD in knowledge management, focusing on social VR and its benefits for organizations

- Collaboration with European industry and XR companies

- Now building XR Campus for ECIU Universities

- Consultation, e.g., Mika Häkkinen's iNZDR

How XR revolutionizes car industry and motorsport ecosystems?

1. Immersive 3D content
2. Realistic training and simulations
3. Spatial collaboration and communication
4. Connecting XR with other emerging technologies

Photo by Varjo

#1: Immersive 3D content

Immersion boost a student's motivation and learning

- 3D content makes sense: we live in a 3D world and our brains are adjusted to that

- AR: overlaying a digital world over the real one

- VR: stepping into the virtual world

- XR: includes both

- Digital content can be anything – laws of physics do not matter

Photo by Varjo

Example: AR HUDs

In the future, advanced camera, LiDAR, and AI systems enable us to:

1. ADD any digital element into a driver's/passenger's field of view (e.g., navigation, dragons, you name it…)

2. REMOVE physical obstructions from the field of view (e.g., transparent car/trailer)

Photo by https://autoelectronics.co.kr/

Photo buentaller.com

Photo CNET,com

Photo by Varjo

Example: Design reviews

Photorealistic XR content is already here (Varjo XR-1/XR-3)

By using XR-1, KIA's global design review process went from **days to an hour**

https://www.youtube.com/watch?v=vZt5MW63_a4

Example: teleportation

Varjo Reality Cloud: https://www.youtube.com/watch?v=MHDFNr0MNek (8:40-11:30)

Real-time volumetric content from motorsports events (XR/mobile/TV broadcasts)?

Connecting users with the most amazing 1) **locations** (circuits, stadiums, behind the scenes) and 2) **people** (stars/athletes/entertainers) in the world - in real-time, just like being on the spot

Varjo.com

Photo by Varjo

#2: Realistic training and simulations

THE POWER OF XR IN EDUCATION:

If the XR content feels like real, people are likely to behave realistically as well

- Acquiring professional SKILLS and KNOWLEDGE via the use of XR holds exceptional potential

- Enables experiences that are "better than reality" (e.g., gamifying features of XR and aspects of work routines)

- XR training suits ESPECIALLY WELL for learning that includes:
    - MANUAL SKILLS
    - COMPLEX PROBLEMS
    - 3D CONTENT

- A list of case studies: https://axonpark.com/how-effective-is-vr-training-13-case-studies-and-examples/

Example: Machine repair and maintenance

- Step-by-step 3D instructions for machine maintenance

- Embedded videoconferencing

- Remote guidance

- No physical training manuals needed

- Combine with e.g., indoor navigation – voilà!

Photo by Microsoft

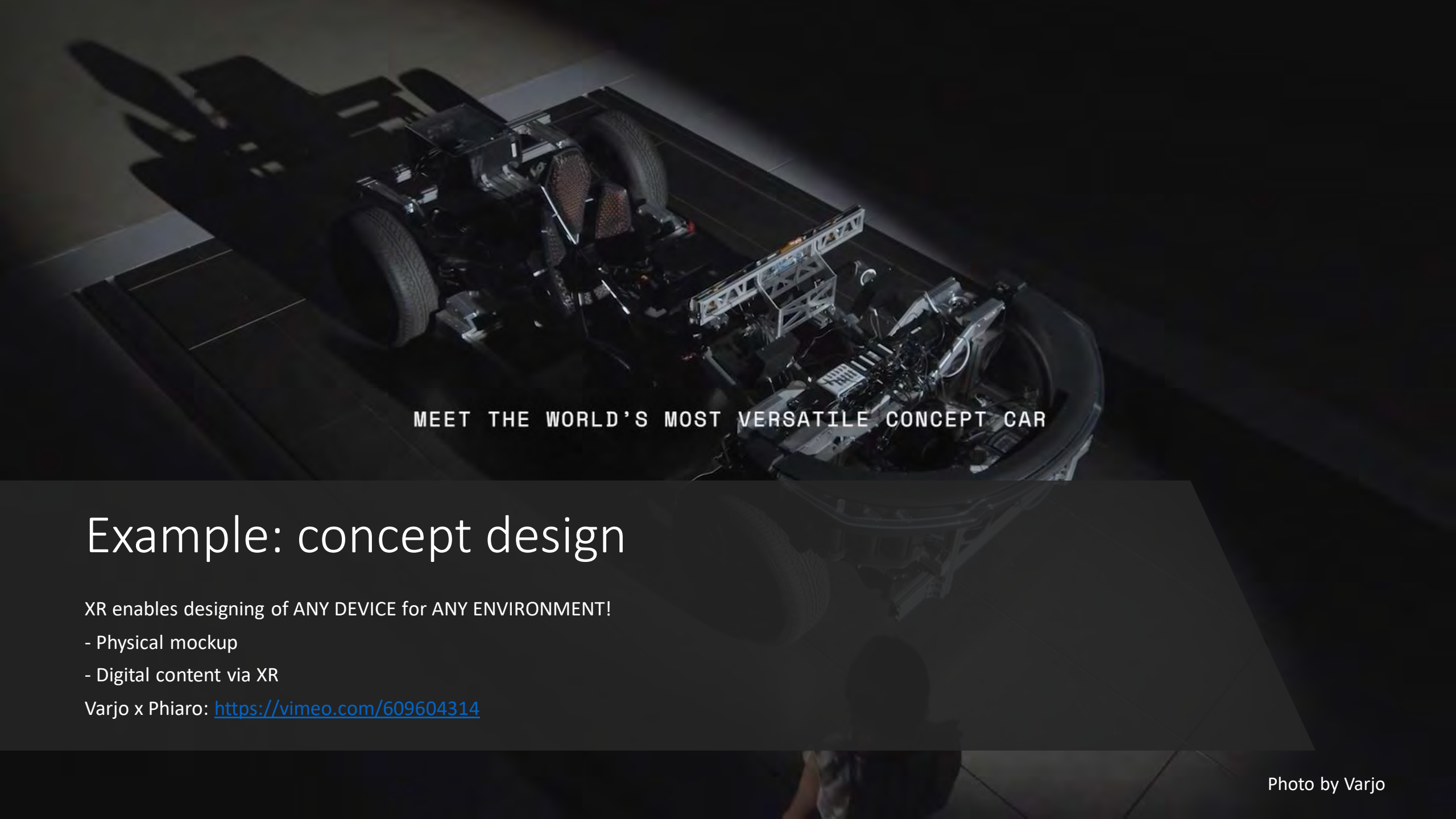# Example: Pilot training

Varjo x Boeing

Astronaut training for spaceflights
- Pre-launch
- Docking
- Landing

Varjo x VRM Switzerland

The first VR helicopter simulator qualified by European Union Aviation Safety Agency (EASA)

If it's dangerous and/or costly – do it in XR!

Photo by Varjo

Photo by Varjo

Example: concept design

XR enables designing of ANY DEVICE for ANY ENVIRONMENT!

- Physical mockup

- Digital content via XR
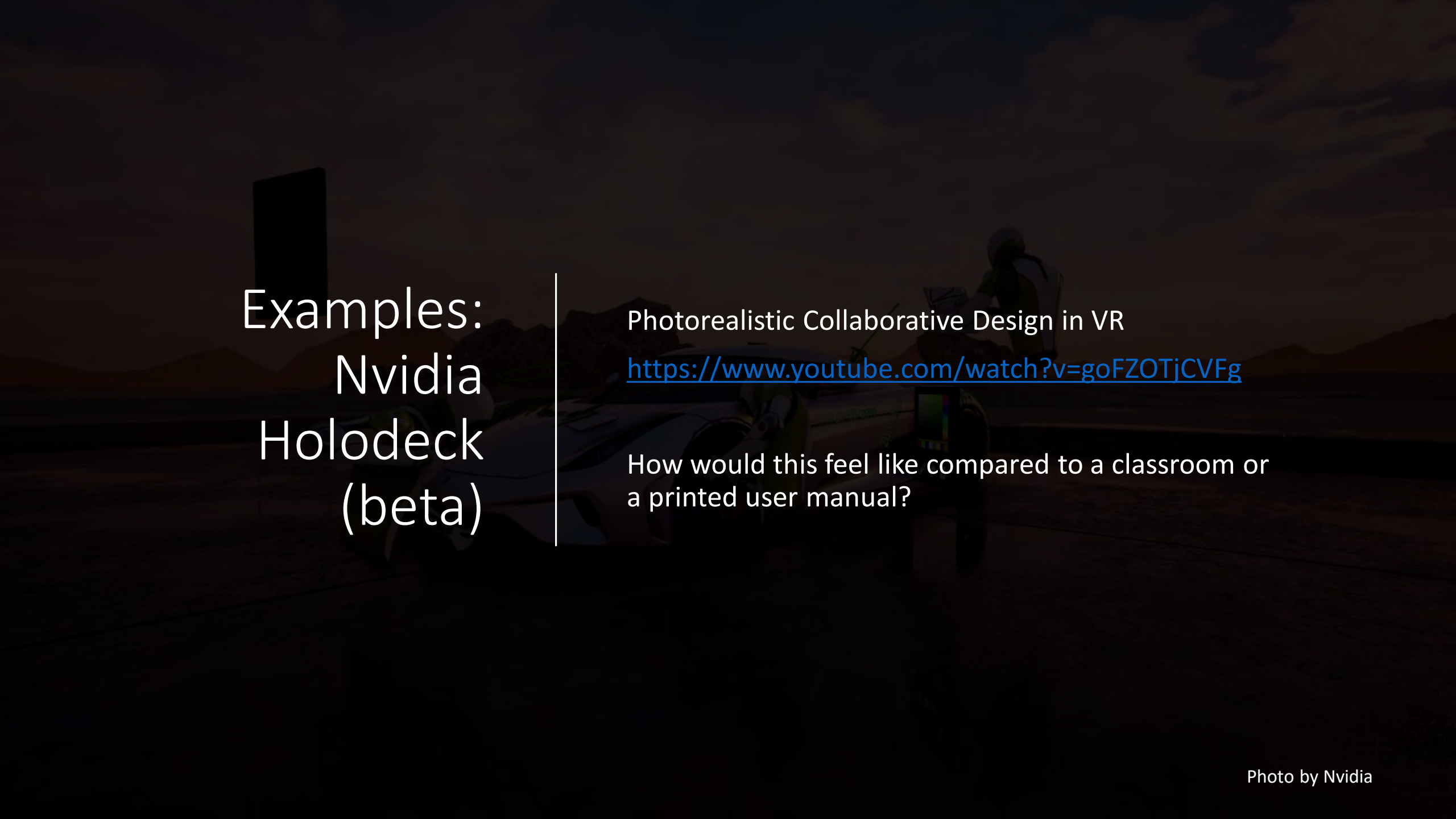
Varjo x Phiaro: https://vimeo.com/609604314

Photo by Varjo

Photo by Nvidia

#3: Spatial collaboration and communication

- The content in VR with the most potential is other people (e.g., collaborative learning and teamwork)

- Natural spatial communication + Interactivity + task-related content = ideal platform for collaboration and learning

- Enhanced focus: communication can be filtered to fit precisely the task at hand

Examples: Nvidia Holodeck (beta)

Photorealistic Collaborative Design in VR

https://www.youtube.com/watch?v=goFZOTjCVFg

How would this feel like compared to a classroom or a printed user manual?

Photo by Nvidia

#4: Connecting XR with other emerging technologies

High immersion, interactivity, and user engagement in XR leverage and compound the organizational potential of other emerging technologies such as:

- Robotics

- Brain-Computer interface (BCI), Neural interface (NI)

- Artificial intelligence
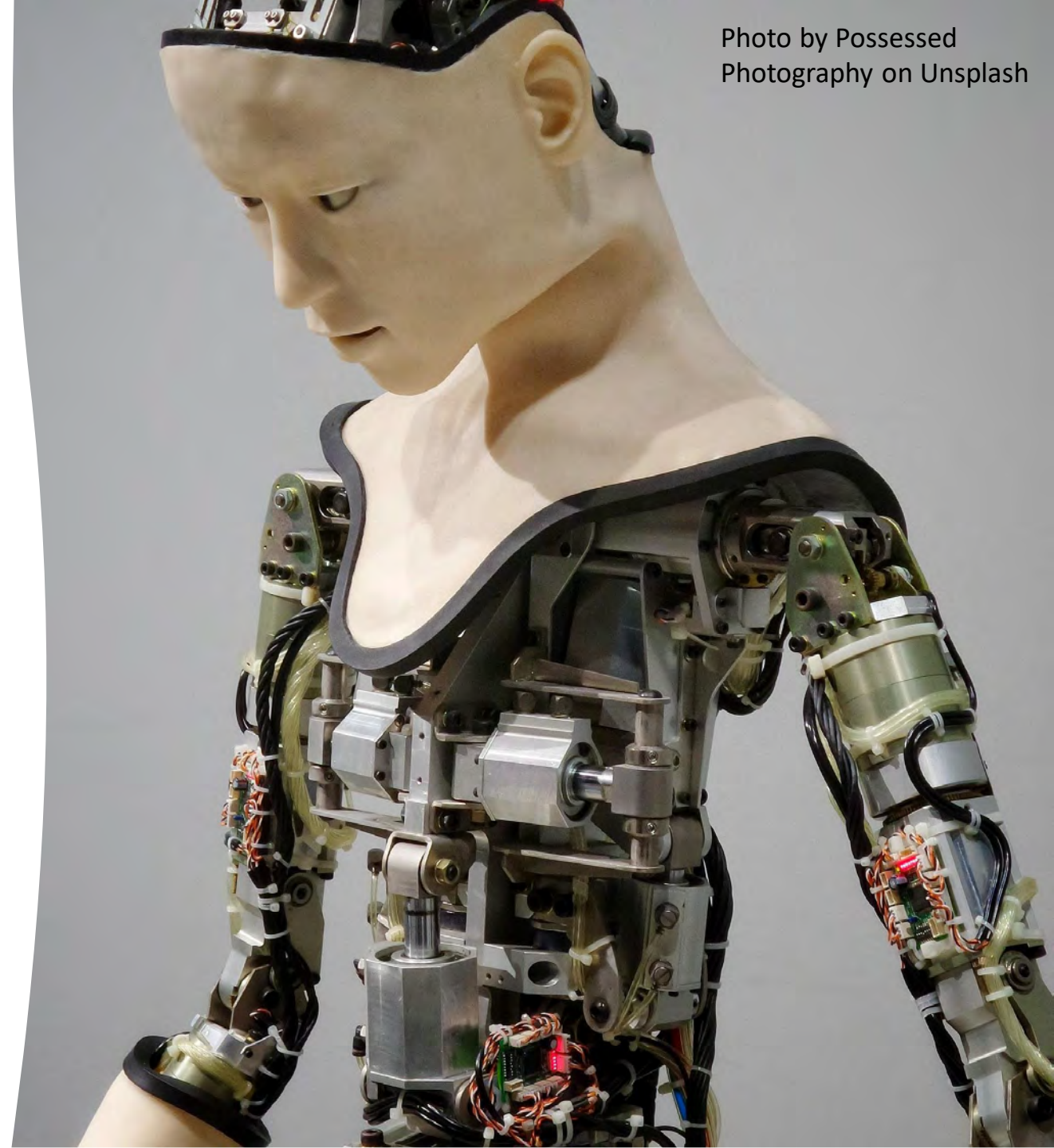
Example: Robotics

XR enables us to work through remote hand, and seeing through remote eyes
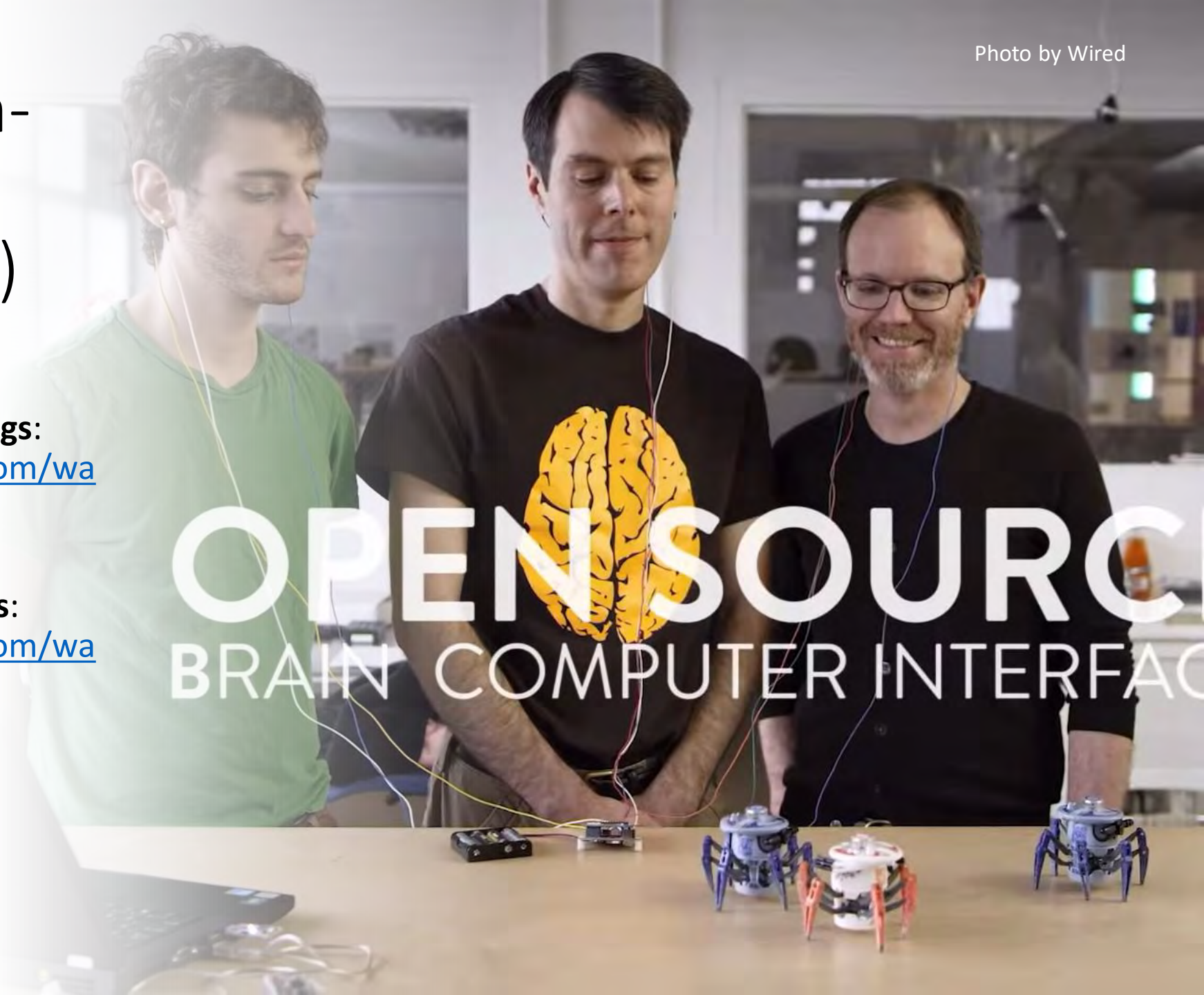
Remote teleoperation via robots: https://www.youtube.com/watch?v=lRWna6mEMv0

Example: Brain-Computer Interfaces (BCI)

Controlling **physical things**:
https://www.youtube.com/watch?v=LZPZFeOOerA

Controlling **virtual things**:
https://www.youtube.com/watch?v=SMXfyZc_Gvg

Example: Neural interface (NI) system

Detects neural signals from your body

Enables interactions with the physical (e.g., robots) and the digital (e.g., XR)

Enables HAPTIC feedback and the sense of touch (i.e., feedback from the digital content into your body)

Neural interfaces by Facebook: https://www.youtube.com/watch?v=hc2ADtNgeCM

but rather squeezing on the wrist

Photo by Facebook

Example: AI avatars (i.e., agents)

- REALISTIC agents that mimic the human mind: **reasoning**, **object and speech recognition**, and **a dialogue system** (verbal and nonverbal))

- Routine or assistive tasks (similar than Digital Voice Agents (DVAs) or chat-bots)

- Advanced tasks such as decision making (e.g., big data analytics)

- Perceived as physical entities in the digital realm (e.g., marketing, training…)

- Agents can e.g., recognize your user's emotions via face tracking

Baby X: https://www.youtube.com/watch?v=yzFW4-dvFDA

Photo by Bloomberg/YouTube

In the year 2035

- AR digital layer embedded in the real-world

- Virtual worlds via VR

- Teleport into ANY location

- Interoperability via Metaverse!

- Training and education is routinely done in XR

- We have our digital representations i.e., avatars that can be customized to ANYTHING

- You can control both physical and virtual objects with your mind/neural input

- Communication w. AI agents becomes nearly indistinguishable from human-to-human communication

WELCOME TO THE METAVERSE

Photo by https://podtail.com/fi/podcast/welcome-to-the-metaverse/

AI for General Purpose Robotics

ERAS

UTER

MULTI-
NEU

DOJ

How does automotive
industry look in 2035?

Photo by Tesla