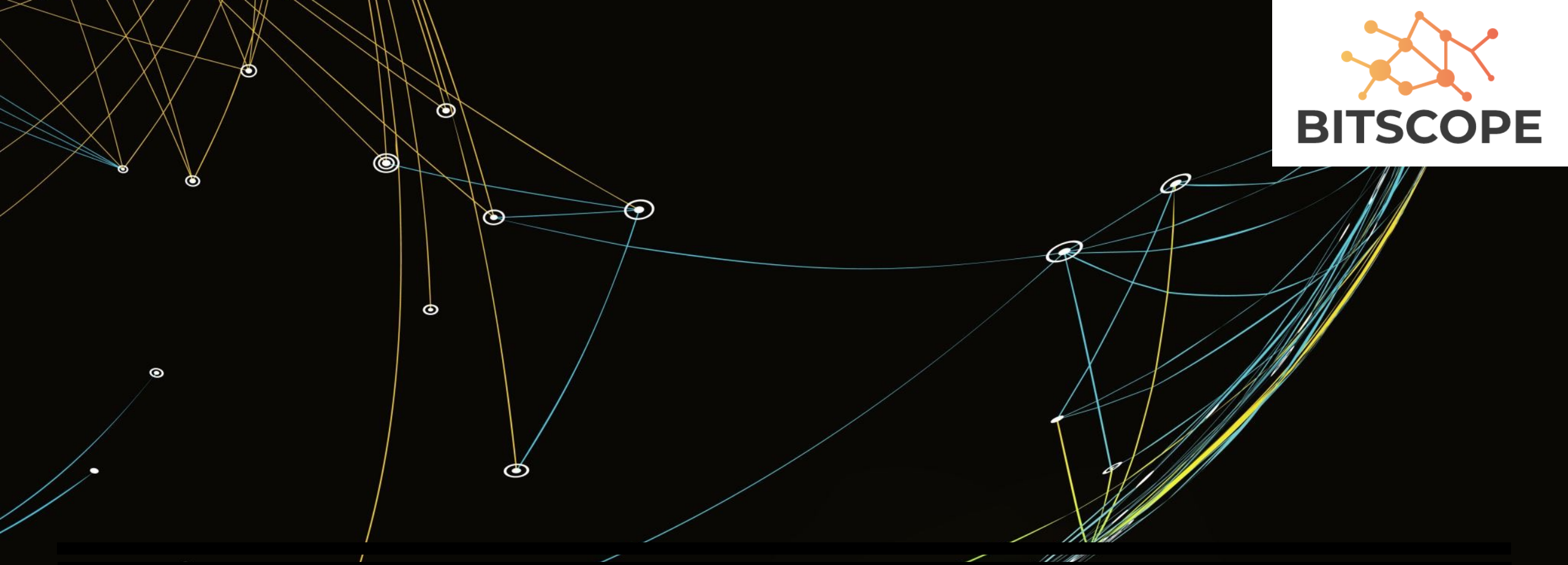

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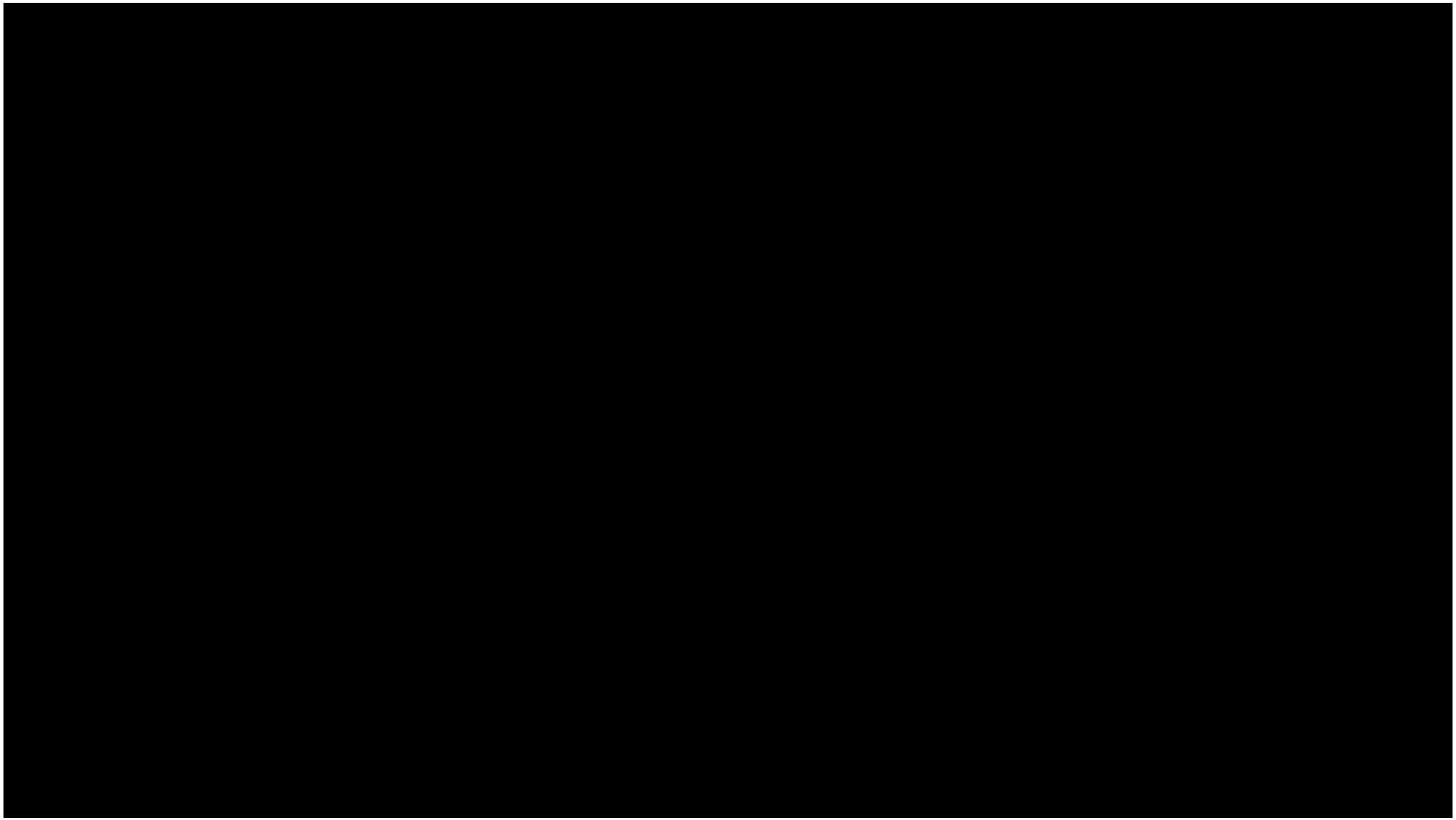
Brain Integrated Tagging for Socially Curated Online Personalised Experiences

AKA A TECHNOLOGY FOR CO-CURATED VIRTUAL ART GALLERIES USING SOCIAL NEURAL AND BEHAVIORAL TAGGING

PRESENTER: TOMÁS WARD

LONG TERM VISION

BITSCOPE presents a *vision* for brain computer interfaces (BCI) which can enhance our relationships with other people in the context of sharing virtual experiences



THE CONCEPT – INSTANCE OF THE VISION

- Use passively collected signals such as neural signals related to attention/curiosity/memorability, eye gaze to tag art works (and even non-intentioned art works in the virtual world)
- Use AI-based recommender systems approach to share personalized virtual galleries (as per Spotify- Weekly Playlist Recommendations)
- The virtual art gallery is a 3-D space
- There will be a number of formal galleries and at least 1 community/outsider space.
- Like a solved Rubiks cube initially – siloed individual galleries but as people interact with art there is ”jumbling” of the gallery pieces and spaces in this virtual world but this is the personalized version.

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CORE TECHNOLOGY

- A ***passive hybrid BCI*** (phBCI) capable of operating ***"in the wild"*** and capable of monitoring user attention, memorability and curiosity.

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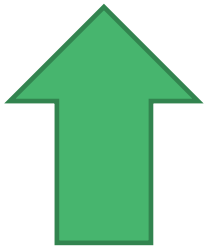

This is the KEY CHALLENGE

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PROJECT OBJECTIVES

- **Objective 1:** Through a co-design process, demonstrate a robust, hybrid, i.e., multimodal passive BCI working as an experimental proof of concept for automated tracking of user engagement (attention/memorability/curiosity) in a virtual environmental setting that offers improved performance over competing approaches from an end-user perspective.

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PROJECT OBJECTIVES

- **Objective 2:** Collect and make openly available multimodal data sets (at least 60 experimental subjects), ground truths and code which can enable others to advance hybrid, passive BCI development through improved machine learning.

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PROJECT OBJECTIVES

- **Objective 3:** Develop signal processing methods for noise suppression in the context of ecologically valid artefacts allowing more power-efficient extraction of useful signal for hybrid passive BCI compared to classical filtering methods.

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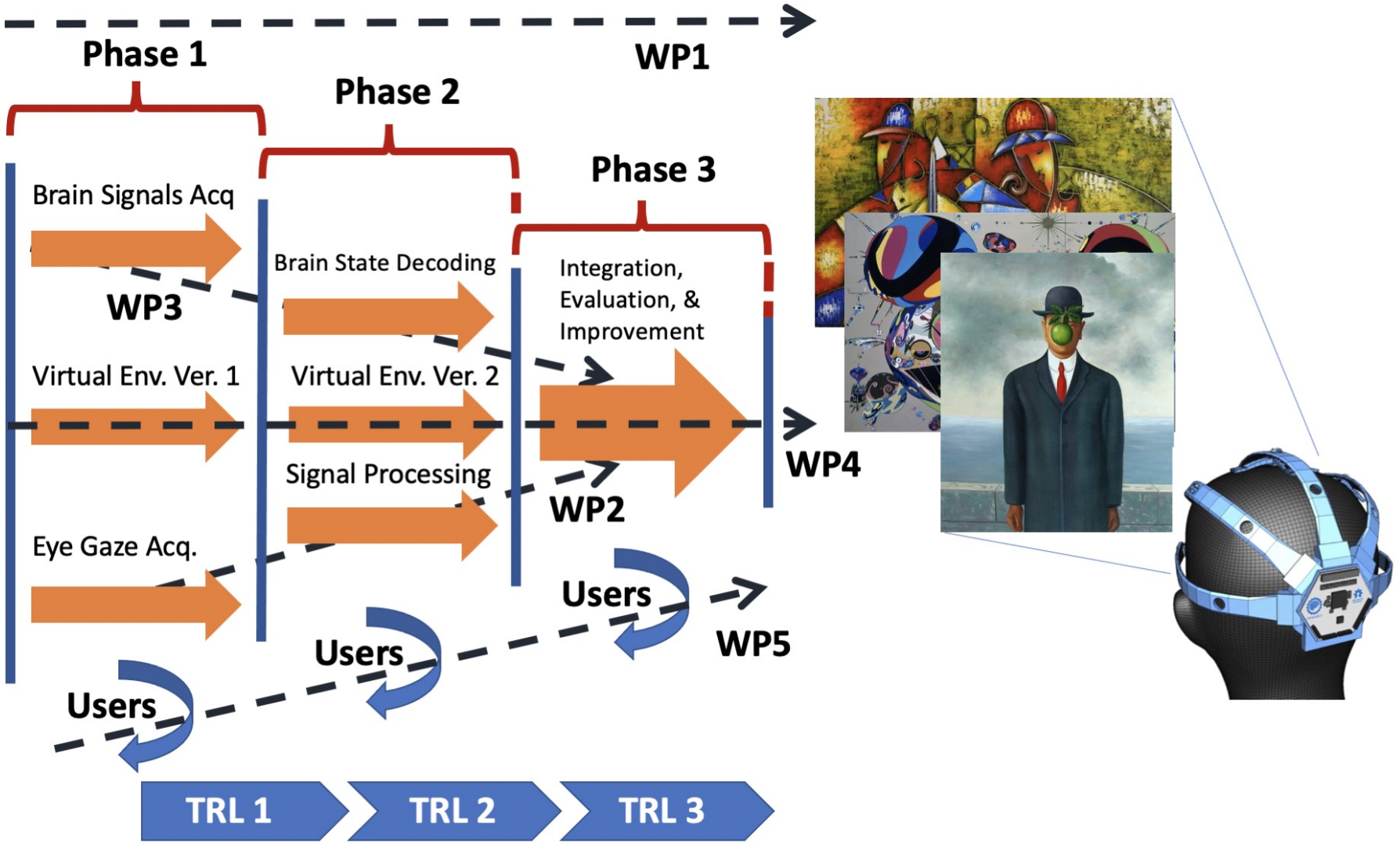
RESEARCH METHODOLOGY



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PHASE 1

Experimental Set-ups	Resources	Metrics
A set of pilot subjects will be used to collect neural, physiological and behavioural data for scoping and iterative design purposes	(1) Image presentation software integrating eye tracking and event marker output (2) OpenViBE adapted for enhanced set of physiological inputs (3) Image sets sourced from partners (NGI/Wikimedia in the form of gallery, libraries, archive and museum data).	(1) Open-source software made available (2) No. of preliminary datasets collected (3) No. of curated images made available from partners.

PHASE 2

Experimental Set-ups	Resources	Metrics
Extensive data collection from at least 60 experimental subjects for (a) denoising studies (b) system co-design (c) attention/memorability/ curiosity	(1) End-user Workshops for design/creation, (2) Object presentation software improved from Phase 1 (3) OpenViBE enhanced through Phase 1 results. (4) Further GLAM objects sourced through partners, artists, public.	(1) Workshop reports made available, (2) Datasets (>=60 subjects) collected and made publicly available.

PHASE 3

Experimental Set-ups	Resources	Metrics
Evaluation data collection in virtual experiences supporting open world behaviour in GLAM contexts.	(1) Open world virtual environment suitable for GLAM applications integrating phBCI.	(1) Final denoising and UX models made available (papers+code) (2) All software made available for (virtual environment, OpenViBE enhancements) (3) Measures demonstrating improved performance via BITSCOPE (study results)

TARGETTED BREAKTHROUGHS

1	We will improve signal quality through noise suppression based on modern neural networks methods and geometrical approaches trained on representative artefact scenarios.
2	We will collect, annotate and share larger datasets than have been provided previously for hybrid passive BCI involving EEG, physiological signals and eye tracking.
3	We will develop classifiers capable of weighting and fusing multimodal sensor streams using geometrical approaches, in particular Riemannian geometry approaches.
4	We target interaction information for the first time related to curiosity, attention and memorability.

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- Insight SFI Research Centre for Data Analytics, Dublin City University, Ireland

- Wearable Sensing
- Artefact Processing
- Data Analytics
- BCI for Attention/Memory
- Media Analytics

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- Institute for Research and Innovation in Bioengineering (i3B), Polytechnic University of Valencia (UPV), Spain

- Extended Reality
- Consumer Neuroscience
- GLAM/VR/EEG
- Neuroergonomics

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- Nicholas Copernicus University, Torun, Poland

- Eye-tracking
- Data Visualisation
- User-centred Design

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- Inria Bordeaux Sud-Ouest, LaBRI (CNRS, Univ. Bordeaux, Bordeaux INP), France

- Open Source Software for Neurotechnology
- Open Science
- New BCI paradigms
- BCI Classifiers

RESULTS SO FAR, DISSEMINATION/SUSTAINABILITY/TECH TRANSFER/EXPLOITATION

RESULTS SO FAR, DISSEMINATION/SUSTAINABILITY/TECH TRANSFER/EXPLOITATION

D1.1	M1	Website, social media accounts
D1.2	M2	The BITSCOPE Open Science policy
D1.3	M3	Data Management Plan First Version, updated when significant changes occur and prior to reviews
D1.4	M3	Data Transfer Agreement Framework
D1.5	M1	Communication, Dissemination and Exploitation plan

Milestone	Month	WP involved	Title
M.1	1	1	Project Kick-off Meeting
M.2	2	1	Online presence launch (web, social media presence)
M.3	12	1	First Update of Communication, Dissemination and Exploitation plan
M.4	12	2,3	First Pilot Datasets Collected
M.5	12	4	An internal functional OpenViBE implementation (Version 1) of the UX and denoising protocols.
M.6	15	4	An internal OpenViBE version (Version 2) with a user-preference management interface.
M.7	15	5	First Co-design/Co-creation Workshops Held
M.8	18	3	UX Dataset now available for high quality modelling purposes
M.9	24	2	Availability of first usable denoising algorithms
M.10	24	4	Virtual Exhibition Space Prototype (Version 2) Available
M.11	33	4	An internal functional OpenViBE implementation (Version 3) of the real-time denoising and passive UX BCI classifiers.
M.12	36	5	Evaluation with Stakeholders Complete
M.13	36	1,3,4	Project Complete

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TOO EARLY TO SAY!

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QUESTIONS?

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