MEPHESTO
Digital Phenotyping 4 Psychiatric Disorders from Social Interaction

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Motivation

- Clinical insights through keen behavioral observation & subjective questionnaires and scales

- Punctual assessments based on interactions between patient and clinician only

- Variability in results, errors and misdiagnosis

→ Need for **diverse data** and **dimensional approaches** as fundamental principles for better diagnosis of mental disorders

→ **"Measurement-based care"** rather than relying only on clinical judgment

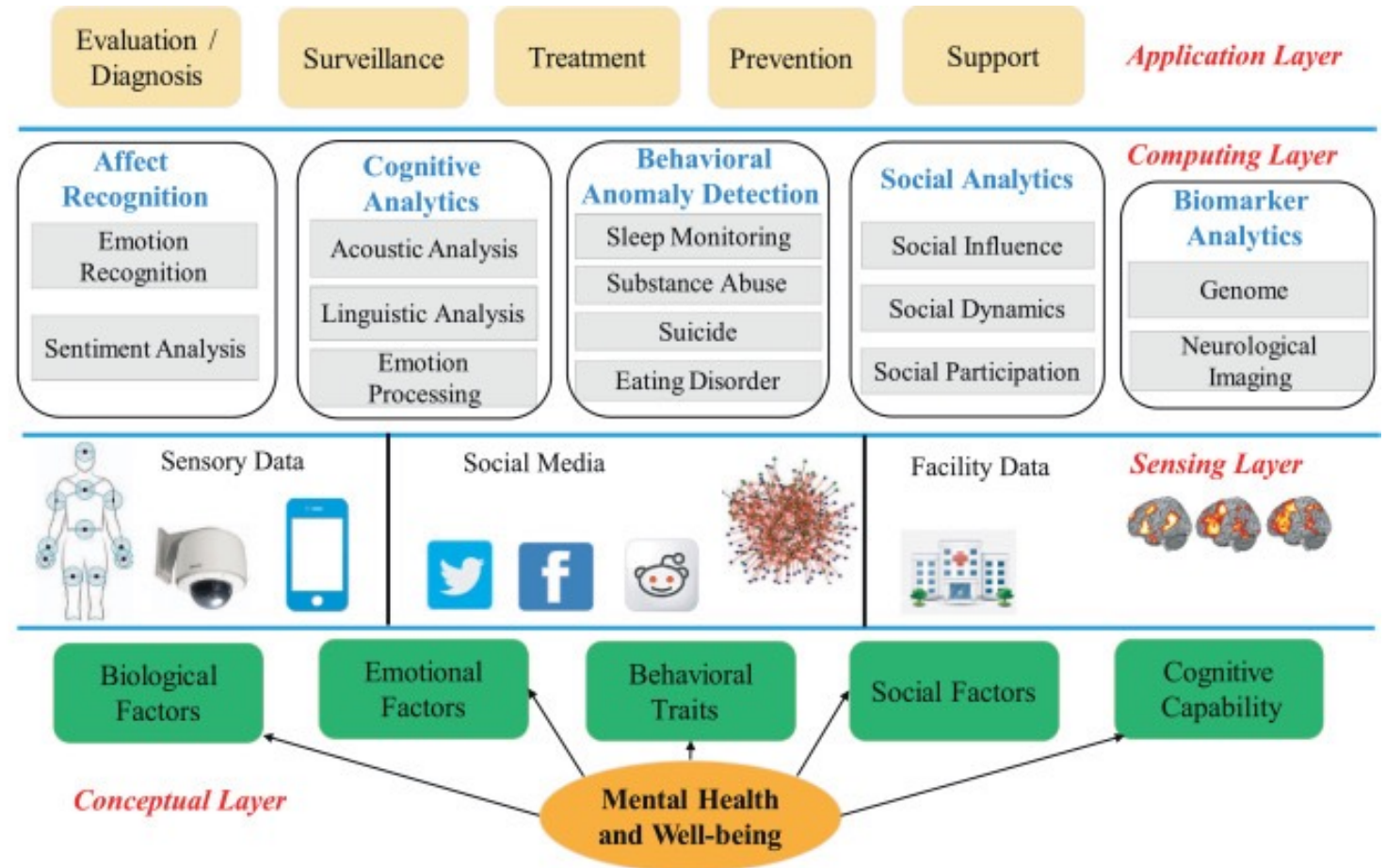→ Shift from late disease management and cure to **preventative-personalized precision medicine**

Solutions = Digital phenotyping?

- Refers to the instantaneous and **personalised quantification** of a human phenotype using computerised measurement tools

  (Torous et al. 2016)

Active   Passive

| Evaluation / Diagnosis | Surveillance | Treatment | Prevention | Support | *Application Layer* |

| Affect Recognition | Cognitive Analytics | Behavioral Anomaly Detection | Social Analytics | Biomarker Analytics | *Computing Layer* |

- Affect Recognition: Emotion Recognition, Sentiment Analysis
- Cognitive Analytics: Acoustic Analysis, Linguistic Analysis, Emotion Processing
- Behavioral Anomaly Detection: Sleep Monitoring, Substance Abuse, Suicide, Eating Disorder
- Social Analytics: Social Influence, Social Dynamics, Social Participation
- Biomarker Analytics: Genome, Neurological Imaging

Sensory Data — Social Media — Facility Data — *Sensing Layer*

Biological Factors — Emotional Factors — Behavioral Traits — Social Factors — Cognitive Capability

Conceptual Layer   Mental Health and Well-being

Insel, 2017; Liang et al., 2019.

MEPHESTO *The Vision*

"The vision of MEPHESTO is to help break the scientific ground for the next generation of precision Psychiarty through AI-based social interaction analysis."
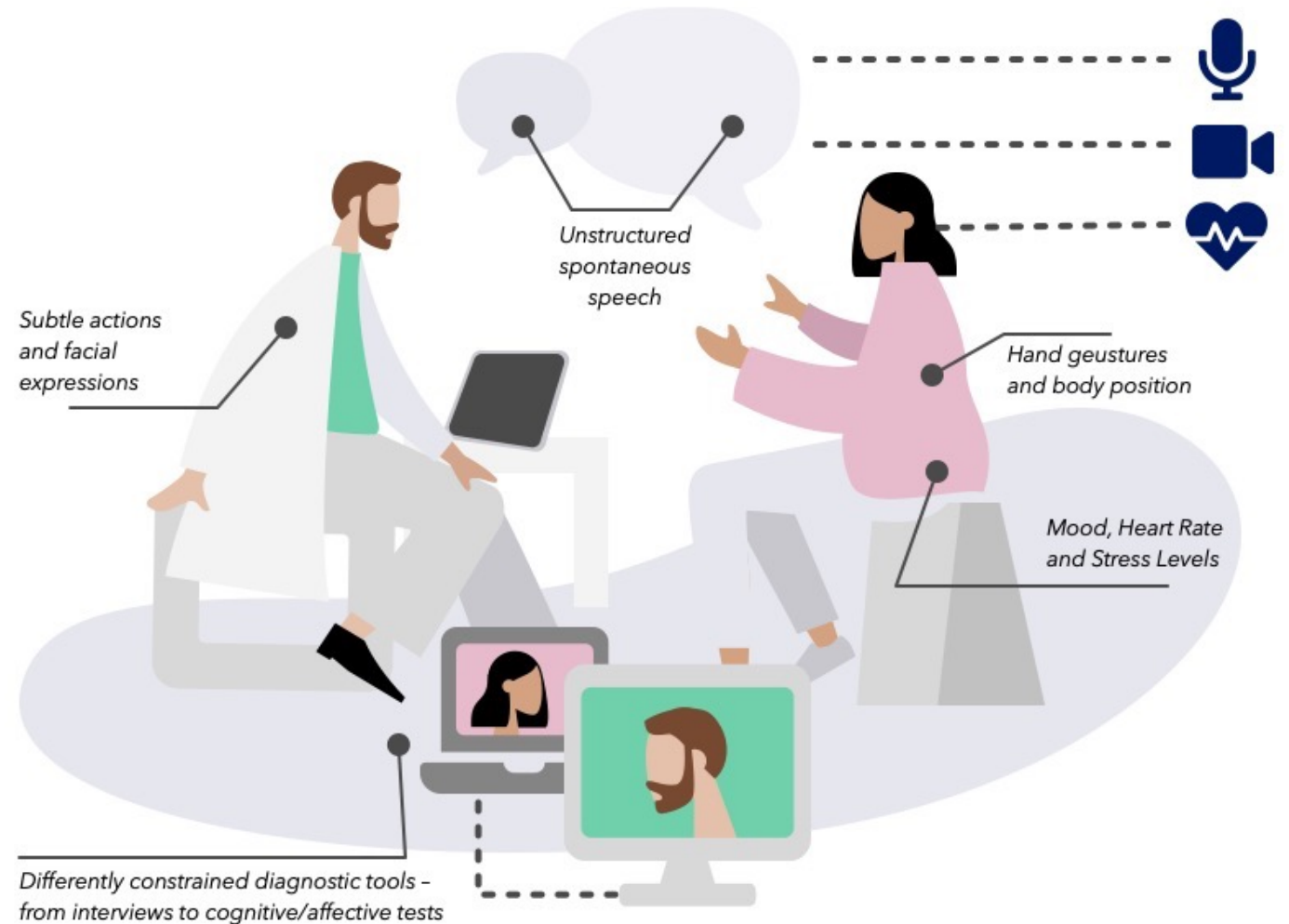
MEPHESTO

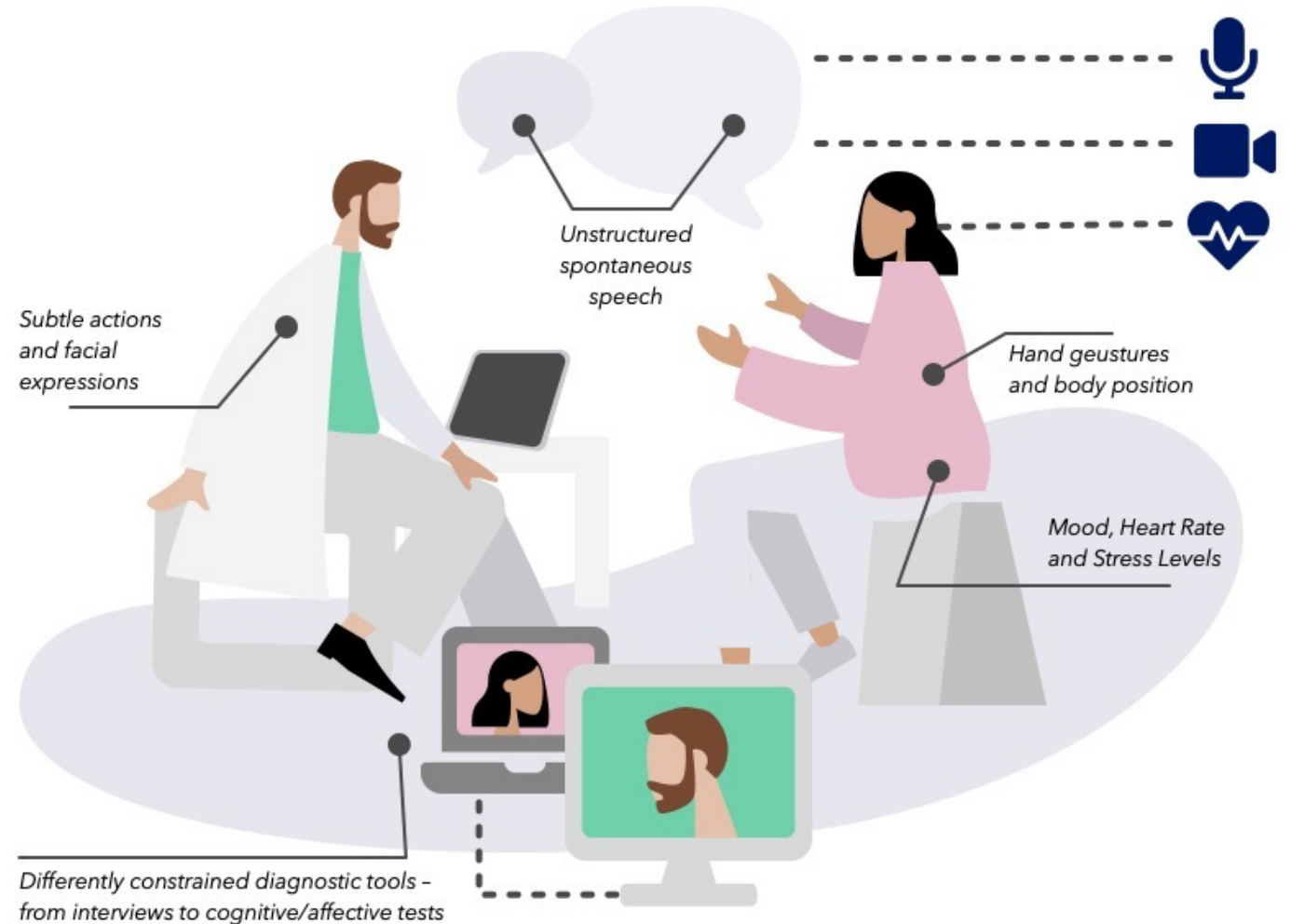*Digital Phenotyping 4 Psychiatric Disorders from Social Interaction*

MEPHESTO

Measuring clinical evidence where it really matters

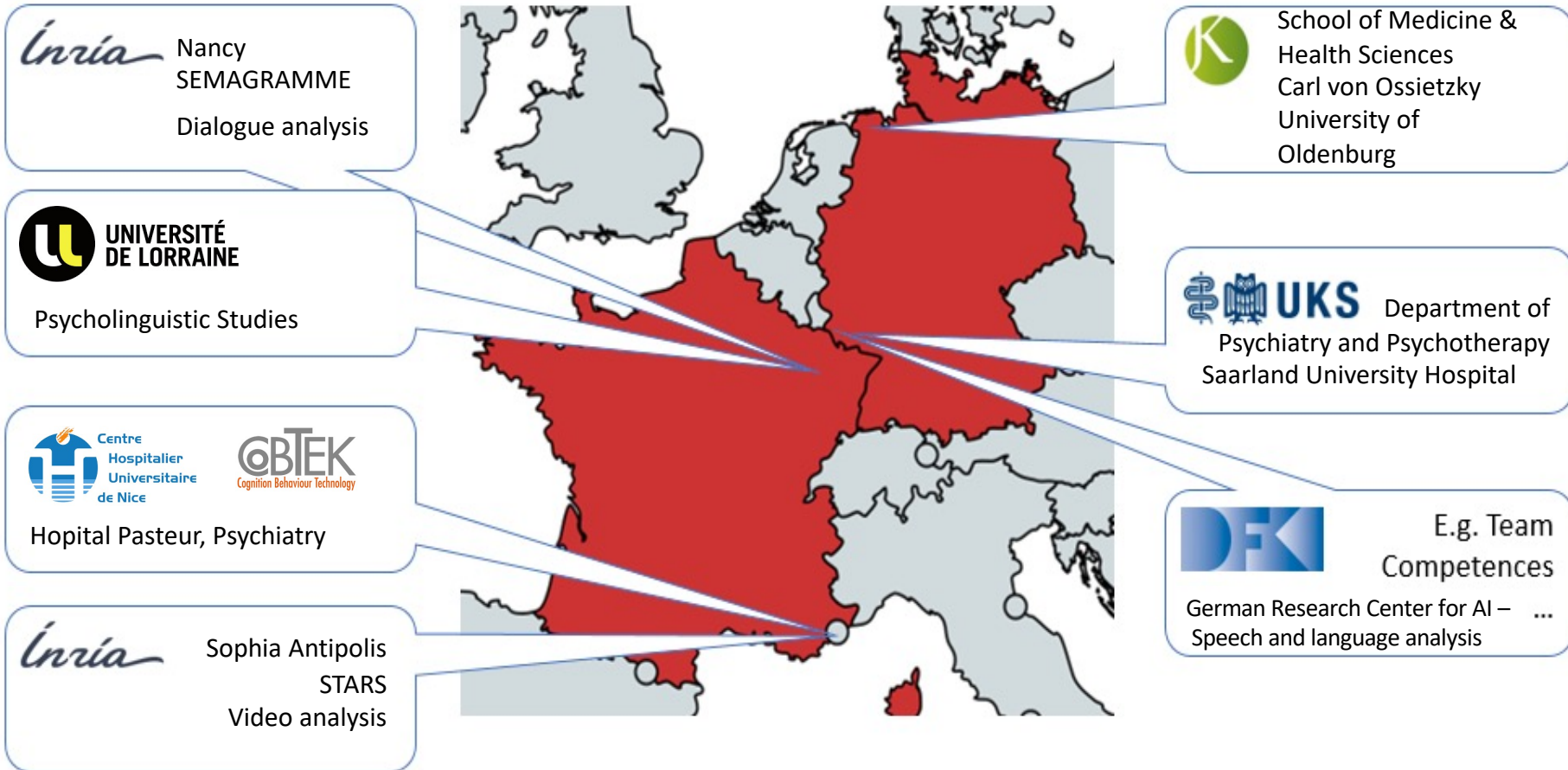*By modelling symptoms through multi-modal sensors*

Unstructured spontaneous speech

Subtle actions and facial expressions

Hand geustures and body position

Mood, Heart Rate and Stress Levels

Differently constrained diagnostic tools – from interviews to cognitive/affective tests

MEPHESTO

*Developing a framework for validation of **digital phenotypes** for psychiatric disorders from clinical social interactions.*

Unstructured spontaneous speech

Subtle actions and facial expressions

Hand geustures and body position

Mood, Heart Rate and Stress Levels

Differently constrained diagnostic tools – from interviews to cognitive/affective tests

Team

Nancy
SEMAGRAMME
Dialogue analysis

UNIVERSITÉ DE LORRAINE
Psycholinguistic Studies

Centre Hospitalier Universitaire de Nice
CoBTEK — Cognition Behaviour Technology
Hopital Pasteur, Psychiatry

Sophia Antipolis
STARS
Video analysis

School of Medicine & Health Sciences
Carl von Ossietzky University of Oldenburg

UKS Department of Psychiatry and Psychotherapy Saarland University Hospital

DFKI E.g. Team Competences
German Research Center for AI — ...
Speech and language analysis

MEPHESTO *operational objectives*

- Establish a multidisciplinary French-German team
- Design a multi-site data collection study
- Establish a set of beyond state-of-the-art multimodal digital biomarkers for psychiatric pathologies
- Demonstrate feasibility of the use of theses innovative markers und clinical scenarios
- Publishing and conferences
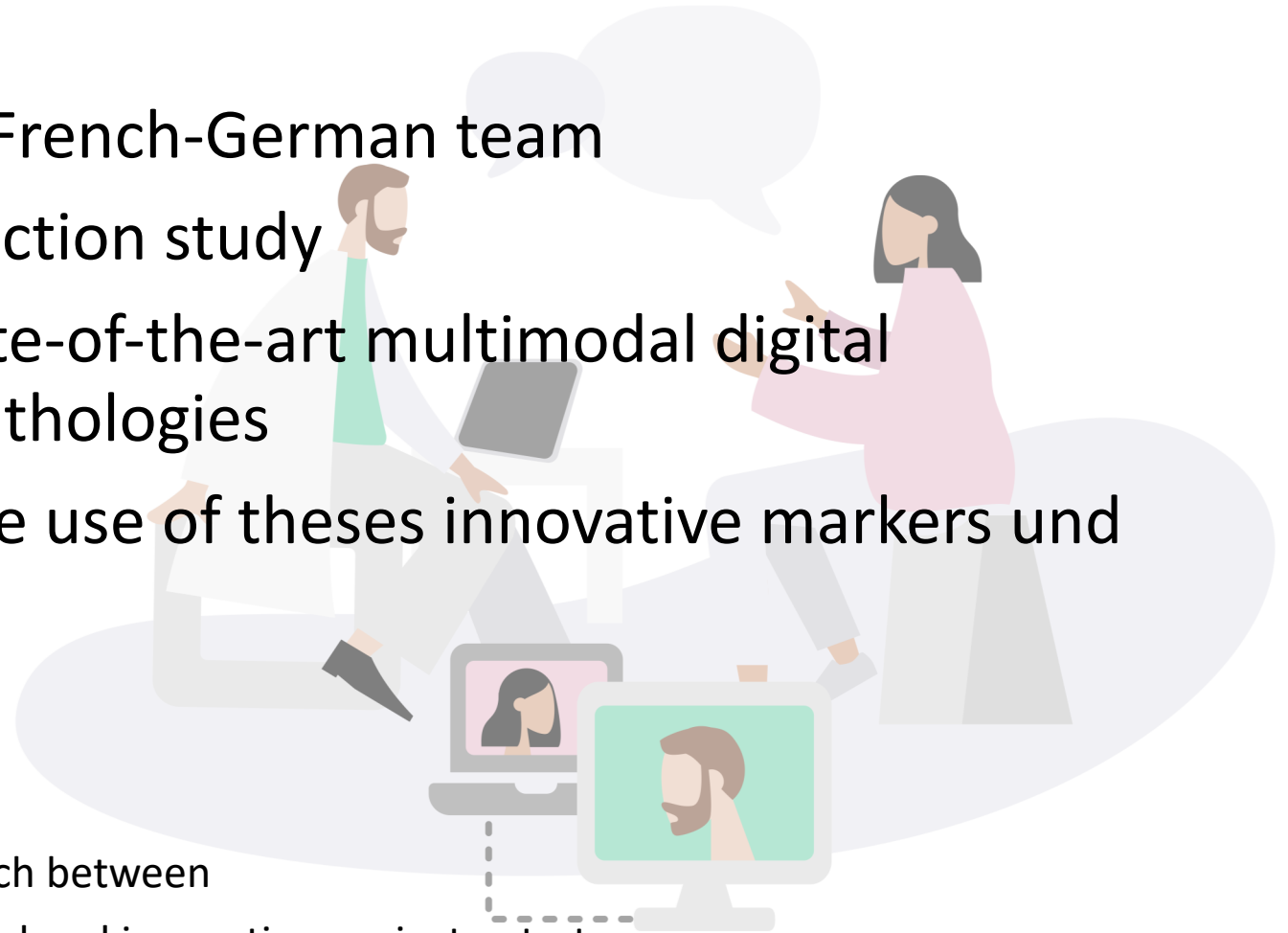
Short-term| Establishing multidisciplinary research between INRIA and DFKI

Long Term| generate applied and innovation projects, start-up creation & industrial projects

MEPHESTO *protocol*

T0 T1 T2 T3 T4 T5

Study start

Recruitment
- Screening for Schizophrenia, Bipolar disorder and Depression
- Scale for assessing symptom severity
- Cognitive tests

Recorded Semi-structured clinical interviews:
« What do you want to talk about? »
(family, work, relationship, hobbies)

- Working Alliance Inventory (3 items)

Discharge
- Symptom severity scales
- Working Alliance Inventory
- Patient satisfaction Questionnaire

MEPHESTO *protocol*

Follow-up Remote or F2F

T0   T1   T2   T3   T4   T5   T6   T7   T8

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- Working Alliance Inventory
- Patient satisfaction Questionnaire

at 3 Months:

Symptom severity scales

Interview (video-conference)

at 6 Months:

Symptom severity scales

Interview (video-conference)

at 9 Months:

Symptom severity scales

Interview (video-conference)
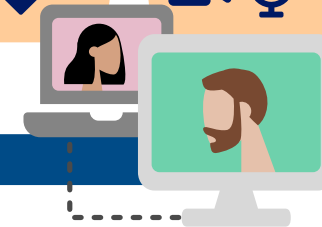
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Technical Set up at Pasteur Clinic Nice
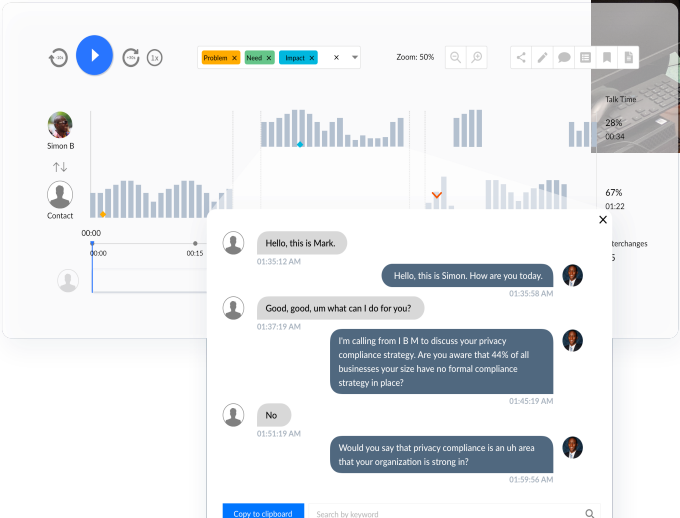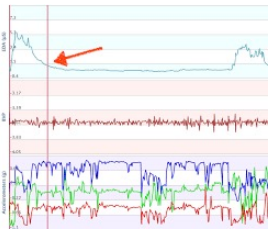
MEPHESTO Use Cases

MEPHESTO Use Cases
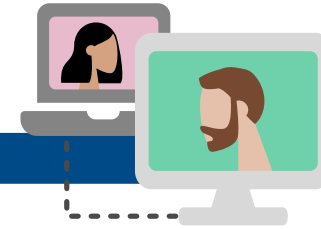
Study 1: Cross-sectional analysis:

Correlation of audio, video and physiological data with symptom severity on standard clinical scales (in all disorders)

Study 2 : Supporting Differential Diagnosis :

Predictive early markers for signs of trauma in Major Depressive Episode, Bipolar Disorder and Post Traumatic Stress Disorder
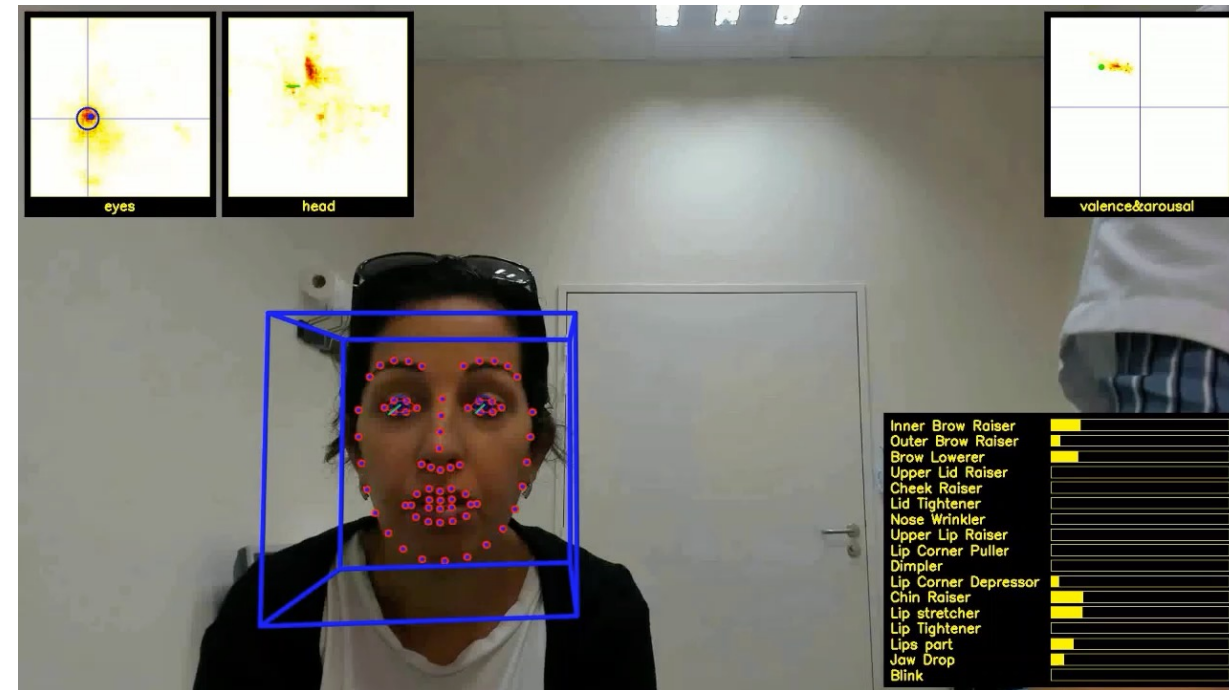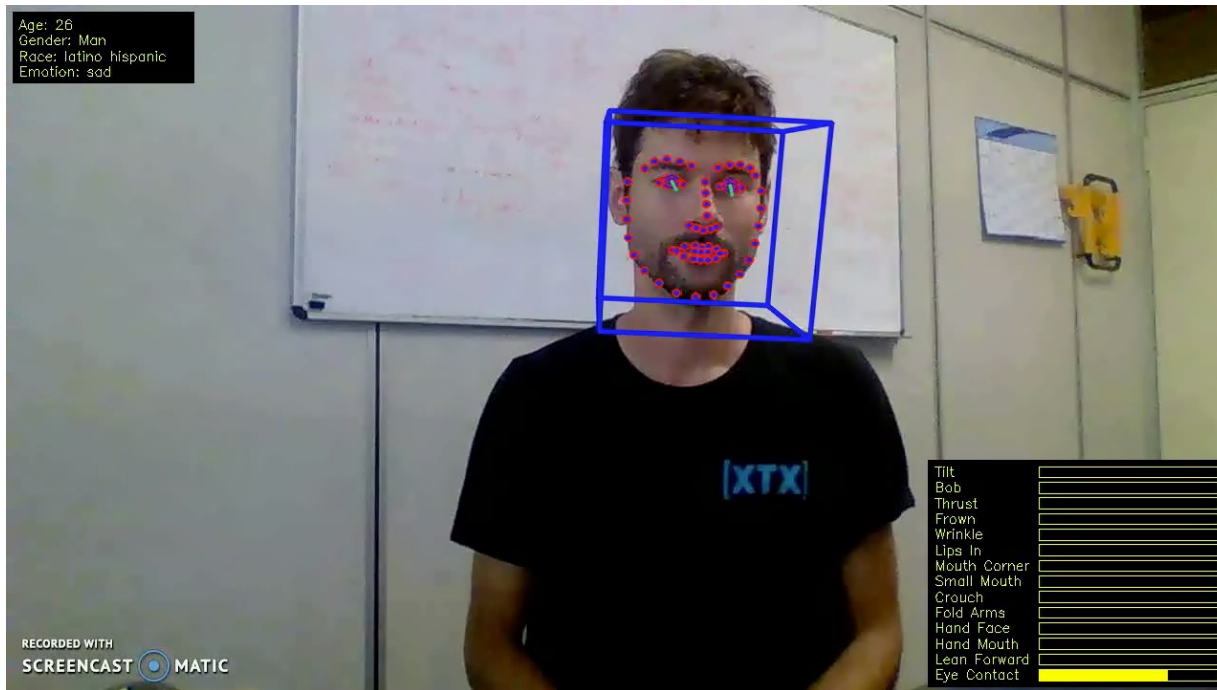
Study 3: Quantify Therapeutic Alliance:

Which multimodal measure are indicative for interaction quality levels between clinicians and partients?

Study 4: Relapse Prediction:

Prediction of symptoms progress & treatment response; definition of digital phenotypes (over time)

Interaction analysis

Remote Telemedicine setup