# Multimodal hyperscanning in the context of team performance

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## Abstract / Short description

Measures obtained from recordings from multiple individuals at the same time, often referred to as hyperscanning when this concerns EEG, have been associated with shared attention, communication and interpersonal bonds. In this workshop, we 1) want to explore the meaning of interpersonal metrics in different modalities, ranging from EEG and other physiological measures, to gestures and blinks, and 2) how we can make next steps in utilizing these metrics to understand, predict and support team performance in real life situations. We will do this by having expert scientists tell us about their research and potential users about the need of monitoring team performance. Subsequently we will brainstorm on worthwhile next steps to defeat existing challenges in this research.

## Keywords

Hyperscanning, physiological synchrony, teams, neurophysiology, behavior, real-life

## Prerequisites

There are no prerequisites for joining, though some experience in using or knowledge about hyperscanning is a pre for the discussion.

## Timing and tentative schedule

| Multimodal hyperscanning in the context of team performance – chair: Ivo Stuldreher | |
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| 8:00 am | Welcome and introduction |
| 8:05 am | Talks by experts and users (15-20 min each) |
| 10:00 am | Break |
| 10:15 am | Break-out sessions |
| 11:15 am | Reconvene and plenary discussion |
| 12:00 noon | Workshop ends |

## Speakers

- Hasan Ayaz (Drexel University, Philadelphia, USA): *Hemodynamic Signals of Brains and Bodies in Sync: Communication, Collaboration and Clinical Applications*
- Ivo Stuldreher (Netherlands Organisation for Applied Scientific Research TNO, Soesterberg): *Physiological synchrony in brain and body as a measure of attentional engagement*
- Ravi Kanth (University of Stuttgart, Germany): *Shared attention for mediated inter-personal experiences outside the laboratory*
- Suzanne Dikker (New York University, USA): *Pros and cons of using multimodal, multi-person biofeedback to support group cohesion*
- Michael Tolston (Airforce Research Lab, Dayton, USA): *A longitudinal analysis of team communication dynamics in a collaborative multi-UAV control task*
- Erik Frijters (Center for Man in Aviation of the Royal Netherlands Airforce, Soesterberg, the Netherlands): *From a potential user perspective: team performance in a military context*

## Bios of the organizers and speakers

### Organizers

Ivo Stuldreher is a scientist at the Human Performance department of the Netherlands Organisation for Applied Scientific Research (TNO). He recently obtained his PhD on the topic of physiological synchrony in brain and body as a measure of attention at the University of Twente in the Netherlands.

Anne-Marie Brouwer is a senior scientist at TNO and professor 'Mental state monitoring' at Donders Institute/Radboud University in Nijmegen, the Netherlands. She has been working on BCI and multimodal measures of attention, workload and emotion since 2007.

Maykel van Miltenburg is a Human Performance Specialist at the Netherlands Aerospace Center (NLR). In his research he aims to monitor operator load using multimodal physiological measurements, for instance including EEG and eye-tracking.

Micheal Tolston is core research area lead of Distributed Teaming and Communications CRA at the Air Force Research Laboratory (AFRL). In his research in the areas of human-human and human-machine teaming he applies advanced data analytic techniques.

Gregory Funke is the Dynamic Team Performance Assessment Line of Effort Lead in the Collaborative Technologies Branch, Air Force Research Laboratory (AFRL). His research is focused on assessing and optimizing team performance of human-human and human-machine teams.

All of the above recently started working on a research program 'Team Metrics' that aims to monitor attentional engagement and predict performance from an individual and team perspective in the context of teams operating Unmanned Arial Vehicles.

Mathias Vukelic is leading the research department Applied Neurocognitive Systems at Fraunhofer Institute for Industrial Engineering IAO in Stuttgart, Germany. His research interests are on neuroergonomics, brain-computer interfaces and neuronal mechanisms of cognition and emotion.

**Presenters**

Ravi Kanth Kosuru is a researcher in the department Applied Neurocognitive Systems with the Institute for Human Factors (IAT) at the University of Stuttgart (Cooperative partner of Fraunhofer IAO) in Germany. Since 2018 he has been working on projects involving neuroadaptive systems in various settings and is interested in understanding how to foster human-machine and inter-personal interactions in semi-controlled environments.

Lt. Kol. Erik Frijters is a senior flight surgeon at the Center for Man in Aviation of the Royal Netherlands Airforce. He is involved as air force stake holder in the Team Metrics research program.

Suzanne Dikker merges cognitive neuroscience, performance art and education. She is associated with the New York University and as broad experience with hyperscanning in out-of-lab settings.

Hasan Ayaz is an associate professor at Drexel University. His research is focused on unraveling the complexities of human brain functioning through mobile neuroimaging. He designs and develops next-generation brain sensing technologies and neuro/physiological data analytic approaches with applications ranging from aerospace to healthcare.