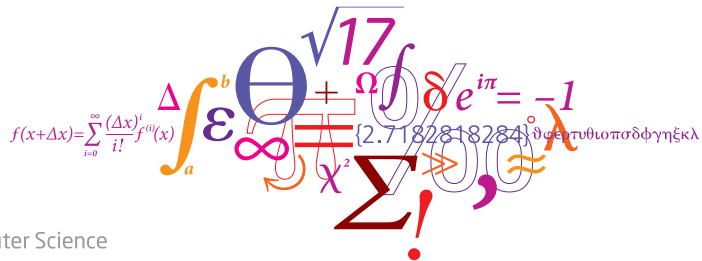
EmoPairCompete - Physiological Signals Dataset for Emotion and Frustration Assessment Under Team and Competitive Behaviours

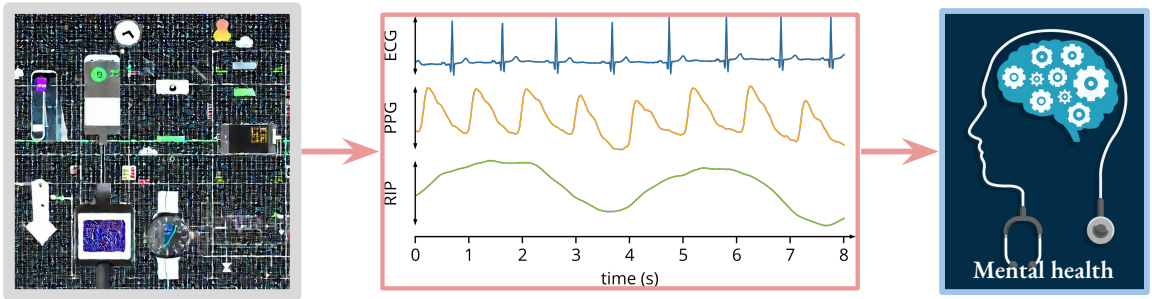
Sneha Das, Nicklas Leander Lund, Carlos Ramos González, Nicole Nadine Lønfeldt, Line Clemmensen

Department of Applied Mathematics and Computer Science, Technical University of Denmark (DTU)



DTU Compute
Department of Applied Mathematics and Computer Science

Physiological signals → (Mental) Health

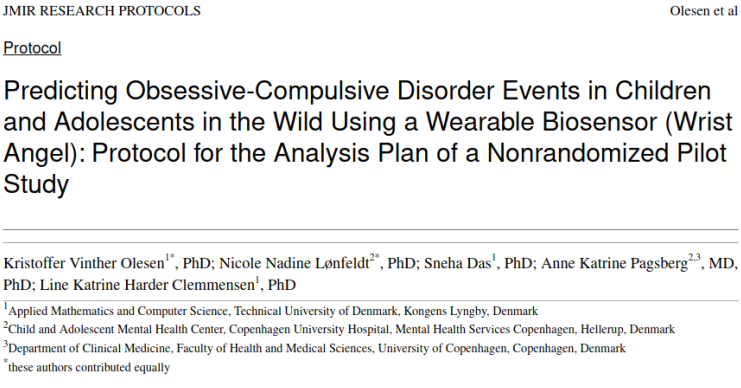


1. Mental health management is a long process: screening, diagnosis, intervention,
2. Objective biomarkers from physiological signals can *complement* experts.

Presenting EmoPairCompete

Why another dataset? → Open dataset for OCD

- Study of emotional dynamics during teamwork and competition is critical within mental-health care.
- Indicator - physiological manifestation of emotions and frustration during group-work.
- Gap to be filled - open datasets to enable the study emotional dynamics in social interactions.



JMIR RESEARCH PROTOCOLS Olesen et al

Protocol

Predicting Obsessive-Compulsive Disorder Events in Children and Adolescents in the Wild Using a Wearable Biosensor (Wrist Angel): Protocol for the Analysis Plan of a Nonrandomized Pilot Study

Kristoffer Vinther Olesen[1*], PhD; Nicole Nadine Lønfeldt[2*], PhD; Sneha Das[1], PhD; Anne Katrine Pagsberg[2,3], MD, PhD; Line Katrine Harder Clemmensen[1], PhD

[1]Applied Mathematics and Computer Science, Technical University of Denmark, Kongens Lyngby, Denmark
[2]Child and Adolescent Mental Health Center, Copenhagen University Hospital, Mental Health Services Copenhagen, Hellerup, Denmark
[3]Department of Clinical Medicine, Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark
[*]these authors contributed equally

Presenting EmoPairCompete

Why another dataset? → Open dataset for OCD

- Study of emotional dynamics during teamwork and competition is critical within mental-health care.
- Indicator - physiological manifestation of emotions and frustration during group-work.
- Gap to be filled - open datasets to enable the study emotional dynamics in social interactions.

What is EmoPairCompete

- Paired competition - reflecting interaction and synchrony.
- Comprises of physiological signals (Empatica E4) and self-rated PANAS questionnaire over phases.
- Multiple cohorts → individual and group-level dynamics.
- Semi-controlled setting → in-the-wild studies.

Collection process

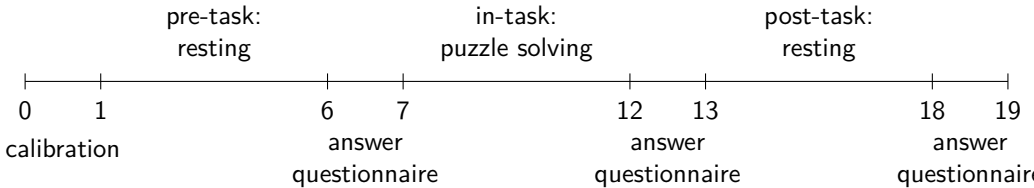
1. Ethical approval

- Collection and analysis plan submitted to the Institutional Review Board for approval.

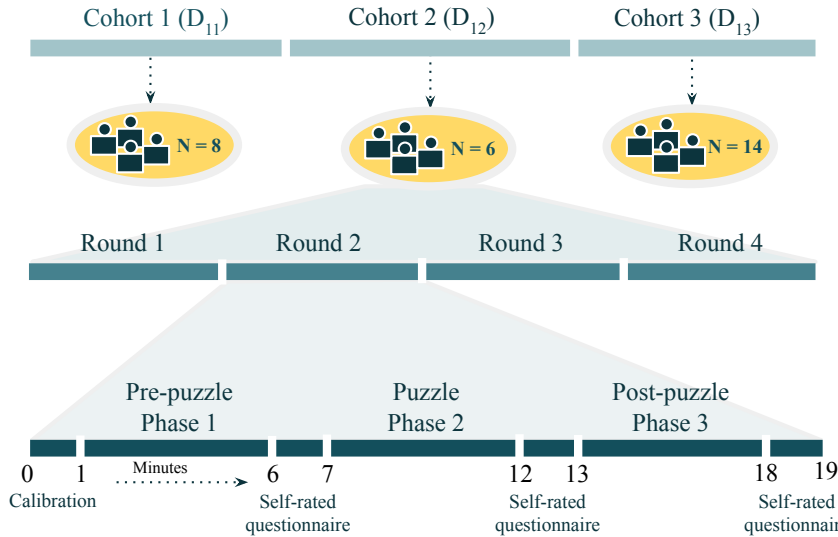
2. Participation

- Convenience sample.
- Students and employees from interdisciplinary university research group; Ages between 20 to 42
- Three collection cohorts (varying times of the year and time during the day).

3. Collection



Dataset organization



Dataset composition

Variables	Description
HR	Time-domain Heart-rate signal
BVP	Time-domain Blood Volume Pulse signal
EDA	Time-domain electro dermal activity
TEMPERATURE	Time-domain temperature signal
ACC	Time-domain accelerometer signal
Round	Puzzling round (1-4)
Phase	Phase of data collection in a round (1-3)
Individual	Index of the individual
Puzzler	Was the individual puzzling or instructing
PANAS responses	self-rated levels of frustrated, upset, hostile, alert, ashamed, inspired, nervous, determined, attentive, afraid, active, difficult
Cohort	Different population groups

Labels: International PANAS Short Form (I-PANAS-SF)

On a scale from 0-10, where 0 is not X at all and 10 is extremely X, how X are you feeling right now?
X = {Frustrated, Upset, Hostile, Alert, Ashamed, Inspired, Nervous, Determined, Attentive, Afraid, Active, Difficulty}

Biosignal summary

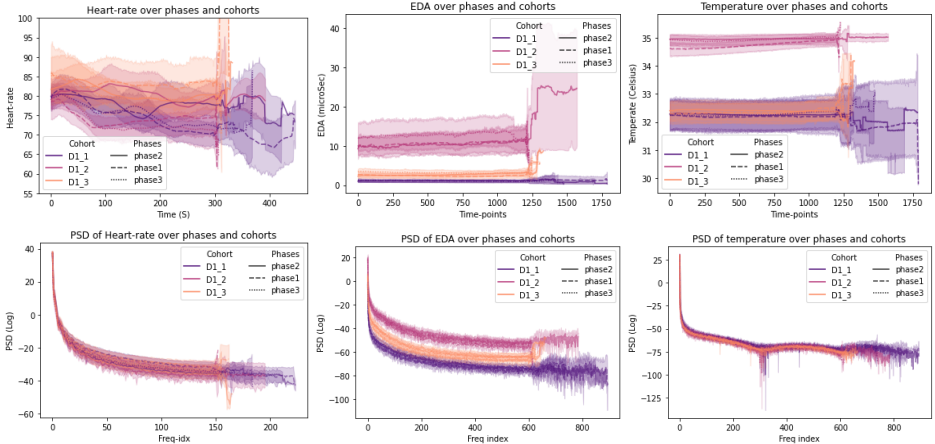


Figure: Mean and standard deviation of the time-domain and frequency domain power spectral density (PSD) signals (HR, EDA, Temperature).

Biosignal t-SNE visualization

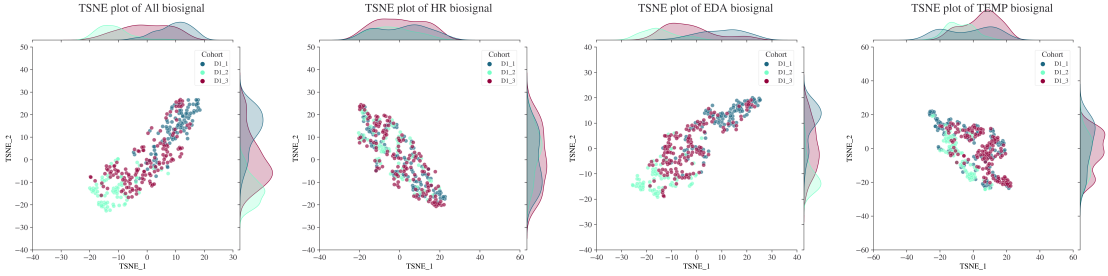
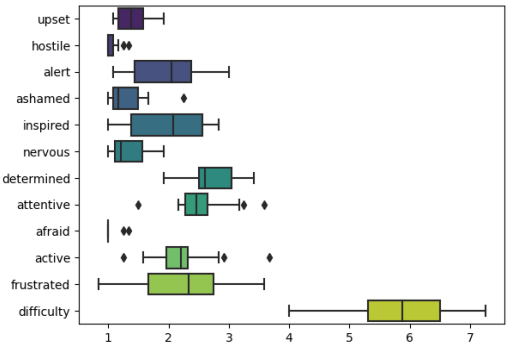
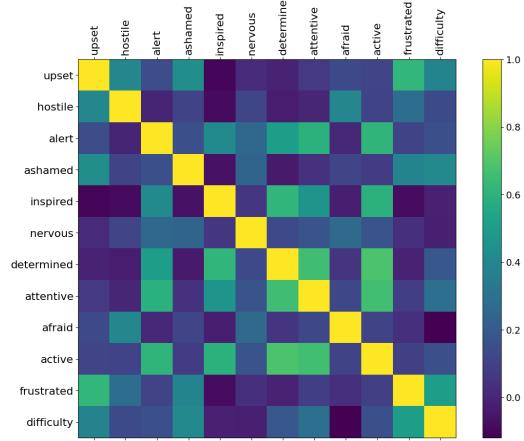


Figure: t-SNE visualisation of the features extracted from the signals (all, HR, EDA, TEMP) coloured based on cohorts.

Exploring self-rated responses



(a) Boxplots showing the distributions of PANAS variables responses.



(b) Correlation of PANAS variables responses.

Figure: Self-rated responses

Exploring subspace of PANAS responses

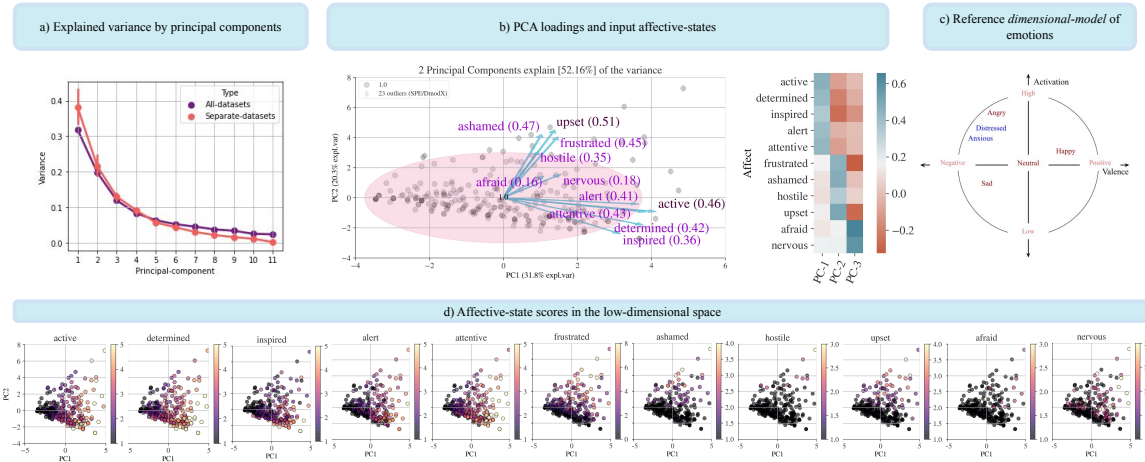


Figure: PANAS responses in lower-dimensional space and its correspondence to the dimensional-model of emotions.

Exploring difference response between task and rest phases

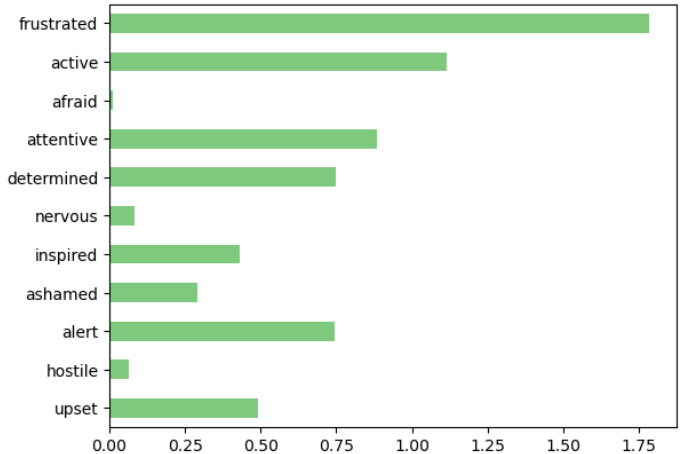


Figure: PANAS responses in lower-dimensional space and its correspondence to the dimensional-model of emotions.

Conclusions

- [+] EmoPairCompete: dataset for emotional dynamics in social interaction.
- [+] Physiological signals and self-rated responses to the PANAS questionnaire.
- [+] Factors of variation: cohorts, teams, team-roles.
- [+] Repeated individual measures (signals).
- [–] Noisy BVP signal due to motion artefacts.

(a) Github

(b) Dataset

Questions?