Universität Stuttgart
Institut für Arbeitswissenschaft und Technologiemanagement IAT

stuttgarter **maschinenbau**
interdisziplinär und vielfältig

Socio-Cognitive Neuroergonomics

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CENTRAL HYPOTHESIS

Cognitive, social and emotional demands interact through shared control processes.



01 INDIVIDUAL PROCESSING

Multisensory processing and executive control

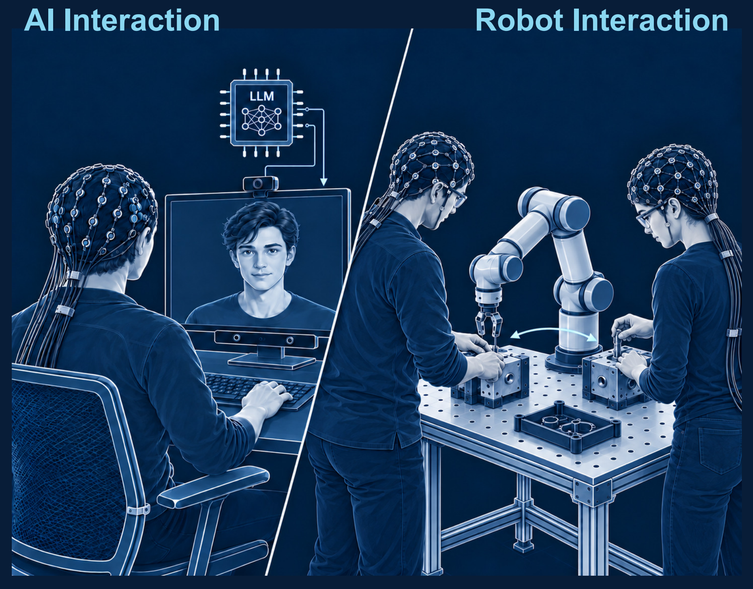
How are competing sensory inputs prioritised during multitasking and distraction?



02 INTERPERSONAL COORDINATION

Social cognition and interpersonal coordination

How do cognitive demands alter social inference and joint action?



03 HYBRID WORK SYSTEMS

Human–AI and human–robot collaboration

How do artificial partners change cognitive demands and human–human coordination?

CONVERGING METHODS

MEASUREMENTS

M/EEG · fNIRS · Eye tracking · Behaviour · Subjective ratings

ANALYSES

Mass-univariate analysis · Multivariate analysis · Explainable Machine Learning

Research Example - Topic 01 Individual Processing

Neural basis of interacting emotional and cognitive processes

How do we process emotional speech under varying visuospatial workload?[1]

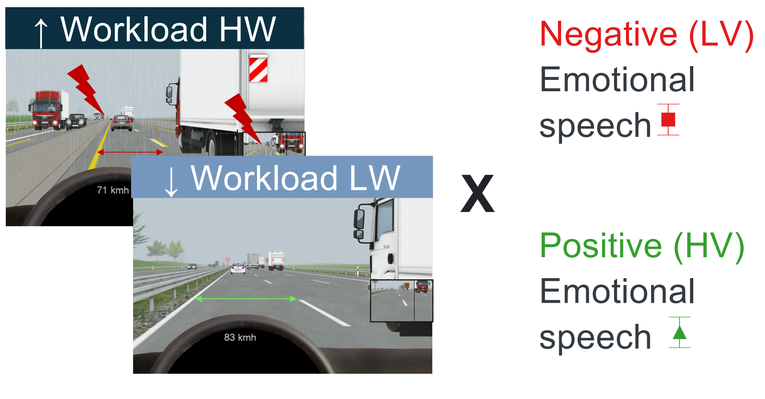
In cooperation with CARL VON OSSIETZKY UNIVERSITÄT OLDENBURG
ANCP APPLIED NEUROCOGNITIVE PSYCHOLOGY

MAIN HYPOTHESIS

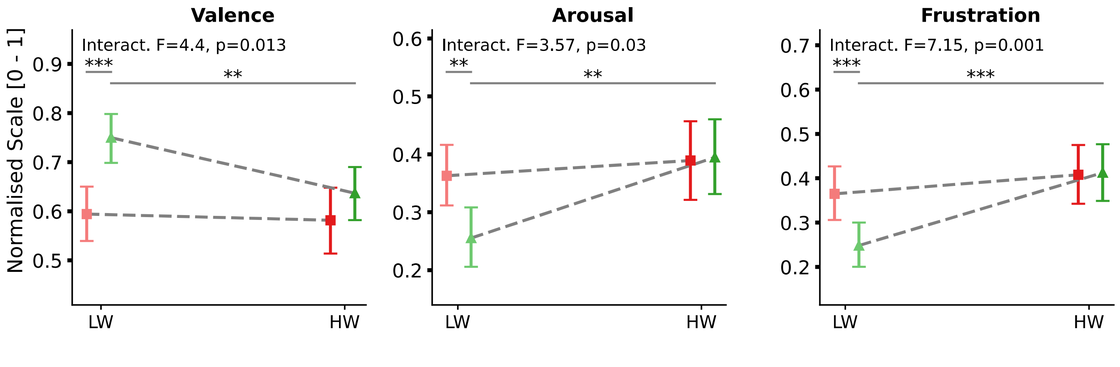
Fronto-temporal γ-band oscillations contribute to top-down control of emotional interference and are modulated by available cognitive resources.



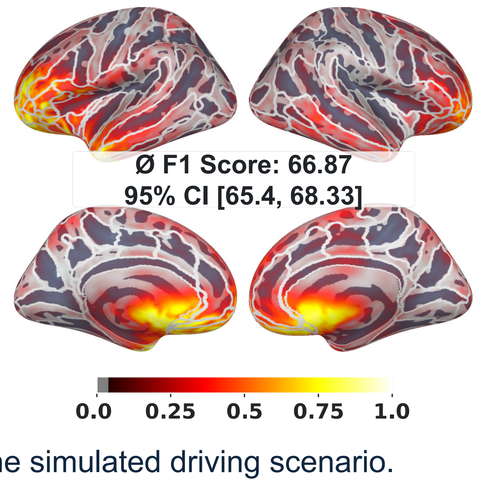
Simulated driving
MEG and eye tracking
N = 48
2 × 2 within-subject design

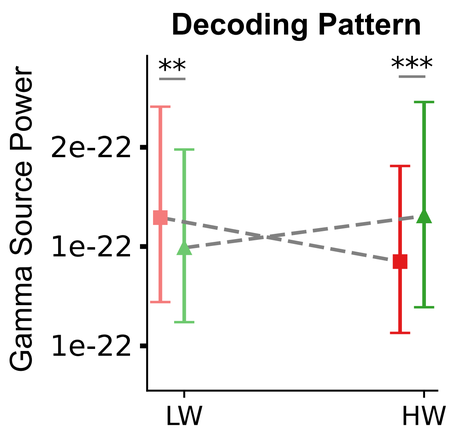


Subjective ratings



Multivariate decoding of γ oscillations





CONCLUSION

Valence and workload co-modulate the subjective experience of emotional speech and the simulated driving scenario.
Cross-over interactions suggest that positive speech is down-regulated only under high cognitive demand, whereas down-regulation of negative speech becomes less effective as cognitive workload increases.

APPLICATION

01 Neuroadaptive assistance for safety-critical systems and intelligent tutoring

02 Collaborative environments for learning, cooperation, creativity and concentration

03 Sustainable and effective human–AI/robot teamwork and virtual-agent training



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[1] Lingelbach, K., Herrmann, C. S., & Rieger, J. W. (2026). Oscillatory and gaze signatures of socio-emotional speech processing, visuo-spatial cognition, and their interaction in a near-realistic dual-task MEG study. Imaging Neuroscience, 4, 1–30. https://doi.org/10.1162/IMAG.a.1134

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