Collaborative Brain Wave Analysis Pipeline

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on behalf the development team

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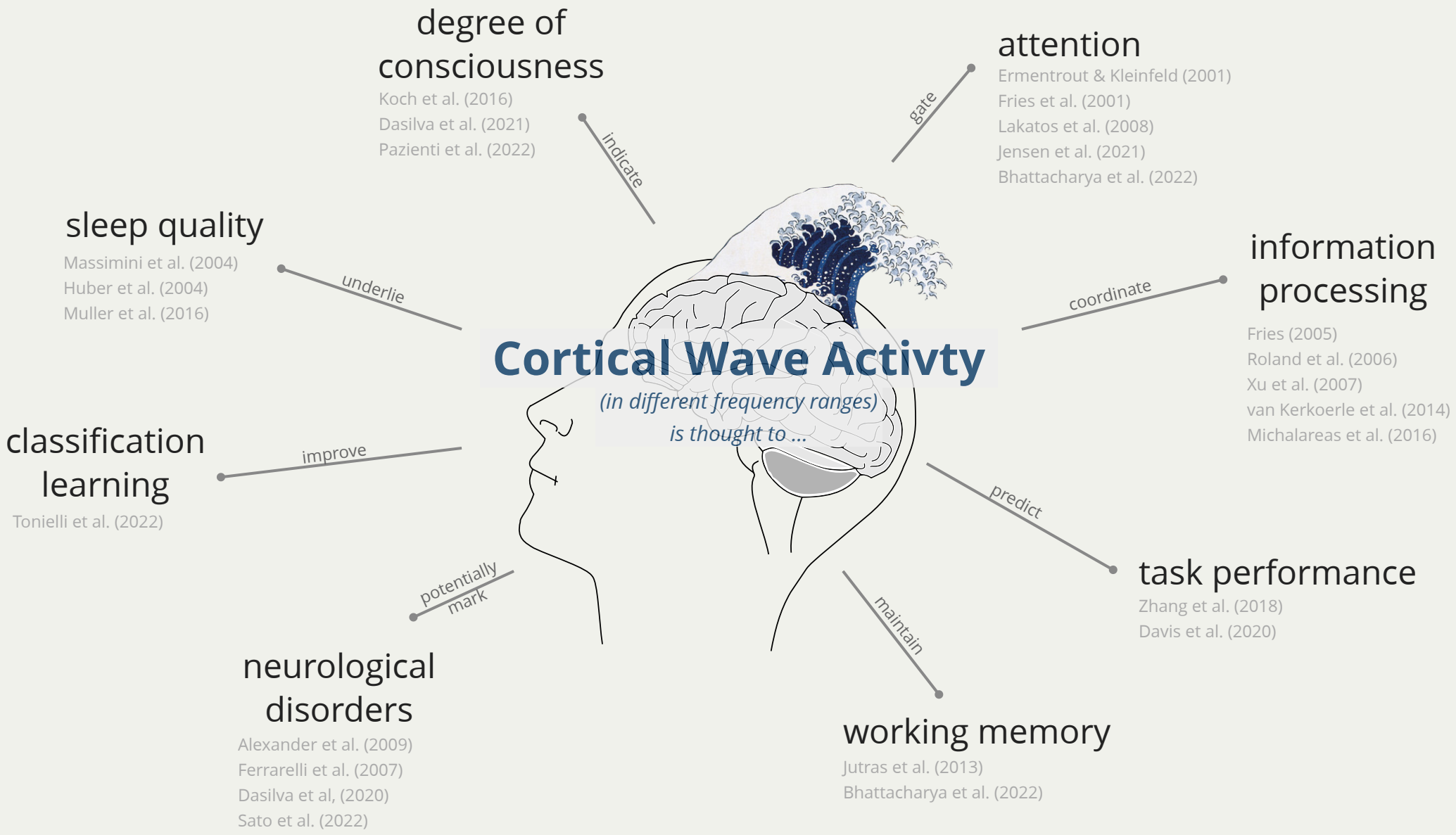
The Context


degree of consciousness
Koch et al. (2016)
Dasilva et al. (2021)
Pazienti et al. (2022)
indicate
attention
Ermentrout & Kleinfeld (2001)
Fries et al. (2001)
Lakatos et al. (2008)
Jensen et al. (2021)
Bhattacharya et al. (2022)
gate
sleep quality
Massimini et al. (2004)
Huber et al. (2004)
Muller et al. (2016)
underlie
Cortical Wave Activty
(in different frequency ranges)
is thought to ...
information processing
Fries (2005)
Roland et al. (2006)
Xu et al. (2007)
van Kerkoerle et al. (2014)
Michalareas et al. (2016)
coordinate
classification learning
Tonielli et al. (2022)
improve
predict
task performance
Zhang et al. (2018)
Davis et al. (2020)
potentially mark
maintain
neurological disorders
Alexander et al. (2009)
Ferrarelli et al. (2007)
Dasilva et al, (2020)
Sato et al. (2022)
working memory
Jutras et al. (2013)
Bhattacharya et al. (2022)

The Team




combining **expertise** in

- *data analysis*
- *software development*
- *neural recording techniques*
- *signal processing*
- *brain modeling and simulation*
- *data management*

emphasizing our **values** of

- *open science & open-source*
- *rigor & reproducibility*
- *reusability*
- *interoperability*

Creators and Developers

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The Tool

Problem:

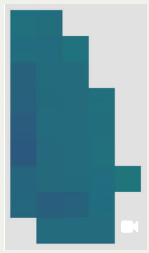
Results are not comparable across domains and data sources.

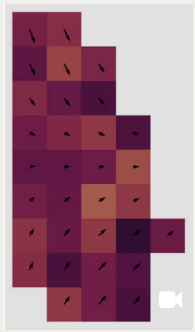
Approach:

Creating modular shared components operating on common standardized descriptions.

Goals:

Providing reusable analysis workflows for relating knowledge across neuroscience domains.





Implanted Arrays

ECoG

EEG

spatio-temporal activity data

...

MEG

Model Simulation

Calcium Imaging

common representation

common methods & algorithms

common analyses

common wave description

velocity

direction

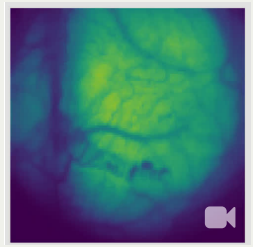
frequency

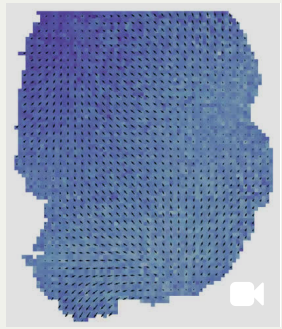
planarity

building on existing tools and standards

common brain wave characterizations

cross-domain comparisons





COBRA WAP

Gutzen et al. (in review) Cell Press Methods

https://cobrawap.readthedocs.io

The Services

Teaching/Training

- empower scientists building open reproducible analysis workflows
- facilitate exchange and collaboration by interfacing tools and data
- increase scope of available methods

Basic and Clinical Research

- enable complex analyses to classify medical brain states
- consult on workflow development
- analyze of wave dynamics as a service
- explore possibilities of diagnosis

Hardware/Software Manufacturing

- provide compatibility for data formats
- integrate into commercial products
- enable cost-efficient interoperability and reuse of data and methods
- support brain-computer interfaces and neurofeedback applications

Dual-Licensing/Consultancy

Development of the open-source tool base

- implement requested new features
- support academic research
- maintain interfaces within the open-source software ecosystem

The Services

Teaching/Training

Create a comfortable environment for students and academics

Basic and Clinical Research

Offer a user-friendly service for applying scientific methods

Hardware/Software Manufacturing

Provide a convenient set-up for vendors

Development of the open-source tool base

Supporting cutting-edge research