

Toolbox for Frequency-based Fingerprinting

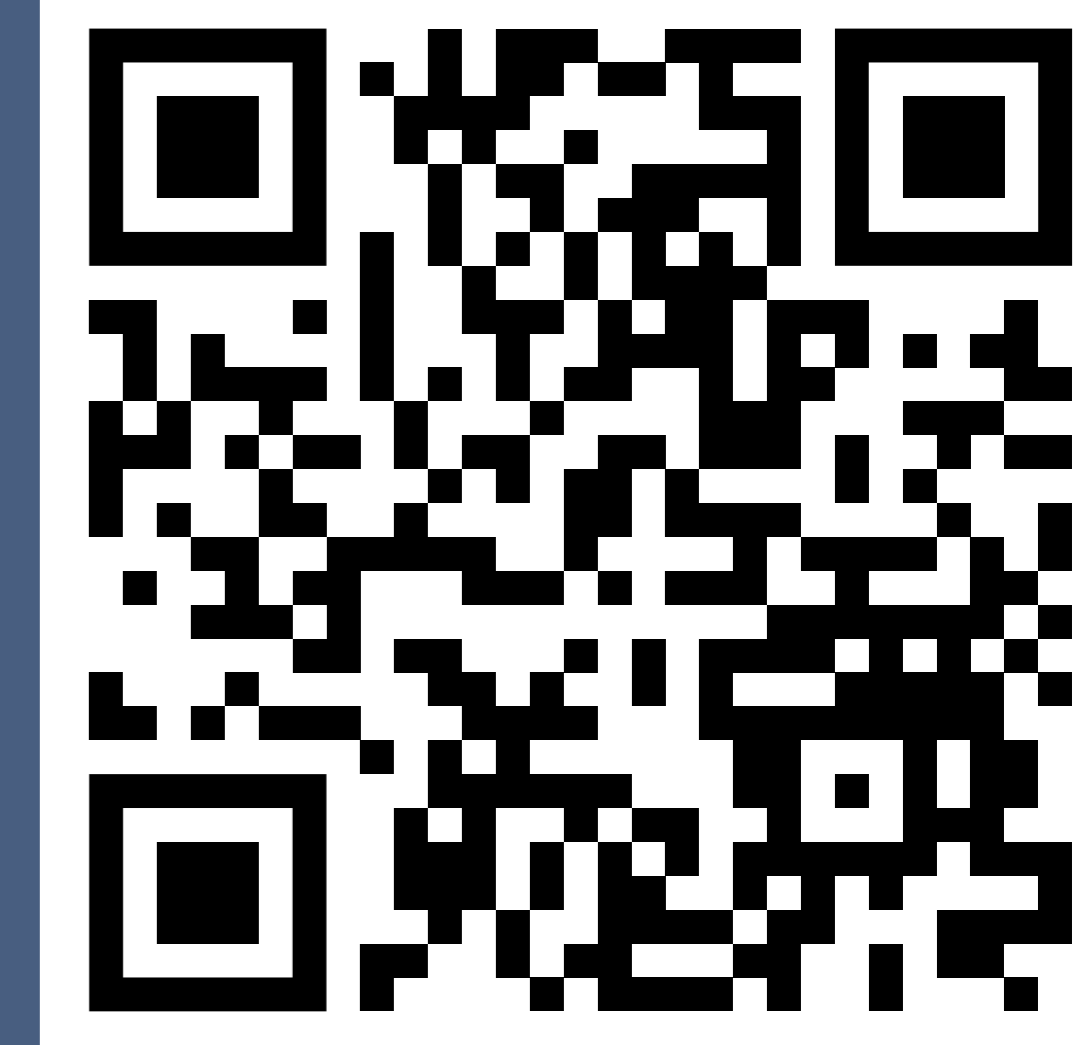
ToFFi Toolbox

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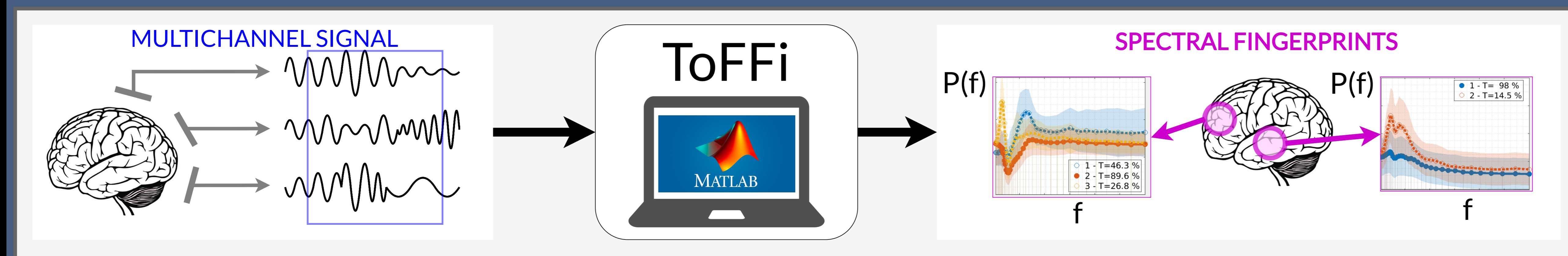
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Check preprint and code on GitHub!



Toolbox:
https://github.com/micholeodon/ToFFi_Toolbox/

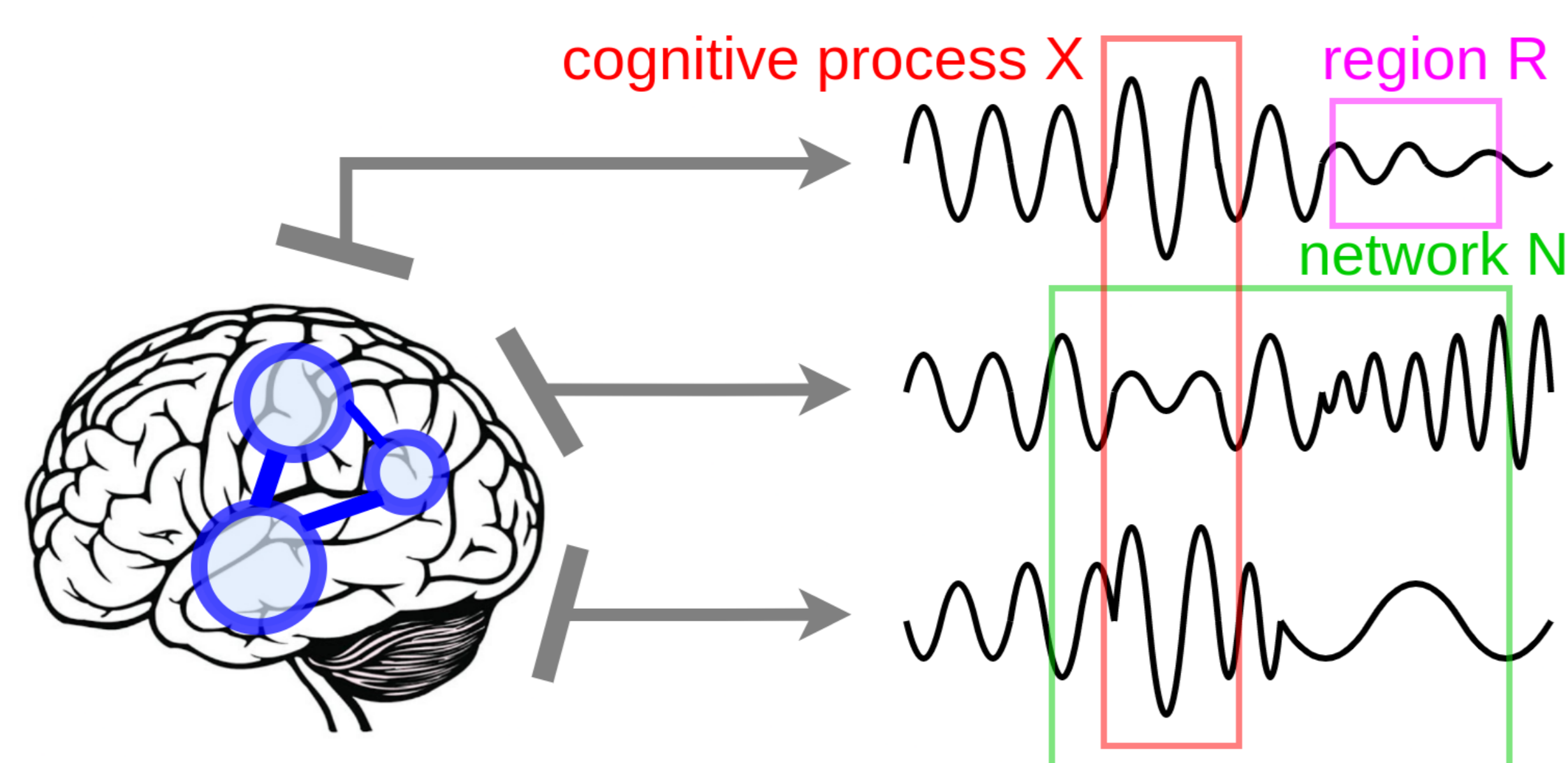
Manual:
https://github.com/micholeodon/ToFFi_Toolbox/blob/master/ToFFi_Toolbox-20211013/docs/ToFFi_Manual.pdf



CONTEXT: BRAIN FINGERPRINTING

Common understandings of the term "brain fingerprinting":

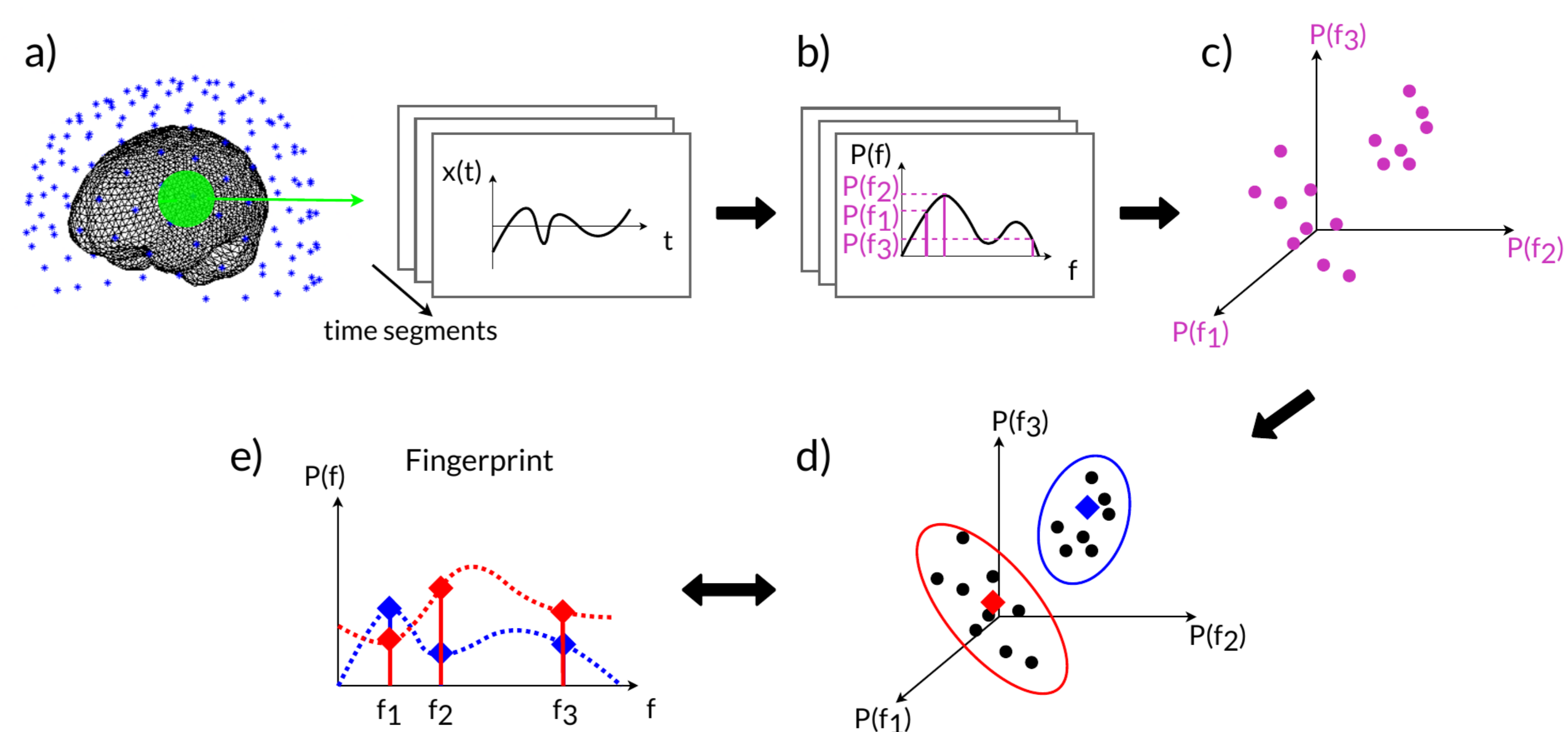
- detection of concealed information (Farwell, 2012)
- subject identification (Chauvin et al., 2021)
- brain activity features for studying regions/networks dynamics (Singer, 2013)



MAIN METHOD: SPECTRAL FINGERPRINTING

Input: MEG/EEG signal, lead field

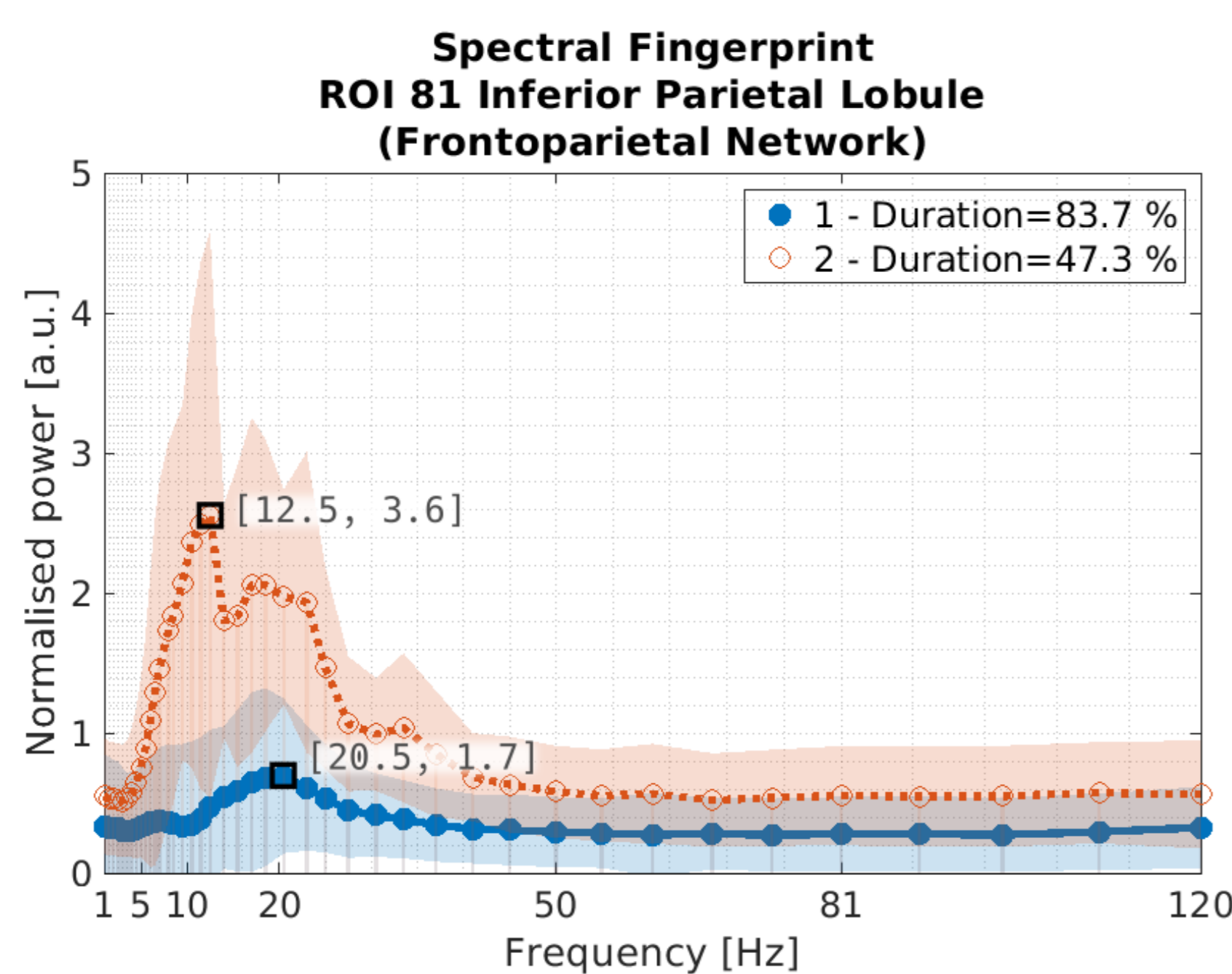
Output: Fingerprints representing individual-level / group-level activity in the frequency-domain



a) source activity reconstruction, b) transformation into the frequency domain, c) spectral power as point coordinates in space, d) clustering, e) centroids as spectral curves (a.k.a. modes)

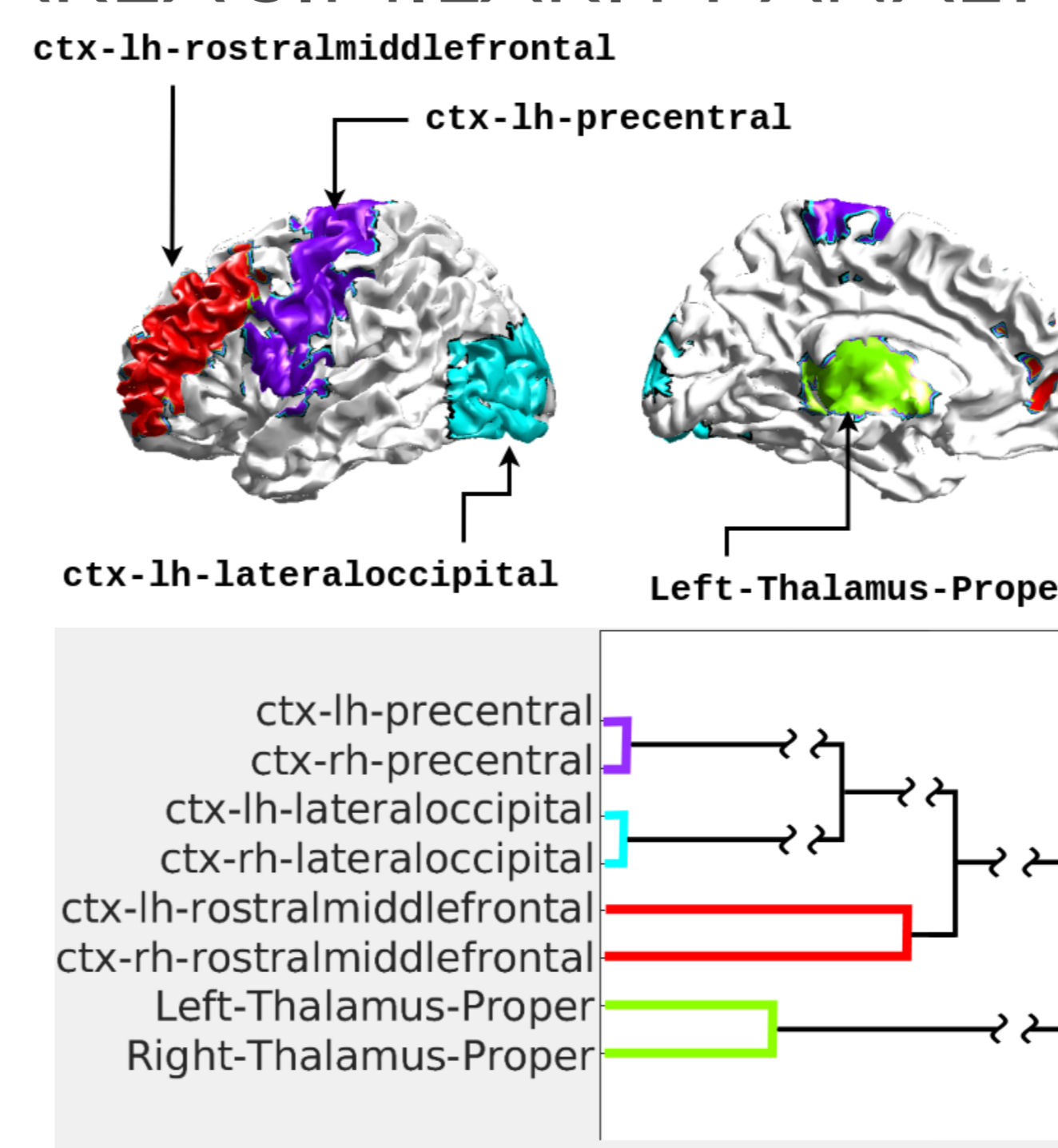
TOOLBOX CAPABILITIES

FINGERPRINT GENERATION

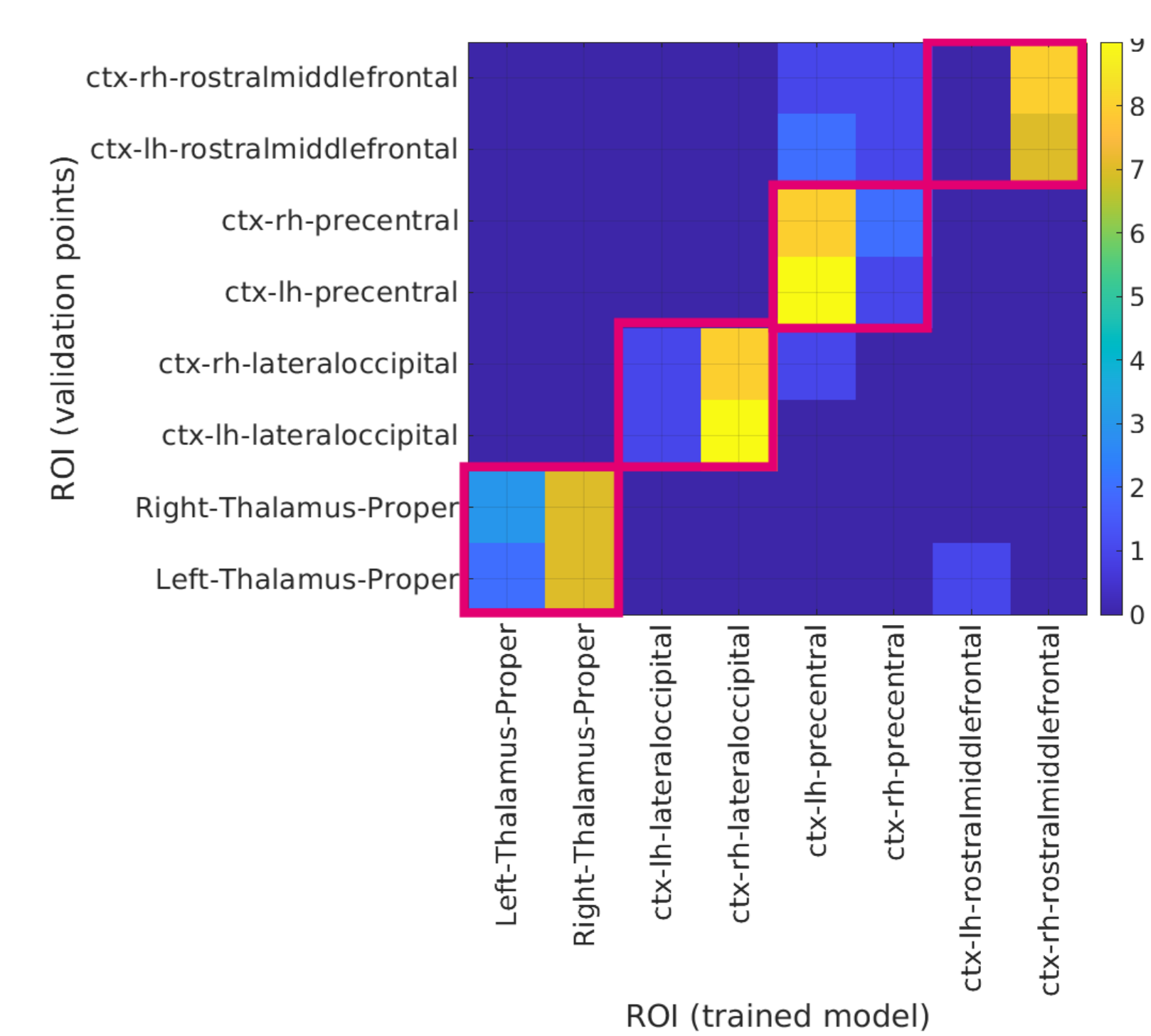


$$SF_{81} = \{(m_1, t_1 = 83.7\%), (m_2, t_2 = 47.3\%)\}$$

AREA SIMILARITY ANALYSIS

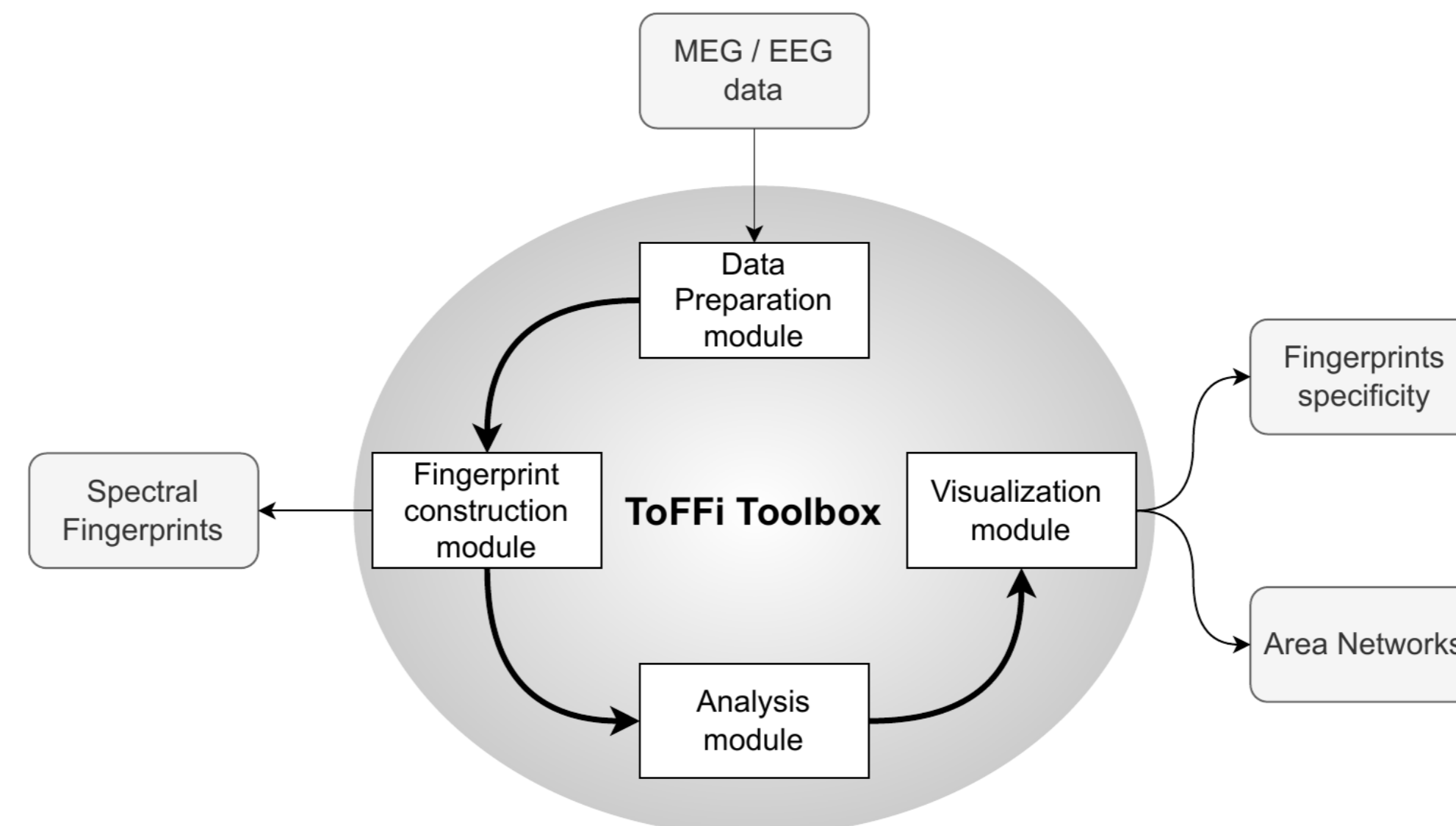


IDENTIFICATION ACCURACY SIMULATION



POTENTIAL APPLICATIONS

- normative bases of cognitive process fingerprints of healthy/diseased brains
- regions/networks identification underlying cognitive process (Keitel & Gross, 2016; Komorowski et al., 2018)
- subject identification via their individual fingerprints
- relationship between fingerprint features and psychological traits and behavioral measures (Lubinus et al., 2021)



- parallel computations supported
- build-in reproducibility control
- visualization modules included
- highly-configurable
- open-source
- languages: Matlab, Bash
- runs on: Linux, Windows, macOS

REFERENCES

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