

BR41N.10

THE BRAIN-COMPUTER INTERFACE
DESIGNERS HACKATHON



Doc-Hoc: **BR41N.IO** a BCI Adaptive Language Learning Assistant

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Group 14
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ML
JC

Learning a language

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Career

Education

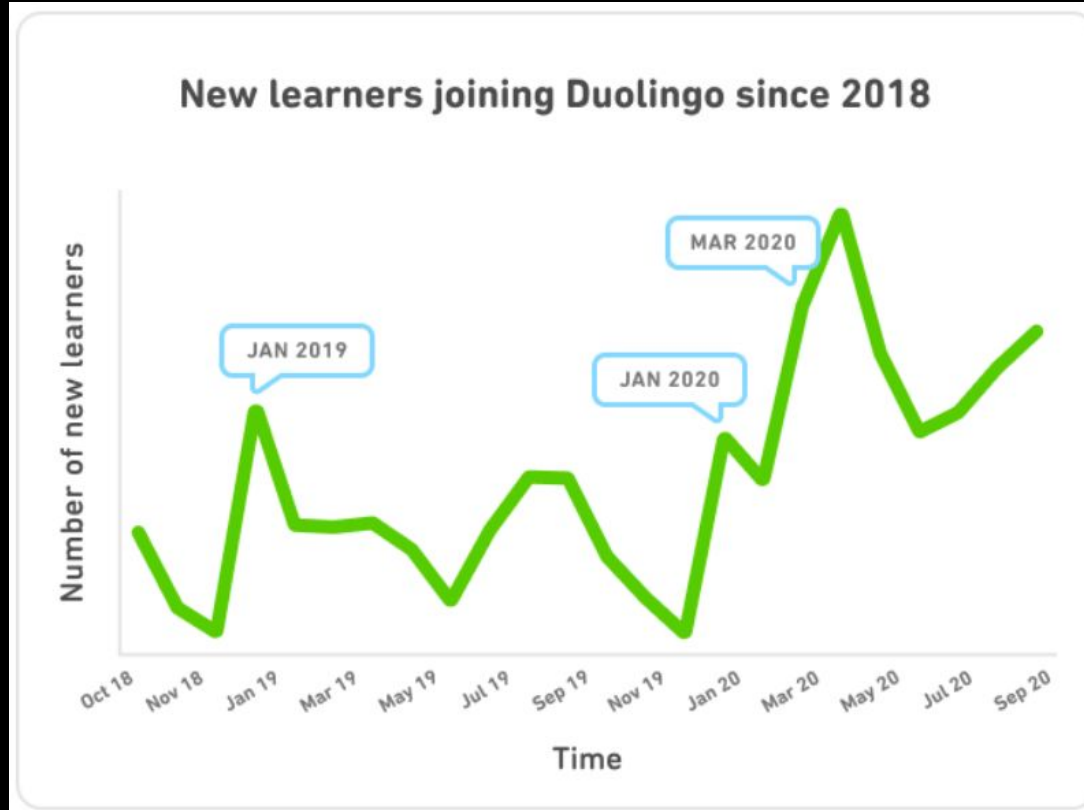
Personal development



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Learning a language

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30 million new users in 2020, a 67% increase from the previous year

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Current methods

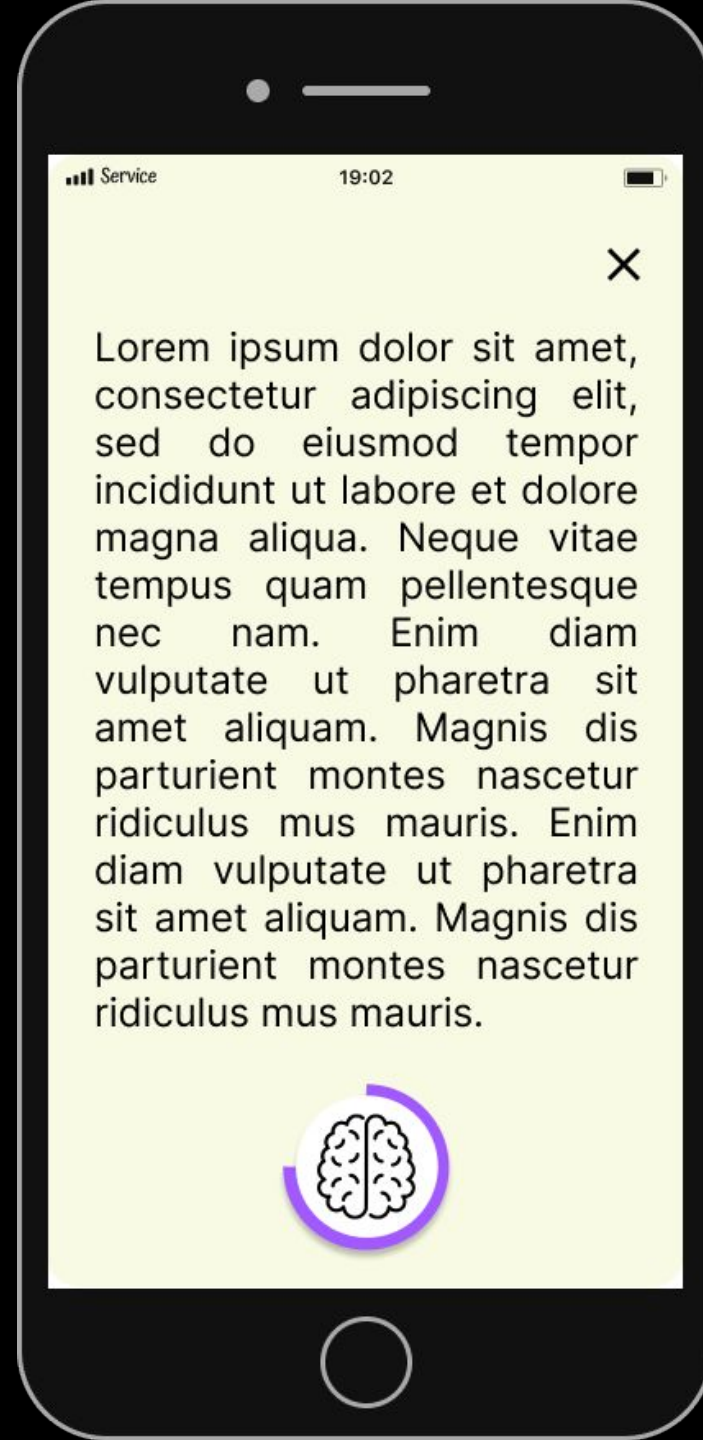
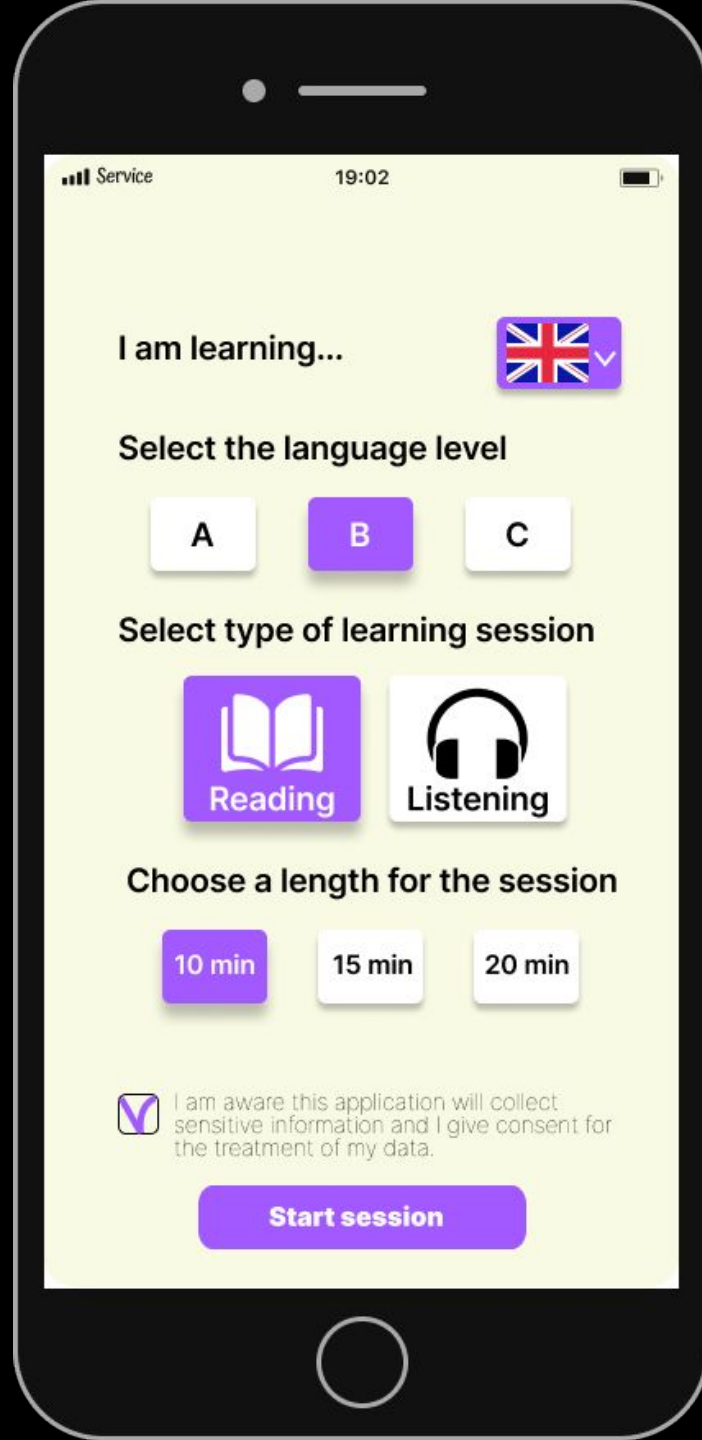
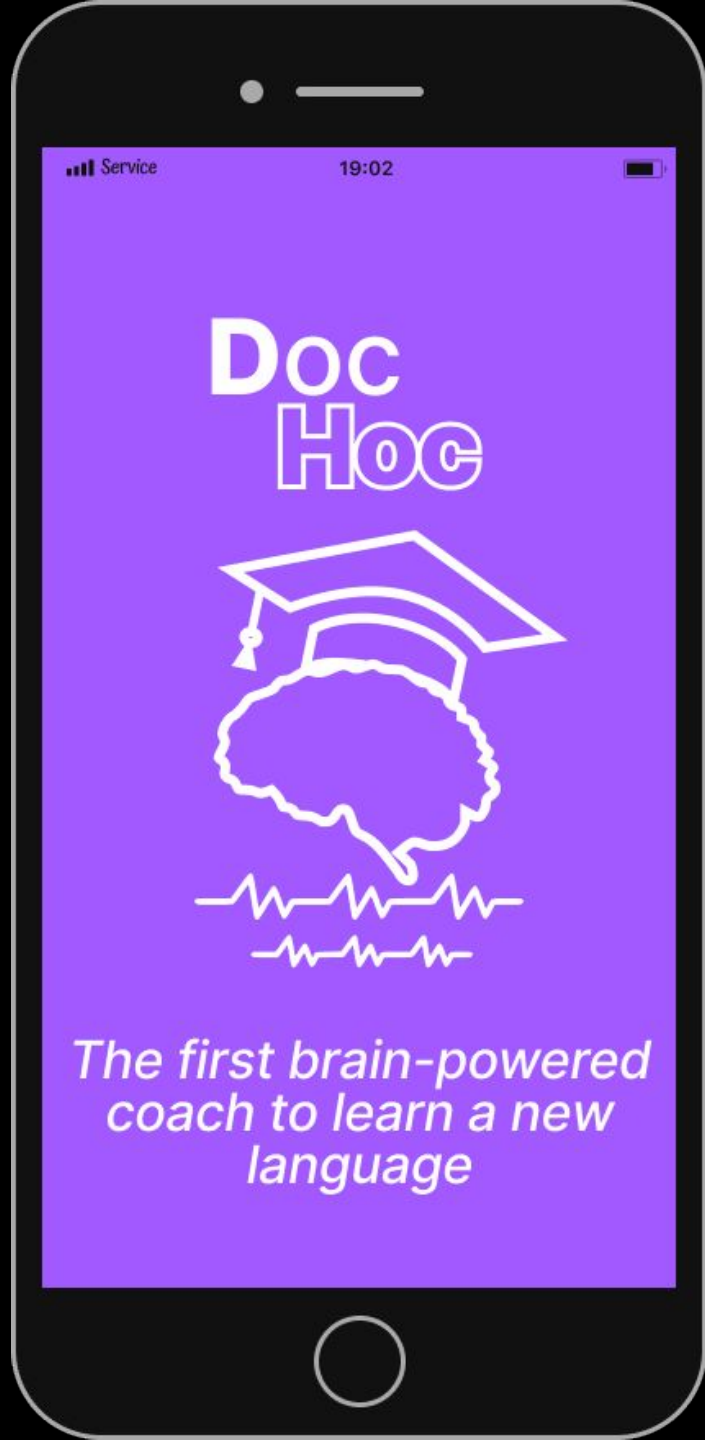
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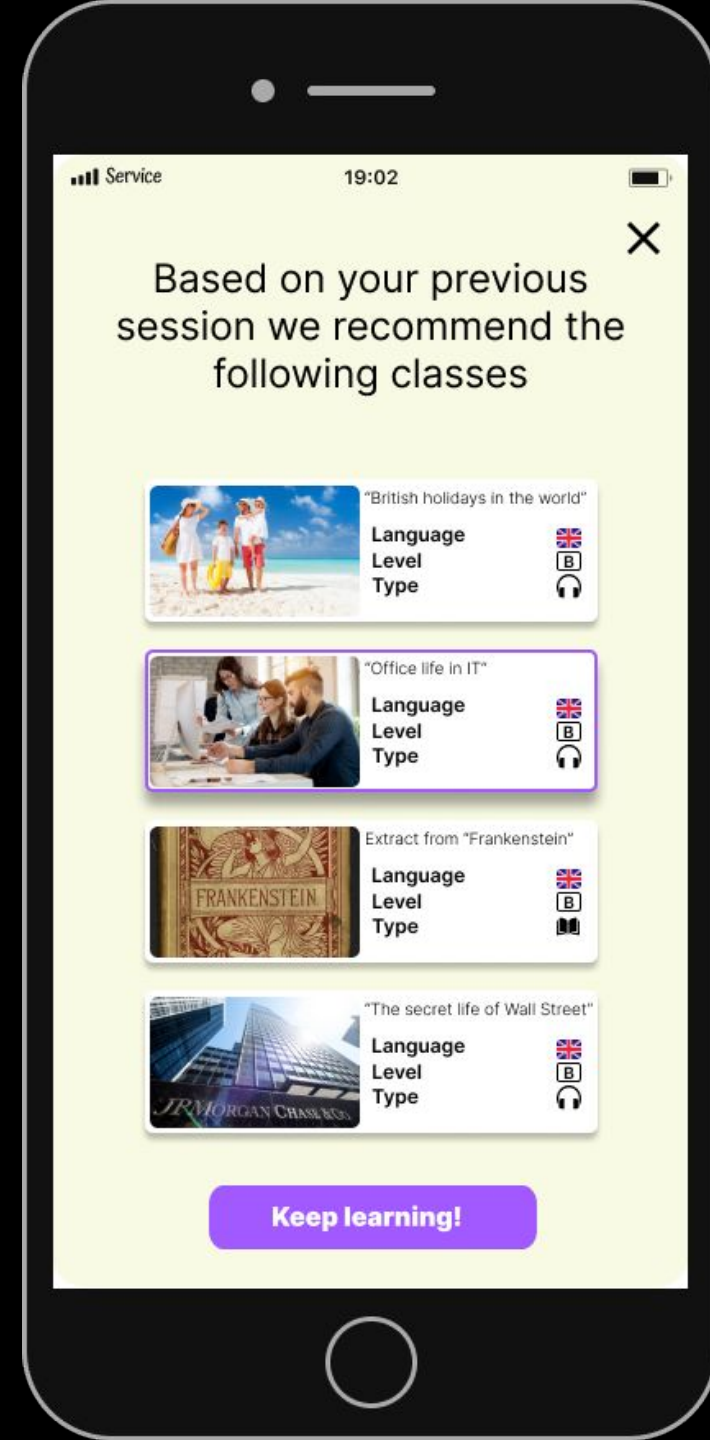
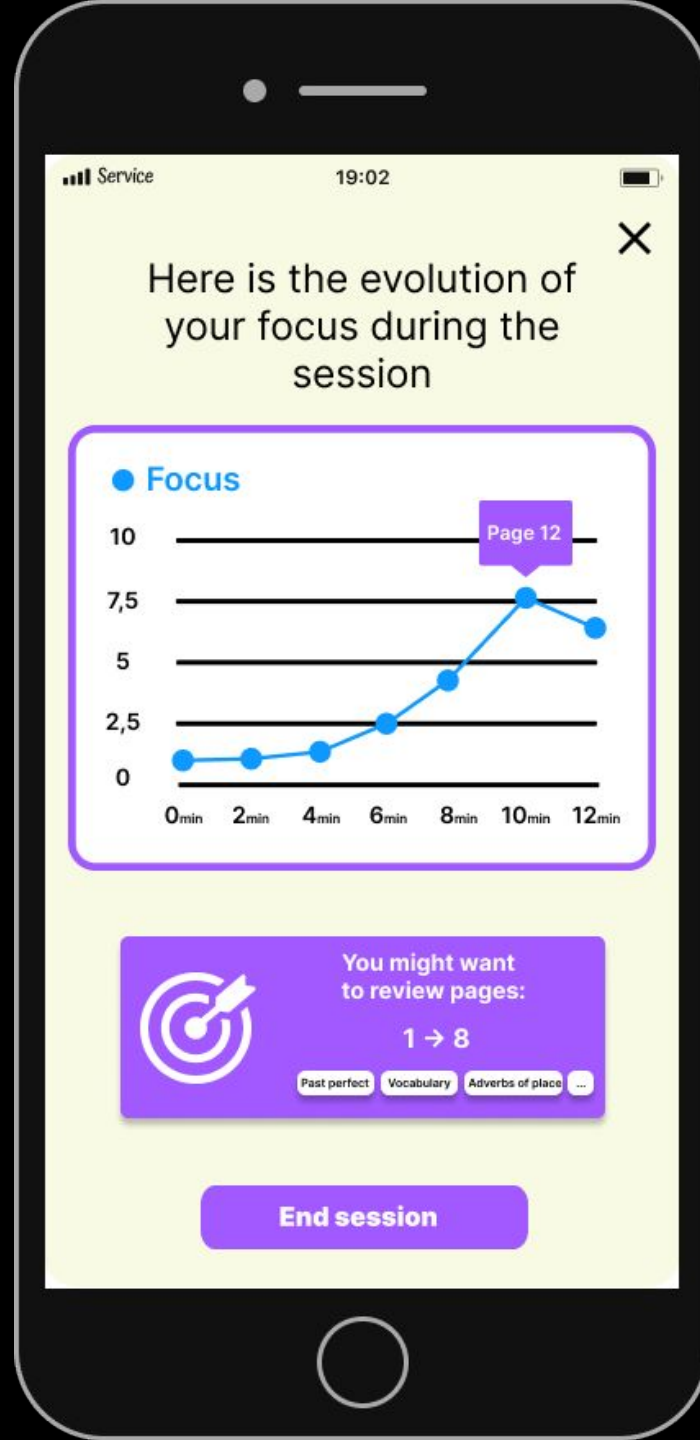
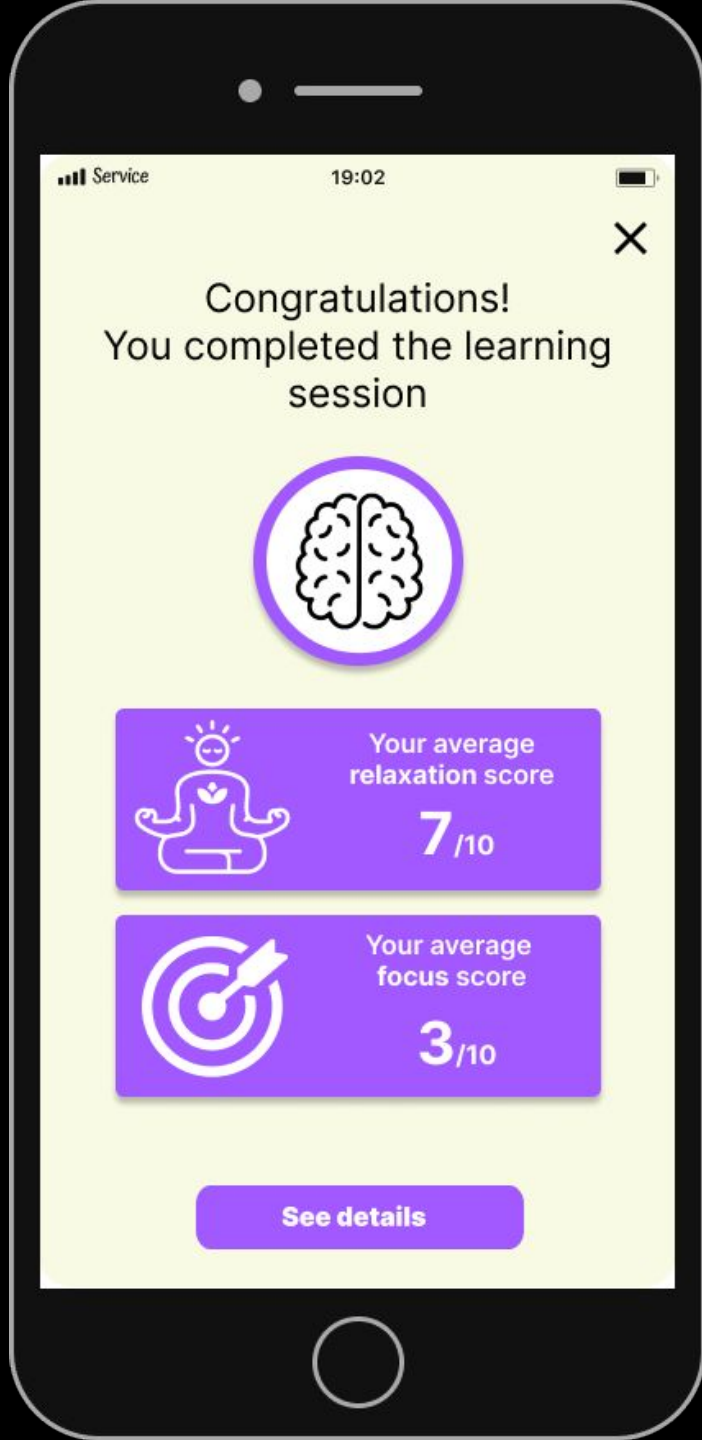
Not adaptable

**Not focused on the mental
state of the person**

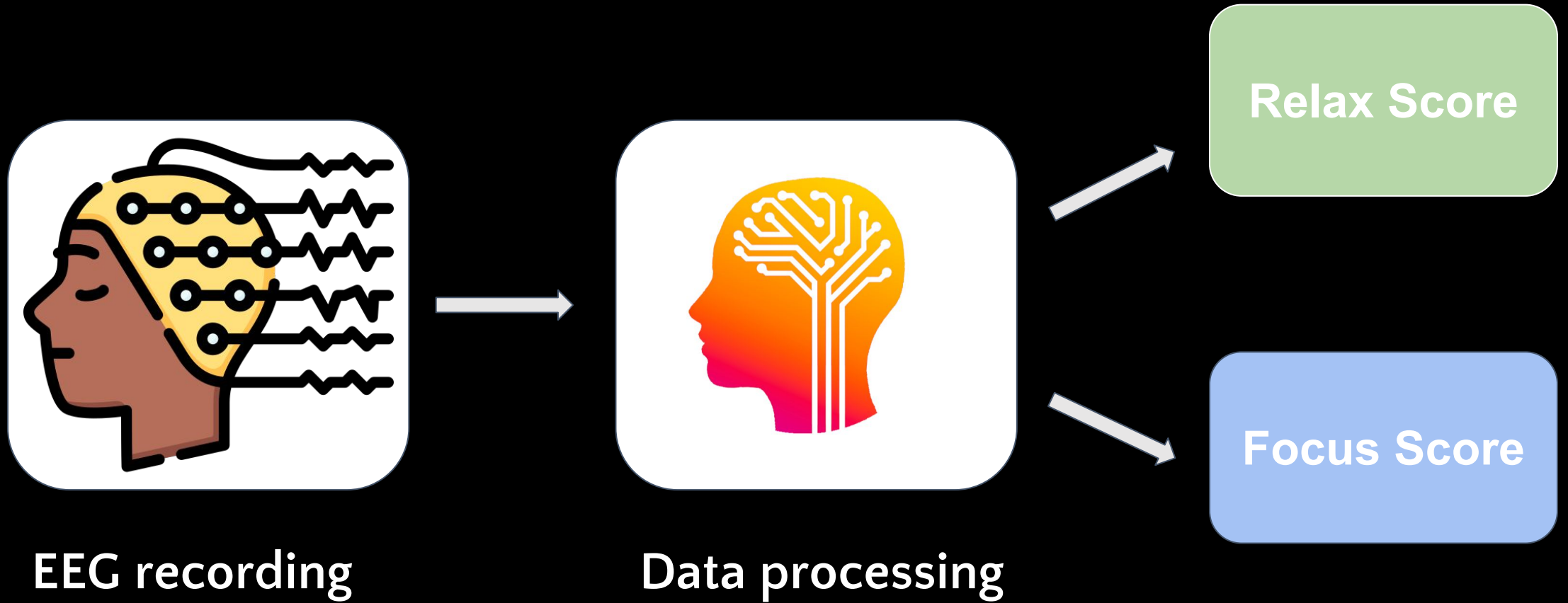
Not cognitive feedback

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Real Time Processing Pipeline



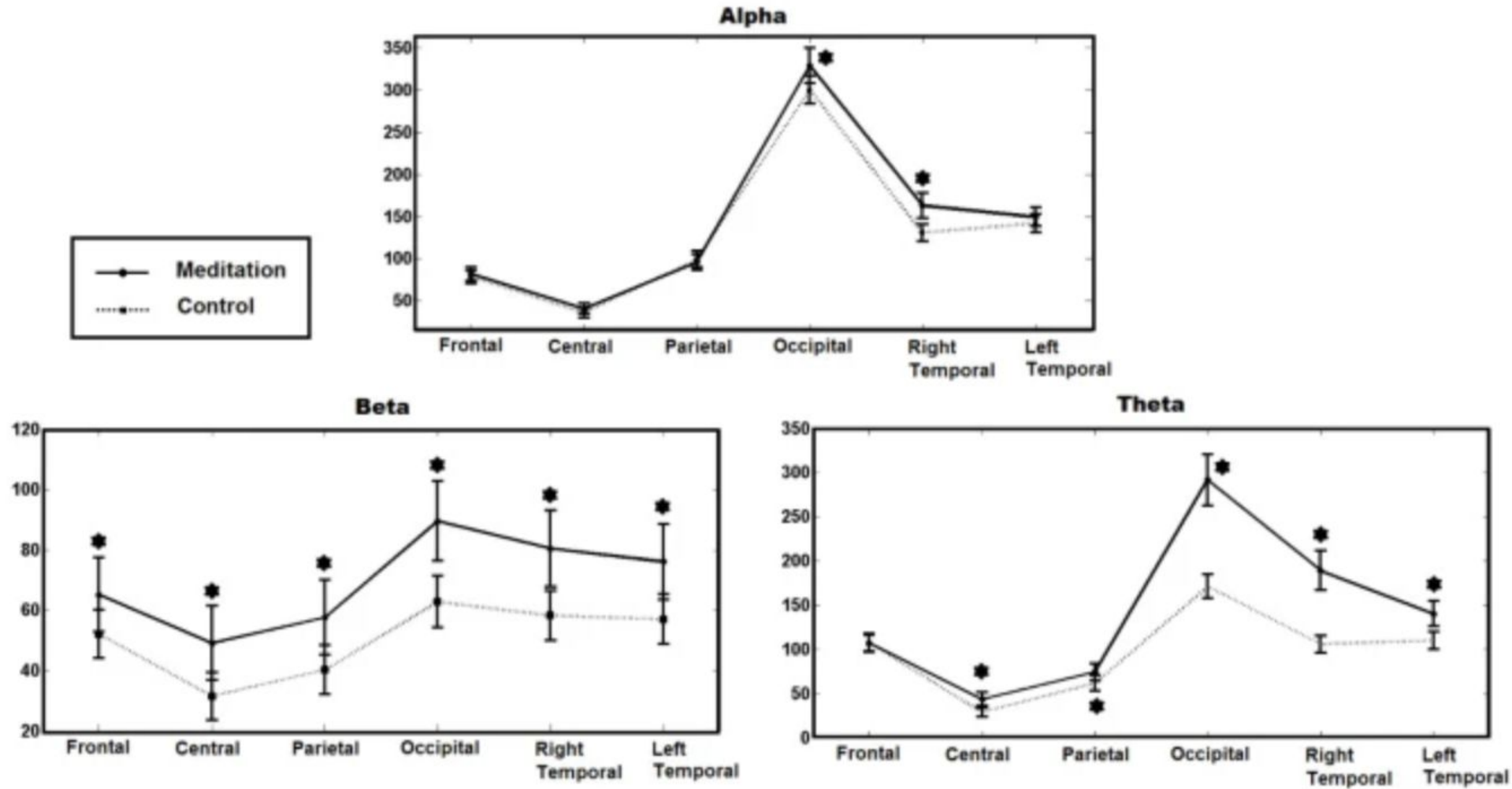
Real Time Processing Pipeline

- EEG recording during our task (**OpenBCI Cython** 16 channels)
- Pre-processing in real time with **Brainflow**
 - Notch filter 50Hz
 - 0.1-30 Hz Bandpass filter
- Evaluate the **average band power**
- Detecting relax and focus state using pre-trained **Brainflow classifiers** (LDA, SVM, KNN)



Detecting Relaxation state

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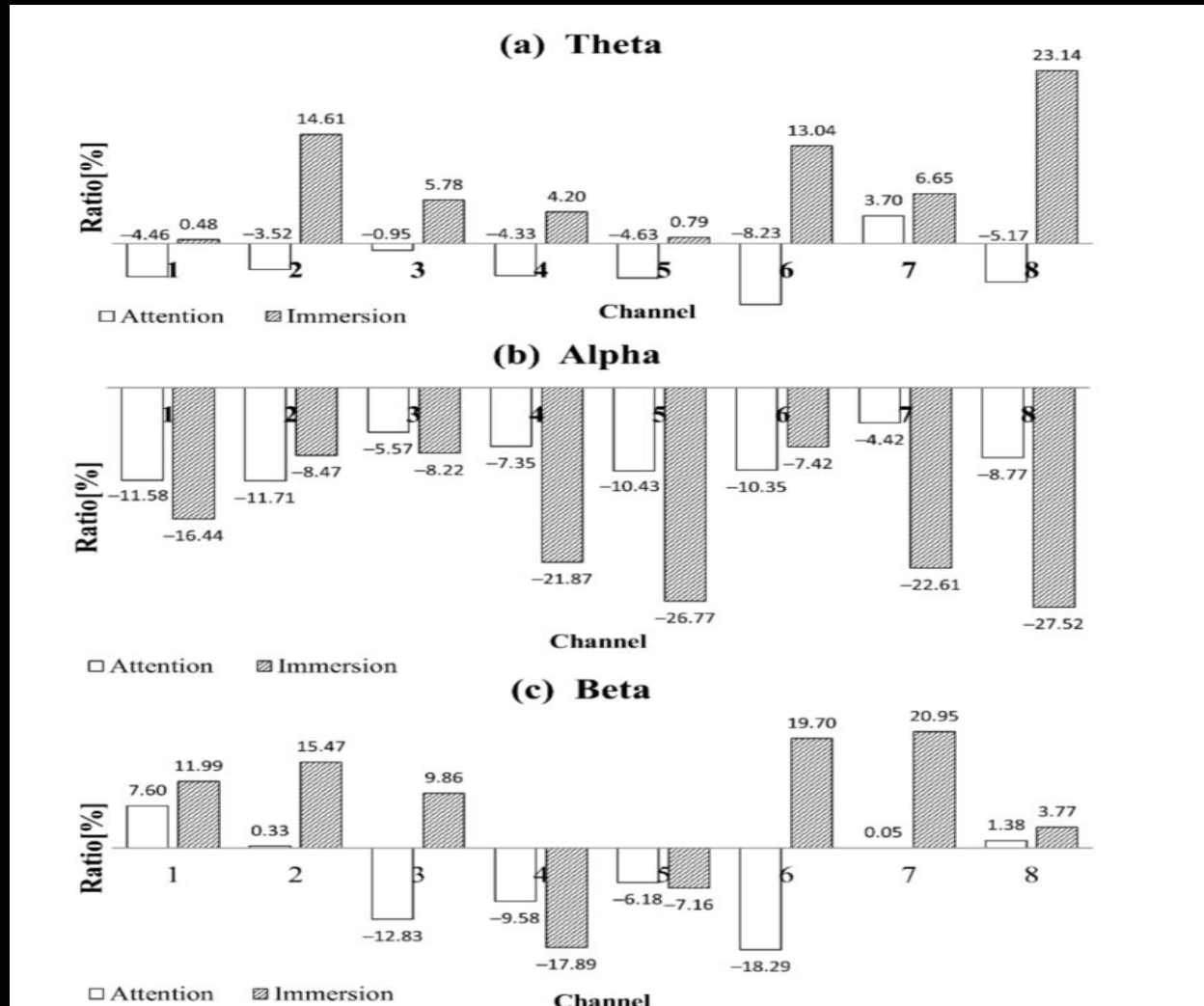


Quantitative change of EEG and respiration signals during mindfulness meditation – A. Ahani, H.Wahbeh, H. Nezamfar, M. Miller

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Detecting Focus state

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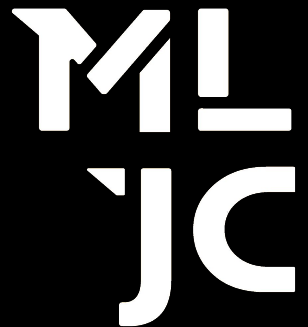


Channel Legend:

- 1: Fp1
- 2: Fp2
- 3: T3
- 4: C3
- 5: C4
- 6: T4
- 7: O1
- 8: O2

Future Perspective

- Training general and user-specific classifiers **on our learning sessions**
- Consider **spatial informations**
- Leverage **other mental states** (fatigue, arousal..)



OUR TEAM



<https://www.mljc.it/>

References

- *[1] EEG alpha and theta oscillations reflect cognitive and memory performance: a review and analysis – W. Klimesch*
- *[2] Characterizing Focused Attention and Working Memory Using EEG – Z. Mohamed, M. El Halaby, T. Said, D. Shawky, A. Badawi*
- *[3] How Does Anxiety Affect Second Language Learning? A Reply to Sparks and Ganschow – P. MACINTYR*
- *[4] Comparison between Concentration and Immersion Based on EEG Analysis – Seokbeen Lim , Mina Yeo, Gilwon Yoon*
- *[5] Induced alpha band power changes in the human Eeg and attention– W.Klimesch, H.Russegger, T.Pachinger*
- *[6] EEG-Based attention tracking during distracted driving– Yu-Kai Wang, Tzyy-Ping Jung*

