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A classification-based generative approach to selective targeting of Global slow oscillations during sleep

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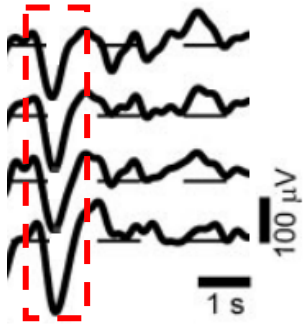
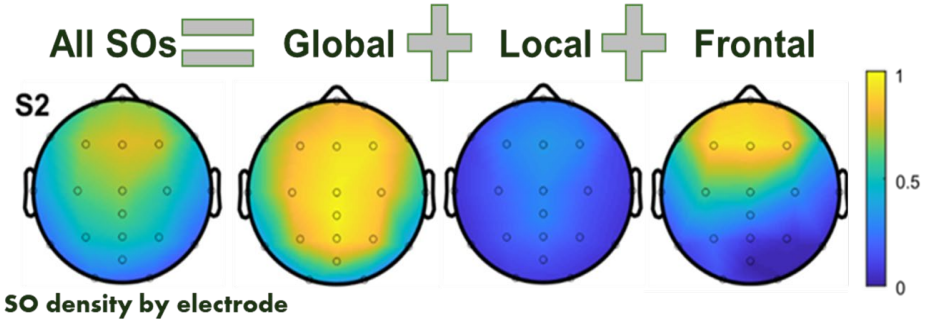
Background

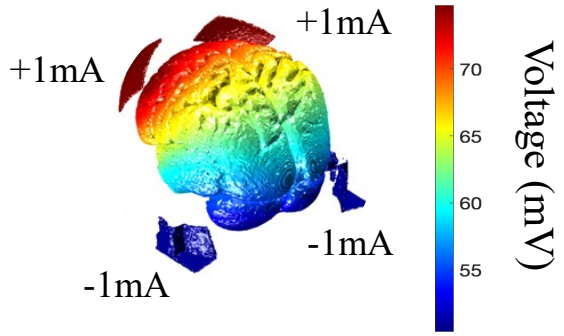


Massimini. M, et. al. (2004)

Sleep slow oscillations (SOs, 0.5-1.5 Hz)



Electrical Brain stimulation



Materials and Methods

EEG dataset; 22 volunteers, 64-channel

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SO Space-time profile

↓

Global/non-Global SOs Classifier

Modeling stimulation paradigms

↓ +

Stimulation protocol

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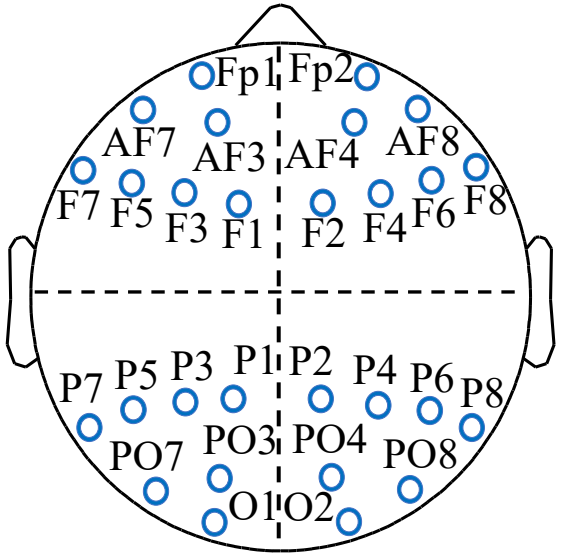
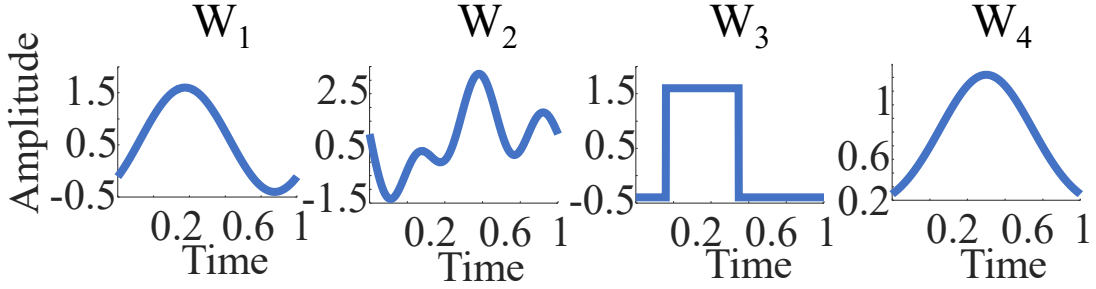
Results

Stimulation parameters

I)



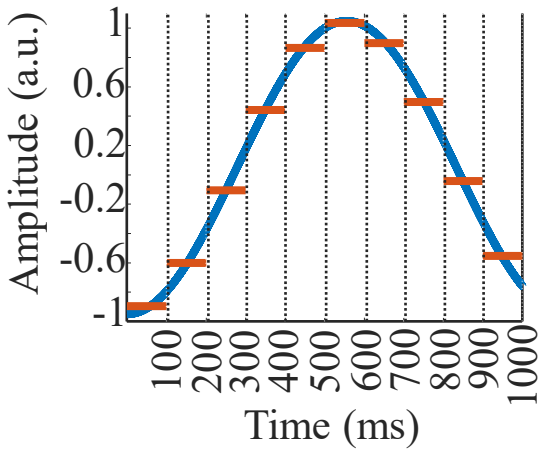
II)

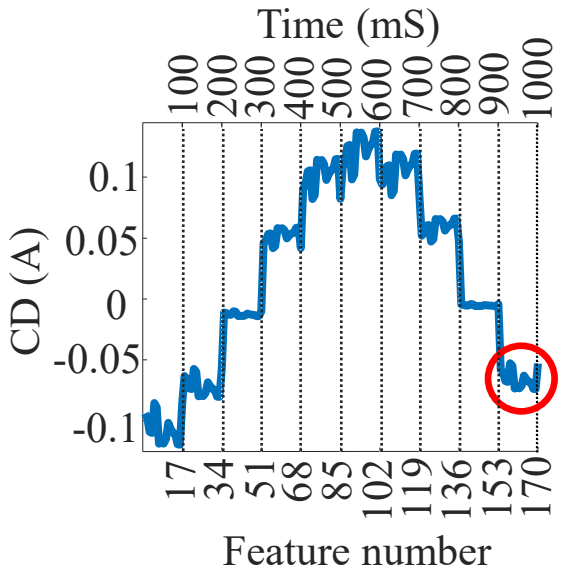


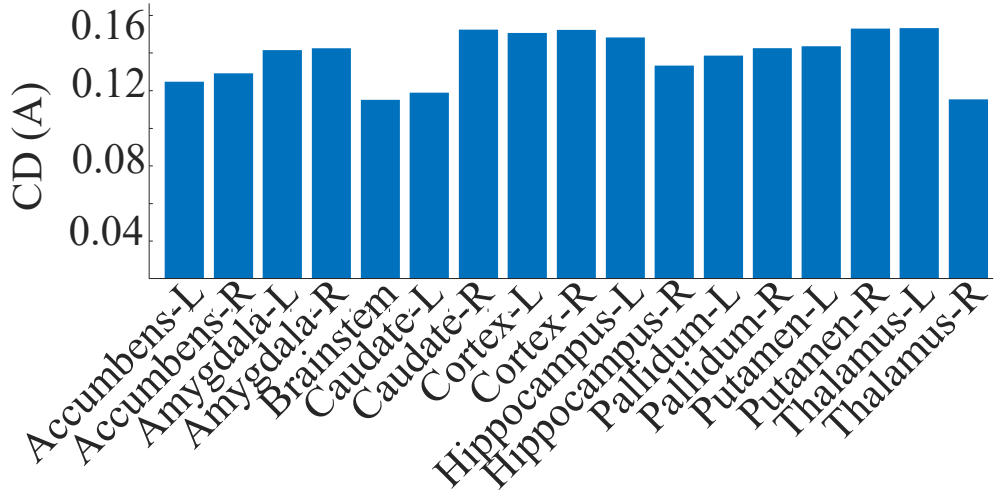
III)

Time windows (Δt)			
20ms	50ms	100ms	200ms

Model of stimulation

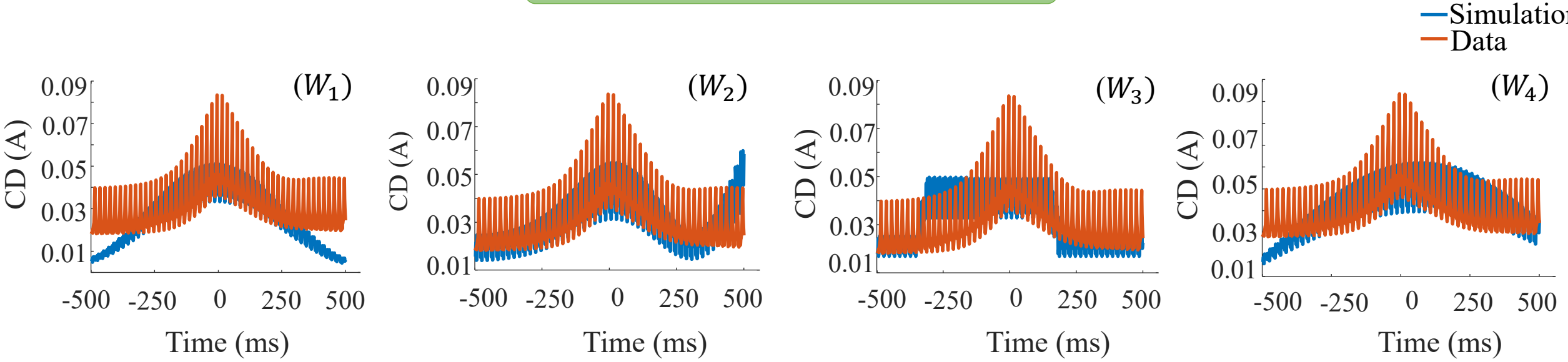






Results

Optimization with Genetic algorithm



Posterior probability of classification

Optimal stimulation protocol using W_2 and $\Delta t = 20ms$			
Parameters			**Electrode montage**
A_1 =0.0899	A_2 =0.1028	A_3 =0.2092	AF7, F6, P2, PO7
f_1 =1.1558	f_2 =0.1171	f_3 =1.2754	
$\emptyset_1$ =-0.6966	$\emptyset_2$ =1.2957	$\emptyset_3$ =2.6255	
		O =0.3500	

Conclusion

We introduce a technique for shaping a brain stimulation protocol which is capable of:

- Targeting global SOs and has the potential to be applied to other type of SOs.
- Allowing for the modulation of other physiological events, with implications for potential new treatments for brain disorders.
- Enabling learning from the sleeping brain how to interact with the sleeping brain.