

camh

Krembil Centre for
Neuroinformatics



Whole Brain Modelling

Modelling EEG large-scale brain network dynamics following an external perturbation with single-pulse TMS

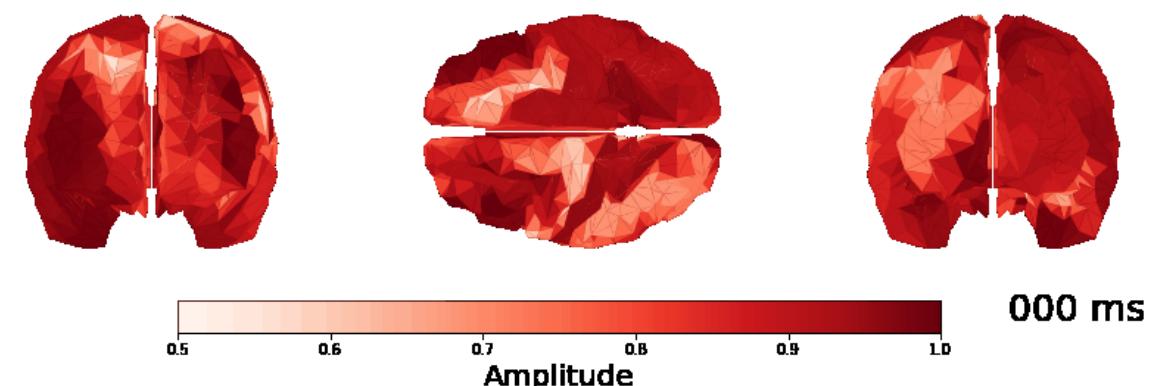
DAVIDE MOMI
Post-Doctoral Research Fellow
Whole Brain Modelling Group
Krembil Centre for Neuroinformatics
Centre for Addiction & Mental Health (CAMH)
<https://davi1990.github.io/>
250 College St., Toronto, ON M5T 1R8



@DaveMomi



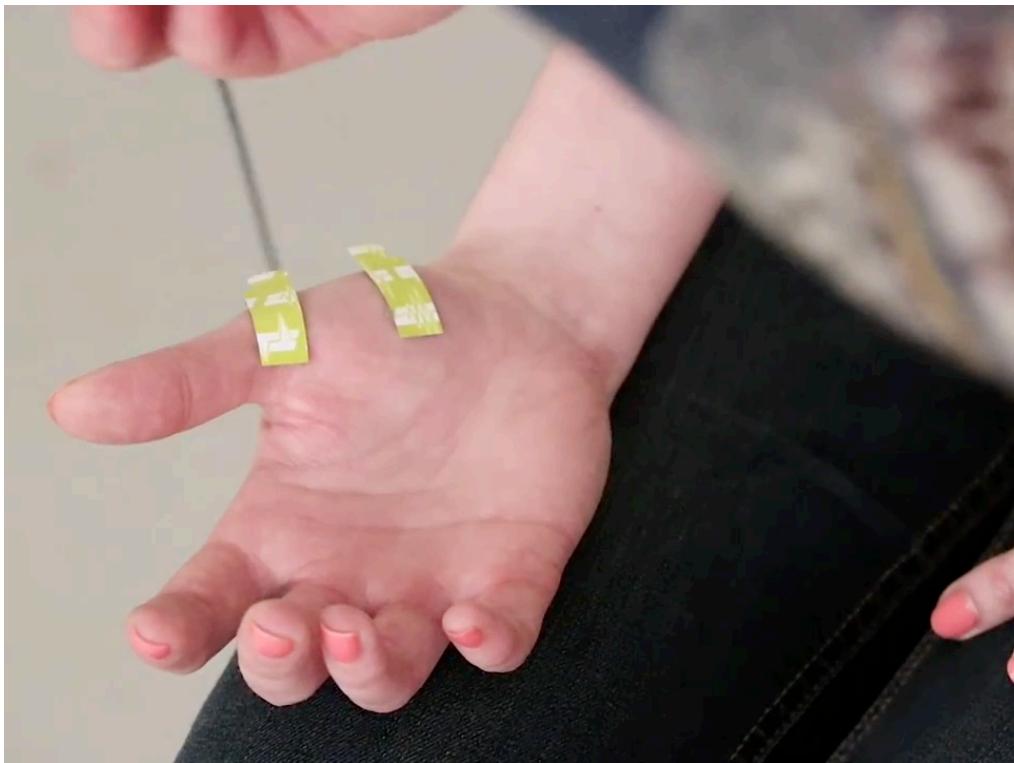
@Davi1990



The Krembil Centre for Neuroinformatics Virtual Open House
21st June 2021

Non-Invasive techniques to study the brain

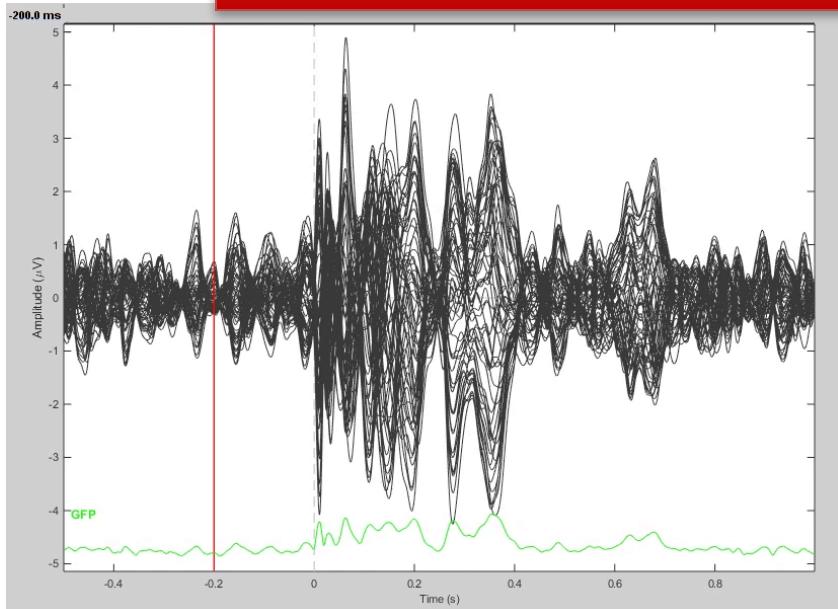
Transcranial Magnetic Stimulation (TMS)



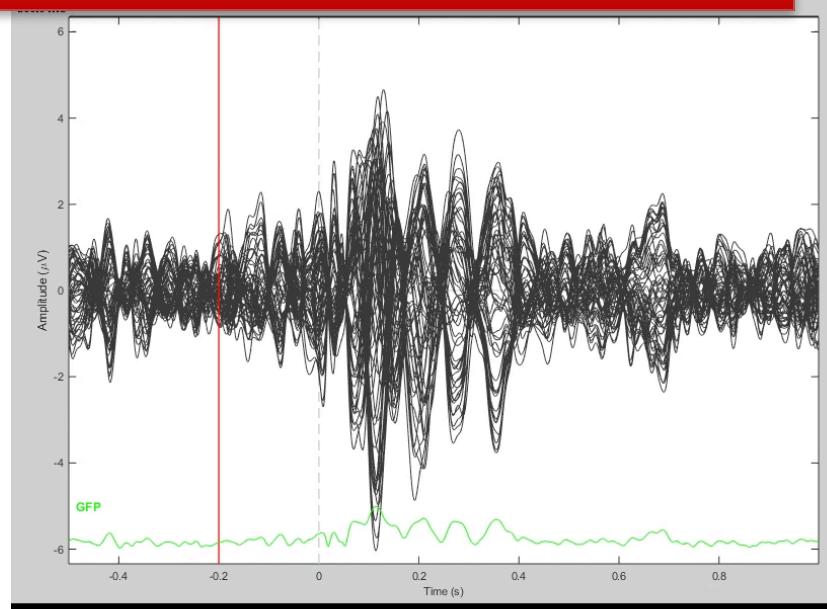
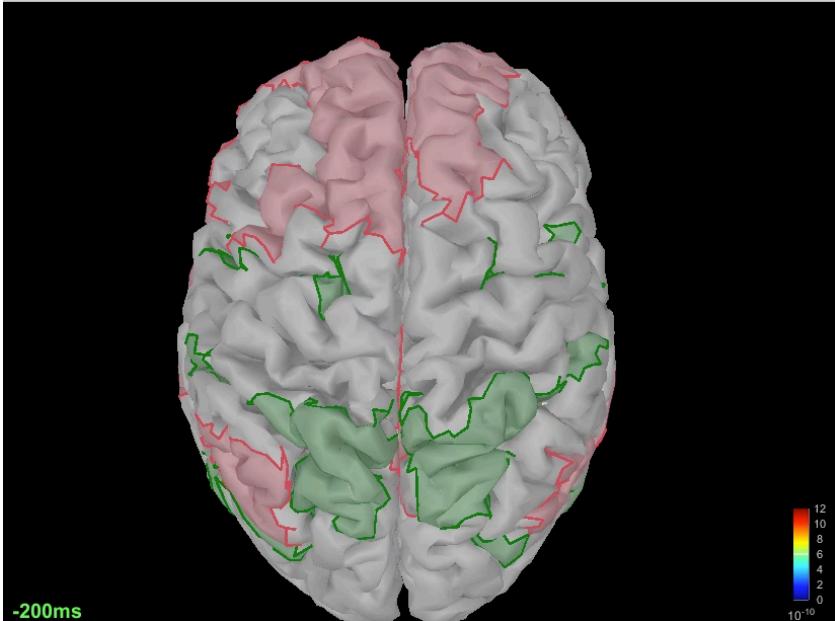
Electroencephalography (EEG)



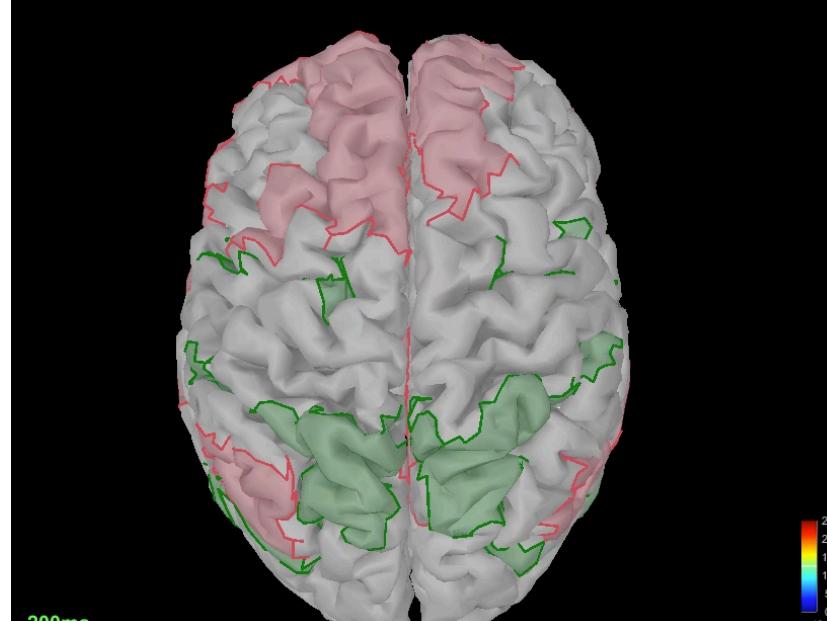
Propagation of TMS-induced signal



Propagation of
TMS induced brain
activity within the
DMN



Propagation of
TMS induced brain
activity within the
DAN



Transcranial magnetic stimulation for the treatment of obsessive-compulsive disorder

José Luis Rodríguez-Martín¹, José Manuel Barbanoj², V Pérez
¹Department of Clinical Research, Foundation for Health Research, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain
²Department of Epidemiology, Hospital de la Santa Creu i Sant Pau, Barcelona, Spain

Repetitive TMS combined with cognitive behavioral therapy for the treatment of obsessive-compulsive disorder: A preliminary study

Elizabeth A. Osuch^{a,*}, Brian M. Post^a, Una McNamee^b
^aBiological Psychiatry Branch, National Institute of Mental Health, Bethesda, Maryland, USA
^bClinical Center Nursing Department, National Institutes of Health, Bethesda, Maryland, USA

Transcranial magnetic stimulation in anxiety and trauma-related disorders: A systematic review and meta-analysis

Patricia Cirillo^{1,2,3} | Alexandra K. Gold^{4,5} | Antonio E. Nardi³ | Ana C. Ornelas³ |
Andrew A. Nierenberg^{1,5,6} | Joan Camprodon^{1,2,5} | Gustavo Kinrys^{1,5,6} 

¹Department of Psychiatry, University of Pennsylvania, Philadelphia, PA, USA

Transcranial Magnetic Stimulation (TMS) in the Treatment of Major Depression — a Pilot Study

HANS MARTIN KOLBING¹,
HANS-JÜRGEN MÖLLER¹,
¹Department of Psychiatry and Psychotherapy, University of Bonn, Bonn, Germany

RON HÖFLICH¹, ANDREAS HUFNER²,
RIED KASPER³,
Mund-Freud-Strasse 25, D-53105 Bonn, Germany
Wien, Austria

²Department of Psychiatry, University of Bonn, Bonn, Germany
³Department of Psychiatry, University of Vienna, Vienna, Austria

Treatment effect variability in brain stimulation across psychiatric disorders: A meta-analysis of variance

Stephanie Homan^{a,b,*}, Whitney Muscat^{c,d,e}, Andrea Joanlanne^{c,d,e}, Nikolaos Marousis^a, Giacomo Cecere^a, Lena Hofmann^a, Ellen Ji^a, Maria Neumeier^a, Stefan Vetter^a, Erich Seifritz^a, Thomas Dierks^b, Philipp Homan^{a,c,d,e}

^a University Hospital of Psychiatry Zurich, Zurich, Switzerland

^b University Hospital of Psychiatry and Psychotherapy, University of Bern, Bern, Switzerland

^c Center for Psychiatric Neuroscience, Feinstein Institute for Medical Research, Manhasset, NY, USA

^d Division of Psychiatry Research, Zucker Hillside Hospital, Northwell Health, New York, NY, USA

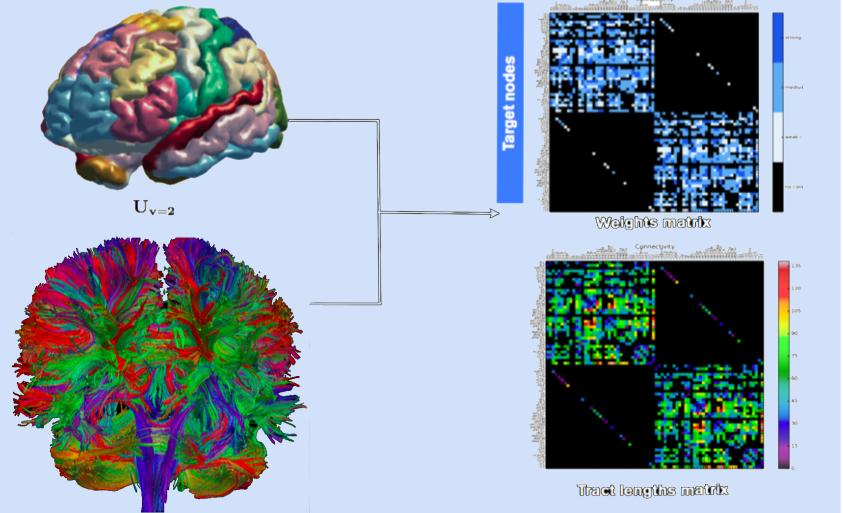
^e Department of Psychiatry, Zucker School of Medicine at Northwell/Hofstra, Hempstead, NY, USA

Transcranial magnetic stimulation in the treatment of psychiatric disorders: A Review up to Date

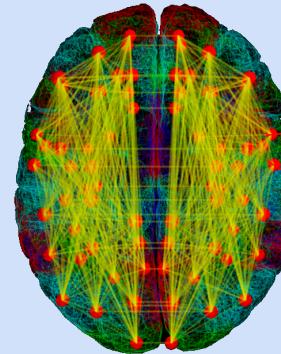
JOHN GREEN BERNACKI, DO;
A PENNINTI, MD;
Medicine, Stratford, New Jersey

and
All from the Row...
Innov Clin Neurosci. 2015;12(7-8):12-13

Individual MRI

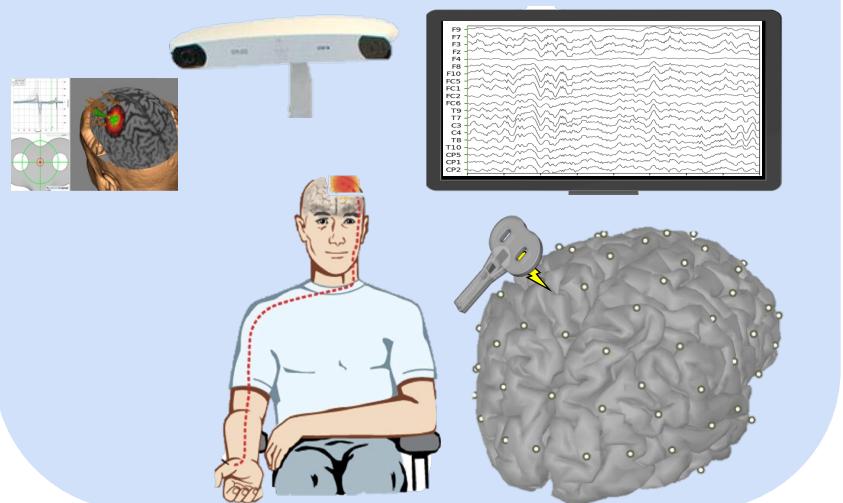


Model

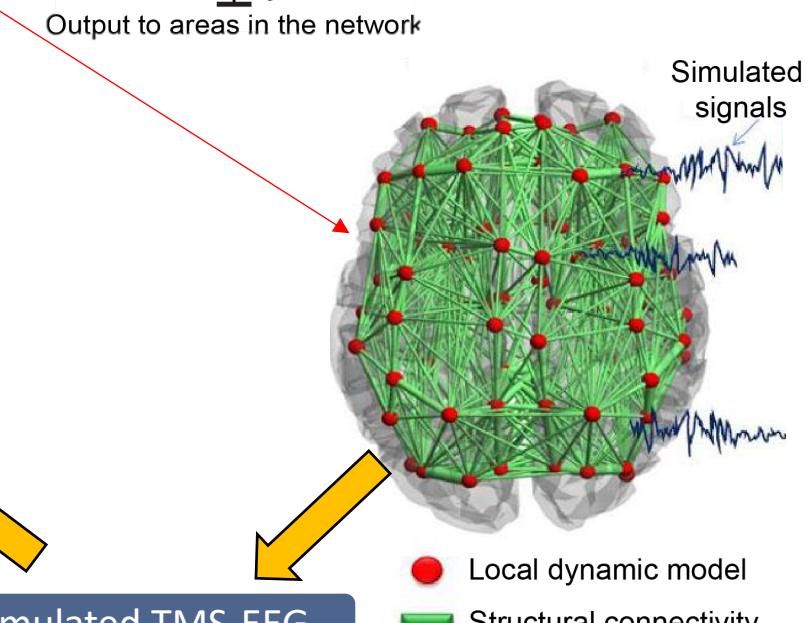
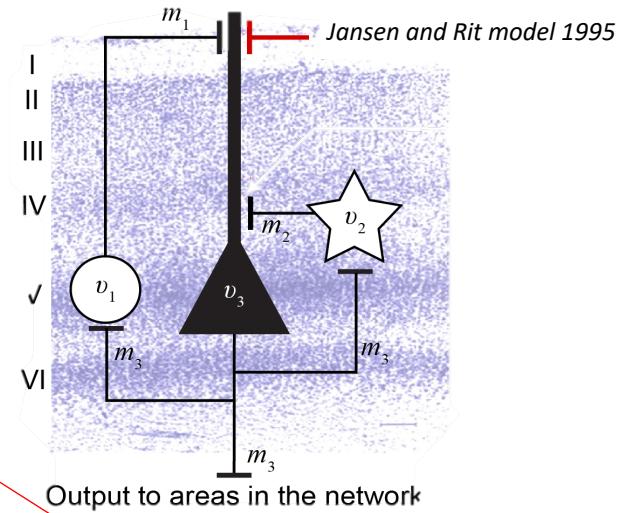
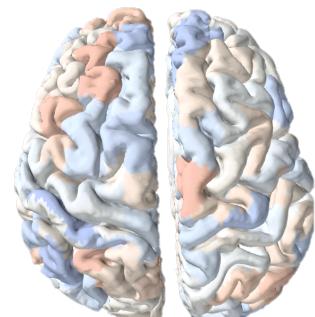


$$\frac{dx}{dt} = f(x, I, v)$$

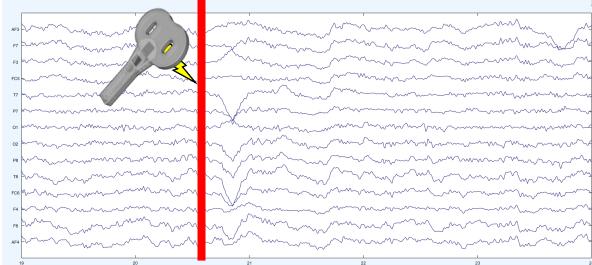
Empirical TMS-EEG



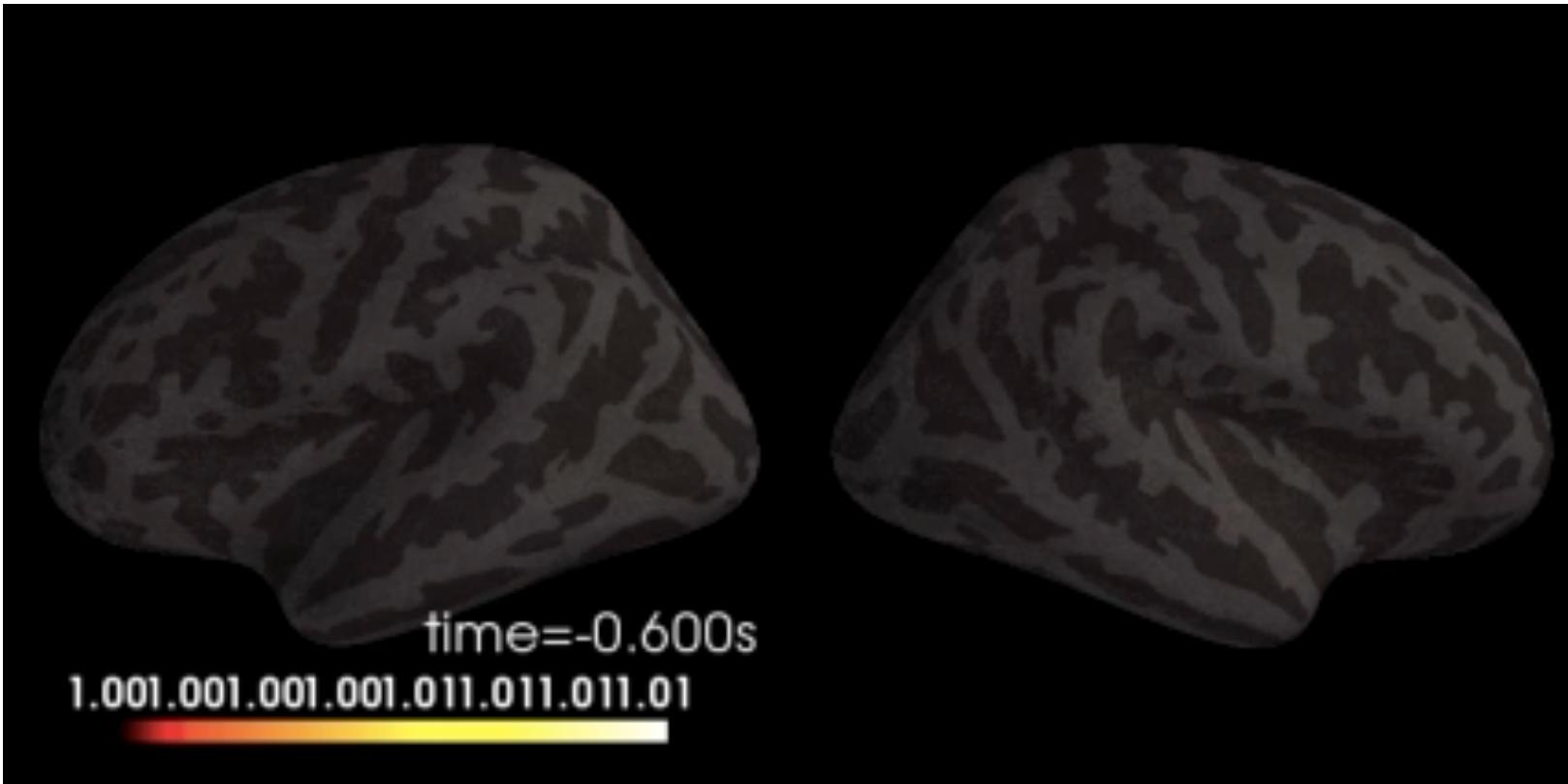
Comparison



Simulated TMS-EEG



Simulation of TMS-induced signal propagation



$$\dot{y}_0(t) = y_3(t)$$

$$\dot{y}_3(t) = AaSigm[y_1(t) - y_2(t)] - 2ay_3(t) - a^2y_0(t)$$

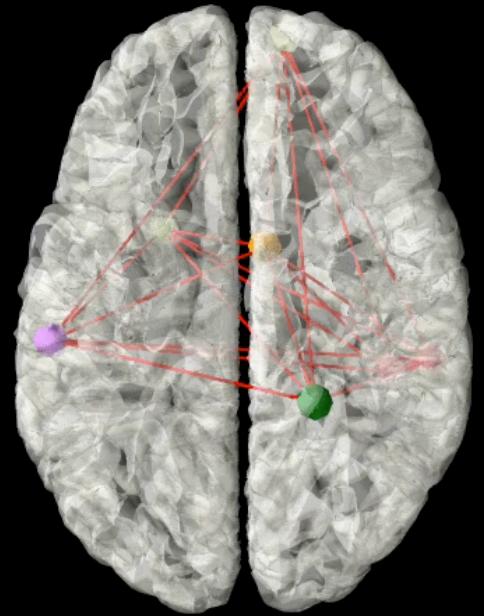
$$\dot{y}_1(t) = y_4(t)$$

$$\dot{y}_4(t) = Aa(p(t) + C_2Sigm[C_1y_0(t)]) - 2ay_4(t) - a^2y_1(t)$$

$$\dot{y}_2(t) = y_5(t)$$

$$\dot{y}_5(t) = Bb(C_4Sigm[C_3y_0(t)]) - 2by_5(t) - b^2y_2(t)$$

Resting state activity



1000.0 ms

Evoked activity

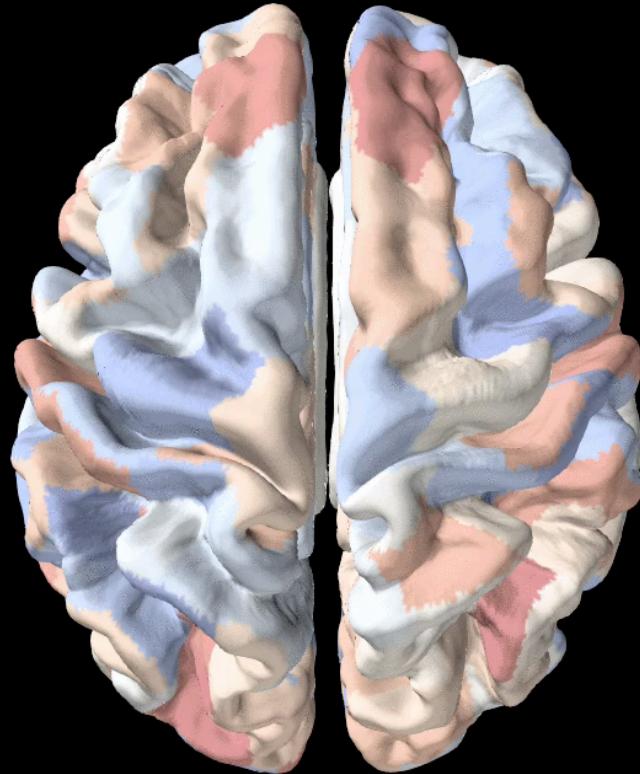


1450.0 ms

Comparison between empirical and simulated data

Correlation in source space

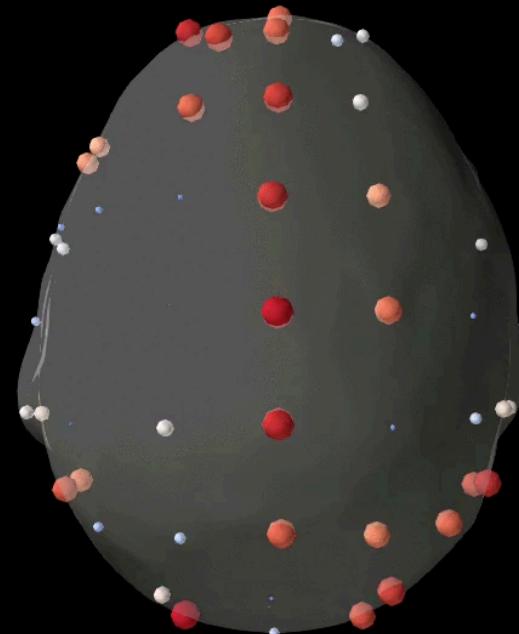
-0.6 ms



-0.999 -0.713 -0.428 -0.143 0.143 0.428 0.713 0.998

Correlation in channels space

-0.6 ms

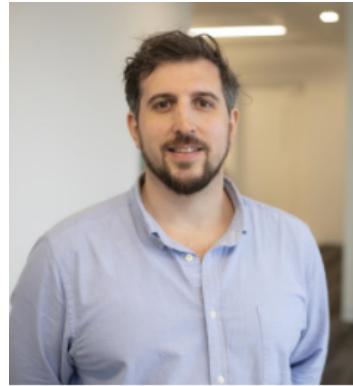


Acknowledgments

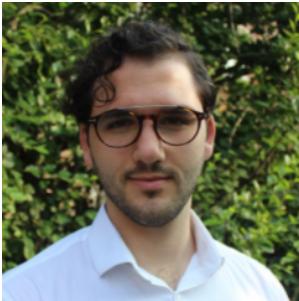
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Whole Brain Modelling



Dr. John Griffiths



Frank Mazza



Taha Morshedzadeh



Hussain Ather



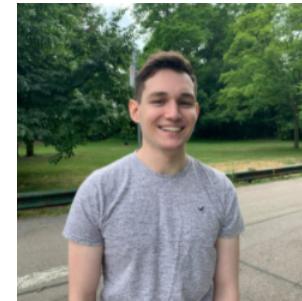
FuTe Wong



Sorenza Bastiaens



Shreyas Harita



Kevin Kadak