University of Wisconsin
SCHOOL OF MEDICINE
AND PUBLIC HEALTH

Available Imaging data

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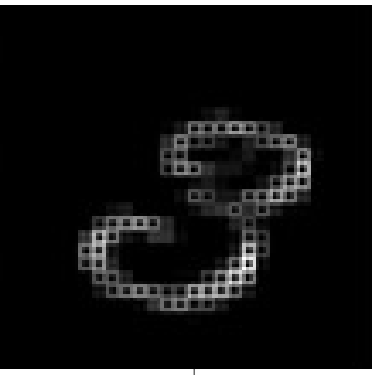
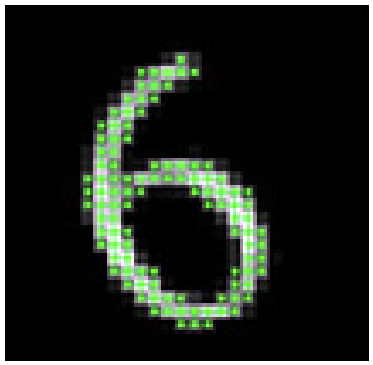
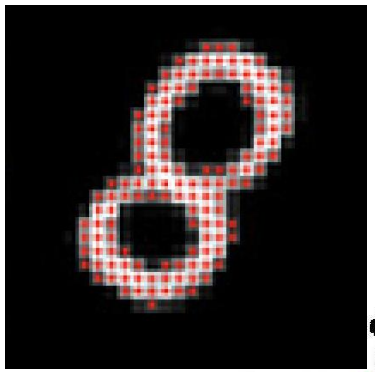
Topological Embedding and clustering on Matlab MINST database







8

Deaths

average of all death values

$$\frac{1}{|E_1|}\sum_{d\in E_1} d$$

4

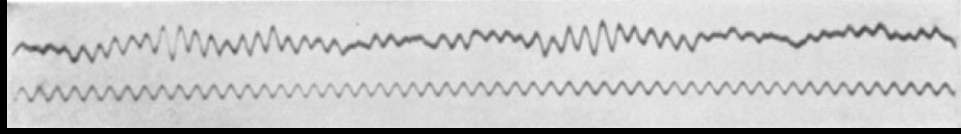
3

Births

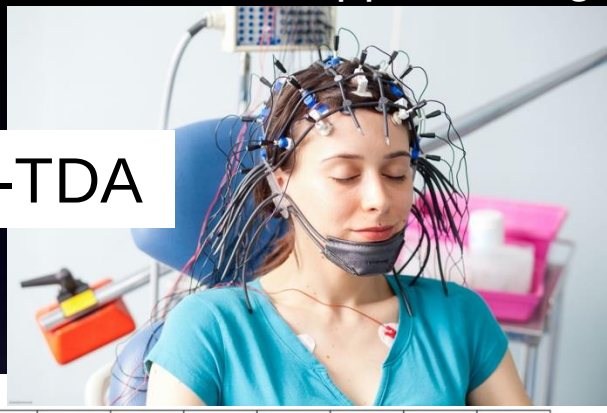
$$\frac{1}{|E_0|}\sum_{b\in E_0} b$$

average of all birth values

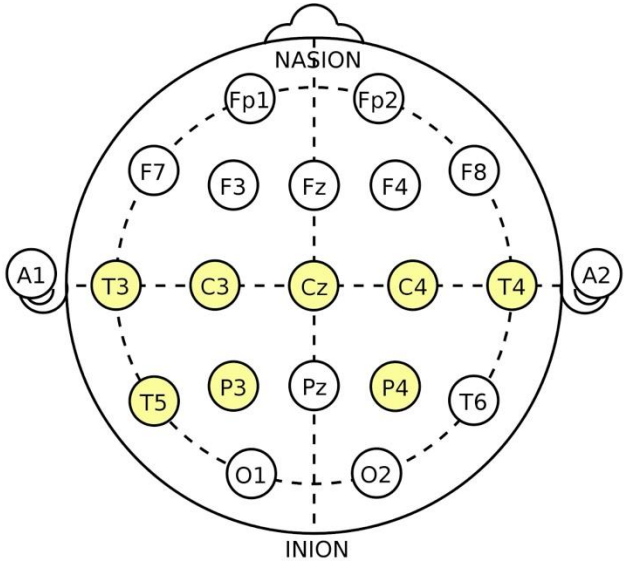
Electroencephalography (EEG)

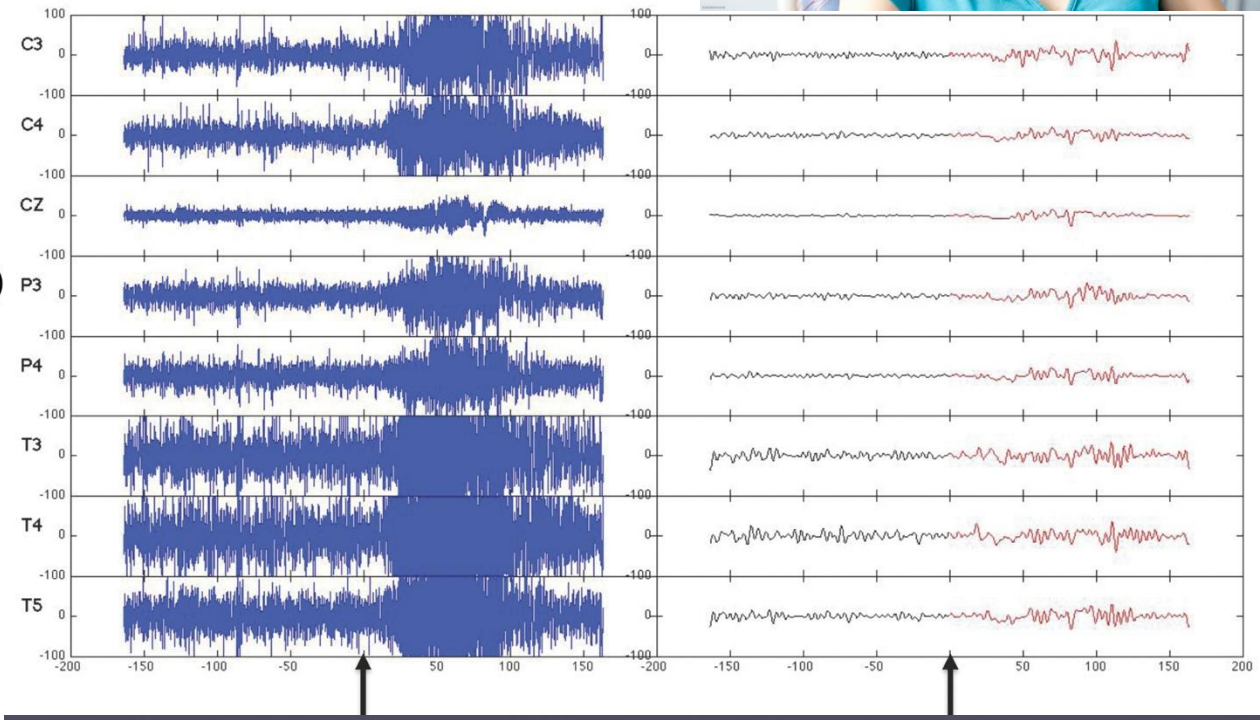


The first human EEG recording obtained by Hans Berger in 1924. The upper tracing is EEG.



https://github.com/A-EL-YAAGOUBI/Dynamic-TDA





Wang et al. 2018
Annals of Applied Stat
used TDA

Epileptic seizure

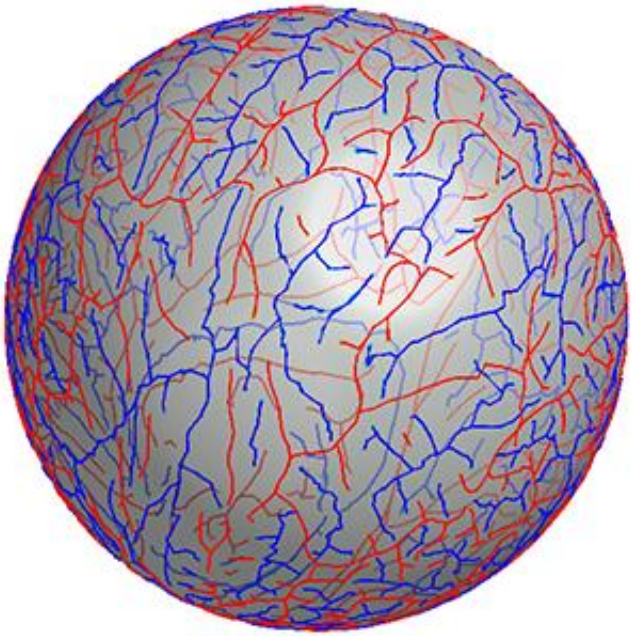
Wavelet transform

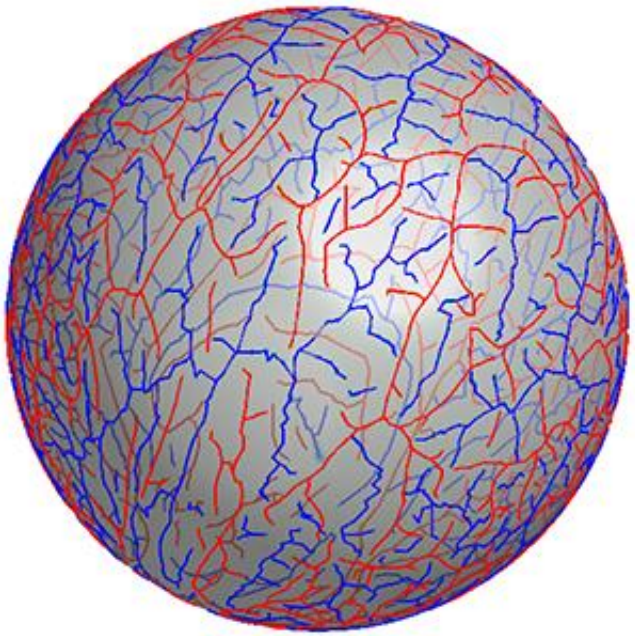
Resting state fMRI time series data

https://github.com/laplcebeltrami/rsfMRI

M.K. Chung, S. Das, and H. Ombao. Dynamic topological data analysis of functional human brain networks. Foundations of Data Science, 6:22–40, 2024.

Curve data

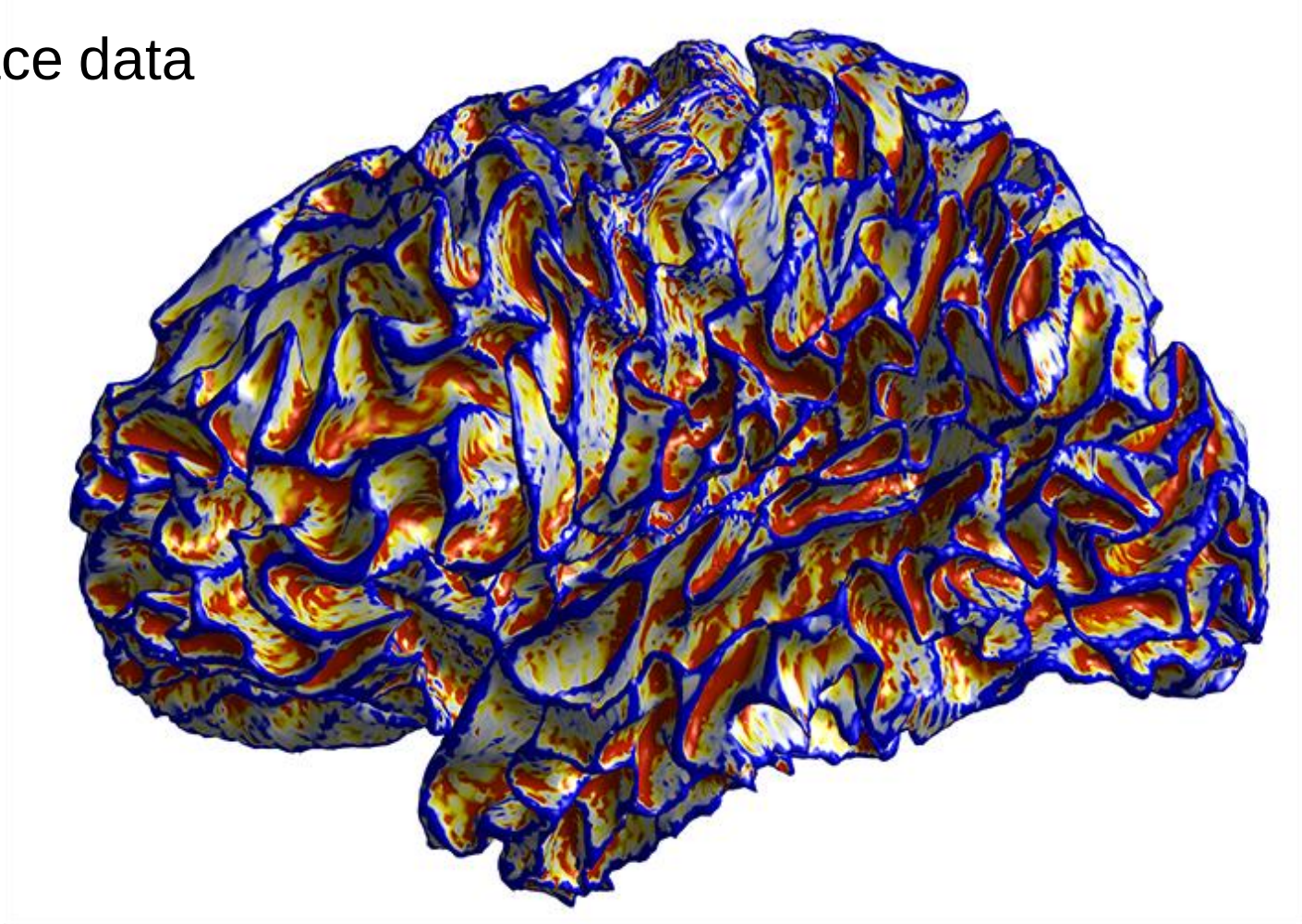




https://github.com/laplcebeltrami/sulcaltree

Huang, S.-G., Lyu, I., Qiu, A., Chung, M.K. 2020. Fast polynomial approximation of heat kernel convolution on manifolds and its application to brain sulcal and gyral graph pattern analysis, IEEE Transactions on Medical Imaging 39:2201-2212 https://pages.stat.wisc.edu/~mchung/papers/huang.2020.TMI.pdf

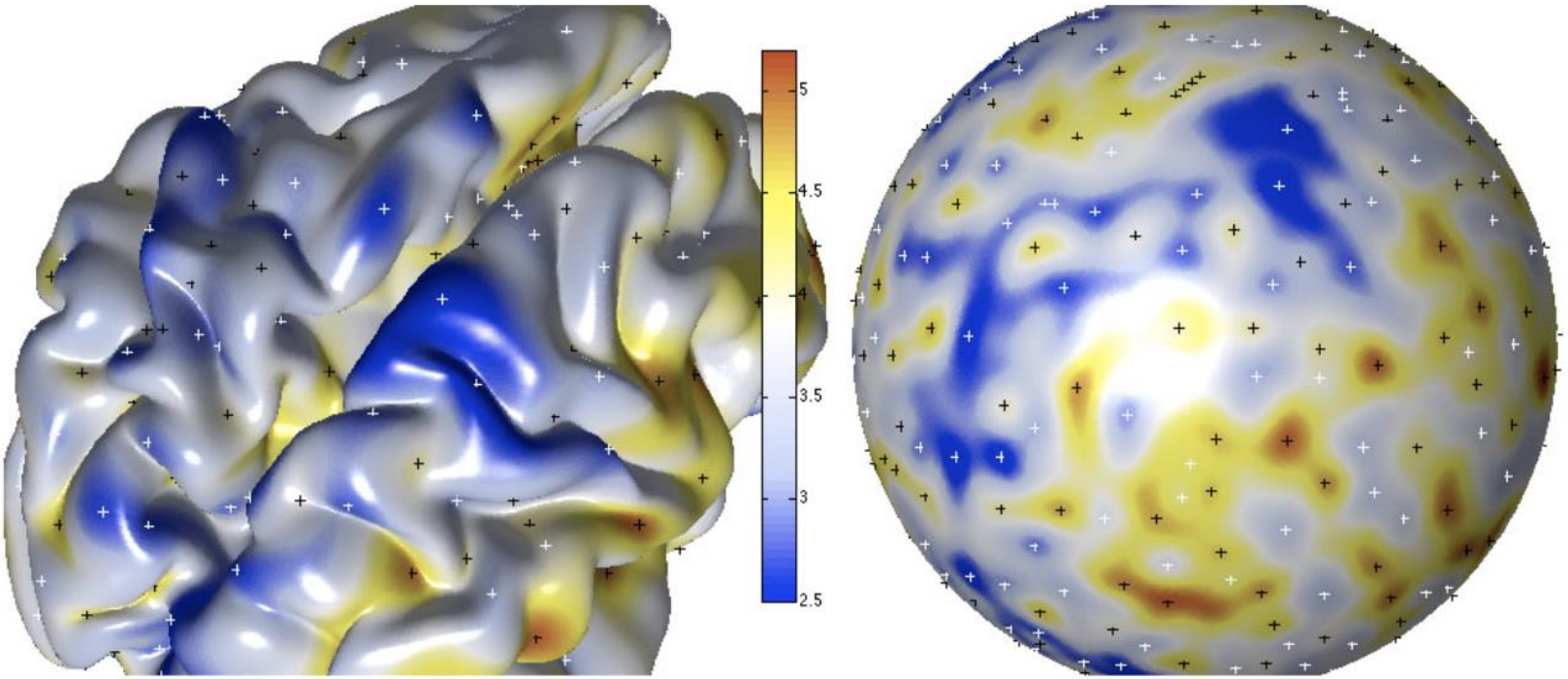
Surface data



Chung, M.K., Worsley, K.J., Robbins, S., Evans, A.C. 2003. Tensor-based brain surface modeling and analysis, CVPR, 467-473 http://pages.stat.wisc.edu/~mchung/papers/CVPR/CVPR.pdf

https://github.com/laplcebeltrami/curvatures

Autistic Surface Mesh Data



Chung, M.K., Dalton, K.M., Davidson, R.J. 2008. Tensor-based cortical surface morphometry via weighed spherical harmonic representation. IEEE Transactions on Medical Imaging. **27**:1143-1151.

https://brainimaging.waisman.wisc.edu/~chung/persistence/

Extensive network simulation data

https://github.com/laplcebeltrami/hodge

Anand and Chung 2023 Hodge Laplacian of Brain Networks, IEEE Transactions on Medical Imaging 42:1563-1573.

Darkurah, S., Anand, D.V., Chen, Z., Chung, M.K., 2022 Modelling cycles in brain networks with the hodge Laplacian, MICCAI, LNCS 13431:326-355, which received the travel award as one of the best papers in the conference.

54 Subjects Multimodal Brain Network Data

http://github.com/laplcebeltrami/maltreated

Chung, M.K., Hanson, J.L., Ye, J., Davidson, R.J. Pollak, S.D. 2015 Persistent homology in sparse regression and its application to brain morphometry. *IEEE Transactions on Medical Imaging*, 34:1928-1939

Chung, M.K., Hanson, J.L., Lee, H., Adluru, N., Alexander1, A.L., Davidson, A.L., Pollak, S.D. 2013. Persistent homological sparse network approach to detecting white matter abnormality in maltreated children: MRI and DTI multimodal study, *MICCAI* 8149:300-307

Chung, M.K., Hanson, J.L., Adluru, Aleander, A.L., Davidson, R.J., Pollak, S.D. 2017 Integrative structural brain network analysis in diffusion tensor imaging, *Brain Connectivity* 7:331-346

Resting state fMRI time series data

https://github.com/laplcebeltrami/rsfMRI

M.K. Chung, S. Das, and H. Ombao. Dynamic topological data analysis of functional human brain networks. Foundations of Data Science, 6:22–40, 2024.