BMC Neuroscience

Poster presentation

Open Access

Analysis of spontaneous activity patterns in developing retina: algorithms and results

Jennifer D Simonotto*[1,2], Stephen J Eglen[3], Marcus Kaiser[1,2], Christopher Adams[2] and Evelyne Sernagor[2]

Address: [1]School of Computing Science, Newcastle University Newcastle upon Tyne, UK, [2]Institute of Neuroscience, Newcastle University Newcastle upon Tyne, UK and [3]Department of Applied Mathematics and Theoretical Physics, University of Cambridge, Cambridge, UK

Email: Jennifer D Simonotto* - jennifer.simonotto@ncl.ac.uk

* Corresponding author

from Eighteenth Annual Computational Neuroscience Meeting: CNS*2009
Berlin, Germany. 18–23 July 2009

Published: 13 July 2009

BMC Neuroscience 2009, **10**(Suppl 1):P66 doi:10.1186/1471-2202-10-S1-P66

This abstract is available from: http://www.biomedcentral.com/1471-2202/10/S1/P66

Our interest is to unravel dynamics and characteristics of small-scale neural networks; thus, our aim is to develop tools to characterize and quantify these properties. We use recordings of spontaneous activity in the retina to refine our analysis tools; these developed tools are also useful outside of retinal research (such as in epileptogenesis, cardiac dynamics, etc). Traditionally, retinal data processing focuses on linear and frequency-based analysis of extracted spikes; however, these methods do not necessarily detect subtle network communication differences. Nonlinear dynamics in conjunction with network and frequency-based analysis methods can reveal more about the underlying dynamics.

As part of a recent consortium (CARMEN – Code, Analysis Repository and Modeling for E-Neuroscience), we investigated the spatiotemporal dynamics of retinal waves using spike times extracted from multi-electrode array (MEA) recordings taken at different labs at corresponding ages in development of different genetic strains of mice. The CARMEN infrastructure allows us to store and analyze these large data sets in a consistent manner. Burst analysis, entropy changes, network characteristics (based on networks extracted from correlation analysis), and wave measures (number, speed, length, interval), were used to quantify spike-time data; results were combined and compared. More analysis methods will be implemented in the future and compared with existing results, with the final aim to correlate and compare many result 'frames' with each other, extracting more complete information regarding underlying network structure of during/between wave and burst activation. All tools will be available in the near future through the CARMEN portal http://www.carmen.org.uk.

Acknowledgements

This study is part of the CARMEN Consortium Work Package 6 investigating small neural networks dynamics. We thank the CARMEN Consortium for their support. (EPSRC:EP/E002331/1)