

Topological analysis of neural systems

Ran Levi

University of Aberdeen

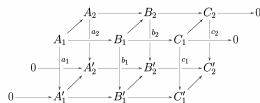
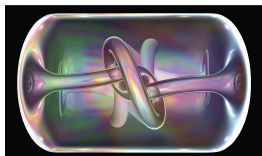
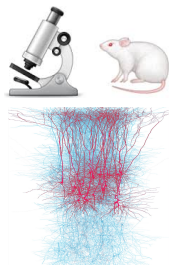
Joint project with

- ▶ Pawel Dłotko – University of Swansea
- ▶ Kathryn Hess, Martina Scolamiero, Gard Spreaman and Katharine Turner – Laboratory for Topology and Neuroscience, EPFL
- ▶ Henry Markram, Eilif Muller, Max Nolte and Michael Reimann – Blue Brain Project, EPFL

19 July 2017 - Kyoto



What can a topologist and a neuroscientist talk about?



Topological Data Analysis: Neuroscience, like many other biological sciences, produces huge amounts of data. In the past decade topology based methods of data analysis, generally referred to as Topological Data Analysis, or TDA, became widely used. Data emerging from neuroscience can be analysed by these methods. In this talk we will not use TDA.

What can a topologist and a neuroscientist talk about?

Our aim: merge neuroscience knowledge and technology and mathematical techniques, particularly from algebraic topology to generate data that naturally lends itself to analysis by topological methodology.

In this talk:

- ▶ Basic fact about the brain.
- ▶ The Blue Brain Project.
- ▶ Topology in the brain.
- ▶ What's next.

The Brain - Some basic fact



The brain of any organism lucky enough to have one is made out of billions of cells called neurons.

The brain of any organism lucky enough to have one is made out of billions of cells called neurons.

L23 NBC



Layer 2/3 Nest Basket Cell

Neurons connect to each other using synapses

Neurons connect to each other using synapses

