Keita Watanabe

Education

2016–Present **PhD in Complexity Science**, *The University of Tokyo*, Chiba, Japan.
Development of an embedding algorithm for neuronal activity data.

2016 **MSc in Complexity Science**, *The University of Tokyo*, Chiba, Japan.
Proposal of an algorithm for repetitive sequential activity in neuronal data.

2014 **BE in Computer Science**, *Utsunomiya University*, Tochigi, Japan.
Proposal of a fast and efficient quantum annealing simulation algorithm in von Neumann architecture computers

Master thesis

title *Detection of Spatiotemporal Neuronal Activity Patterns by Edit Similarity Score*

supervisor Dr. Tomoki Fukai

description Considerable methodological progress suggests that sequential firing of cortical neurons plays an active role in processing behaviorally relevant information, yet methods for analyzing the spatiotemporal structure of population neuronal activity, particularly those for detecting sequential firing patterns, are limited. My thesis introduces "Edit Similarity" to analyze the temporal structure of spike trains in noisy neuronal population activity. Edit similarity was originally introduced in computer science for analyzing arbitrary strings such as words and genomes. The proposed framework applies this metric to sequences of neuronal population spikes. I show in both artificial and real neural activity data that the method enables the detection of spike sequences in the presence of various kinds of noise.

Experience

2017–Present **Junior Research Associate**, *RIKEN Center for Brain Science*, Laboratory for Neural Coding and Brain Computing, Saitama, Japan.
Development of a data mining software for Brain MINDS project.
Achievements:
- Software is available at Github

| 2014–2016 | **Student Trainee**, *RIKEN Brain Science Institute*, Laboratory for Neural Circuit Theory, Saitama, Japan. |

Development of a data mining software for Brain MINDS project
Achievements:
- Proposal of a novel framework of sequential spiking activity detection software,
- Implement it in Julia, Python and Bash shell script,
- Demonstrate the developed software in Society for Neuroscience 2016.

| Aug. 2014 | **Intern**, *Yahoo! Japan*, Tokyo, Japan. |

Development of a recommendation system for Yahoo! Chiebukuro (japanese Yahoo! Answers)
Achievement:
- Programming a collaborative filtering-based recommendation system in Python.

Languages

Julia	Advanced	2014 - Present
Python	Advanced	2014 - Present, Python3
MatLab	Intermediate	2014 - Present
R	Upper Intermediate	2013 - 2015
C++	Advanced	2009 - Present, C++14
C	Upper Intermediate	2009 - Present, C99

Co Curricular

Training Program	**Brain Science Training Program**, *by RIKEN Center for Brain Science*, Wako, 2017-2018.

Receive one-year comprehensive training from researchers in the broad interdisciplinary expertise in the field of brain science. Covered topics are listed in the program website.

Summer School	**Berkeley summer course in mining and modeling of neuroscience data**, *by Redwood Center for Theoretical Neuroscience, UC Berkeley*, Berkeley, 2017.

Study state-of-the-art techniques for analyzing and modeling neuroscience data sets. Covered topics are listed in the course website.

Workshop	**An introduction to the statistical analysis of point process networks**, *at Student Association for Brain Science's Training Camp*, Kanagawa, 2016.

Study the statistical point process based spiking neuron modeling theory with collaborative implementation in Julia. Code is available at Github.

Extra Curricular

Summer School | **Summer boot camp of infectious disease modeling**, *by Infectious Disease Modeling Consortium*, Tokyo, 2015.
Design Avian Influenza pandemic simulation model in Kyushu prefecture in Japan. Python code is available at Github.

Honors & Awards

2016 | **JASSO Category 1 Graduate Student Loans: Repayment Exemption for Outstanding Achievement (Half-exemption)**.
○ Funding Agency: Japan Student Services Organization
○ Amount: 1056000 JPY $\simeq$ 10560 USD

Research Supports

Jun.–Nov. 2017 | **Academic Research Grant for GSFS Doctor Course Student 2017**.
○ Funding Agency: The University of Tokyo, Graduate School of Frontier Sciences (GSFS)
○ Amount: 300000 JPY $\simeq$ 3000 USD

Nov. 2016 | **The Graduate School of Frontier Sciences Academic Research Grant Program 2016**.
○ Funding Agency: The University of Tokyo, Graduate School of Frontier Sciences (GSFS)
○ Amount: 150000 JPY $\simeq$ 1500 USD

Jun.–Nov. 2016 | **Academic Research Grant for GSFS Doctor Course Student 2016**.
○ Funding Agency: The University of Tokyo, Graduate School of Frontier Sciences (GSFS)
○ Amount: 300000 JPY $\simeq$ 3000 USD

Invited Talks

[1] Keita Watanabe. Multiple neural spike train data analysis. In *Fusion Brain Seminar*, Waseda University, Tokyo, Japan, Sep 2018.

[2] Keita Watanabe, Tatsuya Haga, Masami Tatsuno, David R. Euston, and Tomoki Fukai. Blind detection of behavior related population activity by using edit similarity measurement. University of Lethbridge, Lethbridge, Canada, Nov 2017.

Publications

[1] Keita Watanabe, Tatsuya Haga, David R Euston, Masami Tatsuno, and Tomoki Fukai. Unsupervised detection of cell-assembly sequences with edit similarity score. *bioRxiv*, page 202655, October 2017.

Presentations

[1] Keita Watanabe and Tomoki Fukai. Siamese bi-directional LSTM network for learning edit similarity. In *Society for Neuroscience*, San Diego, Nov 2018. Poster Presentation.

[2] Keita Watanabe and Tomoki Fukai. Neural network-based analysis of simultaneous behavioral and cell-assembly sequence data. In *Annual Meeting of the Japan Neuroscience Society*, Kobe, Jul 2018. Poster Presentation.

[3] Keita Watanabe, Tatsuya Haga, Masami Tatsuno, David R. Euston, and Tomoki Fukai. Blind detection of behavior related population activity by using edit similarity measurement and statistical modeling. In *Society for Neuroscience*, Washington DC, Nov 2017. Poster Presentation.

[4] Keita Watanabe, Tatsuya Haga, Masami Tatsuno, David R. Euston, and Tomoki Fukai. Detection of cell assemblies in the Hippocampus and PFC by Edit Similarity score. In *Annual Meeting of the Japan Neuroscience Society*, Makuhari, Jul 2017. Poster Presentation.

[5] Keita Watanabe, Tatsuya Haga, and Tomoki Fukai. Detection of repetitive spike sequences in neural ensemble based on Edit Similarity. In *Society for Neuroscience*, San Diego, Nov 2016. Poster Presentation.

[6] Keita Watanabe, Tatsuya Haga, and Tomoki Fukai. Finding repetition of sequential activativity patterns in spike trains by Edit Similarity score. In *Annual Meeting of the Japan Neuroscience Society*, Yokohama, Jul 2016. Poster Presentation.

[7] Keita Watanabe, Tatsuya Haga, and Tomoki Fukai. A novel approach for repetitive sequential activity detection. In *INCF Japan Node International Workshop, Advances in Neuroinformatics*, Saitama, May 2016. Poster Presentation.

[8] Keita Watanabe, Tatsuya Haga, and Tomoki Fukai. Detection of Spatiotemporal Neural Activity Patterns by Edit Similarity. In *INCF Japan Node International Workshop, Advances in Neuroinformatics*, Tokyo, Nov 2015. Poster Presentation.

[9] Keita Watanabe, Tatsuya Haga, and Tomoki Fukai. Detecting Spatiotemporal Patterns with Calculation of Edit Similarity. In *Annual Meeting of the Japan Neuroscience Society*, Kobe, Jul 2015. Poster Presentation.