Eric E. Thomson

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Education

University of California, San Diego

Ph.D.: Neuroscience September 2004
Thesis Title: How the Leech and its Nervous System Discriminate Touch Location
Areas of Specialization: Sensory coding, behavioral neuroscience
Advisor: William B. Kristan

M.A.: Philosophy March 2004
Thesis Title: Concepts in People and Artificial Neural Networks
Areas of Specialization: Philosophy of mind, philosophy of science
Advisors: Patricia S. Churchland and Paul Churchland

University of New Hampshire

Summa Cum Laude
June 1996 *B.S. in Interdisciplinary Math Physics*
June 1994 *B.S. in Ecology and Evolutionary Biology*
June 1994 *B.A. in Philosophy*

Research Expertise

- Systems neuroscience
- Behavioral neuroscience
- Python programming language

SELECTED ACCOMPLISHMENTS

Gigapixel imaging platform

- Designed Python-based *multi-camera imaging processing* pipeline.
- Deep learning-based analysis, including large-scale object detection workflow with custom augmentation pipeline (gigadetector package).

Maintained and taught usage of brain imaging analysis software

- Caiman package is used to extract calcium traces from movies of brain activity.
- Led workshops to teach people the theory and practical use of software.

Design and implementation of visual prosthetic device

- Designed, implemented, and tested a visual prosthetic system for rodents.
- Trained a team to build and use the system.
- Analyzed large-scale neuronal recordings during prosthetic use.

Peer-Reviewed Publications (*: Authors contributed equally)

Khani, J, Nayar, G, Thomson, EE, Nicolelis, MAL. Use of a cortical neuroprosthesis to detect invisible light generates infrared light representations in two somatosensory thalamic nuclei. Brain Network Disorders. In press.

Harfouche M, Kim K, Zhou KC, Konda PC, Sharma S, Thomson EE, et al. (2023) Imaging across multiple spatial scales with the multi-camera array microscope. Optica. Apr 1;10(4):471–80.

Haam, J, Gunin, S, Wilson, L, Fry, S, Bernstein, B, Thomson, EE, Noblet, H, Cushman, J, Yakel, J. (2023) Entorhinal cortical delta oscillations drive memory consolidation. Cell Reports 42: 113267.

Thomson EE*, Harfouche M*, Kim K, Konda PC, Seitz CW, Cooke C, (2022). Gigapixel imaging with a novel multi-camera array microscope. Elife. Dec 14;11.

Spry, K, Fry, S, DeFillip, J, Drye, S, Stevanovic, K., Hunnicutt, J, Bernstein, B, Thomson, EE, Cushman, J (2021) 3D-Printed Capacitive Sensor Objects for Object Recognition Assays. eNeuro 8: 1-9.

Thomson, EE, and Piccinini, G (2018) Neural representations observed. Minds and Machines 28: 191-235.

Thomson, EE*. Zea, I.*, Windham, W., Thenaise, Y., Walker, C., Pedowitz, J., Franca, W., Graneiro, A., Nicolelis, MAL (2017) Cortical neuroprosthesis merges visible and invisible light without impairing native sensory function. eNeuro 4: 1-17.

Hartmann, K.*, Thomson, EE*, Zea, I, Yun, R, Mullen, P, Canarick, J, Huh, A, Nicolelis, MAL (2016) Embedding a Panoramic Representation of Infrared Light in the Adult Rat Somatosensory Cortex through a Sensory Neuroprosthesis. J. Neurosci. 36: 2406 – 24.

Thomson, EE, Lou, J, Sylvester, K, McDougal, A, Tica, S, Nicolelis, MAL (2014) Basal forebrain dynamics during a tactile discrimination task. J. Neurophysiology 112: 1179-1191.

Thomson, EE, Carra, R, and Nicolelis, MAL (2013) Perceiving Invisible Light through a Somatosensory Cortical Prosthesis. Nature Communications. 4: 1482, 10.1038/ncomms2497.

Wiest, MC*, Thomson, EE*, Pantoja, J, and Nicolelis, MAL (2010) Changes in S1 Neural Responses During Tactile Discrimination Learning. Journal of Neurophysiology, 104:300-312.

Thomson E.E. and Kristan W.B. (2006) Encoding and Decoding Touch Location in the Leech CNS. J. Neurosci. 26: 8009-8016.

Thomson E.E. and Kristan W.B. (2005) Quantifying stimulus discriminability: A comparison of information theory and ideal observer analysis. Neural Computation 17: 741-778.

Baca S.M.*, Thomson E.E.*, and Kristan W.B. (2005) Location and intensity discrimination in the leech local bend response quantified using optic flow and principal components analysis. J. Neurophys. 93: 3560-72.

Review chapters and articles

Loring, M., Thomson, E., Naumann, E (2020) Whole-brain interactions underlying zebrafish behavior. Curr Opin Neurobiol 65: 88-99.

Wiest, M, and Thomson, EE, Meloy, J (2008) Multielectrode recordings in the somatosensory system. Chapter 6 in Nicolelis MAL, editor. Methods for Neural Ensemble Recordings. 2nd edition. Boca Raton (FL): CRC Press.

Wiest, MC, Thomson EE, Nicolelis MAL (2007). Twenty-Five Years of Multi-Electrode Recordings in the Somatosensory System. In: The Senses: A Comprehensive Reference. (eds-Basbaum et al) Academic Press, San Diego CA.

Posters

Thomson, EE, Stevanovic, K, Gu, Z, Yakel, J, Cushman, J (2022) Behavioral, learning, and theta ratio dynamics during trace conditioning. SFN Abstract

Thomson, EE, Harfouche, M … Horstmeyer, R, and Naumann, EA (2019) Gigapixel-scale behavioral and neural activity imaging with a multicamera array microscope. Cold Spring Harbor Zebrafish Neural Circuits and Behavior conference.

Thomson, EE, Naumann, E (2018) Asymmetries of motion processing in the zebrafish. Duke Neurobiology Retreat.

Thomson, EE, Zea, I, Thenaisie, Y, Franca, W, Windham, W, Nicolelis, MAL (2016) Integrated multimodal representations investigated using a distributed IR prosthetic system. SFN Abstract 805.07.

Thomson, EE, Hartmann, K, Nicolelis, MAL (2015) Constructing a distributed infrared sensory modality in the adult rat. SFN Abstract 419.06.

Thomson, EE, Sylvester, K, Takigami,Â, Lou, J, Nicolelis, MAL (2013) Population coding of stimulus and reward in rat basal forebrain. SFN Abstract 581.07.

Thomson, EE, Lou, J, McDonough, A, Nicolelis, MAL (2011) Basal forebrain activity during a tactile discrimination task. SFN Abstract 495.24.

Thomson, EE, Meloy, J, and Nicolelis, MAL (2010) Whisker-based aperture width discrimination in the mouse. SFN Abstract 285.17.

Thomson, EE, Lehew, G, and Nicolelis, MAL (2007) Multielectrode design for simultaneously recording from rat primary and secondary somatosensory cortices. SFN Abstract 403.16.

Thomson, EE, Wiest, MC, Pereira, A, and Nicolelis, M (2005) A behavioral paradigm for the study of category discrimination in the rat whisker system. SFN Abstracts 883.6.

Thomson, E.E., and Kristan W.B. (2004) Encoding and decoding touch location in the leech. Computational and Systems Neuroscience (CoSyne) abstract (Cold Spring Harbor).

Thomson, E.E. and Kristan W.B. (2003) Mechanoreceptor latency encodes touch location in the leech. SFN Abstracts 269.4.

Thomson E.E., Churchland P.S., and Kristan W.B. (2001) EMG in the leech (H. medicinalis) body wall: A signal-to-noise analysis. SFN Abstracts 518.4.

Talks and Workshops

Workshops on Calcium imaging Analysis using Caiman

November 2023: Society for Neuroscience (Washington, DC)
September 2023: LindoScope (Magdeburg, Germany)
February 2023: Nemonic multiphoton imaging workshop (UC Santa Barbara)
January 2023: Flatiron Center for Computational Neuroscience (NYC)
June 2022: Flatiron Center for Computational Neuroscience (NYC)

Deep processing of ridiculously large images. Triangle Python User's Group, Durham NC; September 2019.

Large-scale behavioral and neural imaging with a multi-camera array microscope (MCAM). Triangle Zebrafish Symposium. Duke University, Durham, NC; April 2019.

Perceiving Invisible Light through a Somatosensory Cortical Prosthesis. Barrels XXV New Orleans, LA, October 2012; NIH Bethesda, August 2012; Duke Neurobiology Retreat November 2012.

A comparison of information theory and ideal observer analysis in the study of coding. NeurIPS December 2006.

Coding and decoding touch location in the leech. NeurIPS December 2006.

Professional Experience

Data scientist: Triangle AI (Durham, NC) 2024-Present
Develops user-friendly tooling for data analysis in machine vision and other tasks. Summarizes studies each month in systems neuroscience to help researchers stay on top of current trends.

Data Scientist: Flatiron Center for Computational Neuroscience (New York City) 2023-2024
Responsibilities: Maintainer of Caiman, Python package for extraction of Calcium signals from movies of brain activity. Ran multiple workshops to explain theory/practice of nonnegative matrix factorization.

Data Scientist: NIH/NIEHS (Durham, NC) 2020-2023
Responsibilities: Work with multiple neurobiology laboratories to design and analyze neuronal and behavioral experiments. Examine data using Python and Matlab.

Senior Research Scientist: Duke University (Durham, NC) 2018-2020
Responsibilities: Large-scale imaging with a multicamera array microscope. Python-based image acquisition and analysis. Tensorflow for large-scale object detection.

Research Scientist: Duke University (Durham, NC) 2004-2018
Responsibilities: Sensory coding and plasticity in the rat somatosensory cortex. Sensory prosthetics. Construction and implantation of recording and stimulating electrodes in rats. Extensive analysis of video and physiological data (Matlab) from awake behaving rats.

References available upon request