

# Eli Shlizerman

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## Education

9/2009	Ph.D.	Weizmann Institute of Science	Computer Science & Applied Mathematics
2004	M.Sc.	Weizmann Institute of Science	Computer Science & Applied Mathematics
2002	B.Sc.	Bar-Ilan University, Israel	Computer Science, Mathematics (magna cum laude)

## Academic Positions

10/16-present	Research Scientist	Facebook
8/15-present	Assistant Professor (tenure-track) Washington Research Foundation Professor	Dept. Applied Math., Dept. Electrical Engineering, University of Washington
10/12-7/15	Assistant Professor	Dept. Applied Math., University of Washington
2009-9/12	Acting Assistant Prof. (Postdoctoral)	Dept. Applied Math., University of Washington
8/2010	Visiting Postdoctoral Fellow	Prog. Applied. Comp. Math., Princeton University
2004-2009	Graduate Student	Dept. Comp. Sci. & Applied Math., Weizmann Inst. Sci.
6-9/2006	Visiting Research Student	Dept. Applied Math & Applied Phys., Columbia University

## Awards and Honors

2016	<b>Outstanding Teaching Award</b> , Applied Math, UW
2015	<b>Data Science Fellow</b> , eScience Institute, UW
2014	<b>NSF/NIGMS</b> Initiative Award
2012	<b>AIMS</b> Early Career Travel Award
2011	<b>Boeing Award</b> for <i>outstanding research, teaching and service</i> , Applied Math, UW
2011	<b>SIAM Early Career</b> Travel Award
2010	Highly Downloaded Collection in Nonlinearity
2009	SIAM Student Travel Award
2007	DANCE Spanish network award for RTNS winter school in DS
2006	BIRS workshop award on Evolution of microscopic and macroscopic fields
2005	Adi Shamir travel award, Weizmann Institute
2005	SIAM Student Travel Award
2005-2009	Feinberg graduate school full scholarship, Weizmann Inst.
2003	NATO ASI Summer School Scholarship
2002	B.Sc. magna cum laude, honors thesis, Bar-Ilan University

## Research Coverage

### Audio to Body

#### Dynamics

CNBC

UK YAHOO

[Facebook researchers think poses could be predicted from audio](#)

[Facebook A.I. researchers figured out how to make avatars look like they're playing music](#)

## Monarch Navigation

Blog	<a href="#">Time-compensated sun compass in the migrating monarch butterfly</a>
<a href="#">Cell News</a>	<a href="#">Modeling a monarch butterfly's personal compass</a>
<a href="#">UW News</a>	<a href="#">Scientists crack secrets of the monarch butterfly's internal compass</a>
Newspapers	<a href="#">BBC News</a>   <a href="#">BBC Science Video</a>   <a href="#">Daily Mail</a>   <a href="#">The Telegraph</a>   <a href="#">CBC News</a>
Online media	<a href="#">Mexico News Daily</a>   <a href="#">Australia Network News</a>   <a href="#">Gizmodo</a>   <a href="#">China.org</a>   <a href="#">National Post</a>   <a href="#">Phys.Org</a>   <a href="#">Value Walk</a>   <a href="#">CSMonitor</a>   <a href="#">Gazeta.ru</a>   <a href="#">La Vanguardia</a>   <a href="#">CDA News</a>   <a href="#">The British Journal</a>   <a href="#">WIRED.IT</a>   <a href="#">Science News</a>   <a href="#">Science 2.0</a>   <a href="#">Tech Times</a>   <a href="#">Weekly Observer</a>   <a href="#">Fox News</a>   <a href="#">Technology</a>   <a href="#">Nacional ...</a>
Radio	<a href="#">BBC World Series</a>   <a href="#">BBC World Series AM</a>   <a href="#">Sirius FM</a>   <a href="#">KCBS</a>

## Data Science

<a href="#">UW EE News</a>	<a href="#">Eli Shlizerman Appointed UW eScience Institute Data Science Fellow</a>
<a href="#">UW EE News</a>	<a href="#">Capstone Project Tracks Urban Air Quality</a>

## Olfactory Network

<a href="#">"Science" News</a>	<a href="#">Car exhaust keeps moths from smelling the roses</a>
<a href="#">"Science" Perspective</a>	<a href="#">Follow the odor</a>
<a href="#">UW News</a>	<a href="#">Foul fumes derail dinner for hungry moths</a>
<a href="#">The Daily UW</a>	<a href="#">Giant moths experience the world through scent</a>
Newspapers	<a href="#">NY Times</a>   <a href="#">BBC Nature</a>   <a href="#">Daily Mail UK</a>   <a href="#">KPLU (NPR)</a>   <a href="#">Slashdot</a>   <a href="#">Reuters</a>   <a href="#">Russia 24</a>   <a href="#">Tech Times</a>   <a href="#">Climate Progress</a>   <a href="#">Canada Journal</a>   <a href="#">Frankfurter AZ</a> ...
TV	<a href="#">KIRO TV</a>   <a href="#">Q13FOX</a>

## Teaching

### *Instructor @ UW*

Winter/Spring UW EE Engineering Entrepreneurial Capstone (Crowdsensing 1,2,3)  
2015-2018

Fall 2015&	Scientific Computing Undergraduate (AMATH 481)
Fall 2014&	Scientific Computing Graduate On Campus & Online (AMATH 581 A,B,C,D)
Fall 2013	Scientific Computing Undergraduate (AMATH 481)
	Scientific Computing Graduate On Campus & Online (AMATH 581 A,B,C,D)
	Number of Students (total): <b>125</b>
Fall 2012	Applied PDEs and Fourier Analysis (AMATH 353), Number of Students: <b>55</b>
	Introduction to Scientific Computing (AMATH 301 A,B), Number of students: <b>180</b>
Spr 2012	Introduction to Scientific Computing (AMATH 301 A,B,C), Number of students: <b>340</b>
Fall 2011	Beginning Scientific Computing (AMATH 301 A,B,C), Number of students: <b>250</b>
Fall 2010	

### *Reading / Indep. Research Advisor @ UW*

Fall 2015	Undergraduate Research Study (AMATH 499)
Fall 2014	PhD Independent Research Study (AMATH 600)
	Masters Independent Research Study (AMATH 600)
	Master Thesis (AMATH 700)
Sum 2014	Undergraduate Research Study (AMATH 499)
	Master Thesis (AMATH 700)
Spr 2014	Masters Independent Research Study (AMATH 600)

Win 2014 Masters Independent Research Study (AMATH 600)  
Fall 2013 Masters Independent Research Study (AMATH 600)  
2012 Masters Independent Research Study (AMATH 600)  
2011 Masters Independent Research Study (AMATH 600)

**Teaching Assistant @ Weizmann Inst. Sci.**

2007-2008 Dynamical Systems and Modeling  
2008 Students Course on Dynamical systems, Mechanics and Chaos

**Research Students**

2017- *Yi Chu, MSc Candidate, AMATH, UW*  
Project: Neuromorphic convolutional neural networks

2017- *Yuying Liu, PhD Candidate, AMATH, UW*  
Project: Dynamical systems approach to neural networks

2017- *Kate Jung, PhD Candidate, EE, UW (COE Fellowship)*  
Project: Olfactory learning mechanisms

2017 *Lucio Dery, Research Intern, Facebook (URM, CMU PhD Candidate)*  
Project: Correlation of audio and body landmarks via LSTMs

2016-2018 *Kelly Liu, MSc, AMATH, UW (J Hammack Prize)*  
Project: Functional Connectomics of neural networks

2016- *Jimin Kim, PhD Candidate, EE, UW*  
Project: Interactive interfaces to neural dynamics; Neural dynamics to behavior

2012-2016 *James Kunert, PhD, Physics & AMATH, UW (joint w. JN Kutz)*  
Project: Dynamics of *C. elegans* connectome.

2014-2016 *Julia Santos, MSc (thesis), AMATH, UW (J Hammack Prize)(Data Research Scientist at Google)*  
Project: Feedback control algorithms for neuronal networks.

2014-2016 *S. Grant Babb, MSc, AMATH, UW (now: Data Research Scientist at Intel)*  
Project: Probabilistic graphical models for dynamic networks.

2013-2014 *Judith Moore, MSc, AMATH, UW*  
Project: Dynamical models for a network connectome.

2014 Spr *Derek Hendwerk, MSc, AMATH, UW (now: PhD student at Colorado State)*  
Project: Continuation methods to detect Hopf bifurcations in a large network.

2013 *Thomas Mikula, MSc, AMATH, UW (now: Sr. Decision Analyst, Highmark Inc.)*  
Project: Synaptic integration in nonlinear dendrites.

2012 Fall *Syuzanna Sargsyan, Msc, AMATH, UW (now: PhD student at AMATH UW)*  
Project: Nonlinear dimension reduction for the Fermi-Pasta-Ulam problem.

2010-2011 *Charles Delahunt, PhD, EE, UW (now: Intellectual Ventures)*  
Project: Learning algorithms for excitatory-inhibitory neural networks with feedback.

2010-2011 *Nomin Oyun, Noshad Bagha, Undergrad. EE, UW (now: Nomin is PhD student at UBC)*  
Project: Building electronic circuits mimicking the dynamics of coupled neural networks.

2009-2011 *Matthew Glibboff, PhD, Physics, UW (now: adjunct faculty, UW Tacoma)*  
Project: Computational study of sub-populations dynamics in networks of neurons.

- 2009-2012 *Matthew Williams, PhD, AMath, UW (now: NSF Postdoc, Princeton)*  
 Projects: Dimension reduction and bifurcation study of governing PDEs for waveguide array lasers and gravity periodic waves. Publications [11,12,13,14,16].
- 2009-2010 *Konrad Schroder, MSc, AMATH, UW (now: UW HTI-LAB Asst. Director)*  
 Project: Comp. modeling of synchronous dynamics in networks of neurons. Publication [10].
- 2009-2011 *Edwin Ding, PhD, AMATH, UW (now: assist. prof. at Azusa Pacific)*  
 Projects: Application of dimension reduction to the dynamics of ring cavity mode-locking lasers. Mean-field modeling of ring cavity lasers. Publications [14,15,17].

### **Invited Talks and Conferences**

- 2018 Royal Society London (The mind of the worm)  
 SIAM LS (invited minisymposium)  
 CVPR (Spotlight)
- 2017 SFN  
 UW Undergraduate ACMS Lecture  
 GSA C. elegans: i) Neural Interactome ii) Network analyses and experimental approaches  
 NIPS Workshop on Big data for Brain
- 2016 Sloan-Swartz meeting in Computational Neuroscience (invited)  
 OCNS: i) C. elegans Interactome ii) Inference of Network structure from dynamics  
 FACM (invited minisymposium)  
 COSYNE: i) Neural integration in time-compensated sun compass of the monarch butterfly  
 UW Institute for Neural Engineering Meeting  
 SAP Special Interest Group Data Science & Machine Learning (invited)
- 2015 UW EE Colloquium (invited)  
 UW NeuroBio Undergraduate seminar (invited)  
 KITP Program on 'Deconstructing the sense of smell'  
 Cornell University (invited)  
 Indiana University (invited)  
 UT Austin (invited)  
 UC Santa Cruz (invited)  
 UW Data-science seminar (invited)  
 COSYNE, Salt Lake City  
 IMACS 9th conference, Atlanta (invited)
- 2014 SIAM Dyn. Sys. (SIADS), Snowbird (invited)  
 Q-Bio Summer School (invited lectures)  
 Soc. for Neuro. (SFN), Washington DC  
 COSYNE, Salt Lake City, March
- 2013 SFN, San Diego, Nov  
 Bio. Med. Eng. Soc., Seattle, Sep
- 2012 SIAM Dyn. Sys. (SIADS), Snowbird, SLC, May  
 Comp. Neuro. Soc (CNS), Atlanta, July  
 Am. Math. Soc. (AIMS), Orlando, July  
 SIAM NW & CS, Seattle, July  
 WAVES, Vancouver, July  
 Neuro Connections, U. Washington  
 U. Minnesota, May  
 Clarkson U., Apr.  
 Virginia Tech, Mar.  
 U. Washington, Mar.  
 U. Nebraska-Lincoln, Jan.  
 The Hebrew U., Jan.

2011 Weizmann Inst. of Science, Dec.  
University of Oxford, Dec.  
U. Washington, Nov.  
Columbia U., Oct.  
Princeton U., Oct.  
Cornell U., Oct.  
Brown U., Oct.  
Boston U., Oct.  
FACM, NJIT, June  
SIAM DS, Snowbird, May  
SPIE OPTO Photonics West, San Francisco, Jan  
UC Berkeley, Apr.

2010 Princeton U., Feb.  
ICAND , Lake Louise, Canada, Sep  
Young Researchers workshop, MBI, Ohio State, Aug.  
SIAM NW and CS, Philadelphia, August

2009 Tel Aviv U., May  
UC Santa Barbara}, Feb 2009  
Brown U., 2009  
Columbia U.,2009

2008 Stability and Instability in Mechanical Systems, Barcelona, December  
SIAM NW and CS, Rome, July

2007 SIAM DS, Snowbird, May

2006 Columbia University, Jul. 2006

2005 Caltech, Jun. 2005  
SIAM DS, Snowbird, May, 2005

### Professional Activities

Leadership UW CNC: UW Computational Neuroscience Center  
Core Faculty UW eScience  
UWIN: UW Institute for neural engineering

Committees Masters program in data science  
UW EE students fellowship committee

Seminars Organizer Network Computation Workgroup, UW (2013-2015)  
Boeing Distinguished Colloquium, AMATH, (2009-2012)

UW Representative NSF Math. Bio. Inst. (MBI) (2013-)

PC Bio. Med. Eng. Soc. (BMES) Annual Conference (Symposium chair), 2013  
SIAM NW and CS Conference (Local Chair, Symposium organizer), 2012  
SIAM DS Conference (Symposium organizer), 2011  
SIAM NW and CS Conference (Symposium organizer), 2010

Reviewer NSF Panelist, Opinion in Neurobiology, Nature Reviews, PLOS  
Computational Biology, Frontiers in Neuroscience, PLOS One, BMES Proc.,  
Physics Review E, Nonlinearity, SIAM J. on Applied Dyn Sys., SIAM J. on  
Applied Math., Physica D, Physics Letters A, New Journal of Physics,  
Scientific Reports, Chaos

Member SFN, OCNS, BMES, SIAM, IEEE, MBI

## Publication List

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- [1] K. Jung, J. A. Riffell, and E. Shlizerman, “Modeling network connectivity for dopamine-mediated olfactory learning in mosquitoes,” *Society for Neuroscience*, 2018.
- [2] E. Shlizerman, L. Dery, H. Schoen, and I. Kemelmacher-Shlizerman, “Audio to body dynamics,” in *Proc. CVPR*, 2018.
- [3] H. Liu, J. Kim, and E. Shlizerman, “Functional connectomics from neural dynamics: probabilistic graphical models for neuronal network of caenorhabditis elegans,” *Phil. Trans. R. Soc. B*, vol. 373, no. 1758, p. 20170377, 2018.
- [4] A. K. Barreiro, J. N. Kutz, and E. Shlizerman, “Symmetries constrain dynamics in a family of balanced neural networks,” *The Journal of Mathematical Neuroscience*, vol. 7, no. 1, p. 10, 2017.
- [5] D. Blaszkza, E. Sanders, J. A. Riffell, and E. Shlizerman, “Classification of fixed point network dynamics from multiple node timeseries data,” *Frontiers in neuroinformatics*, vol. 11, p. 58, 2017.
- [6] J. M. Kunert-Graf, E. Shlizerman, A. Walker, and J. N. Kutz, “Multistability and long-timescale transients encoded by network structure in a model of *C. elegans* connectome dynamics,” *Frontiers in computational neuroscience*, vol. 11, p. 53, 2017.
- [7] B. Deconinck, Q. Guo, E. Shlizerman, and V. Vasan, “Fokas’s uniform transform method for linear systems,” *Quarterly of Applied Mathematics*, vol. 76, pp. 463–488, 2017.
- [8] J. Kim, W. Leahy, and E. Shlizerman, “Neural interactome: Interactive simulation of a neuronal system,” *bioRxiv*, p. 209155, 2017.
- [9] E. Shlizerman, J. Phillips-Portillo, D. B. Forger, and S. M. Reppert, “Neural integration underlying a time-compensated sun compass in the migratory monarch butterfly,” *Cell reports*, vol. 15, no. 4, pp. 683–691, 2016.
- [10] J. Santos and E. Shlizerman, “Closing the loop: optimal stimulation of *C. elegans* neuronal network via adaptive control to exhibit full body movements,” *BMC neuroscience*, vol. 16, no. 1, p. O14, 2015.
- [11] E. Shlizerman and G. Babb, “Inference of functional sub-circuits in the dynamical connectome of the *C. elegans* worm,” *Computational Systems and Neuroscience (COSYNE)*, 2015.
- [12] J. Kunert, E. Shlizerman, and J. N. Kutz, “Identifying proxies for behavior in full-network *C. elegans* neural simulations,” *Computational Systems and Neuroscience (COSYNE)*, 2015.
- [13] J. Kunert, E. Shlizerman, and J. N. Kutz, “Low-dimensional functionality of complex network dynamics: Neurosensory integration in the caenorhabditis elegans connectome,” *Physical Review E*, vol. 89, no. 5, p. 052805, 2014.
- [14] J. A. Riffell, E. Shlizerman, E. Sanders, L. Abrell, B. Medina, A. J. Hinterwirth, and J. N. Kutz, “Flower discrimination by pollinators in a dynamic chemical environment,” *Science*, vol. 344, no. 6191, pp. 1515–1518, 2014.
- [15] E. Shlizerman, J. A. Riffell, and J. N. Kutz, “Data-driven inference of network connectivity for modeling the dynamics of neural codes in the insect antennal lobe,” *Frontiers in computational neuroscience*, vol. 8, p. 70, 2014.

- [16] J. Kunert, E. Shlizerman, and J. N. Kutz, “Investigating dynamical properties of the caenorhabditis elegans connectome through full-network simulations,” *BMC neuroscience*, vol. 14, no. 1, p. P229, 2013.
- [17] E. Shlizerman, K. Schroder, and J. N. Kutz, “Neural activity measures and their dynamics,” *SIAM Journal on Applied Mathematics*, vol. 72, no. 4, pp. 1260–1291, 2012.
- [18] E. Shlizerman and P. Holmes, “Neural dynamics, bifurcations, and firing rates in a quadratic integrate-and-fire model with a recovery variable. i: deterministic behavior,” *Neural computation*, vol. 24, no. 8, pp. 2078–2118, 2012.
- [19] E. Shlizerman, J. Riffell, and J. N. Kutz, “Modeling the dynamics of neural codes in the olfaction of the manduca-sexta moth,” *BMC neuroscience*, vol. 13, no. 1, p. O18, 2012.
- [20] M. O. Williams, E. Shlizerman, J. Wilkening, and J. N. Kutz, “The low dimensionality of time-periodic standing waves in water of finite and infinite depth,” *SIAM Journal on Applied Dynamical Systems*, vol. 11, no. 3, pp. 1033–1061, 2012.
- [21] E. Shlizerman and J. N. Kutz, “Analysis of the multi-pulsing instability in mode-locked lasers using dynamical dimension reduction,” in *Integrated Photonics Research, Silicon and Nanophotonics*, pp. JM5A–42, Optical Society of America, 2012.
- [22] E. Ding, W. H. Renninger, F. W. Wise, P. Grelu, E. Shlizerman, and J. N. Kutz, “High-energy passive mode-locking of fiber lasers,” *International journal of optics*, vol. 2012, 2012.
- [23] E. Shlizerman, E. Ding, M. O. Williams, and J. N. Kutz, “The proper orthogonal decomposition for dimensionality reduction in mode-locked lasers and optical systems,” *International Journal of Optics*, vol. 2012, 2012.
- [24] M. O. Williams, J. Wilkening, E. Shlizerman, and J. N. Kutz, “Continuation of periodic solutions in the waveguide array mode-locked laser,” *Physica D: Nonlinear Phenomena*, vol. 240, no. 22, pp. 1791–1804, 2011.
- [25] E. Ding, E. Shlizerman, and J. N. Kutz, “Generalized master equation for high-energy passive mode-locking: the sinusoidal ginzburg–landau equation,” *IEEE journal of quantum electronics*, vol. 47, no. 5, pp. 705–714, 2011.
- [26] E. Ding, E. Shlizerman, and J. N. Kutz, “Energy enhancement in mode-locked lasers using sinusoidal transmission functions for saturable absorption,” in *Physics and Simulation of Optoelectronic Devices XIX*, vol. 7933, p. 793323, International Society for Optics and Photonics, 2011.
- [27] M. O. Williams, E. Shlizerman, and J. N. Kutz, “The multi-pulsing transition in mode-locked lasers: a low-dimensional approach using waveguide arrays,” *JOSA B*, vol. 27, no. 12, pp. 2471–2481, 2010.
- [28] E. Ding, E. Shlizerman, and J. N. Kutz, “Modeling multipulsing transition in ring cavity lasers with proper orthogonal decomposition,” *Physical Review A*, vol. 82, no. 2, p. 023823, 2010.
- [29] E. Shlizerman and V. Rom-Kedar, “Classification of solutions of the forced periodic nonlinear schrödinger equation,” *Nonlinearity*, vol. 23, no. 9, p. 2183, 2010.
- [30] E. Shlizerman and V. Rom-Kedar, “Parabolic resonance: A route to hamiltonian spatiotemporal chaos,” *Physical review letters*, vol. 102, no. 3, p. 033901, 2009.

- [31] E. Kirr, P. Kevrekidis, E. Shlizerman, and M. I. Weinstein, “Symmetry-breaking bifurcation in nonlinear schrödinger/gross–pitaevskii equations,” *SIAM Journal on Mathematical Analysis*, vol. 40, no. 2, pp. 566–604, 2008.
- [32] E. Shlizerman and V. Rom-Kedar, “Three types of chaos in the forced nonlinear schrödinger equation,” *Physical review letters*, vol. 96, no. 2, p. 024104, 2006.
- [33] E. Shlizerman and V. Rom-Kedar, “Hierarchy of bifurcations in the truncated and forced nonlinear schrödinger model,” *Chaos: An Interdisciplinary Journal of Nonlinear Science*, vol. 15, no. 1, p. 013107, 2005.
- [34] E. Shlizerman and V. Rom-Kedar, “Energy surfaces and hierarchies of bifurcations,” in *Chaotic Dynamics and Transport in Classical and Quantum Systems*, pp. 189–223, Springer, 2005.