

Keiland W. Cooper

Graduate Scholar
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EDUCATION

University of California, Irvine

Ph.D., Neurobiology and Behavior
Advisors: Dr. Norbert Fortin

In progress

Indiana University, Bloomington

B.S., Cognitive Science *with Honors*;
Computation specialization
Certificate in Neuroscience; Minor in Psychology
Advisors: Dr. Ehren Newman, Dr. Mike Jones

May the Fourth, 2019

RESEARCH EXPERIENCE

2019-now	with Dr. Norbert Fortin Neuroscience - <i>Non-spatial theta sequences and precession</i> - <i>11 brain region electrophysiology</i>
2020-now	with the GCCR Neuroscience - <i>COVID-19 and the chemical senses</i>
2020-now	with ContinualAI Research Artificial Intelligence - <i>Building tools to aid AI research</i>
2019-2020	with Dr. Bruce McNaughton Neuroscience - <i>Hippocampal and cortical replay during sleep</i>
2016-2019	with Dr. Ehren Newman Neuroscience / Cognitive Science - <i>Computational modeling of ACh + brain oscillations</i> - <i>Entorhinal region electrophysiology</i> - <i>Hippocampal imaging with Miniscopes</i> - <i>Theta + optic flow rodent behavior</i>
2018-2019	with Dr. Mike Jones Cognitive Science - <i>Catastrophic Forgetting in connectionist language models</i>
2017-2018	with Dr. Amit Hagar Philosophy + Physics - <i>The natural computation of the brain</i>
2015-2016	with Dr. Susane Ressler Microbiology - <i>Structural biochemistry of synaptic proteins</i>

AWARDS	School of Biological Sciences Travel Award	<i>UC BioSci</i>	2021
	Norman Weinberger Award	<i>UC Irvine CNLM</i>	2021
	Graduate Research Fellowship (GRFP)	<i>National Science Foundation</i>	2021
	Best International AI Research Organization	<i>Wealth & Finance</i>	2020
	DTEI Pedagogical Fellowship	<i>UC Irvine</i>	2020
	Cognitive Science Outstanding Research	<i>Indiana University</i>	2019
	GRFP (Honorable Mention)	<i>National Science Foundation</i>	2018
	Outstanding Contribution in Cognitive Science	<i>Indiana University</i>	2018

PREPRINTS **stars** = mentee; **bold** = me

- [11] Increasing incidence of parosmia and phantosmia in patients recovering from COVID-19 smell loss.
Ohla, K., Veldhuizen, M.G., Green, T., Hannum, M.E., Bakke, A.J., Moein, S., Tognetti, A., Postma, E.M., Pellegrino, R., ... **Cooper, K. W.**, ... Hwang, L.D. and Albayay, J.. (2021) medRxiv
- [10] Hippocampal ensembles represent sequential relationships among discrete nonspatial events
Shahbaba, B., Li, L., Agostinelli, F., Saraf, M., Elias, G. A., **Cooper, K. W.**, Baldi, P., Fortin, N. J.. (2021) Accepted

- PEER
REVIEWED [9] Avalanche: an End-to-End Library for Continual Learning
Vincenzo Lomonaco, Lorenzo Pellegrini, Andrea Cossu, Antonio Carta, Gabriele Graffieti, ... **Keiland Cooper**, ... Davide Bacciu, Davide Maltoni. (2021) Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition
↳ *Won CLVision WB Best Library Award*
- [8] Recent smell loss is the best predictor of COVID-19 among individuals with recent respiratory symptoms.
Gerkin, R. C., Ohla, K., Veldhuizen, M. G., Joseph, P. V., Kelly, C. E., Bakke, A. J., ... **Cooper, K.W.** ... and Baguma, M. . (2020) Chemical senses
- [7] Smell and taste changes are early indicators of the COVID-19 pandemic and political decision effectiveness.
Pierron, D., Pereda-Loth, V., Mantel, M., Moranges, M., Bignon, E., Alva, O., **Cooper, K. W.**, ... Dinnella, C. . (2020) Nature Communications
↳ *#4 of Top 100 Nature Communications papers of 2020*
- [6] COVID-19 and the chemical senses: supporting players take center stage.
Cooper, K. W., Brann, D.H., Farruggia, M.C., Bhutani, S., Pellegrino, R., Tsukahara, T., Weinreb, C., Joseph, P.V., Larson, E.D., Parma, V. and Albers, M.W.,. (2020) Neuron
↳ *Top 10 Neuron papers of 2020*
- [5] More than smellCOVID-19 is associated with severe impairment of smell, taste, and chemesthesis.
Parma, V., Ohla, K., Veldhuizen, M. G., Niv, M. Y., Kelly, C. E., Bakke, A. J., **Cooper. K. W.**, ..., Hayes, J. E.. (2020) Chemical Senses

- [4] Coronaviruses and the chemical senses: past, present, and future
Pellegrino, R., **Cooper, K. W.**, Di Pizio, A., Joseph, P. V., Bhutani, S., and Parma, V. . (2020) Chemical senses
- [3] Medial entorhinal cortex activates in a traveling wave in the rat
Hernandez-Perez, J. J., **Cooper, K. W.**, Newman, E. L.. (2020) eLife
- [2] Can the Machine Understand: An Evidence Based Approach to the Chinese Room
Cooper, K. W.. (2018) IU Journal of Undergraduate Research

THESIS

- [1] Cholinergic modulation may explain hippocampal encoding and retrieval mode switching
Cooper, K. W.. (2019) Indiana University, Bloomington Undergraduate Thesis

Total citations (as of last update):

🔍 Google Scholar: **593** | 🔍 Semantic Scholar: **526**

SELECTED ABSTRACTS + TALKS

****stars**** = mentee; **bold** = me

- [21] Hippocampal ensembles represent the sequential order of nonspatial events.
Cooper KW, Li L, Saraf MP, Elias GA, Baldi P, Shahbaba B, Fortin NJ. (2021) Plexon Data Blitz.
- [20] Hippocampal ensembles represent the sequential order of nonspatial events.
Cooper KW, Li L, Saraf MP, Elias GA, Baldi P, Shahbaba B, Fortin NJ. (2021) Program No P858.03. Chicago, IL: Society for Neuroscience.
- [19] Medial prefrontal cortex represents ordinal position within a sequence of events.
Elias GA, Tran AH, Saraf MP, **Cooper KW**, Shahbaba B, Fortin NJ. (2021) Program No P858.01. Chicago, IL: Society for Neuroscience.
- [18] The sequential organization of hippocampal ensemble activity provides a key temporal signal supporting the memory for the order of events.
Saraf MP, Haghverdian D, **Cooper KW**, Elias GA, Shahbaba B, Fortin NJ. (2021) Program No P858.02. Chicago, IL: Society for Neuroscience.
- [17] Deep neural network models learn distinguishable features from hippocampal local field potential and ensemble data
****Pan, C. J., Cooper, K. W.**, Li, L., Agostinelli, F., Saraf, M., Elias, G. A., Baldi, P., Shahbaba, B., Fortin, N. J.. (2021) UROP Symposium.
- [16] Avalanche: an End-to-End Library for Continual Learning
Cooper K. W., Lomonaco, V., Pellegrini, L., Carta, A., Cossu, A., Graffieti, G.. (2021) ContinualAI Meetup.
- [15] Hippocampal theta oscillations support nonspatial sequence coding in hippocampal neurons
Cooper, K. W., Shahbaba, B., Li, L., Agostinelli, F., Saraf, M., Elias, G. A., Bornstein, A., Baldi, P., Fortin, N. J.. (2021) SFN Global Connectome.
- [14] The neuroscience and AI feedback loop: Catastrophic Forgetting and Sequences
Cooper, K. W.. (2020) UCI AGS Symposium.

- [13] The Art of Email
Cooper K. W. (2020) UCI GPS-STEM.
- [12] Dual processes of hippocampal mode switching
Cooper, K. W. (2020) Neuromatch online Conference.
- [11] Continual Learning: neuroscience + AI.
Cooper, K. W. (2020) Contiuat AI Meetup.
- [10] Cholinergic abolition disrupts encoding and retrieval mode switching
Cooper, K. W. (2020) 11th Annual Emerging Scientists Symposium.
- [9] The neuroscience amd AI feedback loop
Cooper, K. W. (2019) UCI Brain.
- [8] On neuroscience and AI
Cooper, K. W. (2019) IUJUR Research Slam.
- [7] Is theta a traveling wave in the medial entorhinal cortex?
Hernández J, **Cooper, K. W.**, Newman E.L.. (2018) Program No. 330.10. Society for Neuroscience.
- [6] Consequences of Catastrophic Forgetting on Semantic Representations Learned by Deep Neural Embedding Models
Cooper, K. W., Dachapally P.R, Jones M.N. (2018) Midwest CogSci.
↳ *Best poster award*
- [5] Is theta in the Medial Entorhinal Cortex a Traveling Wave?
Cooper, K. W., Hernández, J., Newman, E.L.. (2018) Society for Neuroscience, Greater Indiana Chapter.
- [4] 3D Brain Model Extraction and Virtual Applications
Cooper, K. W. (2018) (Panelist) Media School Graduate Association Conference.
- [3] FlapAI: Genetically Evolved Neural Networks
Cooper, K. W. (2018) Midwest Undergraduate Cognitive Science Conference.
- [2] Bridging the Gap: Natural Computation and Neural Systems
Cooper, K. W. (2017) Indiana University Undergraduate Research Conference.
- [1] Downstream Hippocampal Activity Prediction with Neural Networks
Cooper, K. W., Osborn, Z.. (2016) Midwest Undergraduate Cognitive Science Conference.

TEACHING

as Co-Instructor:

Continual Learning	<i>Neuromatch</i>	<i>enrollment:</i> 5000+	<i>Su</i> 2021
Autonomous Robotics	<i>Indiana Univ.</i>	18	<i>Sp</i> 2019
Programming in Cognitive Sciences	<i>Indiana Univ.</i>	27	<i>Sp</i> 2018

as Teaching Assistant:

Mind, Memory, and the Brain	<i>UC Irvine</i>	<i>enrollment:</i> 142	<i>Sp</i> 2021
Neurobiology and Behavior Laboratory	<i>UC Irvine</i>	196	<i>Wt</i> 2020
Neurobiology and Behavior Laboratory	<i>UC Irvine</i>	93	<i>Fa</i> 2020
Brain and Behavior	<i>UC Irvine</i>	366	<i>Fa</i> 2020
Cognitive Psychology	<i>Indiana Univ.</i>	80	<i>Fa</i> 2018
Introduction to Neuroscience	<i>Indiana Univ.</i>	106	<i>Fa</i> 2017

MENTORED STUDENTS	Tien Lam	<i>now preparing for medical school</i>	
	Brandon McIntosh	<i>now preparing for medical school</i>	
	Chelsea Pan	<i>now Zendesk</i>	
	Troy Good	<i>now Amazon</i>	
NETWORKS	<i>Present:</i>		
	Cognitive Science Society		Society for Neuroscience
	Continual AI (co-founder)		Indiana Academy of Science
	Psi Chi		Sigma Xi
	Sigma Alpha Pi		Carboncopies Foundation
	AI for People		Internet Society
	<i>Past:</i>		
	IU Student Org. for Cog Sci (President)		ADAPT Consulting (VP)
SCI COMM + OUTREACH	AskANeuroscientist	<i>Founder; Live Q/A via in class video-chat (>400 students)</i>	
	Hoosier STARS	<i>Co-founder; K-12 neuro demos reaching >300 students</i>	
	Quora Writer	<i>Answers to neuroscience and AI questions (800k+ views)</i>	
	CNLM Ambassadors	<i>Co-chair; SoCal Learning and memory outreach</i>	
	The Boys and Girls Club	<i>Taught primary school aged students about the brain</i>	
	IU Science Fest	<i>Led a booth with hands on sheep brain interaction</i>	
	Celebrate Science Indiana	<i>Led an EEG and brain booth > 500 people</i>	
	Observatory Guide	<i>Volunteer astronomical guide at the Kirkwood Observatory</i>	
UNIVERSITY SERVICE	UC Advocacy Network Ambassador	<i>University of California, Irvine</i>	<i>2021 -</i>
	End Racism Initiative	<i>University of California, Irvine</i>	<i>2020 -</i>
	Education Policy Committee	<i>Indiana University</i>	<i>2016 - 2017</i>
	Faculty Council	<i>Indiana University</i>	<i>2016 - 2017</i>
	Office of First Year Experience	<i>Indiana University</i>	<i>2015 - 2016</i>
REFeree SERVICE	Physiological Reviews		
	CLVision @ CVPR		

TRAININGS + WORKSHOPS	FFASt Workshop on Scientific Leadership	UC Irvine	2021
	Certified Peer Reviewer	Elsevier	2020
	Computational Psychiatry Course	University of Zurich	2020
	The Meaning and History of the Constitution	Hillsdale College	2020
	Estes Cognitive Electrophysiology Workshop	University of Pennsylvania	2020
	NIH Grant Writing Workshop	UC Irvine	2020
	HHMI Productivity Workshop	UC Irvine	2020
	Nonlinear Dynamics: Math. and Comp. Approaches	Santa Fe Institute	2019
	Complexity Science	Santa Fe Institute	2018
	Science Communication Workshop	Indiana University	2017
	High Performance / Supercomputing Workshop	Indiana University	2017
	Aseptic Surgery: Proper Practice Training	Indiana University	2016
	Animal Handling and Animal Care Training	Indiana University	2016
	IUNI Network Science Workshop	Indiana University	2016
	First Aid and CPR Certified	American Red Cross	2014
	Pediatric Neurosurgery Shadowing	Riley Hospital	2014

OPEN DATASETS	[3] Hippocampal ensembles represent sequential relationships among an extended sequence of nonspatial events (2021) Dryad
	[2] GCCR COVID-19 Questionnaire (2020) OSF
	[1] Extracellular recordings from across the dorsoventral axis of the medial entorhinal cortex of the rat. hc-27 (2020) CRCNS

PRESS	[23] John Desmond (April 15, 2021) <i>Scientists Working on Continual Learning to Overcome Catastrophic Forgetting</i> . AI Trends
	[22] Kyle Wiggers (April 9, 2021) <i>AI Weekly: Continual learning offers a path toward more humanlike AI</i> . VentureBeat
	[21] (April 8, 2021) <i>ContinualAI Releases Avalanche: An End-to-End Library for Continual Learning</i> . Synced Review
	[20] Grace Hauck (January 31, 2021) <i>Millions of COVID-19 survivors have lost senses of smell and taste. Researchers don't know if they'll come back</i> . USA Today
	[19] Brooke Jarvis (January 28, 2021) <i>What Can Covid-19 Teach Us About the Mysteries of Smell?</i> . The New York Times Magazine
	[18] Misha Gajewski (December 9, 2020) <i>Is Losing Your Sense Of Smell And Taste The First Sign Of Covid-19? More Research Says Yes</i> . Forbs
	[17] Vincent Racaniello (October 18, 2020) <i>TWiV 673: Wake up and smell the pandemic</i> . This Week In Virology
	[16] Sara Harrison (August 5, 2020) <i>Many COVID-19 patients lost their sense of smell. Will they get it back?</i> . National Geographic

- [15] Bob Curley (July 7, 2020) *Lifestyle Changes You Can Make to Help Lower the 19 Risk Factors for Alzheimers*. Healthline
- [14] Salynn Boyles (July 6, 2020) *Majority of Patients with Mild Covid-19 Experience Altered Smell/Taste*. Physicians Weekly
- [13] Katie Boateng (June 15, 2020) *Episode 64 - An Interview with Some of the Authors*. The Smell Podcast
- [12] Leslie Kay (June 13, 2020) *Why COVID-19 Makes People Lose Their Sense of Smell*. Scientific American
- [11] John E Hayes, Valentina Parma (June 4, 2020) *COVID-19, smell and taste how is COVID-19 different from other respiratory diseases?* . The Conversation
- [10] Anthony Cusumano (February 2, 2020) *What a difference a decade makes..* Katalys Tech
- [9] Kevin Casey (September 30, 2019) *5 AI fears and how to address them..* The Enterprisers Project
- [8] Kevin Casey (September 17, 2019) *How to explain natural language processing (NLP) in plain English*. The Enterprisers Project
- [7] David Roe (August 27, 2019) *Is Augmented Artificial Intelligence Already Disrupting Artificial Intelligence?*. CMS Wire
- [6] Kristine Fellizar (August 7, 2019) *Why Is My Arm Asleep? 6 Reasons Your Limbs Go Numb When You're Sleeping*. Bustle
- [5] Lauren Wellbank (August 1, 2019) *Neuralink Update: How far off is Elon Musks high tech vision for our brains?*. Parentology
- [4] Tina Arnoldi (July 19, 2019) *Ready for Amazon to Read Human Emotions?*. Theravive
- [3] Ann Lewandowski (September 28th, 2018) *IU undergraduates practice science outreach at Indiana high schools*. IDS
- [2] Alexandra Moussa-Tooks (August 14, 2018) *The art of dissemination part 3: Care to share?*. SclU
- [1] Liz Rosdeitcher (2017) *Community Partnerships..* Psyugrad

ERDÖS N=4

as of 2021:

Paul Erdős → Noga Alon → Nicolò Cesa-Bianchi → Fabio Cuzzolin

as of 2019:

Paul Erdős → Ronald L. Graham → Feng Zhou → Michael J. Kahana → Ehren L. Newman