

# Keiland W. Cooper

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National Science Foundation Fellow  
Department of Neurobiology and Behavior  
University of California, Irvine

✉ kwcooper@uci.edu  
🏠 kwcooper.com  
🆔 0002-0358-9645  
🐦 @kw\_cooper

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## Education

**University of California, Irvine**  
Ph.D., Neurobiology and Behavior  
*Advisors: Dr. Norbert Fortin*

*In progress*

**Quantic School of Business and Technology, D.C.**  
Master of Business Administration (MBA)

*March 16, 2022*

**Indiana University, Bloomington**  
B.S., Cognitive Science *with Honors*  
Computer science specialization  
Certificate in Neuroscience; Minor in Psychology  
*Advisors: Dr. Ehren Newman, Dr. Mike Jones*

*May the Fourth, 2019*

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## Research Experience

2019-now	•	with Dr. Norbert Fortin   Neuroscience - Non-spatial theta sequences and precession - 11 brain region electrophysiology
2020-now	•	with the GCCR   Neuroscience - COVID-19 and the chemical senses
2018-now	•	with ContinualAI   Artificial Intelligence - Building tools to aid AI research
2019-2020	•	with Dr. Bruce McNaughton   Neuroscience - Hippocampal and cortical replay during sleep
2016-2019	•	with Dr. Ehren Newman   Neuroscience / Cognitive Science - Computational modeling of ACh & neural oscillations - Entorhinal region electrophysiology & signal processing - Ca <sup>2+</sup> miniscope imaging & rodent behavior
2018-2019	•	with Dr. Mike Jones   Cognitive Science - Catastrophic Forgetting in connectionist language models
2017-2018	•	with Dr. Amit Hagar   Philosophy + Physics - The natural computation of the brain
2015-2016	•	with Dr. Susane Ressler   Microbiology - Structural biochemistry of synaptic proteins

## Awards

Graduate Travel Award	<i>UC Irvine</i>	2021
School of Biological Sciences Travel Award	<i>UC Irvine 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 &amp; 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

## Publications

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

- PREPRINTS [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
- PEER REVIEWED [10] Hippocampal ensembles represent sequential relationships among discrete nonspatial events  
Shahbaba, B., Li, L., Agostinelli, F., Saraf, M., **Cooper, K. W.**, Elias, G. A., Haghverdian, D., Baldi, P., Fortin, N. J..  
(2022) Nature Communications 13(1), 1-17
- [9] Avalanche: an End-to-End Library for Continual Learning  
Lomonaco, V., Pellegrini, L., Cossu, A., Carta, A., Graffieti, G., Hayes, T.L., ... **Cooper K. W.**, ... Bacciu D., Maltoni D..  
(2021) Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition 3600-3610  
↳ *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 46
- [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 11(1), 1-8.  
↳ *#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 107(2), 219-233

↳ *Top 10 Neuron papers of 2020*

- [5] More than smell COVID-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* 45(7), 609-622
- [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* 45(6), 415-422
- [3] Medial entorhinal cortex activates in a traveling wave in the rat  
Hernandez-Perez, J. J., **Cooper, K. W.**, Newman, E. L..  
(2020) *eLife* 9
- [2] Can the Machine Understand: An Evidence Based Approach to the Chinese Room  
**Cooper, K. W.**  
(2018) *IU Journal of Undergraduate Research* 4(1), 82-85

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: **743** | 🔍 Semantic Scholar: **699**

**Selected  
Abstracts  
+ Talks**

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

- [22] Stitching memories into predictable patterns  
**Cooper KW.** (2022) Neuroblitz.
- [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) Continual AI Meetup.**
- [10] Cholinergic abolition disrupts encoding and retrieval mode switching  
**Cooper, K. W.. (2020) 11th Annual Emerging Scientists Symposium.**
- [9] The neuroscience and 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

<i>as Co-Instructor:</i>		<i>enrollment:</i>	
Continual Learning	Neuromatch	5000+	Su 2021
Autonomous Robotics	Indiana Univ.	18	Sp 2019
Programming in Cognitive Sciences	Indiana Univ.	27	Sp 2018
<i>as Teaching Assistant:</i>		<i>enrollment:</i>	
Mind, Memory, and the Brain	UC Irvine	142	Sp 2021
Neurobiology and Behavior Laboratory	UC Irvine	196	Wt 2020
Neurobiology and Behavior Laboratory	UC Irvine	93	Fa 2020
Brain and Behavior	UC Irvine	366	Fa 2020
Cognitive Psychology	Indiana Univ.	80	Fa 2018
Introduction to Neuroscience	Indiana Univ.	106	Fa 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
Global Consortium for Chemosensory Research	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)

## SciComm + Outreach

AskANeuroscientist	<i>Founder; Live Q/A via in class video-chat (&gt;400 students)</i>
Hoosier STARS	<i>Co-founder; K-12 neuro demos reaching &gt;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 &gt; 500 people</i>
Observatory Guide	<i>Volunteer astronomical guide at the Kirkwood Observatory</i>

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## University Service

UC Advocacy Network Campus Leader	<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>

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## Referee Service

Physiological Reviews  
CLVision @ CVPR

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## Trainings + Workshops

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

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## 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
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## Press

- [26] (March 7, 2022) *Study reveals how the brain organizes memories.* Al Jazeera
- [25] Mary McGorray (January 14, 2022) *Predicting Alzheimers risk: Why cognitive testing alone may not work..* Medical News Today
- [24] David Oliver (December 22, 2021) *Has COVID destroyed our attention spans?.* USA Today

- [23] Jeanna D. Smiley (November 21, 2021) *Why are human neurons different from those of other mammals?*. Medical News Today
- [22] Kyle Wiggers (April 9, 2021) *AI Weekly: Continual learning offers a path toward more humanlike AI*. VentureBeat
- [21] (April 8, 2021) *ContinualAI Releases Avalanche: An End-to-End Library for Continual Learning*. Synced Review
- [20] Grace Hauck (January 31, 2021) *Millions of COVID-19 survivors have lost senses of smell and taste. Researchers don't know if they'll come back*. USA Today
- [19] Brooke Jarvis (January 28, 2021) *What Can Covid-19 Teach Us About the Mysteries of Smell?*. The New York Times Magazine
- [18] Misha Gajewski (December 9, 2020) *Is Losing Your Sense Of Smell And Taste The First Sign Of Covid-19? More Research Says Yes*. Forbs
- [17] Vincent Racaniello (October 18, 2020) *TWiV 673: Wake up and smell the pandemic. This Week In Virology*
- [16] Sara Harrison (August 5, 2020) *Many COVID-19 patients lost their sense of smell. Will they get it back?*. 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

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## Erdős N=3

*as of 2022:*

Paul Erdős → Richard M. Wilson → Pierre F. Baldi → me

*as of 2021:*

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

*as of 2019:*

Paul Erdős → Ronald Graham → Feng Zhou → Michael Kahana → Ehren Newman → me