

Taylor W. Webb

Contact	<i>Email:</i> taylor.w.webb@gmail.com	<i>Website:</i> taylorwwebb.github.io
Appointments	University of California, Los Angeles Postdoctoral Research Fellow Advisers: Keith Holyoak, Hongjing Lu, Hakwan Lau	Los Angeles, CA 2019 – 2024
	Princeton University Postdoctoral Research Fellow Adviser: Jonathan Cohen	Princeton, NJ 2018 – 2019
Education	Princeton University PhD, MA, Cognitive Psychology and Neuroscience Adviser: Michael Graziano	Princeton, NJ 2012 – 2018
	University of Southern California BA, Neuroscience BM, Music Composition	Los Angeles, CA 2005 – 2010
Awards	F32 Postdoctoral National Research Service Award (NIH)	2019 – 2021
	T32 Training Fellowship in Computational Neuroscience (NIH)	2018 – 2019
	Charlotte Elizabeth Procter Fellowship (Princeton University)	2017
	Graduate Student Teaching Award (Princeton University)	2017
	Graduate Student Fellowship (Princeton University)	2017
	Graduate Student Research Funding (Princeton University)	2016 – 2017
	Discovery Scholar Award (University of Southern California)	2010
Undergraduate Research Fellowship (Rose Hills Foundation)	2008 – 2010	
Research interests	Analogy and relational reasoning; metacognition; decision-making; visual attention; computational modeling; artificial intelligence; neuroimaging	
Publications	Webb, T. W. , Holyoak, K. J., & Lu, H. (2023). Emergent analogical reasoning in large language models. <i>Nature Human Behaviour</i> , 7, 1526-1541. doi.org/10.1038/s41562-023-01659-w	
	Webb, T. W.* , Fu, S.*, Bihl, T., Holyoak, K. J., & Lu, H. (2023). Zero-shot visual reasoning through probabilistic analogical mapping. <i>Nature Communications</i> , 15, 5144. doi.org/10.1038/s41467-023-40804-x . * Equal contribution	
	Webb, T. W. , Miyoshi, K., Yan So, T., Rajananda, S., & Lau, H. (2023). Natural statistics support a rational account of confidence biases. <i>Nature Communications</i> , 14, 3992. doi.org/10.1038/s41467-023-39737-2	

- Webb, T. W.***, Mondal, S. S.*, & Cohen, J. D. (2023). Systematic visual reasoning through object-centric relational abstraction. In *37th Conference on Neural Information Processing Systems (NeurIPS)*. doi.org/10.48550/arXiv.2306.02500.
- * Equal contribution
- Mondal, S. S.*, **Webb, T. W.***, & Cohen, J. D. (2023). Learning to reason over visual objects. In *11th International Conference on Learning Representations (ICLR)*. doi.org/10.48550/arXiv.2303.02260
- * Equal contribution
- Mondal, S. S., Frankland, S. M., **Webb, T. W.**, & Cohen, J. D. (2023). Determinantal Point Process Attention Over Grid Codes Supports Out-of-Distribution Generalization. *eLife*, *12*, RP89911. doi.org/10.7554/eLife.89911.1
- Webb, T. W.**, Sinha, I., & Cohen, J. D. (2021). Emergent symbols through binding in external memory. In *9th International Conference on Learning Representations (ICLR)*. doi.org/10.48550/arXiv.2012.14601
- Webb, T. W.**, Dulberg, Z., Frankland, S. M., Petrov, A. A., O'Reilly, R. C., & Cohen, J. D. (2020). Learning representations that support extrapolation. In *37th International Conference on Machine Learning (ICML)*. (pp. 10136-10146). doi.org/10.48550/arXiv.2007.05059
- Wilterson, A. I., Kemper, C. M., Kim, N., **Webb, T. W.**, Reblando, A. M., & Graziano, M. S. A. (2020). Attention control and the attention schema theory of consciousness. *Progress in Neurobiology*, *195*, 101844. doi.org/10.1016/j.pneurobio.2020.101844
- Guterstam, A., Kean, H. H., **Webb, T. W.**, Kean, F. S., & Graziano, M. S. A. (2019). Implicit model of other people's visual attention as an invisible, force-carrying beam projecting from the eyes. *Proceedings of the National Academy of Sciences*, *116*(1), 328-333. doi.org/10.1073/pnas.1816581115
- Bio, B. J., **Webb, T. W.**, & Graziano, M. S. A. (2018). Projecting one's own spatial bias onto others during a theory-of-mind task. *Proceedings of the National Academy of Sciences*, *115*(7), E1684-E1689. doi.org/10.1073/pnas.1718493115
- Webb, T. W.**, Igelstrom, K. M., Schurger, A., & Graziano, M. S. A. (2016). Cortical networks involved in visual awareness independent of visual attention. *Proceedings of the National Academy of Sciences*, *113*(48), 13923-13928. doi.org/10.1073/pnas.1611505113
- Igelstrom, K. M., **Webb, T. W.**, & Graziano, M. S. A. (2016). Functional connectivity between the temporoparietal cortex and cerebellum in autism spectrum disorder. *Cerebral Cortex*, *27*(4), 2617-2627. doi.org/10.1093/cercor/bhw079
- Igelstrom, K. M., **Webb, T. W.**, Kelly, Y. T., & Graziano, M. S. A. (2016). Topographical organization of attentional, social and memory processes in the human temporoparietal cortex. *Eneuro*, *3*(2). doi.org/10.1523/ENEURO.0060-16.2016

- Webb, T. W.**, Kean, H. H., & Graziano, M. S. A. (2016). Effects of awareness on the control of attention. *Journal of Cognitive Neuroscience*, 28(6), 842-851. doi.org/10.1162/jocn.a_00931
- Igelstrom, K. M., **Webb, T. W.**, & Graziano, M. S. A. (2015). Neural processes in the human temporoparietal cortex separated by localized independent component analysis. *Journal of Neuroscience*, 35(25), 9432-9445. doi.org/10.1523/JNEUROSCI.0551-15.2015
- Webb, T. W.**, & Graziano, M. S. A. (2015). The attention schema theory: a mechanistic account of subjective awareness. *Frontiers in psychology*, 6, 500. doi.org/10.3389/fpsyg.2015.00500
- Graziano, M. S. A., & **Webb, T. W.** (2014). A mechanistic theory of consciousness. *International Journal of Machine Consciousness*, 6(02), 163-176. doi.org/10.1142/S1793843014400174
- Kelly, Y. T., **Webb, T. W.**, Meier, J. D., Arcaro, M. J., & Graziano, M. S. A. (2014). Attributing awareness to oneself and to others. *Proceedings of the National Academy of Sciences*, 111(13), 5012-5017. doi.org/10.1073/pnas.1401201111

Manuscripts
under review

- Webb, T. W.**, Frankland, S. M., Altabaa, A., Krishnamurthy, K., Campbell, D., Russin, J., O'Reilly, R., Lafferty, J., & Cohen, J. D. (2023). The relational bottleneck as an inductive bias for efficient abstraction. Preprint available on [arXiv](https://arxiv.org).
- Webb, T. W.***, Mondal, S. S.*, Wang, C., Krabach, B., & Momennejad, I. (2023). A Prefrontal Cortex-inspired Architecture for Planning in Large Language Models. Preprint available on [arXiv](https://arxiv.org).
- * *Equal contribution*
- Altabaa, A., **Webb, T. W.**, Cohen, J. D., & Lafferty, J. (2023). Abstractors: Transformer Modules for Symbolic Message Passing and Relational Reasoning. Preprint available on [arXiv](https://arxiv.org).
- Frankland, S. M., **Webb, T. W.**, & Cohen, J. D. (2021). No Coincidence, George: Capacity-Limits as the Curse of Compositionality. Preprint available on [PsyArXiv](https://psyarxiv.org).

Conference
proceedings
(non-archival)

- Webb, T. W.**, Miyoshi, K., Yan So, T., & Lau, H. (2021). A task-optimized neural network model of decision confidence. In *Proceedings of the 43rd Annual Meeting of the Cognitive Science Society*. [pdf](#)
- Dulberg, Z., **Webb, T. W.**, & Cohen, J. D. (2021). Modelling the development of counting with memory-augmented neural networks. In *Proceedings of the 43rd Annual Meeting of the Cognitive Science Society*. doi.org/10.48550/arXiv.2105.10577
- Frankland, S. M., **Webb, T. W.**, Petrov, A. A., O'Reilly, R. C., & Cohen, J. D. (2019). Extracting and Utilizing Abstract, Structured Representations for Analogy. In *Proceedings of the 41st Annual Meeting of the Cognitive Science Society*. [pdf](#)

Book chapters	<p>Miyoshi, K., Webb, T. W., Rahnev, D., & Lau, H. (2024). Confidence and metacognition. In <i>Reference Module in Neuroscience and Biobehavioral Psychology</i>. pdf</p> <p>Graziano, M. S. A., & Webb, T. W. (2018). Understanding consciousness by building it. In <i>The Bloomsbury Companion to the Philosophy of Consciousness</i>, 187. pdf</p> <p>Graziano, M. S. A., & Webb, T. W. (2016). From sponge to human: The evolution of consciousness. In <i>Evolution of Nervous Systems: Second Edition</i> (pp. 547-554). Kaas J. and Krubitzer L., Eds., Elsevier. pdf</p>								
Presentations	<p>2023. Emergent analogical reasoning in large language models. Invited talk at <i>Large language models meet cognitive science</i> workshop, Cognitive Science Society Annual Meeting, Sydney.</p> <p>2023. Emergent analogical reasoning in large language models. Invited talk at the Santa Fe Institute. Santa Fe, NM.</p> <p>2021. Performance-optimized neural networks as an explanatory framework for decision confidence. Invited talk at <i>Metacognition in the Age of AI: Challenges and Opportunities</i> workshop, Neural Information Processing Systems (NeurIPS), Virtual.</p> <p>2021. Emergent symbols through binding in external memory. Talk presented at International Conference on Learning Representations (ICLR), Virtual.</p> <p>2019. Canonical representations for generalization in relational reasoning. Talk presented at the <i>Understanding interactions amongst cognitive control, learning and representation</i> symposium, Cognitive Science Society Annual Meeting, Montreal.</p> <p>2017. A functional role for consciousness in model-based control of attention. Talk presented at the Association for the Scientific Study of Consciousness Annual Meeting, Beijing.</p> <p>2016. Manipulating visual awareness while controlling attention: effects on cortical networks. Talk presented at the Association for the Scientific Study of Consciousness Annual Meeting, Buenos Aires.</p>								
Teaching	<p><i>Assistant Instructor</i>, Princeton University</p> <table border="0" style="width: 100%;"> <tbody> <tr> <td style="padding-left: 20px;">Life Cycles of Behavior.</td> <td style="text-align: right;">2017</td> </tr> <tr> <td style="padding-left: 20px;">Introduction to Clinical Neuropsychology.</td> <td style="text-align: right;">2015 – 2016</td> </tr> <tr> <td style="padding-left: 20px;">Introduction to Cognitive Neuroscience.</td> <td style="text-align: right;">2014 – 2016</td> </tr> <tr> <td style="padding-left: 20px;">Fundamentals of Neuroscience.</td> <td style="text-align: right;">2013 – 2014</td> </tr> </tbody> </table>	Life Cycles of Behavior.	2017	Introduction to Clinical Neuropsychology.	2015 – 2016	Introduction to Cognitive Neuroscience.	2014 – 2016	Fundamentals of Neuroscience.	2013 – 2014
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Outreach	<table border="0" style="width: 100%;"> <tbody> <tr> <td style="padding-left: 20px;"><i>Volunteer Instructor</i>, Princeton Prison Teaching Initiative.</td> <td style="text-align: right;">2014 – 2018</td> </tr> </tbody> </table>	<i>Volunteer Instructor</i> , Princeton Prison Teaching Initiative.	2014 – 2018						
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