

Charley M. Wu

Curriculum Vitae

AI Research Building
Maria-von-Linden-Str. 6
72076 Tübingen, Germany
☎ 1 (857) 498 8893
✉ charley.wu@uni-tuebingen.de
📄 charleywu.github.io
Nationality: Canadian

Academic Background

Current Position

2020 – **Independent Research Group Leader**, *Human and Machine Cognition Lab*, University of Tübingen, Tübingen, Germany.
Jointly funded by the Excellence Cluster “Machine Learning for Science” and the Tübingen AI center.

Previous Positions

2019 – 2020 **Post-Doctoral Fellow**, *Department of Psychology*, Harvard University, Cambridge, MA.
2019 **Post-Doctoral Fellow**, *Center for Adaptive Rationality (ARC)*, Max Planck Institute for Human Development, Berlin, Germany.
2018 **Visiting Research Fellow**, *Computational Cognitive Neuroscience Lab*; hosted by Samuel J. Gershman, Harvard University, Cambridge, MA.
2016-2019 **Pre-Doctoral Fellow**, *Center for Adaptive Rationality (ARC) and Center for Adaptive Behavior and Cognition (ABC)*, Max Planck Institute for Human Development, Berlin, Germany.
2014-2015 **Research Assistant**, *Center for Adaptive Behavior and Cognition (ABC)*, Max Planck Institute for Human Development, Berlin, Germany.
2014 **Student Research Scientist**, *PetaByte Research*, Budapest, Hungary.
2013-2014 **Research Assistant**, *Intelligent Software Agents and New Media Group*, Austrian Institute for Artificial Intelligence (OFAI), Vienna, Austria.
2009 **Research Assistant**, *Center for Human Evolution, Cognition, and Culture (HECC)*, University of British Columbia, Vancouver, Canada.

Education

2016-2019 **Dr. rer. nat. (Ph.D.) Psychology**, *Humboldt University of Berlin*, Berlin, Germany, *Summa Cum Laude*.
2013-2015 **M.Sc. Cognitive Science**, *University of Vienna*, Vienna, Austria, *with Distinction*.
2004-2009 **B.A. Philosophy**, *University of British Columbia*, Vancouver, Canada, *Dean's List*.

Funding

2022 **Computational Summer School on Modeling Social and Collective Behavior (COS-MOS) Konstanz 2022**, *William K. and Katherine W. Estes Fund*, Co-Organizer: Wataru Toyokawa, \$18k.

- 2021 **Cumulative Culture in AI** (Postdoc funding), *Tübingen AI Center, supported by the Federal Ministry of Education and Research (BMBF)*, Co-PI: Claudio Tennie, ~ €115k.
- 2021 **Compositionality in Minds and Machines** (Mini-graduate School), *Innovation Fund Program of the Cluster of Excellence "Machine Learning: New Perspectives for Science"*, University of Tübingen, Co-PI: Martin Butz, ~ €114k.
- 2021 **Machine Learning for Education** (Mini-graduate School), *Innovation Fund Program of the Cluster of Excellence "Machine Learning: New Perspectives for Science"*, University of Tübingen, Co-PI: Álvaro Tejero-Cantero, ~ €114k.
- 2019 **Dean's Competitive Fund for Promising Research**, *Harvard University, Cambridge, MA* (written with and awarded to Sam Gershman), \$33,353 (USD).
- 2019 **Glushko and Samuelson Student Travel Grant**, *40th Annual Conference of the Cognitive Science Society, Montreal, QC*, \$500 (USD).
- 2016-2019 **Pre-Doctoral Fellowship**, *International Max Planck Research School on Adapting Behavior in a Fundamentally Uncertain World*, Joint PhD Fellowship in Psychology, Economics, and Law, ~€100k.
- 2011-2012 **Joseph-Armand Bombardier Canada Graduate Scholarship**, *Social Sciences and Humanities Research Council of Canada (SSHRC), Canada*, \$17,500 (CAD), *Declined*.

Publications

In Prep

- submitted Collins, R. N., Mandel, D. R., Karvetski, C. W., **Wu**, C. M., & Nelson, J. D. (submitted). The wisdom of the coherent: improving correspondence with coherence-weighted aggregation. *PsyArXiv*. doi:[10.31234/osf.io/fmnty](https://doi.org/10.31234/osf.io/fmnty)
- Giron, A. P., Ciranka, S., Schulz, E., van den Bos, W., Ruggeri, A., Meder, B., & **Wu**, C. M. (submitted). Developmental changes in learning resemble stochastic optimization. *PsyArXiv*. doi:[10.31234/osf.io/9f4k3](https://doi.org/10.31234/osf.io/9f4k3)
- in press Dezza, I. C., Schulz, E., & **Wu**, C. M. (Eds.). (in press). *The Drive for Knowledge: The Science of Human Information-Seeking*. Cambridge: Cambridge University Press.
- Wu**, C. M., Vélez, N., & Cushman, F. A. (in press). Representational exchange in human social learning: Balancing efficiency and flexibility. In I. C. Dezza, E. Schulz, & C. M. Wu (Eds.), *The Drive for Knowledge: The Science of Human Information-Seeking*. Cambridge: Cambridge University Press.

Peer reviewed

- 2022 Ciranka, S., Linde-Domingo, J., Padezhki, I., Wicharz, C., **Wu**, C. M., & Spitzer, B. (2022). Asymmetric learning facilitates human inference of transitive relations. *Nature Human Behaviour*. doi:<https://doi.org/10.1038/s41562-021-01263-w>
- Wu**, C. M., Schulz, E., Pleskac, T. J., & Speekenbrink, M. (2022). Time pressure changes how people explore and respond to uncertainty. *Scientific Reports*, 12, 1–14. doi:<https://doi.org/10.1038/s41598-022-07901-1>
- 2021 Humaidan, D., Otte, S., Gumbsch, C., **Wu**, C. M., & Butz, M. V. (2021). Latent event-predictive encodings through counterfactual regularization. In T. Fitch, C. Lamm, H. Leder, & K. Teßmar-Raible (Eds.), *Proceedings of the 43rd Annual Conference of the Cognitive*

Science Society (pp. 1726–1731). Vienna, Austria: Cognitive Science Society. eprint: [2105.05894](#)

Meder, B., **Wu**, C. M., Schulz, E., & Ruggeri, A. (2021). Development of directed and random exploration in children. *Developmental Science*, e13095. doi:[10.1111/desc.13095](#)

Wu, C. M., Ho, M. K., Kahl, B., Leuker, C., Meder, B., & Kurvers, R. H. (2021). Specialization and selective social attention establishes the balance between individual and social learning. In T. Fitch, C. Lamm, H. Leder, & K. Teßmar-Raible (Eds.), *Proceedings of the 43rd Annual Conference of the Cognitive Science Society* (pp. 1921–1927). Vienna, Austria: Cognitive Science Society. doi:[10.1101/2021.02.03.429553](#)

Wu, C. M., Schulz, E., & Gershman, S. J. (2021). Inference and search on graph-structured spaces. *Computational Brain & Behavior*, 125–147. doi:[10.1007/s42113-020-00091-x](#)

Zuberer, A., Kucyi, A., Yamashita, A., **Wu**, C. M., Walter, M., Valera, E. M., & Esterman, M. (2021). Integration and segregation across large-scale intrinsic brain networks as a marker of sustained attention and task-unrelated thought. *NeuroImage*, 229, 117610. doi:[10.1016/j.neuroimage.2020.117610](#)

2020 Brändle, F., **Wu**, C. M., & Schulz, E. (2020). What are we curious about? *Trends in Cognitive Science*. doi:[10.1016/j.tics.2020.05.010](#)

Wu, C. M., Schulz, E., Garvert, M. M., Meder, B., & Schuck, N. W. (2020). Similarities and differences in spatial and non-spatial cognitive maps. *PLOS Computational Biology*, 16, 1–28. doi:[10.1371/journal.pcbi.1008149](#)

2019 Analytis, P. P., **Wu**, C. M., & Gelastopoulos, A. (2019). Make-or-break: chasing risky goals or settling for safe rewards? *Cognitive Science*, 43, e12743. doi:[10.1111/cogs.12743](#)

Schulz, E., **Wu**, C. M., Ruggeri, A., & Meder, B. (2019). Searching for rewards like a child means less generalization and more directed exploration. *Psychological Science*, 30(11), 1561–1572. doi:[10.1177/0956797619863663](#)

Tump, A. N., **Wu**, C. M., Bouhlel, I., & Goldstone, R. L. (2019). The evolutionary dynamics of cooperation in collective search. In A. Goel, C. Seifert, & C. Freksa (Eds.), *Proceedings of the 41st Annual Conference of the Cognitive Science Society* (pp. 883–889). Montreal, QB: Cognitive Science Society. (Joint first authorship.)

Wu, C. M., Schulz, E., Gerbaulet, K., Pleskac, T. J., & Speekenbrink, M. (2019). Under pressure: The influence of time limits on human exploration. In A. Goel, C. Seifert, & C. Freksa (Eds.), *Proceedings of the 41st Annual Conference of the Cognitive Science Society* (pp. 1219–1225). Montreal, QB: Cognitive Science Society. (Joint first authorship.)

Wu, C. M., Schulz, E., & Gershman, S. J. (2019a). Generalization as diffusion: human function learning on graphs. In A. Goel, C. Seifert, & C. Freksa (Eds.), *Proceedings of the 41st Annual Conference of the Cognitive Science Society* (pp. 3122–3128). Montreal, QB: Cognitive Science Society.

Wu, C. M., Schulz, E., & Gershman, S. J. (2019b). Searching for rewards in graph-structured spaces. In *Proceedings of the 2019 Conference on Cognitive Computational Neuroscience*. doi:[10.32470/CCN.2019.1041-0](#)

- 2018 Bouhlel, I., **Wu**, C. M., Hanaki, N., & Goldstone, R. L. (2018). Sharing is not erring: pseudo-reciprocity in collective search. In T. T. Rogers, M. Rau, X. Zhu, & C. W. Kalish (Eds.), *Proceedings of the 40th Annual Conference of the Cognitive Science Society* (pp. 156–161). Austin, TX: Cognitive Science Society. (Joint first authorship.)
- Schulz, E., **Wu**, C. M., Huys, Q. J., Krause, A., & Speekenbrink, M. (2018). Generalization and search in risky environments. *Cognitive Science*, 42, 2592–2620. doi:[10.1111/cogs.12695](https://doi.org/10.1111/cogs.12695)
- Wu**, C. M., Schulz, E., Garvert, M. M., Meder, B., & Schuck, N. W. (2018a). Connecting conceptual and spatial search via a model of generalization. In T. T. Rogers, M. Rau, X. Zhu, & C. W. Kalish (Eds.), *Proceedings of the 40th Annual Conference of the Cognitive Science Society* (pp. 1183–1188). Austin, TX: Cognitive Science Society.
- Wu**, C. M., Schulz, E., Speekenbrink, M., Nelson, J. D., & Meder, B. (2018b). Generalization guides human exploration in vast decision spaces. *Nature Human Behaviour*, 2, 915–924. doi:[10.1038/s41562-018-0467-4](https://doi.org/10.1038/s41562-018-0467-4)
- 2017 **Wu**, C. M., Meder, B., Filimon, F., & Nelson, J. D. (2017). Asking better questions: how presentation formats influence information search. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 8, 1274–1297. doi:[doi:10.1037/xlm0000374](https://doi.org/10.1037/xlm0000374)
- Wu**, C. M., Schulz, E., Speekenbrink, M., Nelson, J. D., & Meder, B. (2017). Mapping the unknown: the spatially correlated multi-armed bandit. In G. Gunzelmann, A. Howes, T. Tenbrink, & E. J. Davelaar (Eds.), *Proceedings of the 39th Annual Meeting of the Cognitive Science Society* (pp. 1357–1362). Austin, TX: Cognitive Science Society.
- 2016 Barkoczi, D., Analytis, P. P., & **Wu**, C. M. (2016). Collective search on rugged landscapes: a crossenvironmental analysis. In A. Papafragou, D. Grodner, D. Mirman, & J. Trueswell (Eds.), *Proceedings of the 38th Annual Conference of the Cognitive Science Society* (pp. 918–923). Austin, TX: Cognitive Science Society.

Teaching

- 2021 **Generalization in Reinforcement Learning**, *Guest lecture: Introduction to Cognitive Psychology*, University of Ghent, Ghent, Belgium (via Zoom) [[Slides](#)].
- 2020 **Scientific Thinking: the Art of Communicating Ideas**, “*Becoming a good scientist*” workshop, Max Planck Institute for Biological Cybernetics, Tübingen, Germany (via Zoom).
- 2020 **Computational Modeling**, *Graduate student workshop*, Max Planck Institute for Biological Cybernetics, Tübingen, Germany (via Zoom).
- 2019-2020 **Representation Learning in Reinforcement Learning Seminar**, *Co-organizer and regular Speaker*, Harvard University, Center for Brain Science, Cambridge, MA. [[Notes](#)].
- 2015-2019 **Berlin Machine Learning Seminar**, *Regular Speaker*, Berlin, Germany.
- 2018 **Introduction to Computational Modeling**, *Graduate and undergraduate workshop*, MPRG: iSearch Research Retreat, Bensdorf, Germany.
- 2018 **Intro to Cognitive Modeling**, *Course*, Max Planck Institute for Human Development, Berlin, Germany. (Teaching Assistant to Dr. Björn Meder).
- 2017 **Fast-and-frugal Trees and Models of Information Search**, *Workshop*, ABC Research Retreat, Schloss Ringberg, Germany.

- 2017 **Computational Models of Cognition**, *Lecture*, Berlin School of Mind and Brain (PhD Program), Humboldt University, Berlin, Germany.
- 2016-2017 **Math and Methods Tutorial Series**, *Organizer and regular speaker*, Center for Adaptive Behavior and Cognition (ABC), Berlin, Germany.
- 2016 **A Statistical Framework for Model Comparisons**, *Tutorial*, ABC Research Retreat, Gut Gremmelin, Germany.

Supervision

Theses Supervised

- Anna Giron**. Department of Cognitive Science, University of Tübingen. Masters Thesis: *The Trajectory of Learning and Exploration Over the Lifespan* (2020-2021)
- Theresa Horn**. Department of Cognitive Science, University of Tübingen. Bachelors Thesis: *Use of Visual and Spatial Information in Human Search Behaviour* (2021)
- Kimberly Gerbaulet**. Institute of Cognitive Science, University of Osnabrück. Masters Thesis: *Under pressure: the effect of time pressure on directed and random exploration*. (2018-2019)

Thesis Advisory Committee

- Manuel Traub**. PhD student. Cognitive Modeling group, University of Tübingen. (2021 - present)
- Ruiqi He**. PhD student. Rationality Enhancement Group, Max Planck Institute for Intelligent Systems. (2020 - present)
- Lovis Hendrich**. PhD student. Rationality Enhancement Group, Max Planck Institute for Intelligent Systems. (2020 - present)
- Christian Gumbsch**. PhD student. Autonomous learning, Max Planck Institute for Intelligent Systems. (2019 - present)

Graduate Student Projects

- Kornelius Raeth**. Masters student. Department of Machine Learning, University of Tübingen. *Influence of reward structures on Hippocampal sequence generation*. (2021-Present)
- Sebastian Breit**. Masters student. Department of Cognitive Science, University of Tübingen. *Memory-related changes in exploration and generalization over the lifespan*. (2021-Present)
- Tobias Ludwig**. Masters student. Graduate Training Center for Neuroscience, University of Tübingen. *Planning and generalization on generative graph-structured bandits*. (2020-Present)
- Susanne Haridi**. PhD student. Max Planck School of Cognition. *The scalability of human inference*. (2020-Present)
- Franziska Brändle**. PhD student. Max Planck Institute for Biological Cybernetics. *A computational theory of fun*. (2020-Present)
- Simon Ciranka**. PhD student. Center for Adaptive Rationality (ARC), Max Planck Institute for Human Development. *Asymmetric learning facilitates human inference of transitive relations*. (2019-2021)
- Imen Bouhlel**. PhD student. Department of Economics, Université de Nice. *Sharing is not erring: How environments can encourage pseudo-reciprocity in collective human search*. (2016-2019)
- Alan Novaes Tump**. PhD student. Center for Adaptive Rationality, Max Planck Institute for Human Development. *The evolutionary dynamics of cooperation in collective search*. (2018-2020)
- Ahmad Dawud**. Masters Student. Institute of Cognitive Science, University of Osnabrück. *Collective search and rugged landscapes*. (2017-2019)
- Alexander Djamali**. Masters student. Department of Physics, Ludwig Maximilian University of Munich. *Information search: Finding better questions*. (2016-2017)

Undergraduate Student Projects

Grace Deng. Bachelor student. Brown University. *Cumulative cultural evolution drives the rise and decline of virtual online communities.* (2020-2021)

Professional Service

Steering Committee Member of the Cluster of Excellence – Machine Learning for Science, University of Tübingen (2021-Present)

Organizer of Cognition, Collectives, and Human Culture Workshop (part of CogSci 2020), Toronto, Canada (2020)

Organizer of the 17th annual Summer Institute on Bounded Rationality, Berlin, Germany (2018)

PhD Representative for the Max Planck Institute for Human Development (2017-2018)

Neuromatch mentor (2018)

Ad-hoc Reviewer for Nature Communications, Nature Human Behaviour, Scientific Reports, PLOS Computational Biology, Cognition, Cognitive Psychology, Artificial Intelligence, Computational Brain and Behavior, Journal of Experimental Psychology: Learning, Memory, and Cognition, Cognitive, Affective, and Behavioral Neuroscience, Cognitive Science, Cognitive Computational Neuroscience, Cognitive Science Society, Mind & Society, Futures & Foresight Science, and the National Science Foundation.

Technical Skills

Programming Languages: R, Python, Matlab, Julia, JavaScript, HTML, jQuery, PHP, CSS, and L^AT_EX.

Additional Software Skills: MongoDB, MySQL, Singularity, Tensorflow, Redis, and Adobe Creative Suite.

Languages: English (Native), German (B2), Chinese (Mandarin/Shanghainese; mother tongue), French (B1), Spanish (B1), and Russian (A1)

References

Prof. Dr. Fiery Cushman
Department of Psychology, University of Harvard
William James Hall, 33 Kirkland Street, Cambridge, MA 02138
cushman[at]fas.harvard.edu

Prof. Dr. Samuel J. Gershman
Department of Psychology and Center for Brain Sciences, University of Harvard
Northwest Lab Building, 52 Oxford Street, Cambridge, MA 02138
gershman[at]fas.harvard.edu

Prof. Dr. Björn Meder
Health and Medical University Potsdam
Olympischer Weg 1, 14471 Potsdam, Germany
bjoern.meder[at]health-and-medical-university.de

Prof. Dr. Jonathan D. Nelson
School of Psychology, University of Surrey
388 Stag Hill, Guildford GU2 7XH, UK
jonathan.d.nelson[at]gmail.com