William James Hall 1406
33 Kirkland St.
Cambridge, MA 02138
1 (857) 498 8893
charleymswu@gmail.com
charleywu.github.io
Nationality: Canadian

Charley M. Wu

Curriculum Vitae

Academic Background

Current Position

2019 **Post-Doctoral Fellow**, *Department of Psychology*, Harvard University, Cambridge, MA.

Previous Positions

2019 **Post-Doctoral Research 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 Research Fellow**, *Center for Adaptive Rationality (ARC)*, 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*.

Honors and Awards

2019 **Dean's Competitive Fund for Promising Research**, *Harvard University*, Cambridge, MA, $33,353 (written with and awarded to Sam Gershman).

2019 **Glushko and Samuelson Student Travel Grant**, *40th Annual Conference of the Cognitice Science Society*, Montreal, QC, $500.

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, ∼€100,000.

2011-2012 **Joseph-Armand Bombardier Canada Graduate Scholarship**, *Social Sciences and Humanities Research Council of Canada (SSHRC)*, Canada, $17,500, *Declined*.

Publications

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.

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.

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.

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

Wu, C. M., Schulz, E., Garvert, M. M., Meder, B., & Schuck, N. W. (2018). 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. (2018). Generalization guides human exploration in vast decision spaces. *Nature Human Behaviour*, *2*, 915–924. doi: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

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.

Invited Talks

Nov. 2019 *Domain General Principles of Efficient Human Exploration,* SimTech Colloquium, University of Stuttgart. Stuttgart, Germany

Nov. 2019 *Domain General Principles of Generalization and Exploration* , Cognitive Brain and Behavior Lunch, Harvard University.
Cambridge, MA

May. 2019 *Navigating Vast Decision Spaces with the Principle of Generalization,* Machine Learning in Cognition at UCL (MLCog-UCL) Academic Society, University College London. London, UK

Jan. 2019 *Collective Search in Immersive Virtual Environments,* MPRG: iSearch Retreat, Ringberg. Kreuth, Germany

Jan. 2019 *The Successor Representation,* MPRG: NeuroCode, Max Planck Institute for Human Development. Berlin, Germany

Nov. 2018 *Guiding Exploration Through Generalization,* Cog Lunch, Department of Brain and Cognitive Sciences, MIT. Cambridge, MA

Nov. 2018 *Generalization in Vast Spaces,* Concats, New York University. New York City, NY

Nov. 2018 *Generalization Guides Exploration in Vast Spaces,* Fiery Cushman and Joshua Greene labs, Harvard University. Cambridge, MA

Sept. 2018 *Guiding Exploration Through Generalization,* Samuel Gershman Lab, Harvard University. Cambridge, MA

May. 2018 *Generalization and Exploration: Insights from a spatial search task,* Department of Psychiatry and Psychotherapy, Charité - Universitätsmedizin. Berlin, Germany

Sept. 2017 *Generalization and Exploration in Vast Spaces,* Centre for Mind/Brain Sciences (CIMeC), University of Trento. Trento, Italy

May. 2017 *Active Learning and Search in Unexplored Environments,* MPRGL iSearch lab meeting, Max Planck Institute for Human Development. Berlin, Germany

Apr. 2017 *Generalization Across Vast State Spaces: Human Exploration in Unknown Environments,* Cognition Lab, University of Zürich. Zürich, Switzerland

Mar. 2017 *Terra Incognito: Adaptive Learning and Information Search in Unknown Environments,* The Center for Adaptive Rationality (ARC), Max Planck Institute for Human Development. Berlin, Germany

Feb. 2017 *Adaptive Learning for Language Education,* Babbel, Lesson Nine GmbH. Berlin, Germany

Nov. 2016 *Mapping the Unknown: Human Spatial Exploration-Exploitation,* Learning & Decision Making Lab, University College London. London, UK

Conference Presentations, Workshops, and Seminars

Sep. 2019 **Wu, C.M.,** Schulz, E., & Gershman, S.J., *Searching for rewards in graph-structured spaces*, Poster presented at CCN 2019, Berlin, DE. [Poster].

Jul. 2019 **Wu, C.M.,** Schulz, E., & Gershman, S.J., *Generalization as diffusion: human function learning on graphs*, Poster presented at CogSci 2019, Montreal, QB. [Poster].

Jul. 2019 **Wu, C.M.,** Schulz, E., Gerbaulet, K., Pleskac, T.J., & Speekenbrink, M., *Under pressure: the influence of time limits on human exploration*, CogSci 2019, Montreal, QB.

Jul. 2019 Tump, A.N.,**Wu, C.M.,** Bouhlel, I., & Goldstone, R.L., *The Evolutionary Dynamics of Cooperation in Collective Search*, CogSci 2019, Montreal, QB.

Jul. 2019 **Wu, C.M.,** Schulz, E., Gerbaulet, K., Pleskac, T.J., & Speekenbrink, M., *Time pressure influences attitudes towards uncertainty*, MathPsych 2019, Montreal, QB. [Slides].

Dec. 2018 **Wu, C.M.**, *Inference over graph structures using a diffusion kernel*, Berlin Machine Learning Seminar, Berlin, Germany.

Jul. 2018 **Wu, C.M.,** Schulz, E., Garvert, M.M., Meder, B., & Schuck, N.W., *Connecting conceptual and spatial search*, CogSci 2018, Madison, WI.

Jul. 2018 Bouhlel, I., **Wu, C.M.,** Hanaki, N., & Goldstone, R.L., *Sharing is not erring: Pseudo-reciprocal sharing in collective search*, CogSci 2018, Madison, WI.

Jul. 2018 **Wu, C.M.,** & Meder, B., Nelson, J.D., *Navigating uncertainty through information search*, Poster presented at CogSci 2018, Madison, WI. [Poster].

Jul. 2018 **Wu, C.M.,** Schulz, E., Speekenbrink, M., Nelson, J.D., & Meder, B., *Guiding exploration through generalization*, MathPsych 2018, Madison, WI.

Mar. 2017 **Wu, C.M.,** Schulz, E., Speekenbrink, M., Nelson, J.D., & Meder, B., *Mapping the Unknown: The spatially correlated multi-armed bandit.*, CogSci 2017, London, UK.

Mar. 2017 **Wu, C.M.,** Schulz, E., Speekenbrink, M., Nelson, J.D., & Meder, B., *Mapping the Unknown: Model-based and Model-free Approaches Towards Spatial Reinforcement Learning*, TeaP 2017, Dresden, Germany.

Mar. 2017 **Wu, C.M.**, *Everybody GANs Now: Tutorial on Generative Adversarial Networks*, Berlin Machine Learning Seminar, Berlin, Germany.

Mar. 2017 **Wu, C.M.**, *Voyage into the Unknown: Adaptive Learning and Information Search*, IMPRS Thesis Workshop, Gut Gremmelin, Germany.

Mar. 2017 **Wu, C.M.**, *Adversarial Training: Math and Methods Tutorial*, Center for Adaptive Behavior and Cognition (ABC), Berlin, Germany.

Aug. 2016 **Wu, C.M.,** Jurányi, Z., Gulyas, L., & Kampis, G., *Blindfolded NLP: Unsupervised Learning for Automatically Generating Topic Labels*, Identification, Location and Temporal Evolution of Topics Workshop, Budapest, Hungary.

Jul. 2016 **Wu, C.M.,** Schulz, E., Speekenbrink, M., Nelson, J.D., & Meder, B., *Exploring the Unknown: Modeling Human Exploration-Exploitation Behavior*, Poster presented at Computational and Mathematical Modeling of Cognition, Dobbiaco, Italy. [Poster].

Mar. 2016 **Wu, C.M.**, *Gaussian Process Models: What do you do when you can't optimize?*, Berlin Machine Learning Seminar, Berlin, Germany.

Feb. 2016 **Wu, C.M.**, *Exploring Fitness Landscapes: How to discover good solutions to complex problems*, IMPRS Thesis Workshop, Berlin, Germany.

Feb. 2016 **Wu, C.M.,** Nelson, J.D., & Meder, B., *Characterizing Ruggedness in Fitness Landscapes*, ABC Conference, Berlin, Germany.

Aug. 2015 **Wu, C.M.,** Meder, B., Nelson, J.D., & Filimon, F., *The effect of presentation formats on rational information search*, SPUDM 25, Budapest, Hungary..

Jun. 2015 **Wu, C.M.,** Meder, B., Filimon, F., & Nelson, J.D., *The medium is the message: How presentation formats help people ask better questions*, MEi: CogSci Conference, Ljubljana, Slovenia.

Feb. 2015 Meder, B., **Wu, C.M.,** Nelson, J. D., & Filimon, F., *Presentation formats and information search*, Workshop on "Information, search, and causes: Rational and cognitive approaches", Turin, Italy.

Jun. 2014 **Wu, C.M.,** Skowron, M., & Petta, P., *Reading between the lines: a vector space model of language using semantic role structures*, Poster presented at MEi:CogSci Conference 2014, Kraków, Poland. [Poster].

Teaching

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**, *Graduate 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

Graduate Student Projects

Lucy Lai. *Compositional sequence learning through generative structure learning*. Department of Neuroscience, Harvard University. (2019-Present)
Marcel Binz. *The emergence of compositional language through maximum entropy Reinforcement Learning*. Department of Psychology, Philipps-Universität Marburg. (2019-Present)
Imen Bouhlel. *Sharing is not erring: How environments can encourage pseudo-reciprocity in collective human search*. Department of Economics, Université de Nice. (2016-Present)
Alan Novaes Tump. *The evolutionary dynamics of cooperation in collective search*. Center for Adaptive Rationality, Max Planck Institute for Human Development. (2018-2019)
Ahmad Dawud. *Collective search and rugged landscapes*. Institute of Cognitive Science, University of Osnabrück. (2017-2019)
Alexander Djamali. *Information search: Finding better questions*. Department of Physics, Ludwig Maximilian University of Munich. (2016-2017)

Dissertations

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)

Professional Service

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)
Ad-hoc Reviewer for Nature Human Behaviour (1), Cognitive Computational Neuroscience (6), Cognitive Science Society (11), Mind & Society (1), and Futures & Foresight Science (1)

Technical Skills

Programming Languages: R, Python, Matlab, Julia, JavaScript, HTML, jQuery, PHP, CSS, and LaTeX.

Additional Software Skills: MongoDB, MySQL, Tensorflow, SKlearn, GenSim, NLTK, Redis, and Adobe Creative Suite.

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

Dr. Björn Meder
MPRG iSearch, Max Planck Institute for Human Development
Lentzeallee 94, 14195 Berlin, Germany
meder[at]mpib-berlin.mpg.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