

david reitter

Staff Research Scientist

Google AI
reitter@google.com

EDUCATION

Postdoc (Psychology), Carnegie Mellon University, Pittsburgh, PA	2008-2012
PhD (Cognitive Science), School of Informatics, University of Edinburgh, UK	2008
MSc (Computer Science), University College Dublin, Ireland	2005
Diplom (Computational Linguistics), University of Potsdam, Germany	2003

EMPLOYMENT

Staff Research Scientist, Google , New York City	2022-
Senior Research Scientist	2019-2022

I bootstrapped a specific project engaging in research on information-seeking, grounded dialogue systems, and I now focus on factual generative models. My metric on factuality is used by several teams at Google. I have launched, in Google's Search flagship product, an NLP model leveraging very large-scale data to understand natural-language user input given historical context, outperforming previous production models (10% RER). I led a project team working on multimodal NLP (e.g, ACL and EMNLP 2019).

Associate Professor of Information Sciences and Technology	2018-2019
Assistant Professor	2012-2018

The Pennsylvania State University
Faculty member: Center for Language Science
Co-Director, Applied Cognitive Science Lab

Research in quantitative cognitive science and models of natural language dialogue. Trained and graduated five PhD students (10 graduate students in total); obtained \$4.3M in competitive external funding (PI, Co-PI). See below for publications in top journals and at the highest-ranking computer science conferences. Tenured in 2018.

Postdoc, Adjunct Professor (Intro Cognitive Psychology), Carnegie Mellon University	2011-2012
Research Fellow, MIT Media Lab Europe, Dublin, Ireland	2002-2004
Computational Linguist, Agentscape AG, Berlin, Germany	2000-2001
Radio journalist (freelance, desk editor) for RadioEINS, Berlin, and ARD, Germany	1999-2002

30 Nov 2022

Selected Publications

JOURNAL ARTICLES AND ARCHIVAL PREMIER-TIER CONFERENCE PAPERS

Nouha Dziri, Hannah Rashkin, Tal Linzen, David Reitter

Evaluating Attribution in Dialogue Systems: The BEGIN Benchmark

Transactions of ACL, 10: 1066-1083. https://doi.org/10.1162/tacl_a_00506. 2022.

Hannah Rashkin, David Reitter, Gaurav Singh Tomar, Dipanjan Das.

Increasing Faithfulness in Knowledge-Grounded Dialogue with Controllable Features

In Proceedings of the 59th Annual Meeting of the Association for Computational Linguistics (**ACL**), pages 704-718. <https://aclanthology.org/2021.acl-long.58.pdf>. 2021.

MA Kelly, Moojan Ghafurian, Robert L. West, David Reitter.

[Indirect associations in learning semantic and syntactic lexical relationships](#)

Journal of Memory and Language 115. 2020.

MA Kelly, Nipun Arora, Robert L West, David Reitter.

[Holographic declarative memory: Distributional semantics as the architecture of memory](#)

Cognitive Science 44 (11). 2020.

Jesús Calvillo, Le Fang, Jeremy Cole, David Reitter.

Surprisal predicts code-switching in Chinese-English bilingual text

In *Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP)*.

Online. <https://aclanthology.org/2020.emnlp-main.330/>. 2020.

Chris Alberti, Jefferey Ling, Michael Collins, David Reitter.

Fusion of Detected Objects in Text for Visual Question Answering.

In *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP)* (pp. 2131-2140). Hong Kong, China. <https://doi.org/10.18653/v1/D19-1219>. 2019.

Alexander G. Ororbia II*, Ankur Mali, Matthew A. Kelly*, David Reitter.

Like a Baby: Visually Situated Neural Language Acquisition.

In *Proceedings of the 56th Annual Meeting of the Association for Computational Linguistics (ACL)*, Florence Italy, <https://arxiv.org/abs/1805.11546>. 2019.

Reitter, D., & Grossklags, J.

The Positive Impact of Task Familiarity, Risk Propensity and Need-for-Cognition on Observed Timing Decisions in a Security Game of Timing.

Games, 10(4), 49. <https://doi.org/10.3390/g10040049>. 2019.

Moojan Ghafurian* and David Reitter.

Impatience in Timing Decisions: Effects and Moderation.

Timing & Time Perception 6(2), 183-219, 2018.

Yang Xu* and David Reitter.

Information density converges in dialogue: Towards an information-theoretic model.

Cognition 170, 147-163, <https://doi.org/10.1016/j.cognition.2017.09.018>, 2018.

Michael T. Putnam, Matthew Carlson, and David Reitter.

Integrated, not isolated: Defining typological proximity in an integrated multilingual architecture.

Frontiers in Psychology, <https://doi.org/10.3389/fpsyg.2017.02212>, 2018.

Alexander G. Ororbia II*, Tomas Mikolov, and David Reitter.

Learning Simpler Language Models with the Delta Recurrent Neural Network Framework.

Neural Computation 29(12), 3327-3352, https://doi.org/10.1162/neco_a_01017, 2017.

Yang Xu* and David Reitter.

Spectral Analysis of Information Density in Dialogue Predicts Collaborative Task Performance.

In *Proc. 55th Annual Mtg. of the Association for Computational Linguistics (ACL)*, 147-163.

<http://aclweb.org/anthology/P17-1058>, Vancouver, Canada, 2017.

Vito D'Orazio, Michael Kenwick, Matthew Lane, G. Palmer, and David Reitter.

Crowdsourcing the measurement of interstate conflict.

PLOS ONE, 11(6), <https://doi.org/10.1371/journal.pone.0156527>, 2016.

Yang Xu* and David Reitter.

Entropy converges between dialogue participants: Explanations from an information-theoretic perspective.

In *Proc. 54th Annual Mtg. Association for Computational Linguistics (ACL)*, Vol. 1 (Long Papers), 537-546, <http://anthology.aclweb.org/P16-1051>, Berlin, Germany, 2016.

Yang Xu* and David Reitter.

Convergence of Syntactic Complexity in Conversation

In *Proc. 54th Annual Mtg. Association for Computational Linguistics (ACL)*, Vol. 2 (Short Papers), 443-448,

<http://anthology.aclweb.org/P16-2072>, Berlin, Germany, 2016.

Alexander G. Ororbia II*, C. Lee Giles, and David Reitter.

Learning a Deep Hybrid Model for Semi-Supervised Text Classification.

In *Proc. Empirical Methods in Natural Language Processing (EMNLP)*, 471-481,

<http://anthology.aclweb.org/D15-1053>, Lisbon, Portugal, 2015.

Alexander G. Ororbia II*, David Reitter, Jian Wu, and C. Lee Giles.

Online Learning of Deep Hybrid Architectures for Semi-Supervised Categorization.

In *Machine Learning and Knowledge Discovery in Databases. Proc. European Conference, ECML PKDD 2015*. Lecture Notes in Computer Science, vol 9284. pp 516-532. Porto, Portugal: Springer, 2015.

David Reitter and Johanna D. Moore.

Alignment and Task Success in Spoken Dialogue.

Journal of Memory and Language, 76, 29-46, <https://doi.org/10.1016/j.jml.2014.05.008>, 2014.

David Reitter and Christian Lebiere.

Social cognition: Memory decay and adaptive information filtering for robust information maintenance.

In *Proc. Twenty-Sixth AAAI Conference on Artificial Intelligence (AAAI)*, Toronto, Ontario, 2012.

David Reitter, Frank Keller, and Johanna D. Moore.

A computational cognitive model of syntactic priming.

Cognitive Science, 35(4):587-637, <http://doi.org/10.1111/j.1551-6709.2010.01165.x>, 2011.

David Reitter and Christian Lebiere.

A cognitive model of spatial path planning.

Computational and Mathematical Organization Theory, 16(3):220-245, 2010.

David Reitter and Johanna D. Moore.

Predicting success in dialogue.

In *Proc. 45th Annual Meeting of the Association of Computational Linguistics (ACL)*, pp. 808-815, Prague, Czech Republic, 2007.

David Reitter, Julia Hockenmaier, and Frank Keller.

Priming effects in Combinatory Categorical Grammar.

In: *Proc. 2006 Conference on Empirical Methods in Natural Language Processing (EMNLP)*, pp. 308-316, Sydney, Australia, 2006.

David Reitter, Frank Keller, and Johanna D. Moore.

Computational modelling of structural priming in dialogue.

In *Proc. Human Language Technology conference - North American chapter of the Association for Computational Linguistics annual meeting (HLT-NAACL)*, pp. 121-124, New York, 2006.

GRANTS, CONTRACTS AND FELLOWSHIPS

Major External Support:

- Sum of external funding as PI/Co-PI/Co-I: \$1,454,000 to David Reitter; \$4,339,000 total.** 2018
- PI.** Hands-Free Electronic Health Record Data Entry Initiative. Sub-contract, Applied Research Lab. **Army Research Lab.** \$92,600k.
- Co-I** (with: Ogan (PI, CMU), Clarke (PI, UCSD), Zimmerman (CMU), Millstone (UCSD), Alvarez (UCSD)). 2017
ClassInSight: Insight on Teacher Learning by Scaffolding Noticing and Reflection.
McDonnell Foundation. ~\$270k direct. total: \$2.5M (phase I+II pending mid-term review).
- PI.** CompCog: Computational, distributed accounts of human memory: improving cognitive models 2017
National Science Foundation (Perception, Action, & Cognition, co-funded: Robust Intelligence).
\$500k. (Single PI.)
- Co-PI** (with G. Palmer and V. D’Orazio, UT Dallas). 2015
Updating the militarized dispute data through crowdsourcing: MID5, 2011-2017.
National Science Foundation (Political Science). \$345k, total: \$1 Million.
- PI.** Modeling syntactic priming in language production according to corpus data. 2015
National Science Foundation (Linguistics). \$75k. (Single PI.)
- PI.** Alignment in web-forum discourse: computational models of adaptation and language change. 2015
CISE Research Initiation Initiative grant (CRII)
National Science Foundation (Computer Science/Robust Intelligence). \$174k. (Single PI.)
- PI.** Evaluating the impact of explanation-based transparency approaches on human trust in autonomous unmanned systems. 2014
Air Force Research Laboratory. Prime: SRA; Super: Lockheed Martin Corp. \$90k. (Single PI.)

Other External Support / Support as Co-I / Internal Seed Grants and Contracts:

- PI** (with F. E. Ritter). ICCM 2016: International Conference on Cognitive Modeling. 2016
Conference Support. **National Science Foundation** (SBE PAC, CISE IIS). \$15k
- Co-PI** (with M. Putnam and M. Carlson). Competition, conflict, and optimization: 2016
Toward a dynamic model of multilingualism. SSRI Faculty Fellows Program. \$22.5k.
- Co-PI** (with J. Yen and S. Haynes). Teaching innovation for developing an undergraduate course on 2015
human-robot interaction using a humanoid robot. College of IST. \$10k.
- Consultant.** Voice-enabled agent for realistic integrated combat operations training. 2014
Small Business Innovation Grant to ORION Int’l; Air Force Office of Scientific Research.
- Co-PI** (with J. Grossklags). Once bitten, twice shy: Controlled experiments and cognitive modeling 2013
of online marketing scams. Seed grant funded by the College of IST. \$8.5k.
- PI** (with Co-PIs J. Yen and P. Mitra). Interactive linguistic alignment in large social networks 2013
of health online forums. Seed grant funded by the College of IST. \$8k.
- Co-I** (with G. Palmer et al.). Using crowdsourcing to measure complex social concepts. 2013
Seed grant funded by the Social Science Research Institute. \$20k.
- Co-I** (with C. Lebiere). Learning and modeling for human performance and readiness. 2011
Air Force Research Lab, Human Effectiveness Dir. Prime: Ball Aerospace. ~\$500k.
Reduced to ~\$50k due to sponsor budget cuts.
- Postdoc.** Fellowship, German Academic Exchange Service. Awarded, but not used, ~\$100k. 2008

AWARDS (SELECTION)

Junior Award for Excellence in Research. IST, Penn State	2018
Best Model. Predicting Cognitive Performance in Open-ended Dynamic Tasks - A Modeling Comparison Challenge. International Conference on Cognitive Modeling	2009
Best Paper. Behavior Representation in Modeling and Simulation Conference	2009
Best Thesis Award. German Society for Computational Linguistics & Language Technology	2003

ADVISING AND TEACHING

Former and Current Students

PhD: Dr. Yafei Wang, Web-Forum Discourse, 2013-2017, then: IBM Research, LinkedIn
(with J. Yen)
Dr. Moojan Ghafurian, Timing Decision-Making, 2013-2017, then: U Waterloo
Dr. Yang Xu, Alignment in Web-Forum Discourse, 2013-2018,
now: faculty, San Diego State University
Dr. Alexander G. Ororbia II, Deep Learning, 2013-2018, (with C. L. Giles)
now: faculty, Rochester Institute of Technology
Dr. Jeremy R. Cole, Unsupervised Cogn. Modeling of Language Processing, 2014-2018
now: Google AI
Saranya Venkatraman, 2018-
Zixin Tang, 2018-

PhD committee: Dr. Michael Kenwick (Political Science), 2017, then: Harvard
Dr. Siddhartha Banerjee (IST: Natural Lang. Processing), 2016, then: Yahoo! Research
Dr. Kyle Williams (IST: Information Retrieval), 2016, then: Microsoft Research
Christopher Funk (CS: Computational Cognition), 2016-
Yanjun Gao (CS: Natural Language Processing), 2017-
Berkay Celik (CS: Internet of Things Security), 2018-

MSc: Sadegh Farhang, MSc, 2016-2017 (with J. Grossklags; then: PhD, Penn State)
Saranya Venkatraman, 2017-2018
Chenrong Qin, 2017-2019

Honors: Le Fang, Information Density in Bilingual Code-Switching. 2017-2018.
Phillip Chwistek, A blockchain architecture for content subscriptions. 2018-2019.

Grad Assistant: Bill McDowell, 2016 (then: MSc, Stanford)

Teaching at Penn State

Application Development Design Studio II (400-level)	2018
Distributed-Object Computing (400-level)	2018
Computational Models of Language - Graduate Seminar	2016
Cognitive Science: Introduction (400-level)	2013, 2017
Emerging Issues in Cognitive Science (Graduate)	2015
Intro. and intermediate Object-Oriented Programming (Java, Python; 200-level)	2012-2015

Teaching at Sungkyunkwan University, International Summer Semester, Seoul, Korea

Data Science and Management	2016, 2018
How the Mind Works - A Big Data Approach	2015, 2016, 2018

Teaching at Carnegie Mellon University

Cognitive Psychology, a 200-level lecture (140-180 students, 9 units) Department of Psychology, Carnegie Mellon University	2011, 2012
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ACTIVITIES AND EXTERNAL SERVICE (SELECTION)

Founder and project lead, <u>Aquamacs Emacs</u> , a software project for science and engineering. More than 13,000 regular users world-wide, primarily in academia	2005- -2019
Inventor/Developer, <u>Zot_bib_web</u> , a tool to create interactive, explorable web bibliographies	2016-
Senior program committee member, <i>CogSci: Annual Mtg. of the Cognitive Science Society</i>	2017
Co-editor, Issue on Computational Models of Memory, <i>Topics in Cognitive Science</i>	2017
Program co-chair, <i>International Conference on Cognitive Modeling</i>	2016
Area chair in Cognitive Modeling and Psycholinguistics, <i>ACL: Assoc. Computational Linguistics</i>	2016
General and program co-chair, <i>ICCM: International Conference on Cognitive Modeling</i>	2016
Program co-chair, <i>SBP-BRiMS: Social, Cultural, and Behavioral Modeling</i>	2016
Program co-chair, <i>Behavioral Representation in Modeling and Simulation Conference</i>	2013, 2014, 2015
Co-editor, Issue on Behavior Representation, <i>Computational and Mathematical Organization Theory</i>	2015
Co-editor, Issue on Computational Models in Linguistics, <i>Topics in Cognitive Science</i>	2012
Co-chair, 2nd and 3rd Workshops on <i>Cognitive Modeling and Computational Linguistics</i>	2011, 2012
Board member, ACL SIG Natural Language Generation	2005, 2006
 <i>Reviewing</i>	
Editorial review board member: <i>Frontiers in Psychology</i>	2015-
Proposal review panel member, <i>National Science Foundation</i>	2015
Ad-hoc reviewer for Cognition, Cognitive Science, Memory & Language, Topics in Cog.Sci., Psychonomic Bulletin & Review, J Cog. Sci., Cognitive Science Research, Engineering and Physical Sc. Research Council (EPSRC), Netherlands Organisation for Scientific Research (NWO). Intl. J. Human Computer Studies, J of Cognitive Engineering and Decision-Making, and others.	
Program Committee Member: Mtg. Association Computational Linguistics (ACL); Mtg. North- American ACL (NAACL); Cognitive Modeling and Computational Linguistics (CMCL); Social Computing, Behavioral-Cultural Modeling and Prediction Conference (SBP); Mtg. Cognitive Science Soc. (CogSci, EuroCogSci); previous years: ACM CHI, ACM UIST, INLG, etc.	2015
Thesis examiner: Mr. Chuandong Yin, University of Melbourne	2018
 <i>Visiting</i>	
Language Technologies Institute, Carnegie Mellon University, Pittsburgh	2018
Center for Research in Language, Cognitive Science, University of California, San Diego	2017-2018
Speech Interfaces Group, Media Laboratory, MIT	2004
Dept. of Computer Science, Macquarie University, Australia	2003

SERVICE TO PENN STATE

Founder/Director, Exchange Program with Sungkyunkwan University, Korea	2015-2018
Faculty Area Representative, Data Science, College of IST	2017-2018
Graduate faculty representative (university level)	2017-2018
Member, Search Committee, Data Science	2017
Graduate Advisory Committee, College of IST	2015-2017
Faculty Advisor, Penn State Soaring Club	2012-
Task-Force: Global Engagement Network, PSU / National Taiwan Normal University	2015
Data Science Major development (Course Committee), College of IST, Penn State	2015
Graduate Recruiting Committee, College of IST, Penn State	2013-2015
Assessment Committee, College of IST, Penn State	2012-2014

LANGUAGES AND SKILLS

Native/near native: English, German; conversational: French

Python, Java, C++, C, shell scripting, Prolog, Common Lisp, Emacs Lisp, LaTeX. basic: Perl, assembly, etc.

Commercial and private pilot (airplane, glider), instrument rated, US (FAA), also: glider, UK (CAA).

INVITED LECTURES

Trustworthy and Controlled Conversation: How to ground very large language models. Korea AI Summit. Seoul National University / MSR Seoul	2022
How Language Models Predict Success in Task-Oriented Conversation. Google AI, New York	2018
What makes conversations successful? Amazon Research, Seattle	2018
Language models as models of human language processing? Evidence, from priming and information density in dialogue to language acquisition. Psychology and Brain Sciences, Indiana University	2018
From Information density in dialogue to language acquisition: Neural language models as models of human language processing. Center for Research in Language, UC San Diego	2018
Information density converges in dialogue. School of Informatics, University of Edinburgh	2017
Panelist, Intelligent Cognitive Assistants Workshop, Semiconductor Research Corp., IBM Almaden	2017
Computational approaches to modeling dialogue, Dept. of Linguistics, U. of California, San Diego	2016
Alignment and Information in Dialogue: How contributions of ideas are reflected in language Korea Advanced Institute of Science and Technology (KAIST), Korea	2016
Alignment in Dialogue: Beyond Syntax. Invited talk, Linguistics Dept., Georgetown University	2015
Window into the mind: Syntactic priming and what it reveals about the psychology of dialogue Department of Psychology, Seoul National University, Korea	2015
Large-scale language data as window into the mind, Distinguished Lecture Series, Department of Library & Information Sciences, Sungkyunkwan University, Korea	2015
How the Mind Works: How Big Data Cognitive Science Unlocks the Mystery of the Human Mind, Invited 3-day lecture, King Abdullah University of Science & Technology, Saudi Arabia	2015
Big-data insights into cognitive representations of language processing, International Workshop on Advanced Learning Sciences, Taipei, Taiwan	2014
Social cognition, on the benefits of forgetting. School of Information Sciences & Tech, Penn State, PA	2012
Measuring and Modeling Language Convergence in Networks. TU Berlin, Germany	2011
Adaptation to conversation partners: On alignment in dialogue. IST, Penn State, PA	2010
Two-level, multi-strategy memory based control. Dynamic Stocks and Flows Modeling Challenge Symposium, Int'l Conf. on Cognitive Modeling, Manchester, UK	2009
Cognitive Models of Alignment in Dialogue. Bielefeld University, Germany	2008
Structural Priming: Studies of Syntax and Alignment in Dialogue Corpora. U. Paris 7, France	2007
Statistics tutorial: Linear mixed models. Dept. of Psychology, U. of Dundee, UK	2007
FASiL: A multimodal dialogue system for E-Mail. Institute of Linguistics, U. Potsdam, Germany	2005
Aspects of a situationalized multimodal human-computer interface. School of Computer Science, Carnegie Mellon University, Pittsburgh, PA	2004
Media Laboratory, Massachusetts Institute of Technology, Cambridge, MA	2004
School of Informatics, University of Edinburgh, UK	2004
UI on the Fly: Generating a multimodal user interface with functional unification grammar. Computer Science Department, Macquarie University, Sydney, Australia	2003