Michael Hahn

CONTACT
Saarland University
Department of Language Science and Technology
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EMPLOYMENT

Saarland University   **2022–present**
Saarland Informatics Campus
Department of Language Science and Technology
Professor (Tenure Track, W2)

Facebook AI Research (Paris, France)   **2018**
Research Intern. Mentor: Marco Baroni

EDUCATION

Stanford University   **2016–2022**
Ph.D. in Linguistics
Dissertation: *Computational and Communicative Efficiency in Language*
Committee: Judith Degen, Dan Jurafsky (co-advisors), Michael C. Frank

Massachusetts Institute of Technology   **2019**
Department of Brain and Cognitive Sciences
Visiting PhD student. Advisor: Edward Gibson

University of Edinburgh   **2015–2016**
School of Informatics
Postgraduate Research Visiting Student. Advisor: Frank Keller

University of Tübingen   **2014–2015**
M.Sc. in Mathematics

26th European Summer School in Logic, Language and Information   **2014**

University of Tübingen   **2011–2014**
B.Sc. in Mathematics

University of Tübingen   **2010–2013**
B.A. in Computational Linguistics

REFEREED
JOURNAL
ARTICLES

accepted in principle. Michael Hahn and Xue-Xin Wei. A unifying theory explains seemingly contradictory biases in perceptual estimation. *Nature Neuroscience*.

2023. Michael Hahn and Frank Keller. Modeling Task Effects in Human Reading with Neural Network-based Attention. *Cognition*. 230:105289.

2023. Thomas Hikaru Clark, Clara Meister, Tiago Pimentel, **Michael Hahn**, Ryan Cotterell, Richard Futrell and Roger Levy. A Cross-Linguistic Pressure for Uniform Information Density in Word Order. *Transactions of the Association for Computational Linguistics*.

2022. Michael Hahn, Richard Futrell, Roger Levy, and Edward Gibson. A resource-rational model of human processing of recursive linguistic structure. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*.

2022. Michael Hahn and Yang Xu. Crosslinguistic word order variation reflects evolutionary pressures of dependency and information locality. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*. 119(24):e2122604119.

2022. Richard Futrell and **Michael Hahn**. Information theory as a bridge between language function and language form. *Frontiers in Communication.* 7:657725.

2022. Michael Hahn, Rebecca Mathew, and Judith Degen. Morpheme ordering across languages reflects optimization for processing efficiency. *Open Mind: Discoveries in Cognitive Science.* 5:208–232.

2021. Michael Hahn, Dan Jurafsky, and Richard Futrell. Sensitivity as a complexity measure for sequence classification tasks. *Transactions of the Association for Computational Linguistics*, 9:891–908.

2021. Michael Hahn, Judith Degen, and Richard Futrell. Modeling word and morpheme order in natural language as an efficient tradeoff of memory and surprisal. *Psychological Review*, 128(4):726–756.

2020. Michael Hahn, Dan Jurafsky, and Richard Futrell. Universals of word order reflect optimization of grammars for efficient communication. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 117(5):2347–2353.

2020. Michael Hahn. Theoretical limitations of self-attention in neural sequence models. *Transactions of the Association for Computational Linguistics*, 8:156–171.

2019. Michael Hahn and Marco Baroni. Tabula nearly rasa: Probing the linguistic knowledge of character-level neural language models trained on unsegmented text. *Transactions of the Association for Computational Linguistics*, 7:467–484.

2019. Michael Hahn and Richard Futrell. Estimating predictive rate-distortion curves via neural variational inference. *Entropy*, 21(7):640.

2015. Michael Hahn and Frank Richter. Henkin Semantics for reasoning with natural language. *Journal of Language Modeling*, 3(2):513–568.

PAPERS IN REFEREED CONFERENCE PROCEEDINGS

2022. Songpeng Yan, **Michael Hahn**, and Frank Keller. Modeling fixation behavior in reading with character-level neural attention. In *Proceedings of the 44th Annual Meeting of the Cognitive Science Society (CogSci)*.

2022. Neil Rathi, **Michael Hahn**, and Richard Futrell. Explaining patterns of fusion in morphological paradigms using the memory–surprisal tradeoff. In *Proceedings of the 44th Annual Meeting of the Cognitive Science Society (CogSci)*.

2021. Neil Rathi, **Michael Hahn**, and Richard Futrell. An information-theoretic characterization of morphological fusion. In *Proceedings of the 2021 Conference on Empirical Methods in Natural Language Processing (EMNLP 2021)*, 10115–10120.

2020. John Hewitt, **Michael Hahn**, Surya Ganguli, Percy Liang, and Christopher D. Manning. RNNs can generate bounded hierarchical languages with optimal memory. In *Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing (EMNLP 2020)*, 1978–2010.

2019. Michael Hahn, Frank Keller, Yonatan Bisk, and Yonatan Belinkov. Character-based surprisal as a model of human reading in the presence of errors. In *Proceedings of the 41st Annual Meeting of the Cognitive Science Society (CogSci)*, 401–407.

2018. Michael Hahn, Judith Degen, Noah Goodman, Dan Jurafsky, and Richard Futrell. An information-theoretic explanation of adjective ordering preferences. In *Proceedings of the 40th Annual Meeting of the Cognitive Science Society (CogSci)*, 1766–1771.

2018. Michael Hahn, Andreas Krebs, and Howard Straubing. Wreath products of distributive forest algebras. In *Proceedings of the 33rd Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2018)*, 512–520.

2016. Michael Hahn and Frank Keller. Modeling human reading with neural attention. In *Proceedings of the 2016 Conference on Empirical Methods in Natural Language Processing (EMNLP 2016)*, 85–95.

2015. Michael Hahn, Andreas Krebs, Klaus-Jörn Lange, and Michael Ludwig. Visibly counter languages and the structure of NC^1. In *Mathematical Foundations of Computer Science 2015 – 40th International Symposium, MFCS 2015*, 384–394.

2014. Michael Hahn. Predication and NP structure in an omnipredicative language: The case of Khoekhoe. In *Proceedings of the 21st International Conference on Head-Driven Phrase Structure Grammar*, 238–258. CSLI Publications.

2013. Michael Hahn. Word order variation in Khoekhoe. In *Proceedings of the 20th International Conference on Head-Driven Phrase Structure Grammar*, 48–68. Stanford, CSLI Publications.

2013. Niels Ott, Ramon Ziai, **Michael Hahn**, and Detmar Meurers. CoMeT: Integrating different levels of linguistic modeling for meaning assessment. In *Proceedings of the 7th International Workshop on Semantic Evaluation (SemEval)*, 608–616.

2012. Michael Hahn. Arabic relativization patterns: A unified HPSG analysis. In *Proceedings of the 19th International Conference on Head-Driven Phrase Structure Grammar*, 144–164. Stanford, CSLI Publications.

2012. Michael Hahn and Detmar Meurers. Evaluating the meaning of answers to reading comprehension questions: A semantics-based approach. In *Proceedings of the 7th Workshop on Innovative Use of NLP for Building Educational Applications (BEA7)*, 326–336. Association for Computational Linguistics.

2011. Michael Hahn and Detmar Meurers. On deriving semantic representations from dependencies: A practical approach for evaluating meaning in learner corpora. In *Proceedings of the Int. Conference on Dependency Linguistics (Depling 2011)*, 94–103.

2011. Michael Hahn. Null conjuncts and bound pronouns in Arabic. In *Proceedings of the 18th International Conference on Head-Driven Phrase Structure Grammar*, 60–80. Stanford, CSLI Publications.

CONTRIBUTIONS TO EDITED VOLUMES

2014. Michael Hahn and Detmar Meurers. On deriving semantic representations from dependencies: A practical approach for evaluating meaning in learner corpora. In Kim Gerdes, Eva Hajicová, and Leo Wanner, editors, *Dependency Theory*, Frontiers in AI and Applications Series, 94–103. IOS Press, 2014.

TEACHING AND MENTORING EXPERIENCE

2023. Instructor, *Foundations of Mathematics*, Saarland University.

2020. Mentor for undergraduate summer research, CSLI Summer Internship Program, CSLI, Stanford University.

2020. Teaching Assistant, *Natural Language Understanding (CS 224U)*, with Christopher Potts, Stanford University.

2019. Teaching Assistant, *Natural Language Processing with Deep Learning (CS 224N)*, with Christopher D. Manning, Stanford University.

2017–2018. Linguistics Corpus Teaching Assistant, with Christopher D. Manning, Stanford University.

2018. Web-based Experimental Methods Workshop, Stanford University.

2012. Teaching Assistant, *Grammar Formalisms in Computational Linguistics*, with Detmar Meurers, University of Tübingen.

INVITED TALKS

2023. *Modeling word and morpheme order as an efficient tradeoff of memory and surprisal*, Colloquium General Linguistics, University of Tübingen, Germany, July 2023.

2023. *A Resource-Rational Model of Human Processing of Recursive Linguistic Structure*, Colloquium English Linguistics, University of Frankfurt, Germany, May 2023.

2022. *A Resource-Rational Model of Human Processing of Recursive Linguistic Structure*, Montréal Computational & Quantitative Linguistics Lab, McGill University, Canada, November 2022.

2022. *Comprehending Language in Humans and Machines*, Shanghai Institute for Advaced Study, Zhejiang University, China, May 2022.

2022. *Comprehending Language in Humans and Machines*, Wangxuan Institute of Computer Technology, Peking University, China, March 2022.

2022. *Comprehending Language in Humans and Machines*, School of Engineering, Westlake University, China, February 2022.

2022. *Towards Human-Like NLP with Insights from Human Cognition*, Fudan University, China, January 2022.

2021. *Sensitivity as a Complexity Measure for Sequence Classification Tasks*, NLP Talk Series, Microsoft Research Lab India, November 2021.

2021. *Cognition Constrains Linguistic Diversity in Word Order*, Computational Psycholinguistics Lab, MIT, June 2021.

2021. *Memory Efficiency Predicts Ordering Universals in Language*, Colloquium, Department of Linguistics, University of Düsseldorf, Germany, April 2021.

2021. *Sensitivity as a Complexity Measure for Sequence Classification Tasks*, Singh Lab, Department of Computer Science, UC Irvine, March 2021.

2021. *Word Order as an Efficient Tradeoff of Memory and Surprisal*, Colloquium, Department of Linguistics, UT Austin, February 2021.

2021. *An Information-Theoretic Explanation of Adjective Ordering Preferences*, TExMod2020: Theoretical and Experimental Approaches to Modification. Tübingen, Germany, January 2021.

2020. *A Neural Noisy-Channel Model of Structural Forgetting*, TedLab, MIT, November 2020.

2020. *Word Order Universals Optimize Communicative Efficiency*, Cognitive Lexicon Laboratory, University of Toronto, August 2020.

2019. *Crosslinguistic Word Orders Optimize Efficiency of Human Communication and Processing*, Harvard NLP, Harvard University, July 2019.

2018. *Explaining Syntactic Universals by Optimizing Grammars.* TedLab, MIT, November 2018.

CONTRIBUTED
PRESENTATIONS

2022. *Modeling Fixations with Neural Attention* (work with Songpeng Yan and Frank Keller), Human Sentence Processing Conference, March 2022.

2021. *Sensitivity as a Complexity Measure for Sequence Classification Tasks* (work with Dan Jurafsky and Richard Futrell), EMNLP 2021: Conference on Empirical Methods in Natural Language Processing, November 2021.

2020. *Theoretical Limitations of Self-Attention in Neural Sequence Models*, 58th Annual Meeting of the Association for Computational Linguistics, July 2020.

2020. *Tabula nearly rasa: Probing the linguistic knowledge of character-level neural language models trained on unsegmented text* (work with Marco Baroni), 58th Annual Meeting of the Association for Computational Linguistics, July 2020.

2020. *Lexical Effects in Structural Forgetting: Evidence for Experience-Based Accounts and a Neural Network Model* (work with Richard Futrell and Edward Gibson), 33rd Annual CUNY Conference on Human Sentence Processing 2020, March 2020.

2019. *Character-based Surprisal as a Model of Human Reading in the Presence of Errors* (work with Frank Keller, Yonatan Bisk, Yonatan Belinkov), CogSci 2019, July 2019.

2019. *Crosslinguistic word orders enable an efficient tradeoff of memory and surprisal* (work with Judith Degen, Richard Futrell), 32nd Annual CUNY Conference on Human Sentence Processing, University of Colorado Boulder, March 2019.

2019. *Testing Functional Explanations of Word Order Universals* (work with Richard Futrell), 32nd Annual CUNY Conference on Human Sentence Processing, University of Colorado Boulder, USA, March 2019.

2018. *Testing Functional Explanations of Word Order Universals.* CAMP 2018, USC, Los Angeles, USA, November 2018.

2018. Poster: *An Information-Theoretic Explanation of Adjective Ordering Preferences.* (work with Judith Degen, Noah Goodman, Dan Jurafsky, and Richard Futrell), CogSci 2018, Madison, Wisconsin, USA, July 2018.

2018. *Wreath Products of Distributive Forest Algebras.* (work with Andreas Krebs and Howard Straubing), LICS 2018, Oxford, UK, July 2018.

2018. Poster: *Mutual Information Impacts Adjective Ordering Across Languages.* (work with Judith Degen, Dan Jurafsky, Noah Goodman, Richard Futrell), 31st Annual CUNY Conference on Human Sentence Processing, UC Davis, USA, March 2018.

2018. Poster: *Exploring Adjective Ordering Preferences via Artificial Language Learning.* (work with Judith Degen, Richard Futrell), 31st Annual CUNY Conference on Human Sentence Processing, UC Davis, USA, March 2018.

2017. *Exploring Adjective Ordering Preferences via Artificial Language Learning.* (work with Judith Degen, Richard Futrell), California Meeting on Psycholinguistics, 2017, UCLA, Los Angeles, USA, November 2017.

2017. *Modeling Task Effects in Reading with Neural Attention.* (work with Frank Keller), 30th Annual CUNY Conference on Human Sentence Processing, MIT, March 2017.

2016. *Modeling Human Reading with Neural Attention.* (work with Frank Keller), EMNLP 2016: Conference on Empirical Methods in Natural Language Processing, Austin, Texas, November 2016.

2014. *Predication and NP Structure in an Omnipredicative Language: The Case of Khoekhoe.* 21st International Conference on Head-Driven Phrase Structure Grammar, Buffalo, US, August 2014.

2013. *Word Order Variation in Khoekhoe.* 20th International Conference on Head-Driven Phrase Structure Grammar, Berlin, Germany, August 2013.

2012. *Arabic Relativization Patterns: A Unified HPSG Analysis.* 19th International Conference on Head-Driven Phrase Structure Grammar, Daejeon, South Korea, July 2012.

2012. (with Detmar Meurers) *Evaluating the Meaning of Answers to Reading Comprehension Questions: A Semantics-Based Approach.* 7th Workshop on Innovative Use of NLP for Building Educational Applications (BEA7), Montreal, Canada, July 2012.

2011. *Null Conjuncts and Bound Pronouns in Arabic.* 18th International Conference on Head-Driven Phrase Structure Grammar, Seattle, USA, August 2011.

2011. (with Detmar Meurers) *On deriving semantic representations from dependencies.* International Conference on Dependency Linguistics, Barcelona, Spain, August 2011.

2010. *Agreement and Complex Predicates in Modern Standard Arabic*. Generative Grammatik des Nordens, Berlin, Germany, July 2010.

2009. *Nichtlokale Abhängigkeiten im Hocharabischen/Nonlocal Dependencies in Modern Standard Arabic*. Workshop on Grammar Theory and Grammar Implementation, Berlin, Germany, May 2009.

FELLOWSHIPS
AND AWARDS

Stanford Interdisplicinary Graduate Fellowship, 2019.

Stanford University PhD Fellowship, 2016.

German National Academic Foundation, 2011–2016.
(*Studienstiftung des Deutschen Volkes*)

SERVICE

Area Chair, EMNLP (2023).

Conference Reviewing, ACL Rolling Review (2022-), ACL (2021-), ICLR (2024-), EACL (2021-), EMNLP (2021-), CogSci (2020-), CoNLL (2020-), MFCS (2019), STACS (2015).

Journal Reviewing, Cognition (2020), Open Mind (2021, 2023), Neural Networks (2021), Glossa (2019, 2020, 2022), Neuropsychologia (2019), Journal of Cognitive Psychology (2022), PeerJ (2019, 2022), eLife (2023).

Grant Reviewing, Dutch Research Council (NWO, 2023), German Research Foundation (DFG, 2023).

Institutional Service
CSLI Summer Internship Admissions Committee, Stanford CSLI, 2020.
QP Fest Committee, Stanford Linguistics Department, 2019.
Social Committee, Stanford Linguistics Department, 2016–2017.
EMNLP Student Volunteer, 2016.