

# AARON M. MUELLER

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<b>CONTACT</b>	Center for Language & Speech Processing Johns Hopkins University Hackerman 319, 3400 N. Charles St. Baltimore, MD 21218-2608 (U.S.A.)	<a href="mailto:amueller@jhu.edu">amueller@jhu.edu</a> <a href="https://aaronmueller.github.io">aaronmueller.github.io</a> <a href="https://github.com/aaronmueller">github.com/aaronmueller</a>
<b>RESEARCH INTERESTS</b>	<ul style="list-style-type: none"><li>• Natural language processing</li><li>• Robust generalization, interpretability, evaluation</li><li>• Multilinguality</li><li>• Computational psycholinguistics, syntax, morphology</li></ul>	
<b>EDUCATION</b>	<b>Johns Hopkins University</b>	Baltimore, MD
	Ph.D., Computer Science	May 2023 (expected)
	M.S.E., Computer Science	May 2020
	GPA: 3.9/4.0	
	<i>Advisors:</i> Tal Linzen, Mark Dredze	
	<b>New York University</b>	New York, NY
<b>EXPERIENCE</b>	Visiting academic, Center for Data Science	Aug. 2021 – May 2023
	<i>Advisor:</i> Tal Linzen	
	<b>University of Kentucky</b>	Lexington, KY
	B.S., Computer Science. <i>Honors</i>	May 2018
	B.S., Linguistics. <i>Honors</i>	May 2018
	GPA: 4.0/4.0. <i>Summa cum laude</i>	
<b>EXPERIENCE</b>	<b>Meta</b>	Menlo Park, CA
	<i>Research Intern</i> , AI Integrity	May – Nov. 2022
	Manager: Kanika Narang	
	<ul style="list-style-type: none"><li>– Research in retrieval-augmented generative models for few-shot question answering.</li><li>– Resulted in improved <math>F_1</math> on multiple QA and classification datasets using far fewer parameters than state-of-the-art models. Also resulted in a submission to ACL (under review) [17].</li></ul>	
	<b>Amazon Web Services (AWS)</b>	Santa Clara, CA
	<i>Applied Scientist Intern</i> , Lex	May – Aug. 2021
	Manager: Saab Mansour	
	<ul style="list-style-type: none"><li>– Research in pre-training methods for improving goal-oriented dialogue agents.</li><li>– Resulted in state-of-the-art few-shot intent classification accuracy (&gt;30% 1-shot gains) and a publication at ACL [2].</li></ul>	
	<b>Raytheon BBN Technologies</b>	Cambridge, MA
	<i>Research Intern</i> , Analytics & Machine Intelligence	May – Aug. 2019
<b>EXPERIENCE</b>	Manager: Ilana Heintz	
	<ul style="list-style-type: none"><li>– Research in low-resource cross-lingual word alignment and entity linking.</li><li>– Implemented convolutional neural machine translation models rivaling our prior seq2seq model’s BLEU with over 20% faster training and over 50% faster inference.</li></ul>	
	<b>University of Massachusetts Amherst</b>	Amherst, MA
	<i>Research Intern</i> , SLANG Lab	May – Aug. 2017
	Advisor: Brendan O’Connor	
	<ul style="list-style-type: none"><li>– Research (joint with Katherine A. Keith) in integrating document-level features into an entity-event extraction system.</li></ul>	

## PUBLICATIONS Peer-reviewed Proceedings & Articles

1. **Aaron Mueller**, Robert Frank, Tal Linzen, Luheng Wang, Sebastian Schuster. “[Coloring the Blank Slate: Pre-training Imparts a Hierarchical Inductive Bias to Sequence-to-sequence Models.](#)” In *Findings of the Association for Computational Linguistics (ACL)*, 2022.
2. **Aaron Mueller**, Jason Krone, Salvatore Romeo, Saab Mansour, Elman Mansimov, Yi Zhang, Dan Roth. “[Label Semantic Aware Pre-training for Few-shot Text Classification.](#)” In *Proceedings of the Association for Computational Linguistics (ACL)*, 2022.
3. **Aaron Mueller**, Yu Xia, Tal Linzen. “[Causal Analysis of Syntactic Agreement Neurons in Multilingual Language Models.](#)” To appear in *Proceedings of the Conference on Computational Natural Language Learning (CoNLL)*, 2022.
4. Alexandra DeLucia, Shijie Wu, **Aaron Mueller**, Carlos Aguirre, Mark Dredze, Philip Resnik. “[BERNICE: A Multilingual Pre-trained Encoder for Twitter.](#)” To appear in *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*, 2022.
5. **Aaron Mueller**, Mark Dredze. “[Fine-tuning Encoders for Improved Monolingual and Zero-shot Polylingual Neural Topic Modeling.](#)” In *Proceedings of the North American Chapter of the Association for Computational Linguistics (NAACL)*, 2021.
6. **Aaron Mueller**, Zach Wood-Doughty, Silvio Amir, Mark Dredze, Alicia L. Nobles. “[Demographic Representation and Collective Storytelling in the Me Too Twitter Hashtag Activism Movement.](#)” In *Proceedings of the Association for Computing Machinery (ACM) on Human-Computer Interaction (HCI)*, vol. CSCWI, 2021.
7. Matthew Finlayson\*, **Aaron Mueller\***, Sebastian Gehrmann, Stuart Shieber, Tal Linzen, Yonatan Belinkov. “[Causal Analysis of Syntactic Agreement Mechanisms in Neural Language Models.](#)” In *Proceedings of the Association for Computational Linguistics (ACL)*, 2021. [\*Equal contribution]
8. Alexandra DeLucia\*, **Aaron Mueller\***, Xiang Lisa Li, João Sedoc. “[Decoding Methods for Neural Narrative Generation.](#)” In *Proceedings of the Workshop on Generation Evaluation and Metrics (GEM) at Association for Computational Linguistics (ACL)*, 2021. [\*Equal contribution]
9. **Aaron Mueller**, Garrett Nicolai, Panayiota Petrou-Zeniou, Natalia Talmina, Tal Linzen. “[Cross-linguistic Syntactic Evaluation of Word Prediction Models.](#)” In *Proceedings of the Association for Computational Linguistics (ACL)*, 2020.
10. **Aaron Mueller**, Garrett Nicolai, Arya D. McCarthy, Dylan Lewis, Winston Wu, David Yarowsky. “[An Analysis of Massively Multilingual Neural Machine Translation for Low-Resource Languages.](#)” In *Proceedings of the Language Resources and Evaluation Conference (LREC)*, 2020.
11. Arya D. McCarthy, Rachel Wicks, Dylan Lewis, **Aaron Mueller**, Winston Wu, Oliver Adams, Garrett Nicolai, Matt Post, David Yarowsky. “[The Johns Hopkins University Bible Corpus: 1600+ Tongues for Typological Exploration.](#)” In *Proceedings of the Language Resources and Evaluation Conference (LREC)*, 2020.
12. Garrett Nicolai, Dylan Lewis, Arya D. McCarthy, **Aaron Mueller**, Winston Wu, David Yarowsky. “[Fine-grained Morphosyntactic Analysis and Generation Tools for More Than One Thousand Languages.](#)” In *Proceedings of the Language Resources and Evaluation Conference (LREC)*, 2020.
13. Marten van Schijndel, **Aaron Mueller**, Tal Linzen. “[Quantity Doesn’t Buy Quality Syntax with Neural Language Models.](#)” In *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*, 2019.
14. Arya D. McCarthy, Winston Wu, **Aaron Mueller**, Bill Watson, David Yarowsky. “[Modeling Color Terminology Across Thousands of Languages.](#)” In *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*, 2019.

15. **Aaron Mueller\***, Yash Kumar Lal\*. “[Sentence-Level Adaptation for Low-Resource Neural Machine Translation](#).” In *Proceedings of the Workshop on Technologies for Machine Translation of Low-Resource Languages (LoResMT) at Machine Translation Summit (MTSummit)*, 2019. [\*Equal contribution]

#### **Preprints & In Submission**

16. **Aaron Mueller**, Tal Linzen. “How to Plant Trees in Language Models: Data and Architectural Effects on the Acquisition of Syntactic Inductive Biases.” In submission to *Association for Computational Linguistics (ACL)*, 2023.
17. **Aaron Mueller**, Kanika Narang, Lambert Mathias, Qifan Wang, Hamed Firooz. “Meta-learning with Demonstration Retrieval for Efficient Few-shot Learning.” In submission to *Association for Computational Linguistics (ACL)*, 2023.
18. Julian Michael, Ari Holtzman, Alicia Parrish, **Aaron Mueller**, Alex Wang, Angelica Chen, Divyam Madaan, Nikita Nangia, Richard Yuanzhe Pang, Jason Phang, Samuel R. Bowman. “[What Do NLP Researchers Believe? Results of the NLP Community Metasurvey](#).” *arXiv preprint*, in submission to *Transactions of the Association for Computational Linguistics (TACL)*, 2023.
19. Koustuv Sinha, Jon Gauthier, **Aaron Mueller**, Kanishka Misra, Keren Fuentes, Roger Levy, Adina Williams. “[Language Model Acceptability Judgements Are Not Always Robust to Context](#).” *arXiv preprint*, in submission to *Association for Computational Linguistics (ACL)*, 2023.

#### **INVITED TALKS**

*Planting Trees in Language Models: Emergent Syntactic Behaviors and Mechanisms from Pre-training.*

- Bar-Ilan NLP Seminar, Bar-Ilan University (Ramat Gan, Israel). Dec. 13, 2022.
- NLP Seminar, Technion – Israel Institute of Technology (Haifa, Israel). Dec. 14, 2022.

*What Generalizations do Sequence-to-sequence Models Learn from Multilingual Text? Insights from Translation and Syntactic Transformations.* Multilingual Text Processing Group, National Research Council of Canada (Ottawa, ON). Mar. 4, 2022.

*Syntactic Agreement in Neural Language Models: How Well and Where Do They Perform Subject-Verb Agreement?* Language & Understanding Group, Mila – Québec Artificial Intelligence Institute (Montréal, QC). Mar. 22, 2021.

*Causal Mediation Analysis for Analyzing Neural Networks.* Fairness & Interpretability Research Talk Series, Google (New York, NY). Mar. 17, 2021.

*Causal Analysis of Syntactic Agreement Mechanisms in Neural Language Models.* Center for Language & Speech Processing Seminar, Johns Hopkins University (Baltimore, MD). Feb. 12, 2021.

#### **FELLOWSHIPS AND AWARDS**

<b>National Science Foundation Graduate Research Fellow</b>	2018 - 2023
<b>Gaines Fellow</b> , <i>University of Kentucky</i>	2016 - 2018
Two-year fellowship. Requires the completion of a juried project, a thesis project, and a seminar in the humanities. (\$5,000)	
<b>Patterson Scholar</b> , <i>University of Kentucky</i>	2014 - 2018
Four-year scholarship covering tuition, educational materials, and room & board. Awarded to undergraduates who have earned National Merit semifinalist standing or higher. (\$86,000)	
<b>Goldwater Scholarship (Honorable Mention)</b>	2017
<b>Phi Beta Kappa</b>	2017
<b>Raymond F. Betts Scholar</b> , <i>University of Kentucky</i>	2017
Awarded for thesis research. Used funds to design language technologies for low-resource dialects of French. (\$2,500)	

	<b>Linguistics Research Award, <i>University of Kentucky</i></b> 2016 Awarded to an undergraduate to facilitate a year-long research project in linguistics. (\$500)	
<b>TEACHING</b>	<b>Johns Hopkins University</b> Baltimore, MD <i>Teaching Assistant</i> – Machine Learning: AI System Design & Development. Spring 2020	
<b>MENTORING</b>	Master’s students: • Yash Kumar Lal (Johns Hopkins). Met biweekly. Resulted in a workshop publication [15]. 2018–2019  Undergraduate researchers: • Yu Xia (New York University). Met weekly. Resulted in a publication at CoNLL [3]. 2021–2022 • Matthew Finlayson (Harvard). Met weekly. Resulted in a publication at ACL [7]. 2020–2021	
<b>SERVICE</b>	Organizing Committees: • <a href="#">The BabyLM Shared Task</a> (CoNLL 2023) • <a href="#">The Inverse Scaling Prize</a> (2022)  Reviewing: • ACL Rolling Review (Oct. 2021 – present; monthly) • ACL (2022, 2020) • EMNLP (2022, 2019) • CoNLL (2022) • TACL (2022) • NAACL (2021) • CSCW (2021) • COLING (2020)	
<b>SKILLS</b>	Programming: – Languages: Python, C++, HTML, CSS, Javascript, Bash – Machine Learning Toolkits: PyTorch (incl. HuggingFace, fairseq, sockeye), NLTK, Scikit-learn, numpy – Version Control: DVCS (Git, Bitbucket)  Linguistic Tools: – Praat, AntConc, QGIS, Audacity	
<b>LANGUAGES</b>	English (native language), French (B2, Canadian). Experience in German and Finnish through research.	