

# Aaron M. Mueller

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CONTACT INFORMATION	Center for Language & Speech Processing Johns Hopkins University 3400 N. Charles St., Hackerman 319 Baltimore, MD 21218-2608 (U.S.A.)	<i>E-mail:</i> amueller@jhu.edu <i>Website:</i> aaronmueller.github.io <i>Code:</i> github.com/aaronmueller
RESEARCH INTERESTS	<ul style="list-style-type: none"><li>• Multilingual natural language processing</li><li>• Computational psycholinguistics (syntax &amp; morphology)</li><li>• Machine translation</li></ul>	
EDUCATION	<b>Johns Hopkins University</b> Ph.D., Computer Science. M.S.E., Computer Science. GPA: 3.9/4.0. <i>Advisors:</i> Mark Dredze, David Yarowsky.	Baltimore, MD August 2018 – May 2023 (expected) May 2020
	<b>New York University</b> Visiting academic, Center for Data Science. <i>Advisor:</i> Tal Linzen.	New York, NY August 2021 – May 2023
	<b>University of Kentucky</b> B.S., Computer Science. <i>Honors.</i> B.S., Linguistics. <i>Honors.</i> GPA: 4.0/4.0. <i>Summa cum laude.</i>	Lexington, KY May 2018 May 2018
INDUSTRY EXPERIENCE	<b>Amazon Web Services (AWS)</b> <i>Applied Scientist Intern</i> , Lex Team 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 an ACL submission (under review).</li></ul>	Santa Clara, CA May 2021 – August 2021
	<b>Raytheon BBN Technologies</b> <i>Research Intern</i> , Analytics & Machine Intelligence Team Manager: Ilana Heintz <ul style="list-style-type: none"><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><li>– Research in low-resource Ukrainian/Russian-English word alignment and entity linking.</li></ul>	Cambridge, MA May 2019 – August 2019
PUBLICATIONS	<b>REFEREED</b> <ol style="list-style-type: none"><li>1. <b>Aaron Mueller</b>, Mark Dredze. “Fine-tuning Encoders for Improved Monolingual and Zero-shot Polylingual Neural Topic Modeling.” In <i>Proceedings of the North American Chapter of the Association for Computational Linguistics (NAACL)</i>, 2021.</li><li>2. <b>Aaron Mueller</b>, Zach Wood-Doughty, Silvio Amir, Mark Dredze, Alicia L. Nobles. “Demographic Representation and Collective Storytelling in the Me Too Twitter Hashtag Activism Movement.” In <i>Proceedings of the Association for Computing Machinery (ACM) on Human-Computer Interaction (HCI)</i>, vol. CSCWI, 2021.</li><li>3. Matthew Finlayson*, <b>Aaron Mueller</b>*, Sebastian Gehrmann, Stuart Shieber, Tal Linzen, Yonatan Belinkov. “Causal Analysis of Syntactic Agreement Mechanisms in Neural Language Models.” In <i>Proceedings of the Association for Computational Linguistics (ACL)</i>, 2021. [*Equal contribution]</li><li>4. Alexandra DeLucia*, <b>Aaron Mueller</b>*, Xiang Lisa Li, João Sedoc. “Decoding Methods for Neural Narrative Generation.” In <i>Proceedings of the Workshop on Generation Evaluation and Metrics (GEM) at Association for Computational Linguistics (ACL)</i>, 2021. [*Equal contribution]</li><li>5. <b>Aaron Mueller</b>, Garrett Nicolai, Panayiota Petrou-Zeniou, Natalia Talmina, Tal Linzen. “Cross-linguistic Syntactic Evaluation of Word Prediction Models.” In <i>Proceedings of the Association for Computational Linguistics (ACL)</i>, 2020.</li></ol>	

6. **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.
7. 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.
8. 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.
9. Marten van Schijndel, **Aaron Mueller**, Tal Linzen. “Quantity Doesn’t Buy Quality Syntax with Neural Language Models.” *Empirical Methods in Natural Language Processing (EMNLP)*, 2019.
10. Arya D. McCarthy, Winston Wu, **Aaron Mueller**, Bill Watson, David Yarowsky. “Modeling Color Terminology Across Thousands of Languages.” *Empirical Methods in Natural Language Processing (EMNLP)*, 2019.
11. **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]

#### UNDER REVIEW

12. **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 submission to *Association for Computational Linguistics (ACL)*, 2022.
13. **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 submission to *Association for Computational Linguistics (ACL)*, 2022.

#### NON-REFEREED

14. **Aaron Mueller**, Mark Richard Lauersdorf, Kevin McGowan, Ramakanth Kavuluru. “Neural Machine Translation for Canadian French.” *Undergraduate thesis*, 2018.

- INVITED TALKS – **Aaron Mueller**. “Syntactic Agreement in Neural Language Models: How Well and Where Do They Perform Subject-Verb Agreement?” At Mila – Québec Artificial Intelligence Institute, Language & Understanding Group (Montréal, QC). March 22, 2021. Virtual talk.
- **Aaron Mueller\***, Sebastian Gehrmann\*. “Causal Mediation Analysis for Analyzing Neural Networks.” At Google Fairness & Interpretability Research Group (New York, NY). March 17, 2021. Virtual talk. [\*Equal contribution]
- **Aaron Mueller**. “Causal Analysis of Syntactic Agreement Mechanisms in Neural Language Models.” At Johns Hopkins University, Center for Language & Speech Processing Seminar (Baltimore, MD). February 12, 2021. Virtual talk.

- RESEARCH PRESENTATIONS – **Aaron Mueller**. “Québec French and Language Technology.” 2018 Betts & Rowland Scholar Awards Ceremony, Lexington, KY, April 4, 2018.
- **Aaron Mueller**, Katherine Keith, Abram Handler, Su Lin Blodgett, Brendan O’Connor. “The Identification of Civilians Killed by Police with Supervised Entity-Event Extraction.” UMass Amherst Research Experience for Undergraduates (REU) Showcase. Amherst, MA. August 9, 2017.
- **Aaron Mueller**, Raphael Finkel, Hilaria Cruz. “Documenting and Promoting the Chatino Language and Orthography.” Juried Presentation in Satisfaction of the Requirements of the Gaines Fellowship. Lexington, KY. February 21, 2017.
- **Aaron Mueller**, Huda Khayrallah, Winston Wu, David Yarowsky. “A Lemma-Based Approach for English-Uyghur Statistical Machine Translation.” Refereed Abstract at the *9th Annual Conference of the Illinois Language and Linguistics Society (ILLS9)*. Urbana, IL. March 31, 2017.
- **Aaron Mueller**, Mark Richard Lauersdorf. “Lexical and Semantic Shifts in the Linguistic Construction of Social Gender: A Corpus-Based Analysis of Written U.S. English.” Poster. Refereed Abstract at the *9th Annual Toronto Undergraduate Linguistics Conference (TULCON9)*. Toronto, ON. March 5, 2016.

ACADEMIC RESEARCH EXPERIENCE	<b>New York University</b>	New York, NY
	<i>Visiting Academic</i> , Center for Data Science	August 2021 – Present
	Advisor: Tal Linzen	
	– Behavioral and causal probing into the (morpho)syntactic representations and abilities of neural language models and sequence-to-sequence models.	
	<b>Johns Hopkins University</b>	Baltimore, MD
	<i>Research Assistant</i> , Center for Language & Speech Processing	August 2018 – Present
	Advisors: David Yarowsky, Mark Dredze	
	– Research in neural machine translation, natural language generation, and massively multilingual NLP.	
	<b>University of Kentucky</b>	Lexington, KY
	<i>Research Assistant</i> , Institutional Research & Advanced Analytics Team	May 2018 – August 2018
	Advisors: Nathan Jacobs, Craig Rudick	
	– Implemented deep LSTMs to learn student and course profiles for grade prediction.	
	– Designed various ordinal loss functions.	
	<b>University of Massachusetts Amherst</b>	Amherst, MA
	<i>Research Assistant</i> , Statistical Social Language Analysis Lab	May 2017 – August 2017
	Advisor: Brendan O'Connor	
	– Research in entity-event extraction.	
	– Integrated entity mention and relation systems into pre-existing sentence-level entity-event extraction model. Also integrated document-level information (e.g., noun coreferences) as features.	
	<b>University of Kentucky</b>	Lexington, KY
	<i>Juried Project</i> , Gaines Center	August 2016 – May 2017
	Jurors: Hilaria Cruz, Raphael Finkel, Phil Harling	
	– Preservation and revitalization project for a low-resource indigenous language—Chatino—spoken natively by approximately 40,000 individuals.	
	– Trained ASR systems with Sphinx.	
	– Created and publicized Chatino language-learning resources, including open-source speech data, a speech corpus, and a website.	
	<b>Johns Hopkins University</b>	Baltimore, MD
	<i>Research Assistant</i> , Center for Language & Speech Processing	May 2016 – August 2016
	Advisor: David Yarowsky	
	– Research in statistical machine translation for low-resource languages.	
	– Implemented a lemma-based English-Uyghur translation model, built a morphological generator for Crimean Tatar, and created parsers to extract translation tables from foreign editions of Wiktionary.	
FELLOWSHIPS AND AWARDS	<b>National Science Foundation Graduate Research Fellow</b>	2018 - 2023
	<b>Gaines Fellow</b>	2016 - 2018
	Two-year fellowship awarded to undergraduates based on academic performance, ability to conduct research, an interest in public issues, and a desire to enhance understanding of the human condition through the humanities. Requires the completion of a juried project, a thesis project, and a seminar in the humanities. (\$5,000)	
	<b>Patterson Scholar</b>	2014 - 2018
	Awarded to University of Kentucky students who have earned National Merit semifinalist standing or better. (\$80,000+)	
	<b>Raymond F. Betts Scholar</b>	2017
	Awarded to rising seniors conducting thesis research. Used funds to study Québec French in Montréal and Québec City during winter of 2017–2018. (\$2,500)	
	<b>Goldwater Scholarship (Honorable Mention)</b>	2017
	<b>Phi Beta Kappa</b>	2017
	<b>Linguistics Research Award</b>	2016
	Awarded to a University of Kentucky undergraduate to facilitate a year-long research project in linguistics. Used funds for a quantitative sociolinguistics project examining semantic shifts in gendered words in U.S. media over 200 years. (\$500)	
	<b>National Merit Semifinalist</b>	2014

TEACHING	<b>Johns Hopkins University</b> <i>Teaching Assistant</i> – Machine Learning: AI System Design & Development.	Baltimore, MD  Spring 2020
SKILLS	Programming: – Languages (expert): Python – Languages (proficient): 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	
LANGUAGES	English (native language), French (B2, Canadian). Experience with German and Finnish through research.	
INTERESTS AND HOBBIES	– Music: guitar (classical, electric), bass, banjo, synthesizer, MaxMSP, Ableton Live. – Athletics: cold-weather/snow hiking, swing dance, contra. – Hobbies: natural language learning, reading (philosophy, politics), city exploration. – Cooking: Thai, French, German, Southern.	