Aaron M. Mueller

CONTACT INFORMATION

Center for Language & Speech Processing
Johns Hopkins University
3400 N. Charles St., Hackerman 319
Baltimore, MD 21218-2608 (U.S.A.)

E-mail: amueller@jhu.edu
Website: aaronmueller.github.io
Code: github.com/aaronmueller

RESEARCH INTERESTS

- Multilingual natural language processing
- Computational psycholinguistics (syntax & morphology)
- Machine translation

EDUCATION

Johns Hopkins University, Baltimore, MD
Ph.D., Computer Science. August 2018 – May 2023 (expected)
M.S.E., Computer Science. May 2020
GPA: 3.9/4.0.
Advisors: Mark Dredze, David Yarowsky.

University of Kentucky, Lexington, KY
B.S., Computer Science. Honors. May 2018
B.S., Linguistics. Honors. May 2018
GPA: 4.0/4.0. *Summa cum laude*.
Thesis: Neural Machine Translation for Canadian French.

INDUSTRY EXPERIENCE

Amazon Web Services (AWS) Santa Clara, CA
Applied Scientist Intern, Lex Team May 2021 – August 2021
Manager: Saab Mansour
– Research in pre-training methods for improving goal-oriented dialogue agents.
– Resulted in state-of-the-art few-shot intent classification accuracy (>30% 1-shot gains) and an ACL submission (under review).

Raytheon BBN Technologies Cambridge, MA
Research Intern, Analytics & Machine Intelligence Team May 2019 – August 2019
Manager: Ilana Heintz
– Implemented convolutional neural machine translation models rivaling our prior seq2seq model's BLEU with over 20% faster training and over 50% faster inference.
– Research in low-resource Ukrainian/Russian-English word alignment and entity linking.

PUBLICATIONS

REFEREED

1. **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.
2. **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. CSCW1*, 2021.
3. 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]
4. 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]
5. **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.
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

New York University — New York, NY
Visiting Academic, 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.

Johns Hopkins University Baltimore, MD
Research Assistant, 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.

University of Kentucky Lexington, KY
Research Assistant, 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.

University of Massachusetts Amherst Amherst, MA
Research Assistant, 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.

University of Kentucky Lexington, KY
Linguistics Department
Juried Project 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.

Johns Hopkins University Baltimore, MD
Research Assistant, 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

National Science Foundation Graduate Research Fellow 2018 - 2023

Gaines Fellow 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)

Patterson Scholar 2014 - 2018
Awarded to University of Kentucky students who have earned National Merit semifinalist standing or better. ($80,000+)

Raymond F. Betts Scholar 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)

Goldwater Scholarship (Honorable Mention) 2017

Phi Beta Kappa 2017

Linguistics Research Award 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)

National Merit Semifinalist 2014

Teaching

Johns Hopkins University Baltimore, MD
Teaching Assistant
– Machine Learning: AI System Design & Development. 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.