

Denis Emelin

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EDUCATION

Ph.D in Informatics

February 2024

University of Edinburgh

Edinburgh, UK

- Thesis: *Evaluating and Improving Lexical Language Understanding in Neural Machine Translation*
- Advised by Dr. Rico Sennrich and Dr. Ivan Titov

M.Sc. in Language Science and Technology

2018

Saarland University

Saarbrücken, Germany

- Thesis: *Adversarially Learning to Manipulate the Cognitive Load of Sentences*
- Advised by Dr. Dietrich Klakow
- Developed IDGAN: A fully-unsupervised neural sentence simplification system that combines insights from neural machine translation, psycholinguistics, and adversarial learning
- Grade: 1.4 (~3.7 GPA)

B.A. in German Studies, Linguistics Concentration

2012

University of Tübingen

Tübingen, Germany

- Grade: 1.0 (~4.0 GPA)

PUBLICATIONS

Denis Emelin (2023). "Evaluating and Improving Lexical Language Understanding in Neural Machine Translation" *PhD Thesis*. (Includes novel work on evaluating LLMs to be published separately.)

Denis Emelin, Daniele Bonadiman, Sawsan Alqahtani, Yi Zhang, and Saab Mansour (2022). "Injecting Domain Knowledge in Language Models for Task-Oriented Dialogue Systems" In: *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*.

Campolungo, Niccolò, Tommaso Pasini, **Denis Emelin**, and Roberto Navigli (2022). "Reducing Disambiguation Biases in NMT by Leveraging Explicit Word Sense Information." In: *Proceedings of the 2022 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies (NAACL-HLT)*.

The BIG-Bench Collective (2022). "Beyond the Imitation Game: Quantifying and Extrapolating the Capabilities of Language Models." *ArXiv abs/2206.04615*.

Denis Emelin, Ronan Le Bras, and Yejin Choi (2021). "Moral Stories: Situated Reasoning about Norms, Intentions, Actions and their Consequences." In: *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*.

Denis Emelin, Rico Sennrich (2021). "Wino-X: Multilingual Winograd Schemas for Commonsense Reasoning and Coreference Resolution" In: *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*.

Denis Emelin, Ivan Titov, and Rico Sennrich (2020). "Detecting Word Sense Disambiguation Biases in Machine Translation for Model-Agnostic Adversarial Attacks." In: *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*.

Denis Emelin, Ivan Titov, and Rico Sennrich (2019). "Widening the Representation Bottleneck in Neural Machine Translation with Lexical Shortcuts." In: *Proceedings of the Fourth Conference on Machine Translation (WMT)*.

Alhafni, Bashar, Justin Cho, **Denis Emelin**, Mozhdeh Gheini, Jonathan May et al. (2019). "ELISA System Description for LoReHLT 2019." In: *Proceedings of LoReHLT2019*.

Haddow, Barry, Nikolay Bogoychev, **Denis Emelin**, Kenneth Heafield, Rico Sennrich et al. (2018). "The University of Edinburgh's submissions to the WMT18 news translation task." In: *Proceedings of the Third Conference on Machine Translation (WMT)*.

WORK EXPERIENCE

Research Intern

Feb 2023 - Apr 2023

Zurich University

Zurich, Switzerland (remote, from Edinburgh)

- Explored strategies for aligning the predictive behaviour of pre-trained LLMs with anticipatory mechanisms evidenced in the human brain for the prediction of N next words during language generation.

Applied Scientist Intern

Jun 2021 - Oct 2021

Amazon Web Services, Amazon Lex

Santa Clara, CA, USA (remote, from Edinburgh)

- Manager: Dr. Saab Mansour; Mentors: Dr. Daniele Bonadiman, Dr. Sawsan Alqahtani
- Investigated strategies for the **injection of business knowledge into pre-trained LLMs**
- Defined a **novel knowledge probe** for dialogue models, in form of the knowledge-guided response selection task
- Proposed and implemented several **neural architectures for knowledge injection**, evaluated on task-oriented dialogue

Research Intern

Jun 2020 - Sep 2020

Allen Institute for Artificial Intelligence (AI2)

Seattle, WA, USA (remote, from Edinburgh)

- Advised by Dr. Ronan Le Bras and Dr. Yejin Choi
- Explored **value-alignment and commonsense reasoning capabilities of pre-trained LLMs**
- **Crowd-sourced a dataset** of structured, annotated narratives through Amazon Mechanical Turk
- Developed **novel decoding algorithms** and performed extensive model analysis

Research Intern

Jun 2019 - Sep 2019

University of Southern California, Information Sciences Institute (ISI)

Los Angeles, CA, USA

- Advised by Dr. Jon May
- Evaluated the ability of neural models to translate figurative and non-compositional expressions
- Constructed a **novel, wide-coverage idiom explicitation corpus** from web data

Research Assistant

Nov 2013 - Apr 2014

German Research Center for Artificial Intelligence (DFKI)

Saarbrücken, Germany

- Investigated agent planning for plan verbalization in human-robot interaction
- Contributed to a natural language generation system by refining CCG grammars

Research Assistant

Dec 2012 - Sep 2013

Saarland University

Saarbrücken, Germany

- Gathered language processing data using methods such as EEG and eye tracking
- Analyzed experimental data for statistical significance

PROJECTS

Nematode | Python, TensorFlow, numpy

- Extendable neural machine translation toolkit built around the Transformer model
- Multi-GPU training and gradient aggregation enable large-scale experimentation
- Transformer implementation now merged into Nematus
- Available at: github.com/demelin/nematode

Paper re-implementations | Python, PyTorch, Numpy

- Working re-implementations of several natural language processing publications
- Noise Contrastive Estimation: github.com/demelin/Noise-Contrastive-Estimation-NCE-for-pyTorch
- Neural sentence similarity classifier: github.com/demelin/Sentence-similarity-classifier-for-pyTorch

TECHNICAL SKILLS

Python: PyTorch, Hugging Face Transformers, TensorFlow, Numpy, Scikit-learn, Pandas, spaCy, Stanza, NLTK, SciPy, Matplotlib / Seaborn etc.

R: Limited proficiency focusing on statistical methods

Statistical analysis: Significance testing, effect size analysis

Data collection: Crowd-sourcing (e.g. via Amazon Mechanical Turk), web scraping, cleaning and curation

RESEARCH INTERESTS

Language modeling: LLMs, alignment, multilinguality, multimodality, reasoning, fairness, safety, emergence

Data biases: Dataset artifacts, adversarial samples, sociological biases

Natural language generation: Narrative generation, (constrained) decoding algorithms, task-oriented dialogue, QA

Knowledge representation: Integration of external knowledge into LLMs from structured and unstructured sources

Machine translation and multilingual technologies: Lexical ambiguity, co-reference resolution, low-resource NMT

TEACHING

Teaching Assistant, Tutor, Demonstrator

Apr 2018 - Feb 2020

University of Edinburgh

Edinburgh, UK

- Assisted with teaching undergraduate courses on neural machine translation and language understanding
- Created and evaluated coursework submitted by several hundred students

SERVICE

Reviewer: EMNLP, EACL, ACL Student Research Workshop, ACL Rolling Review (ARR)

Mentor: ACL Student Research Workshop, Women in in STEM @ University of Edinburgh

Representation: Research student representative on the Informatics Staff-Student Liaison Committee,
research student representative for the Institute for Language, Cognition and Computation, University of Edinburgh

LANGUAGES

Native: English, German, Russian

Novice: French, Scottish Gaelic

HOBBIES

Bouldering, performance arts, music, acrobatics, philosophy