

Yuntian DENG

Google Scholar◇ Personal Website

yuntian@uwaterloo.ca

Appointment

University of Waterloo
Incoming Assistant Professor

Waterloo, Canada
Starting Fall 2024

Vector Institute
Incoming Faculty Affiliate

Toronto, Canada
Starting Fall 2024

Allen Institute for AI
Young Investigator (Postdoc)

Seattle, WA
Jul 2023

Education

Harvard University
Ph.D. in Computer Science
Advisors: Alexander Rush and Stuart Shieber

Cambridge, MA
May 2023

Carnegie Mellon University
Master in Language Technologies
Advisor: Eric Xing

Pittsburgh, PA
Aug 2016

Tsinghua University
Bachelor of Engineering, Department of Automation

Beijing, China
Jul 2014

Research Interests

My research interests center on the intersection of natural language processing, machine learning, and multi-agent systems. Specifically, I am interested in exploring how large language models (LLMs) can communicate and collaborate to solve complex tasks together, and how they can be trained to specialize in different domains for a division of labor. My key focus areas include:

- **Inducing Latent Language for Inter-LLM Communication:** Developing methods to induce a specialized language for LLM communication, thereby enabling LLMs to leverage each other's expertise.
- **Communication for Models Across Modalities:** Extending Inter-LLM communication methods to enable collaboration among models that specialize in different modalities, such as language, image, and sensory data.
- **Collaborative Training for Division of Labor among Models:** Exploring ways to foster a division of labor among models, using communication as a tool to distribute knowledge among them during the training process.

I also work on open-source projects such as OpenNMT, Im2LaTeX, LaTeX2Im, and Steganography to make my research efforts more readily available for developers and researchers.

Awards

Argonne National Lab Impact Award	Jan 2023
University of Chicago Rising Stars in Data Science	Nov 2022
ACM Gordon Bell Prize	Nov 2022
Nvidia Fellowship (10 awardees)	Dec 2021
Harvard Certificates of Distinction in Teaching	Spring 2019, Fall 2020, Fall 2021
Twitch Fellowship Finalist	Jan 2021
DAC 2020 Best Paper Award	Jul 2020
Baidu Fellowship (10 awardees)	Feb 2019
French American Doctoral Exchange Program (French Embassy, 10 US laureates)	Jul 2018
ACL 2017 Best Demo Paper Award Runner-Up	Aug 2017

Publications

*Equal Contribution.

Selected Papers

- 26 **Yuntian Deng**, Kiran Prasad, Roland Fernandez, Paul Smolensky, Vishrav Chaudhary, Stuart Shieber. Implicit Chain of Thought Reasoning via Knowledge Distillation. *arXiv 2023*
- 25 John X. Morris, Chandan Singh, Alexander M. Rush, Jianfeng Gao, **Yuntian Deng**. Tree Prompting: Efficient Task Adaptation without Fine-Tuning. *EMNLP 2023*
- 24 **Yuntian Deng**, Volodymyr Kuleshov, Alexander Rush. Model Criticism for Long-Form Text Generation. *EMNLP 2022*
- 23 **Yuntian Deng**, Anton Bakhtin, Myle Ott, Arthur Szlam, Marc'Aurelio Ranzato. Residual Energy-Based Models for Text Generation. *ICLR 2020*
- 22 **Yuntian Deng**, Alexander Rush. Cascaded Text Generation with Markov Transformers. *NeurIPS 2020*
- 21 Sebastian Gehrmann, **Yuntian Deng**, Alexander M. Rush. Bottom-Up Abstractive Summarization. *EMNLP 2018*
- 20 Zachary Ziegler*, **Yuntian Deng***, Alexander Rush. Neural Linguistic Steganography. *EMNLP 2019 oral (Demo: steganography.live)*

- 19 **Yuntian Deng**, Noriyuki Kojima, Alexander Rush. Markup-to-Image Diffusion Models with Scheduled Sampling. *ICLR 2023* (Demo: huggingface.co/spaces/yuntian-deng/latex2im)
- 18 **Yuntian Deng***, Yoon Kim*, Justin Chiu, Demi Guo, Alexander M. Rush. Latent Alignment and Variational Attention. *NeurIPS 2018*
- 17 **Yuntian Deng**, Anssi Kanervisto, Jeffrey Ling, Alexander M. Rush. Image-to-Markup Generation with Coarse-to-Fine Attention. *ICML 2017* (Demo: im2markup.yuntiandeng.com)

Journal Papers

- 16 Anton Bakhtin*, **Yuntian Deng***, Sam Gross, Myle Ott, Marc'Aurelio Ranzato, Arthur Szlam. Residual Energy-Based Models for Text. *JMLR 2021*

Conference Papers

- 15 Richa Rastogi, Yair Schiff, Alon Hachohen, Zhaozhi Li, Ian Lee, **Yuntian Deng**, Mert R. Sabuncu, Volodymyr Kuleshov. Semi-Parametric Inducing Point Networks and Neural Processes. *ICLR 2023*
- 14 Maxim Zvyagin*, Alexander Brace*, Kyle Hippe*, **Yuntian Deng***, Bin Zhang, Cindy Orozco Bohorquez, Austin Clyde, Bharat Kale, Danilo Perez-Rivera, Heng Ma, Carla M. Mann, Michael Irvin, J. Gregory Pauloski, Logan Ward, Valerie Hayot, Murali Emani, Sam Foreman, Zhen Xie, Diansheng Lin, Maulik Shukla, Weili Nie, Josh Romero, Christian Dallago, Arash Vahdat, Chaowei Xiao, Thomas Gibbs, Ian Foster, James J. Davis, Michael E. Papka, Thomas Brettin, Rick Stevens, Anima Anandkumar, Venkatram Vishwanath, Arvind Ramanathan, GenSLMs: Genome-scale language models reveal SARS-CoV-2 evolutionary dynamics. **ACM Gordon Bell Special Covid Prize**
- 13 Justin Chiu*, **Yuntian Deng***, Alexander Rush. Low-Rank Constraints for Fast Inference in Structured Models. *NeurIPS 2021*
- 12 **Yuntian Deng**, Alexander Rush. Sequence-to-Lattice Models for Fast Translation. *EMNLP 2021 Findings*
- 11 Keyon Vafa, **Yuntian Deng**, David Blei, Alexander Rush. Rationales for Sequential Predictions. *EMNLP 2021 oral*
- 10 Anton Bakhtin, Sam Gross, Myle Ott, **Yuntian Deng**, Marc'Aurelio Ranzato, Arthur Szlam. Real or Fake? Learning to Discriminate Machine from Human Generated Text. *arXiv 1906.03351*
- 9 Thierry Tambe, En-Yu Yang, Zishen Wan, **Yuntian Deng**, Vijay Janapa Reddi, Alexander Rush, David Brooks, Gu-Yeon Wei. Algorithm-Hardware Co-Design of Adaptive Floating-Point Encodings for Resilient Deep Learning Inference. *Design Automation Conference (DAC) 2020 Best Paper Award*
- 8 **Yuntian Deng**, David Rosenberg, Gideon Mann. Challenges in End-to-End Neural Scientific Table Recognition. *ICDAR 2019*
- 7 Pengtao Xie, **Yuntian Deng**, Yi Zhou, Abhimanu Kumar, Yaoliang Yu, James Zou, Eric P Xing. Learning Latent Space Models with Angular Constraints. *ICML 2017*

- 6 Guillaume Klein, Yoon Kim, **Yuntian Deng**, Jean Senellart, Alexander M Rush. OpenNMT: Open-Source Toolkit for Neural Machine Translation. *ACL 2017 Best Demo Paper Award Runner-Up*
- 5 Zichao Yang, Zhiting Hu, **Yuntian Deng**, Chris Dyer, Alex Smola. Neural Machine Translation with Recurrent Attention Modeling. *EACL 2017*
- 4 Xuezhe Ma, Yingkai Gao, Zhiting Hu, Yaoliang Yu, **Yuntian Deng**, Eduard Hovy. Dropout with Expectation-linear Regularization. *ICLR 2017*
- 3 Hao Zhang, Zhiting Hu, **Yuntian Deng**, Mrinmaya Sachan, Zhicheng Yan, Eric P. Xing. Learning Concept Taxonomies from Multi-modal Data. *ACL 2016*
- 2 Pengtao Xie, **Yuntian Deng**, Eric P. Xing. Diversifying Restricted Boltzmann Machine for Document Modeling. *KDD 2015*
- 1 Zhiting Hu, Poyao Huang, **Yuntian Deng**, Yingkai Gao, Eric P. Xing. Entity Hierarchy Embedding. *ACL 2015*

Teaching Experience

Harvard University

Head TA, Intro to Computational Linguistics and NLP (Stuart Shieber)	Aug 2021 - Dec 2021
Head TA, Intro to Computational Linguistics and NLP (Stuart Shieber)	Aug 2020 - Dec 2020
TA, Natural Language Processing (Alexander Rush)	Jan 2019 - May 2019
Lecture, Natural Language Processing - Translation (Alexander Rush)	Feb 13, 2019
TA, Advanced Machine Learning (Alexander Rush)	Aug 2017 - Dec 2017

Cornell University

Lab Material Preparation, Break Through Tech AI (Alexander Rush)	Aug 2021
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Carnegie Mellon University

TA, Graduate Probabilistic Graphical Models (Matthew Gormley, Eric Xing)	Jan 2016 - May 2016
TA, Graduate Machine Learning (Ziv Bar Joseph, Eric Xing)	Aug 2015 - Dec 2015

Revere High School

Volunteer Instructor of AP CS (Microsoft Philanthropies)	Sep 2020 - May 2021
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Professional Service

2024: Area Chair of ICLR

2023: Area Chair of EMNLP GEM Workshop, Reviewer of TACL, ICML, ACL, ACL ARR, ACL Demo, AACL, EMNLP, Foundations and Trends in Signal Processing

2022: Reviewer of ACL ARR, EMNLP, ICML, NeurIPS, ICLR, EACL, ML Reproducibility Challenge, ACL Demo, NAACL Demo, and EMNLP GEM Workshop.

2021: Expert Reviewer of ICML. Oral Session Volunteer of ACL. Reviewer of NeurIPS, ACL, ACL ARR, ICLR, AAAI, EACL, NAACL, ML Reproducibility Challenge, ICLR EBM Workshop, IEEE TIIS, and NEJLT. Volunteer of EMNLP.

2020: Top 10% Reviewer of NeurIPS. Reviewer of ICML, ACL, EMNLP, AACL, AAAI, ACL Demo, COLING, IEEE TIFS, Transactions on Information Systems, and Journal of Computer Science and Technology. Volunteer of ICML. Volunteer moderator of ACL.

2019: Reviewer of NeurIPS, EMNLP, ICLR, NAACL, AAAI, IEEE TNNLS, ACM Computing Surveys, NeurIPS LIRE Workshop, NeurIPS Reproducibility Challenge, EMNLP Summarization Workshop, ICML GraphReason Workshop, and ICLR DeepGenStruct Workshop.

2018: Reviewer of ICLR.

2016: Volunteer of ICML.

Community Service

ACL Mentorship Session on CV and Statement of Purpose	Oct 10, 2023
Childcare Chair at NAACL 2022 D&I Committee	Apr - Jul 2022
Organizer and Mentor of Harvard Women in CS NLP Reading Group	Sep 2020 - Present
Volunteer Instructor of AP CS at Revere High School	Sep 2020 - May 2021
Leader of Harvard English Language Table	Sep 2021 - Jan 2023

Internships

Nvidia / Argonne National Lab (Anima Anandkumar / Arvind Ramanathan)	May - Dec 2022
Facebook AI Research (Marc'Aurelio Ranzato)	May - Dec 2019
Bloomberg CTO Office (David Rosenberg, Gideon Mann)	Jan - Aug 2017
UCSD (Charles Elkan)	Jul - Sep 2013

Talks

AI2 Semantic Scholars: Structure Modeling in Language Models	Aug 2023, Seattle, Washington
NYU AI School 2023: Natural Language Processing	Jun 2023, New York, NY

AI2 Mosaic: Structure Modeling in Language Models	Jun 2023, Seattle, Washington
UMass Amherst: Structural Coherence in Text Generation	May 2023, remote
Georgia Tech: Structural Coherence in Text Generation	Apr 2023, Atlanta, Georgia
Harvard Kempner Institute: Structural Coherence in Text Generation	Mar 2023, remote
U Alberta: Structural Coherence in Text Generation	Mar 2023, Edmonton, Canada
TTIC: Structural Coherence in Text Generation	Feb 2023, Chicago
U Waterloo ECE: Structural Coherence in Text Generation	Feb 2023, remote
Cornell Seminar in NLU: Structural Coherence in Text Generation	Feb 2023, New York
U Waterloo CS: Structural Coherence in Text Generation	Jan 2023, Waterloo, Canada
U Chicago Rising Star: Model Criticism for Long-Form Text Generation	Nov 2022, Chicago
Princeton NLP: Model Criticism for Long-Form Text Generation	Nov 2022, Princeton
EMNLP 2021 Findings: Sequence-to-Lattice Models for Fast Translation	Oct 2021, remote
OpenAI: Residual Energy-based Models for Text Generation	Apr 2021, remote
NeurIPS 2020: Cascaded Text Generation with Markov Transformers	Oct 2020, remote
Baidu: Cascaded Text Generation with Markov Transformers	Jun 2020, remote
ICLR 2020: Residual Energy-based Models for Text Generation	Apr 2020, remote
LinkedIn: Residual Energy-based Models for Text Generation	Mar 2020, remote
Wayfair: Neural Encoder-Decoder Models	Nov 2019, Boston
EMNLP 2019: Neural Linguistic Steganography	Nov 2019, Hong Kong
FAIR NLP Meeting: Energy-Based Models for Text Generation	Aug 2019, New York City
NeurIPS 2018: Latent Alignment and Variational Attention	Dec 2018, Montreal, Canada
The French National Center for Scientific Research: Variational Attention	Jul 2018, France
Association for Machine Translation in the Americas: OpenNMT	Mar 2018, Boston
Open-Source Neural Machine Translation Workshop: Image-to-Text	Mar 2018, Paris, France
Tencent Social Network Group TSAIC: OpenNMT	Dec 2017, Shenzhen, China
ICML: Image-to-Markup Generation	Aug 2017, Sydney, Australia

Open Source Projects

Cascaded Generation (125 Github stars)

PyTorch

Neural Linguistic Steganography (170 Github stars)	PyTorch
Variational Attention (325 Github stars)	PyTorch
Image-to-Markup Generation (1.1k Github stars)	LuaTorch
OpenNMT-py (6.3k Github stars)	PyTorch
OpenNMT (2.4k Github stars)	LuaTorch
Attention OCR (1.1k Github stars)	Tensorflow