Bo-Ru (Roy) Lu

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Research Interests

My recent research focuses on improving language models for spoken dialogue systems, with a particular focus on structure learning, model efficiency, and data synthesis. I have a wide-ranging interest in creating conversational AI systems for real-world applications using large language models (LLMs) and deep learning techniques.

Education

- University of Washington — Seattle, WA
  Ph.D. in Electrical & Computer Engineering. Overall GPA: 3.9/4.0. — July 2024 (expected)
  Advisor: Mari Ostendorf.
- National Taiwan University — Taiwan
  M.S. in Communication Engineering. Overall GPA: 4.0/4.0. — 2018
  Advisors: Lin-Shan Lee and Hung-Yi Lee.
- National Taiwan University — Taiwan
  B.S. in Electrical Engineering. Overall GPA: 3.7/4.0 & CS-relevant GPA: 4.0/4.0. — 2016

Research Experiences

- Research Assistant at the University of Washington — Fall 2018 - present
  - Advisor: Mari Ostendorf.
  - Developed a new configuration for encoder-decoder transformer models to boost task performance and increase **training and inference efficiency** on three decomposable tasks (e.g. dialogue state tracking, medical summarization, medical question answering).
  - Built a **collaborative human-LLM framework** to synthesize data, enhancing the performance of fine-tuned T5 models for realistic call center applications.
  - Developed an **unsupervised learning algorithm** that automatically extracts **dialogue structure** to improve transformer performance and summarize call center calls.
  - Built a multi-task model of **knowledge identification in document-grounded conversations** and achieved state-of-the-art results in two recent datasets.
- Applied Scientist Intern at Amazon — Spring & Summer 2022
  - Mentors: Yang Liu and Dilek Hakkani-Tür.
  - Worked on **knowledge-grounded response generation for information-seeking dialogues**. Integrated reranking loss function into a response generation model to improve the inference efficiency.
- Research Intern at Google — Summer 2021
  - Mentors: Joshua Ainslie and Santiago Ontañón.
  - Worked on **multimodal representation learning** via a joint vision-language transformer that integrates 2-D image positional encoding to account for the relatively spatial relationships between pixel patches in images.

- Research Intern at Microsoft Summer 2020
  - Mentors: Xiaofeng Zhu and Pengchuan Zhang.
  - Worked on weakly supervised user question discovery on private customer service data via multiple instance learning.
- Machine Learning Intern at Apple Spring 2018
  - Mentors: Longkai Zhang and Xin Wang.
  - Designed and implemented a neural model for QuickPath keyboard input integrated in iOS 13.
- Research Assistant at National Taiwan University Spring 2015 - Summer 2018
  - Advisors: Lin-Shan Lee and Hung-Yi Lee.
  - LSTM with connectionist temporal classification (CTC) for text and spoken document summarization.

Publications & Preprints

* Equal Contribution

[1] Efficient Encoder-Decoder Transformer Decoding for Decomposable Tasks
Bo-Ru Lu, Nikita Haduong, Chien-Yu Lin, Hao Cheng, Noah A. Smith, Mari Ostendorf. Preprint, arXiv 2024.

[2] Does Collaborative Human-LM Dialogue Generation Help Information Extraction from Human-Human Dialogues?
Bo-Ru Lu*, Nikita Haduong*, Chia-Hsuan Lee, Zeqiu Wu, Hao Cheng, Paul Koester, Jean Utke, Tao Yu, Noah A. Smith, Mari Ostendor. Conference of Language Model (CoLM) 2024.

[3] Unsupervised Learning of Hierarchical Conversation Structure
Bo-Ru Lu, Yushi Hu, Hao Cheng, Noah A. Smith, Mari Ostendorf. EMNLP Findings, 2022.

[4] DIALKI: Knowledge Identification in Conversational Systems through Dialogue-Document Contextualization.
Zeqiu Wu*, Bo-Ru Lu*, Hannaneh Hajishirzi, Mari Ostendorf. EMNLP 2021.

[5] A Multi-Passage Knowledge Selector for Information-Seeking Dialogues
Zeqiu Wu*, Bo-Ru Lu*, Hannaneh Hajishirzi, Mari Ostendorf. DialDoc@ACL, 2021.

[6] Order-Preserving Abstractive Summarization for Spoken Content Based on Connectionist Temporal Classification
Bo-Ru Lu, Frank Shyu, Yun-Nung Chen, Hung-Yi Lee, Lin-Shan Lee. Interspeech, 2017.

Awards and Honors

- Ranked the 1st place out of 23 teams in the shared task 1 at 1st DialDoc workshop, ACL-IJCNLP 2021. 2021
- 2018 Foxconn Techonology Award, Foxconn Education Foundation. 2019
- Government Scholarship for Studying Abroad, Ministry of Education, Taiwan. 2018
- Long-Term Fellowship for Cultivating Elite Students, Hsing Tian Kong, Taiwan. 2017 - 2022
  - Fellowship to support elite students in Taiwan with the acceptance rate of 0.1%.
- Advanced Speech Technologies Scholarship, National Taiwan University, Taiwan. 2017
  - Recognizes students with excellent academic performance in speech processing (3 recipients in the year).
- International Speech and Communication Association Student Travel Grants, ISCA. 2017
- NTU Electrical Engineering 1960 Alumni Scholarship, National Taiwan University, Taiwan. 2015
  - Recognizes undergraduates in EECS with excellent academic performance (2 recipients a year).

Teaching Experiences

- CSIE 5440, Intelligent Conversational Bot, NTU CSIE. Instructor: Yun-Nung (Vivian) Chen. Spring 2017
- EE 5177, Machine Learning, NTU EE. Instructor: Hung-Yi Lee. Fall 2016
  - Lead TA: led the team of 13 TAs and tutored 278 students in the course.
- CSIE 5431, Applied Deep Learning, NTU CSIE. Instructor: Yun-Nung (Vivian) Chen. Fall 2016

Services & Invited Talks

- Program Committee (Reviewer)
  ACL ARR 2023-present, ICASSP 2023-2024, AAAI 2023-2024.
- Invited talks.
  USC CSCI 535 (Multimodal Probabilistic Learning of Human Communication) April 2022
  1st DialDoc Workshop at ACL 2021 July 2021

Skills

- **Languages:** Mandarin (native), Taiwanese (native), English (fluent).
- **Programming Languages:** Python, Shell Script, Javascript, HTML/CSS, C++.
- **Libraries:** PyTorch, TensorFlow, Hugging Face, Scikit-learn, Numpy, Pandas.
- **Tools:** Git, Docker, Apptainer/Singularity, Google Clould, Azure, AWS.
- **High Performance Computing (HPC)**: Slurm, HTCondor

Last updated: July, 2024