Tianyi Zhang

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HIGHLIGHTS

- **Expertise:**

Human Cognition	6 years in B.S., M.Ed.
Natural Language Processing	3 years in MSE

- **Research Experience:**

4 projects in 3 years:	Synopsis:
Event Extraction	DARPA BETTER, 20-22, member, publication [2]
Schema Induction	DARPA KAIROS, 22-23, leader, publication [1]
Entity-State Tracking	AI2, 23 spring, member & leader, publication [3]
Natural to Symbolic Reasoning	Ongoing

- **Research Interests:**
  Reasoning in Natural & Symbolic Language
  Interdisciplinary in NLP, CV, and Robotics
  Happy to explore and confident to work well in varied tasks

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EDUCATION

- **University of Pennsylvania** | Philadelphia, America   Sept. 2018 – Dec. 2022
  MSE in Data Science   GPA: 3.97/4.00
  Advisors: Prof. Dan Roth, Prof. Chris Callison-Burch

  M.Ed. in Learning Science and Technology   GPA: 3.91/4.00
  Advisor: Prof. Yasmin B. Kafai

- **Beijing Normal University** │ Beijing, China   Sept. 2014 – Jul. 2018
  B.S. in Educational Technology   GPA: 88/100
  Advisor: Prof. Qian Fu

PUBLICATIONS

[1] **Zhang, T.** *, Tham, I. *, Hou, Z. *, Ren, J., Zhou, L., Xu, H., Zhang, L., Martin, L., Dror, R., Li, S., Ji, H., Palmer, M., Brown, S., Suchocki, R., and Callison-Burch, C. (2023). Human-in-the-Loop Schema Induction. In Proceedings of the 61st Annual Meeting of the Association for Computational Linguistics (Volume 3: System Demonstrations).

[2] **Zhang, T.**, Sulem, E., Roth, D. Question-Answering Data Augmentation for Argument Role Labeling. In submission

[3] **Zhang, T.** *, Zhang, L. *, Hou, Z., Wang, Z., Gu, Y., Clark, P., Callison-Burch, C., and Tandon, N. PROC2PDDL: Towards Open-Domain Symbolic Planning. In submission

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RESEARCH EXPERIENCE

- **Current Research**   Oct. 2023 –
  Natural to Symbolic Reasoning
  - To enhance human reasoning on events
  - Design approaches imitate human knowledge acquisition, storage, and application
  - Process Natural Language request and infer on Symbolic Language (e.g., Python, PDDL)
  - Improve faithfulness and interpretability of LM reasoning

- **NLP Group at UPenn**   May. 2022 – Jun. 2023
  Entity-State Tracking
  - To reason on events unfold: infer events with fine-grained entity-state
  - Translate open-domain Natural Language text (wikiHow) to
    Symbolic Language (PDDL) with GPT-4

- Decompose the task into three stages: extraction, inference, and translation
- Identify strong text extraction and entity-state inference abilities with complex wikiHow text (~5000 words)
- Acknowledge a weak translation capability to predefined symbolic predicates
- Improve the entity-state tracking using CoT and instructions on translation.
- Publication [3]: "PROC2PDDL: Towards Open-Domain Symbolic Planning"

Event Schema Induction

- To understand event relations: (semi-) automatically create event schema in high quality
- Design the scaffolds (cause, plan, procedure, effect, etc.) for GPT-3
- Apply SRL and constituency parsing to summarize and extract structured events
- Build schema graphs by adding temporal relations to the events
- Iteratively prompt LM and merge graphs
- Design interface for human - GPT interactive schema generation
- Improve accuracy and efficiency (1 hour to 15 mins per schema) and adopted by the UIUC group
- Publication [1]: "Human-in-the-Loop Schema Induction"

- **Cognitive Computation Group at UPenn**   Mar. 2020 – Dec. 2022

    Event Extraction

    - To understand atomic events: extract events with 'who does what to whom'
    - Identify and classify event triggers using sequence tagging
    - Design a pipeline: BIO identify - event type classify model to replace the joint model
    - Improve performance with transfer learning on target language dataset, e.g., OntoNotesArabic
    - Identify and classify event arguments using QA
    - Design fixed questions for each argument role and convert the argument role labeling task to the Question-Answering task
    - Build a pipeline model: has/no answer classification + has answer identification to replace has-and-no-answer joint model
    - Improve performance with transfer learning on auxiliary QA datasets, e.g., SQuAD, QAMR

    Event Data Augmentation

    - To overcome the deficiency of event annotation data
    - Design a pipeline approach: answer extraction (AE) and question generation (QG)
    - Train AEwSRL-QG Bert-T5 model to extract QA pairs from unlabeled event text
    - Evaluate the augmented data on QA event extraction model
    - Prove the effectiveness of the data augmentation approach (8k synthetic data exceeds 80k SQuAD data test on the ACE)
    - Publication [2]: "Question-Answering Data Augmentation for Argument Role Labeling"

INTERNSHIP

- **Research Assistant**   **NLP Group at UPenn**   May. 2022 – Jun. 2023

    See the Research Experience section for details

    Cognitive Computation Group at UPenn   Mar. 2020 – Dec. 2022

    See the Research Experience section for details

- **Teaching Assistant**   **CIS522 Deep Learning**   Jan. 2022 – May. 2022
    - Design course materials and teach deep learning models in CV, NLP, RL, etc.
    - Hold Office Hours and group discussions each week.

- **Data Analyst**   **SciStarter in Philadelphia**   Sep. 2018 – Apr. 2019
    - Use the Python Pandas package to clean and analyze email log-in data (30,000 records).
    - Find the highest possibility of emails being checked is between 9 a.m. to 3 p.m., and within 1 day (over 80%). The most attractive topics are love, games, and high tech. The royalty of the subscriber is 50%.