Xi Victoria Lin

Contact Information

Ph.D. Student
Department of Computer Science and Engineering
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Research Interests

Natural language understanding, machine learning and knowledge representation

Education

University of Washington, Seattle, WA
Ph.D. candidate, Computer Science and Engineering, June 2013 - *present*
- Advisor(s): Prof. Luke Zettlemoyer (November 2013 - *present*)
  Prof. Benjamin Taskar (June 2013 - November 2013)
- Research Interest: semantic parsing, natural language understanding

University of Pennsylvania, Philadelphia, PA
Ph.D. graduated as M.Sc., Computer and Information Science, May 2013
- Cumulative GPA: 3.86/4.0
- Advisor: Prof. Benjamin Taskar
- Research Interest: natural language processing, machine learning

University of Oxford, Kellogg College, Oxford, UK
M.Sc., Computer Science (w. Distinction), September 2011
- Thesis Topic: *Fine-grained Named Entity Classification in Machine Reading*
- Advisor: Prof. Stephen Pulman
- Area of Study: computational linguistics, logic and formal semantics

The Hong Kong Polytechnic University, Kowloon, HK
B.Eng., Electronic and Information Engineering, August 2010
- Cumulative GPA: 4.0/4.0
- Thesis Topic: *Robust Real-time Face Detection*
- Advisor: Prof. Kenneth K. M. Lam
- Minor in Computer Science

Xi'an Jiaotong University, Xi'an, China
Special Class for the Gifted Young, January 2008
- University preparatory program emphasizing math and science training for 9th-grade students selected from across mainland China

Research Projects

Program Synthesis from Natural Language Using Neural Networks
Joint work with Chenglong Wang, Kevin Vu, Deric Pang, Profs. Michael Ernst and Luke Zettlemoyer
This paper sort to make programming easier and more productive by letting programmers use their own words and concepts to express their intended operations, rather than forcing them to accommodate memorized machine grammar. The system we built, Tellina (demo: http://tellina.rocks), lets programmers describe desired operations in natural language, then automatically translates it to a programming language for them to review and approve. In a controlled study, programmers who used Tellina outperformed non-users on a series of controlled programming tasks to a statistically significant degree, even when Tellina's predictions were not completely correct, to a statistically significant degree. We are continuingly improving Tellina's network structure and training data to make it more accurate and cover more programming languages. (Summer 2016 -

present)

Cross-lingual Distant Supervision for Relation Extraction

Joint work with Sameer Singh and Prof. Luke Zettlemoyer and

This project proposed bilingual projection to strengthen the distant supervision signal for relation extraction in two languages, English and Chinese. We assume that text patterns that are translations of each other should express the same set of relations. Conversely, patterns that express the same relations are likely to be translations of each other. We observed that combining the distant supervision data of the languages alone improves predictions over both languages, and adding bilingual projection of the text patterns further improves the results. (Spring 2014 - *Spring 2016*)

Multi-label Learning with Posterior Regularization

Joint work with Sameer Singh, Luheng He, Profs. Benjamin Taskar and Luke Zettlemoyer

It is challenging to gather completely annotated data in many multi-label learning problems, especially as the number of labels grows. This work presents a new approach for multi-label learning from incomplete annotations. Specifically, it uses posterior regularization technique to enforce soft constraints on the output of discriminative classifiers, regularizing them to prefer sparse and low-rank (SLR) predictions. By avoiding strict low-rank constraint we enable a learned trade-off leading to better classifier generation. The resulting joint objective can be optimized efficiently using EM and stochastic gradient descent. Experiments in both image and text domains demonstrate the contributions of each modeling assumption and show that the approach achieve state-of-the-art performance on a number of challenging datasets. (Fall 2013 to Spring 2014)

Fine-grained Named Entity Classification in Machine Reading

Joint work with Prof. Stephen Pulman.

Psycholinguistic study suggests that our lexical memory organizes named entities and common nouns in a taxonomic hierarchy. The task of fine-grained named entity classification intends to classify the set of named entities in text into entry-level categories, i.e., the categories used by humans for understanding the article. We focus specifically on the *person* domain, where we found that in news reports, the right type can often be inferred from the context of target entity within a single document. We formulate the problem as searching for "is-a" relations between a person and an occupation and develop a bootstrapping-style classifier that jointly discovers new person/occupation entities as well as new "is-a" relation tuples. The classifier performs competitively on manually annotated sentences. (Spring 2011 to Summer 2011).

Research Internships

Microsoft Research, Project Hanover, Redmond, WA.

Efficient Relation Extraction from Embedded Knowledge Graph and Text

Joint work with Researchers Kristina Toutanova, Wen-tau Yih, Hoifung Poon and Chris Quirk

Modeling relation paths has offered significant gains in embedding models for knowledge base (KB) completion. This project proposed the first exact dynamic programming algorithm which enables efficient incorporation of all relation paths of bounded length, while modeling both relation types and intermediate nodes in compositional path representations. We conduct a theoretical analysis of the efficiency gain from the approach. Experiments on two datasets show that it addresses representational limitations in prior approaches and improves accuracy in KB completion. (Summer 2015)

Allen Institute for Artificial Inteliigence, Seattle, WA.

Knowledge Extraction for Elementary Physics Reading Comprehension.

Joint work with Researcher Tom Kwiatkowski
Elementary physics reading comprehension posts significant challenges for text understanding and knowledge inference. We formulated the physics reading comprehension problem in a knowledge extraction and inference pipeline and focused on designing a knowledge representation which supports efficient inference. We concluded that hand-engineering the domain-specific knowledge schema does not scale and embroiled us in the knowledge representation explosion faced by most non-statistical AI techniques. This project raised two difficult open problems: 1) Can we develop a symbolic language to describe the operation and inference required to solve physics problems? 2) Can we train machines to deduce and execute highly abstract inference procedures in an end-to-end set-up? (Summer 2014)

Conference Publications

[1] Lin, X. V., Wang, C., Pang, D., Vu, K., Zettlemoyer, L., Ernst, M. Program Synthesis from Natural Language Using Recurrent Neural Networks. *In submission.*

[2] Toutanova, K., Lin, X. V., Yih, W., Poon, H., Quirk, C. Compositional Learning of Embeddings for Relation Paths in Knowledge Bases and Text. In *Processings of the 54th Anunual Meeting of the Association for Computational Linguistics (ACL)*, August 7-12, 2016, Berlin, Germany.

Other Publications

[3] Lin, X.V., Singh, S., He, L., Taskar, B., and Zettlemoyer, L. Multi-label Learning with Posterior Regularization. In *NIPS Workshop on Modern Machine Learning and Natural Language Processing*, December 08–12, 2014, Montreal, Canada.

[4] Lin, X.V. Fine-grained Named Entity Classification in Machine Reading. *M.Sc. thesis.* Oxford University. 2011.

Teaching Experience

University of Pennsylvania, Philadelphia, PA

Teaching Assistant

- CIS520: Machine Learning Fall 2012
  - Writing exam questions; answering Piazza questions; office hours; grading

Honors and Awards

University of Pennsylvania

- Doctoral Fellowship, 2011–2013

The Hong Kong Polytechnic University

- Best Academic Performance Award, EIE Department, 2009–2010
- Hong Kong SAR Government Scholarship, 2009-2010
- Hong Kong Polytechnic University Post-entry Scholarship, 2008–2009
- Hong Kong & Kowloon Electrical Appliances Merchants Association Scholarship, 2008–2009
- Apple Inc. WWDC Student Scholarship, 2009

Conference Services

- Reviewer: EMNLP 2015, 2016, 2017
- Reviewer: ACL 2017
- PC Member: Automated Knowledge Base Construction (AKBC) 2016

Programming Skills

- Deep Learning APIs: Tensorflow, Torch7, Theano
- Languages: Python, Java, Matlab, R, C++, HTML, CSS, JavaScript

References Available to Contact

Prof. Luke Zettlemoyer (e-mail: lsz@cs.washington.edu)
- ⋆ *Ph.D. research adviser*
- • Assistant Professor , Computer Science and Engineering, University of Washington
- ◇ 185 Stevens Way, Seattle, WA 98195-2350

Prof. Stephen Pulman (e-mail: sgp@clg.ox.ac.uk; phone: +44-186-561-0800)
- ⋆ *M.Sc. thesis advisor*
- • FBA Professor, Computational Linguistics, University of Oxford
- ◇ Wolfson Building, Parks Road, Oxford OX1 3QD

Prof. Kenneth Lam (e-mail: enkmlam@polyu.edu.hk; phone: +852-2766-6207)
- ⋆ *B.Eng. thesis advisor*
- • Professor, Electronic and Information Engineering, The Hong Kong Polytechnic University
- ◇ Room DE503c, EIE Department, HKPU, Hung Hom, Kowloon, Hong Kong.