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# Chen Liang

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<b>Research Interests</b>	My current research focuses on (1) integrating deep learning with symbolic modules; (2) making reinforcement learning more efficient; (3) applications in real-world natural language understanding and program synthesis tasks. For example, my recent works designed a hybrid neural network model (Neural Symbolic Machines) and proposed novel policy gradient methods for efficient training. It is the first end-to-end neural network model that achieves new state-of-the-art on the most challenging semantic parsing benchmarks. The model learns from weak supervision to answer compositional questions by generating programs to query and process data from knowledge graph or database tables.
<b>Education</b>	<b>Northwestern University</b> , Evanston, IL <b>Sept 2013 – Present</b> <ul style="list-style-type: none"><li>• <i>Ph.D candidate</i>, Department of Computer Science</li><li>• Advisor: Kenneth D. Forbus</li><li>• Worked on Machine Learning, NLP and Cognitive Modeling</li></ul> <b>Peking University</b> , Beijing, China <b>Sept 2009 – June 2013</b> <ul style="list-style-type: none"><li>• <i>B.S.</i>, School of Physics</li><li>• Selected courses: Algorithms, Artificial Intelligence, CSAPP</li></ul>
<b>Publications</b>	<ol style="list-style-type: none"><li>1. <b>Liang, C.</b>, Norouzi, M., Berant, J., Le, Q. and Ni, L. <i>Memory Augmented Policy Optimization for Program Synthesis with Generalization</i>, under review for <b>NIPS-2018</b></li><li>2. <b>Liang, C.</b>, Berant, J., Le, Q., Forbus, K., and Ni, L. <i>Neural Symbolic Machines: Learning Semantic Parsers on Freebase with Weak Supervision</i>, <b>ACL-2017</b></li><li>3. Forbus, K., <b>Liang, C.</b> and Rabkina, I. <i>Representation and Computation in Cognitive Models</i>, <b>Topics in Cognitive Science, 2017</b></li><li>4. Noraset, T., <b>Liang, C.</b>, Birnbaum, L., and Downey, D. <i>Definition Modeling: Learning to define word embeddings in natural language</i>, <b>AAAI-2017</b></li><li>5. <b>Liang, C.</b>, Paritosh, P., Rajendran, V., and Forbus, K. <i>Learning Paraphrase Identification with Structural Alignment</i>, <b>IJCAI-2016</b></li><li>6. <b>Liang, C.</b> and Forbus, K. <i>Learning Plausible Inferences from Semantic Web Knowledge by Combining Analogical Generalization with Structured Logistic Regression</i>, <b>AAAI-2015</b></li><li>7. <b>Liang, C.</b> and Forbus, K. <i>Constructing Hierarchical Concepts via Analogical Generalization</i>, <b>CogSci-2014</b></li></ol>

**Industrial Experience**

**Google Brain**

**Research Intern**

Nov 2017 – Feb 2018

- Designed and implemented a neural semantic parsing / program synthesis framework based on Neural Symbolic Machines.
- Proposed an efficient distributed RL algorithm using a novel policy gradient objective and systematic exploration strategy, which achieved new state-of-the-art result on program synthesis from natural language. (in submission)

**Google DeepMind**

**Research Intern**

June 2017 – Oct 2017

- Designed and implemented language grounding and hierarchical reinforcement learning algorithm for agents acting in challenging 3D environment (under development)

**Google Search**

**Research Intern**

June 2016 – Oct 2016

- Designed and implemented Neural Symbolic Machines, the first end-to-end hybrid neural network model that achieved new state-of-the-art result on semantic parsing over Freebase (published in ACL-2017)
- Patent pending: “Neural Question Answering System”

**Google Research**

**Research Intern**

June 2015 – Oct 2015

- Designed and implemented a latent structured prediction model to jointly learn structural alignment and similarity estimation, and achieved state-of-the-art result on a well-established paraphrase identification benchmark (published in IJCAI-2016)

**Academic Experience**

**Northwestern University, Evanston, IL USA**

**Research Assistant**

Sept 2013 – Present

- Focus on machine learning, natural language processing, knowledge representation, and cognitive modeling
- Worked on projects in semantic parsing, knowledge base completion and modeling human concept learning

**Teaching Assistant**

March 2016 – June 2016

- Taught lectures on deep learning and designed assignments on Backpropagation and Character-RNN for graduate level course Machine Learning

**Teaching Assistant**

Sept 2014 – Dec 2014

- Critiqued students’ code and held office hours for graduate level course Artificial Intelligence Programming

**Peking University, Beijing, China**

**Research Assistant**

Sept 2010 – June 2013

- Data analysis and simulations for cosmology research in C and Matlab

**Side Projects****TensorFlow Char-RNN**

- An open source easy-to-use implementation of Character RNN in TensorFlow supporting a variety of options

**Sequence Generation with Reinforcement Learning**

- Implementation of policy gradient methods for sequence generation

**Prof. Holmes: an Intelligent Course Advisor**

- Managed a team of 5 developers to build a web-based AI course advisor with IBM Watson API

**Awards****Todd M. and Ruth Warren Fellowship (2013-2018)**

- A competitive 5-year fellowship for top computer science students

**Peking University Scholarship (2009-2013)****Skills&Tools**

TensorFlow, Python, Lisp/Scheme, Matlab/Octave, C, Linux Shell, LaTeX