CHANG XU

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Education

Nankai University, Tianjin, China — Sep. 2014 – Jun. 2019 *(expected)*
Ph.D. in Computer Science ⋄ Joint Ph.D. Program with Microsoft Research Asia

- Topics: *Machine Learning, Computer Vision, Natural Language Processing*
- Ph.D. Supervisors: Tie-Yan Liu and Gang Wang

Nankai University, Tianjin, China — Sep. 2010 – Jun. 2014
B.S. in Computer Science ⋄ GPA: 3.62 (top 5%)

Research Interests

Machine Learning: Deep Learning, Representation Learning, Deep Reinforcement Learning, Unsupervised Learning.

Natural Language Processing: Word Representation Learning, Machine Translation, Text Summarization, Language Modeling.

Computer Vision: Image Recognition, Image Retrieval, Automatic Dataset Construction, Micro-expression Recognition.

Experiences

Microsoft Research Asia, Machine Learning Group, Beijing, China
Research Intern — Aug. 2015 – Present
(Advised by Tie-Yan Liu and Tao Qin)

- Facial micro-expression recognition.
- Reinforcement learning for learning rate control.
- Novel model design for learning dependency in natural language.
- Unsupervised machine translation.

Nankai University, Parallel and Distributed Software Technology Lab, Tianjin, China
Group Member — Sep. 2014 – Jun. 2015
(Advised by Gang Wang and Xiaoguang Liu)

- Health statue prediction for hard drives with recurrent neural networks.

Microsoft Research Asia, Internet Economics and Computing Advertisement Group, Beijing, China
Research Intern — Jul. 2013 – Jun. 2014
(Advised by Tie-Yan Liu, Jiang Bian and Bin Gao)

- Knowledge based word representation learning.

Honors

1. Outstanding Graduate Award at Nankai University, 2019.
2. National Scholarship for Ph.D. students, 2016.
3. Outstanding Reviewer Award of Neurocomputing (impact factor 3.317) from 2015 to 2017.
4. **First Prize** in MSR-Bing Image Retrieval Challenge at ACM MM 2014.
5. Google Anita Borg Memorial Scholarship: Asia Pacific, 2013.
6. **Silver Medal** at ACM International Collegiate Programming Contest (ICPC) Regional Contest, 2012.

Selected Projects

Unsupervised Neural Machine Translation Sep. 2018 – Feb. 2019
(RNN, Unsupervised Learning, Machine Translation)
Unsupervised neural machine translation has great potentials for the low-resource or even zero-resource machine translation. We have proposed a general framework called Polygon-Net, which leverages multi auxiliary languages for jointly boosting unsupervised neural machine translation models. Experiments on the benchmark datasets including UN Corpus and WMT show that our approach significantly improves over the two-language based methods, and achieves better performance with more languages introduced to the framework.

Modeling Local Dependence in Natural Language Sep. 2017 – Feb. 2018
(RNN, Machine Translation, Language Modeling, Text Summarization)
Modeling rich semantic structure information of a sentence is useful for understanding natural languages. We have designed a novel RNN model called Multi-channel RNN to leverage the structural information of text inputs via modeling diverse dependence patterns within natural language. Significant improvement achieved on many NLP tasks, including machine translation, text summarization and language modeling.

Automatic Learning Rate Controller Aug. 2016 – Mar. 2017
(LSTM, Meta Learning, Reinforcement Learning, Deep Learning)
Models trained by SGD are sensitive to learning rates and good learning rates are problem specific. We have proposed a deep reinforcement learning based learning rate controller for neural network training. Use long-term rewards to guide the selection of learning rate. Better performance achieved than traditional human designed optimizers.

Posed and Spontaneous Facial Expression Recognition Oct. 2015 – Jul. 2016
(CNN, Facial Expression Recognition, Fine-grained Image Representation Learning)
Differentiating posed expressions from spontaneous ones is a more challenging task than conventional facial expressin recognition.We have implemented deep Convolutional Neural Networks and Long Short-Term Memory based framework for posed and spontaneous expression recognition. Design a new layer called comparison layer for CNN to represent the difference information between onset and apex facial expression in middle and high abstraction levels.

- State-of-the-art method of two commonly used benchmarks on micro-expression recognition.

Health Status Assessment and Failure Prediction for Hard Drives Jul. 2014 – Jun. 2015
(RNN, CRF, HMM, Failure Prediction for Hard Drives, Health Status Assessment for Hard Drives)
In a petabyte-level file system, hard drives fail almost every day. In response to the problem of hard drive failure, researchers have investigated on both reactive fault tolerance and proactive failure prediction. We have proposed a novel method based on Recurrent Neural Networks to assess the health statuses of hard drives by leveraging the gradually changing sequential SMART attributes. Experiments on real-world datasets for disks of different brands and scales demonstrate that the proposed method can not only achieve a reasonable accurate health status assessment, but also can achieve better failure prediction performance than previous works.

- Applied to the Security Operation Management System of Qihoo 360 Inc.

Incorporating Knowledge Graph into Word Representations Jul. 2013 – Jun. 2014
(Word2Vec, Knowledge Graph, Word Representation Learning)

Learning high-quality word embedding is quite valuable for many text mining and NLP tasks. We have introduced a novel framework called RC-NET to leverage both the relational and categorical knowledge in knowledge graph to produce word representations of higher quality. The experiments on popular text mining and natural language processing tasks have all demonstrated that the proposed model can significantly improve the quality of word representations.

Engineering Capability

C, C++; *Word representations learning, General neural network, Recurrent neural network*
Projects: Health Status Assessment and Failure Prediction for Hard Drives, Incorporating Knowledge Graph into Word Representations

Theano: *Machine Translation Model, Language Model*
Project: Modeling Local Dependence in Natural Language

Tensorflow: *Reinforcement learniong, Image recognition, Meta learning*
Project: Automatic Learning Rate Controller

Pytorch: *Transformer framework, Machine Translation*
Project: Unsupervised Neural Machine Translation

Caffe: *Image recognition, Facial expression recognition*
Project: Posed and Spontaneous Facial Expression Recognition

Publications

Google Scholar | Citations in total until May. 2019: **317**

1. **Chang Xu**, Tao Qin, Gang Wang, Tie-Yan Liu. Polygon-Net: A General Framework for Jointly Boosting Multiple UnsupervisedNeural Machine Translation Models. IJCAI, 2019.
2. **Chang Xu**, Tao Qin, Gang Wang, Tie-Yan Liu. Modeling Local Dependence in Natural Language with Multi-channel Dense Connections. AAAI, 2019.
3. **Chang Xu**, Tao Qin, Gang Wang, Tie-Yan Liu. A Far-sighted Learning Rate Controller with Reinforcement Learning. 2018.
4. **Chang Xu**, Tao Qin, Yalong Bai, Gang Wang, Tie-Yan Liu. Convolutional Neural Networks For Posed and Spontaneous Expression Recognition. ICME, 2017.
5. **Chang Xu**, Gang Wang, Xiaoguang Liu, Dongdong Guo and Tie-Yan Liu. Health Status Assessment and Failure Prediction for Hard Drives with Recurrent Neural Networks. IEEE Transactions on Computers, 2016.
6. Yalong Bai, Kuiyuan Yang, Wei Yu, **Chang Xu**, Wei-Ying Ma, Tiejun Zhao. Automatic Image Dataset Construction from Click-through Logs Using Deep Neural Network. ACM MultiMedia, 2015.
7. **Chang Xu**, Yalong Bai, Jiang Bian, Bin Gao, Gang Wang, Xiaoguang Liu, Tie-Yan Liu. RC-NET: A General Framework for Incorporating Knowledge into Word Representations. CIKM, 2014.
8. Yuyu Zhang, Hanjun Dai, **Chang Xu**, Jun Feng, Taifeng Wang, Jiang Bian, Bin Wang and Tie-Yan Liu. Sequential Click Prediction for Sponsored Search with Recurrent Neural Networks. AAAI, 2014.
9. Yalong Bai, Wei Yu, Tianjun Xiao, **Chang Xu**, Kuiyuan Yang, Wei-Ying Ma, Tiejun Zhao. Bag-of-Words Based Deep Neural Network for Image Retrieval. ACM MultiMedia, 2014.