Renjie Liao

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Research Overview

Machine Learning (Deep Learning on Structures/Graphs, Deep Generative Models of Graphs, Graphical Models)
Computer Vision (Image and Video Segmentation, Image Generation, Image and Video Super-Resolution)
Self-Driving (Prediction, Motion Planning)

Education

University of Toronto
Ph.D. in Computer Science *2015–2020(expected)*
Supervisors: Richard Zemel and Raquel Urtasun

Chinese University of Hong Kong
M.Phil. in Computer Science and Engineering *2013–2015*
Supervisor: Jiaya Jia

Beihang University (former: Beijing University of Aeronautics and Astronautics)
B.Eng. in Automation Science and Electrical Engineering *2007–2011*

Employment

Uber Advanced Technology Group
Senior Research Scientist (Mentor: Raquel Urtasun) *2017–now*

Microsoft Research Cambridge
Research Intern (Mentors: Danny Tarlow, Marc Brockschmidt, and Alexander Gaunt) *2016*

Microsoft Research Asia
Research Intern (Mentors: Fang Wen and Jian Sun) *2011*

Awards and Hornors

2019: Best Reviewer, NeurIPS 2019
2019: RBC Graduate Fellowship
2019: Best Paper Award, ICML Workshop on Tractable Probabilistic Modeling
2015: Connaught International Scholarship for Doctoral Students (20 university-wide), UofT
2015: Departmental Entrance Scholarship (top %2 applicant), Department of Computer Science, UofT
2010: 3rd prize (1% nation-wide), China Finals in Software Design Competition, Microsoft Imagine Cup
2010: 1st prize (10 out of candidates of all majors), Feng Ru Cup, Beihang University
2009: National 2nd Prize (820/12272), China Undergraduate Mathematical Contest in Modeling

Publications

***** below indicates equal contribution

1. Sergio Casas, Cole Gulino, **Renjie Liao**, Raquel Urtasun
   Spatially-Aware Graph Neural Networks for Relational Behavior Forecasting from Sensor Data
   International Conference on Robotics and Automation (**ICRA**), 2020

2. **Renjie Liao**, Yujia Li, Yang Song, Shenlong Wang, William Hamilton, David Duvenaud, Raquel Urtasun, Richard Zemel
   Efficient Graph Generation with Graph Recurrent Attention Networks
   Neural Information Processing Systems (**NeurIPS**), 2019 **Code Link**

3. Mengye Ren, **Renjie Liao**, Ethan Fetaya, Richard Zemel
   Incremental Few-Shot Learning with Attention Attractor Networks
   Neural Information Processing Systems (**NeurIPS**), 2019 **Code Link**

4. **Renjie Liao**, Zhizhen Zhao, Raquel Urtasun, Richard Zemel
   LanczosNet: Multi-Scale Deep Graph Convolutional Networks
   International Conference on Learning Representations (**ICLR**), 2019 **Score Rank: 69/1579 (4.4%)** **Code Link**

5. Xiaohui Zeng*, **Renjie Liao***, Li Gu, Yuwen Xiong, Sanja Fidler, Raquel Urtasun
DMM-Net: Differentiable Mask-Matching Network for Video Object Segmentation
International Conference on Computer Vision (**ICCV**), 2019 **Code Link**

6. Yuwen Xiong*, **Renjie Liao***, Hengshuang Zhao*, Rui Hu, Min Bai, Ersin Yumer, Raquel Urtasun
UPSNet: A Unified Panoptic Segmentation Network
Conference on Computer Vision and Pattern Recognition (**CVPR**), 2019 **Oral 288/5160 (5.6%) Code Link**

7. Dominic Cheng, **Renjie Liao**, Sanja Fidler, Raquel Urtasun
DARNet: Deep Active Ray Network for Building Segmentation,
Conference on Computer Vision and Pattern Recognition (**CVPR**), 2019 **Code Link**

8. Marc T. Law, **Renjie Liao**, Jake Snell, Richard Zemel
Lorentzian Distance Learning for Hyperbolic Representations
International Conference on Machine Learning (**ICML**), 2019 **Code Link**

9. KiJung Yoon, **Renjie Liao**, Yuwen Xiong, Lisa Zhang, Ethan Fetaya, Raquel Urtasun, Richard Zemel, Xaq Pitkow
Inference in Probabilistic Graphical Models by Graph Neural Networks
ICML Workshop on Tractable Probabilistic Modeling, 2019 **Best Paper Award**

10. Ajay Jain*, Sergio Casas*, **Renjie Liao***, Yuwen Xiong*, Song Feng, Sean Segal, Raquel Urtasun
Discrete Residual Flow for Probabilistic Pedestrian Behavior Prediction
Conference on Robot Learning (**CoRL**), 2019

11. **Renjie Liao***, Yuwen Xiong*, Ethan Fetaya, Lisa Zhang, KiJung Yoon, Xaq Pitkow, Raquel Urtasun, Richard Zemel
Reviving and Improving Recurrent Back-Propagation
International Conference on Machine Learning (**ICML**), 2018 **Full Oral 212/2473 (8.6%) Code Link**

12. Lisa Zhang, Gregory Rosenblatt, Ethan Fetaya, **Renjie Liao**, William Byrd, Matthew Might, Raquel Urtasun, Richard Zemel
Neural Guided Constraint Logic Programming for Program Synthesis
Neural Information Processing Systems (**NeurIPS**), 2018 **Code Link**

13. **Renjie Liao**, Marc Brockschmidt, Daniel Tarlow, Alexander Gaunt, Raquel Urtasun, Richard Zemel
Graph Partition Neural Networks for Semi-Supervised Classification
International Conference on Learning Representations (**ICLR**) Workshop, 2018 **Code Link**

14. Tingwu Wang*, **Renjie Liao***, Jimmy Ba, Sanja Fidler
NerveNet: Learning Structured Policy with Graph Neural Networks
International Conference on Learning Representations (**ICLR**), 2018 **Code Link**

15. Yuhuai Wu, Mengye Ren, **Renjie Liao**, Roger Grosse.
Understanding Short-Horizon Bias in Stochastic Meta-Optimization,
International Conference on Learning Representations (**ICLR**), 2018 **Code Link**

16. Xiaojuan Qi, **Renjie Liao**, Zhengzhe Liu, Raquel Urtasun, Jiaya Jia
GeoNet: Geometric Neural Network for Joint Depth and Surface Normal Estimation
Conference on Computer Vision and Pattern Recognition (**CVPR**), 2018 **Code Link**

17. Diego Marcos, Devis Tuia, Benjamin Kellenberger, Lisa Zhang, Min Bai, **Renjie Liao**, Raquel Urtasun
Learning Deep Structured Active Contours End-to-End
Conference on Computer Vision and Pattern Recognition (**CVPR**), 2018 **Spotlight 224/3303 (6.8%) Code Link**

18. Xiaojuan Qi, **Renjie Liao**, Jiaya Jia, Sanja Fidler, Raquel Urtasun
3D Graph Neural Networks for RGBD Semantic Segmentation
International Conference on Computer Vision (**ICCV**), 2017 **Oral 45/2143 (2.1%) Code Link**

19. Xin Tao, Hongyun Gao, **Renjie Liao**, Jue Wang, Jiaya Jia
Detail-revealing Deep Video Super-Resolution,
International Conference on Computer Vision (**ICCV**), 2017 **Oral 45/2143 (2.1%) Code Link**

20. Ruiyu Li, Makarand Tapaswi, **Renjie Liao**, Jiaya Jia, Raquel Urtasun, Sanja Fidler
Situation Recognition with Graph Neural Networks,
International Conference on Computer Vision (**ICCV**), 2017 **Code Link**

21. Mengye Ren*, **Renjie Liao***, Raquel Urtasun, Fabian H. Sinz, Richard Zemel
Normalizing the Normalizers: Comparing and Extending Network Normalization Schemes
International Conference on Learning Representations (**ICLR**), 2017 **Code Link**

22. Jake Snell, Karl Ridgeway, **Renjie Liao**, Brett Roads, Michael Mozer, Richard Zemel
Learning to generate images with perceptual similarity metrics
International Conference on Image Processing (**ICIP**), 2017

23. **Renjie Liao**, Alexander Schwing, Richard Zemel, Raquel Urtasun
Learning Deep Parsimonious Representation
Neural Information Processing Systems (**NIPS**), 2016 **Code Link**

24. **Renjie Liao**, Xin Tao, Ruiyu Li, Ziyang Ma, Jiaya Jia
Video Super-Resolution via Deep Draft-Ensemble Learning,
International Conference on Computer Vision (**ICCV**), 2015 **Code Link**

25. Xiaojuan Qi, Jianping Shi, Shu Liu, **Renjie Liao**, Jiaya Jia
Semantic Segmentation With Object Clique Potential
International Conference on Computer Vision (**ICCV**), 2015

26. Ziyang Ma, **Renjie Liao**, Xin Tao, Li Xu, Jiaya Jia, Enhua Wu
Handling Motion Blur in Multi-Frame Super-Resolution
Conference on Computer Vision and Pattern Recognition (**CVPR**), 2015. **Code Link**

27. Li Xu, Jimmy Ren, Qiong Yan, **Renjie Liao**, Jiaya Jia
Deep Edge-Aware Filters
International Conference on Machine Learning (**ICML**), 2015 **Code Link**

28. Cewu Lu, **Renjie Liao**, Jiaya Jia
Personal object discovery in first-person videos
IEEE Transactions on Image Processing (**TIP**), 2015

29. **Renjie Liao**, Jun Zhu, Zengchang Qin
Nonparametric Bayesian Upstream Supervised Multi-Modal Topic Models
International Conference on Web Search and Data Mining (**WSDM**), 2014

30. Di Lin, Cewu Lu, **Renjie Liao**, Jiaya Jia
Learning Important Spatial Pooling Regions for Scene Classification
Conference on Computer Vision and Pattern Recognition (**CVPR**), 2014

31. Sina Lin, Zengchang Qin, **Renjie Liao**, Tao Wan
A Confidence Growing Model for Super-Resolution
International Conference on Image Processing (**ICIP**), 2014

32. Jianping Shi*, **Renjie Liao***, Jiaya Jia
CoDeL: An Efficient Human Co-detection and Labeling Framework
International Conference on Computer Vision (**ICCV**), 2013

33. Tao Wan, Zengchang Qin, Chenchen Zhu, **Renjie Liao**
A Robust Fusion Scheme for Multifocus Images Using Sparse Features
International Conference on Acoustics, Speech, and Signal Processing (**ICASSP**), 2013

34. **Renjie Liao**, Zengchang Qin
Image Super-Resolution Using Local Learnable Kernel Regression
Asian Conference on Computer Vision (**ACCV**), 2012

35. Tao Wan, **Renjie Liao**, Zengchang Qin
A Robust Feature Selection Approach Using Low Rank Matrices For Breast Tumors in Ultrasound Images
International Conference on Image Processing (**ICIP**), 2011

Manuscripts

1. Avishek Joey Bose, Ariella Smofsky, **Renjie Liao**, Prakash Panangaden, William L. Hamilton
Latent Variable Modelling with Hyperbolic Normalizing Flows
arXiv preprint arXiv:2002.06336 (2020)

2. Yang Song, Chenlin Meng, **Renjie Liao**, Stefano Ermon
Nonlinear Equation Solving: A Faster Alternative to Feedforward Computation
arXiv preprint arXiv:2002.03629 (2020)

3. Yuwen Xiong, Mengye Ren, **Renjie Liao**, Kelvin Wong, Raquel Urtasun

Deformable filter convolution for point cloud reasoning
arXiv preprint arXiv:1907.13079

4. Guangyong Chen, Pengfei Chen, Chang-Yu Hsieh, Chee-Kong Lee, Benben Liao, **Renjie Liao**, Weiwen Liu, Jiezhong Qiu, Qiming Sun, Jie Tang, Richard Zemel, Shengyu Zhang
Alchemy: A Quantum Chemistry Dataset for Benchmarking AI Models
arXiv preprint arXiv:1906.09427

5. **Renjie Liao**, Jianping Shi, Ziyang Ma, Jun Zhu, Jiaya Jia
Bounded-Distortion Metric Learning
arXiv preprint arXiv:1505.02377

Academic Service

Organizer, NeurIPS 2019 Workshop: Graph Representation Learning
Organizer, KDD 2019 Workshop: Deep Learning on Graphs: Methods and Applications
Organizer, ICML 2019 Workshop: Learning and Reasoning with Graph-Structured Data
Journal reviewer: JMLR, IEEE TPAMI, IJCV, IEEE TIP, IEEE TNNLS, IEEE TCSVT, IEEE MM, CVIU, PLOS One
Conference reviewer/program committee: NeurIPS/NIPS (2016, 2017, 2018, 2019), ICML (2017, 2018, 2019, 2020), ICLR (2017, 2018, 2019, 2020), CVPR (2018, 2019, 2020), ICCV (2017, 2019), ECCV (2018, 2020), UAI (2018, 2019, 2020), AISTATS (2020), AAAI (2018), IJCAI (2019), BMVC (2019)

Invited Talks

Mar 2020: *Deep Learning on Graphs*, Google Brain, Toronto
Oct 2019: *Efficient Graph Generation with Graph Recurrent Attention Networks*, Uber AI Lab, San Francisco
Sep 2019: *Efficient Graph Generation with Graph Recurrent Attention Networks*, Facebook AI Research, Montreal
Sep 2019: *Efficient Graph Generation with Graph Recurrent Attention Networks*, Mila-Quebec AI Institute, Montreal
Sep 2019: *Efficient Graph Generation with Graph Recurrent Attention Networks*, Google Brain, Montreal
Aug 2018: *Graph Neural Networks*, IBM Thomas J. Watson Research Center, Yorktown Heights
Aug 2018: *Graph Neural Networks*, NEC Labs, Princeton
July 2018: *Graph Neural Networks*, Borealis AI, Toronto
Apr 2018: *Reviving and Improving Recurrent Back-Propagation*, Borealis AI, Edmonton
Apr 2018: *Graph Neural Networks*, University of Alberta, Edmonton
Mar 2018: *Graph Neural Networks*, Google Brain, Toronto
Jan 2018: *Deep Learning on Graphs*, UTMIST, Toronto
Jan 2018: *Deep Learning on Graphs*, ML Ensemble, Toronto

Teaching

UofT CSC321: Introduction to Neural Networks (2017 Winter)
UofT ECE521: Inference Algorithms and Machine Learning (2017 Winter)
UofT CSC411/2515: Introduction to Machine Learning (2016 Fall)
UofT CSC321: Introduction to Neural Networks (2016 Winter)
UofT CSC 411/2515: Introduction to Machine Learning (2015 Fall)
CUHK CSCI3250: Computers and Society (2014 Winter)

Students/Interns Supervised

Students:
- Xiaojuan Qi (now postdoc at Univ. of Oxford)
- Xiaohui Zeng (now PhD at UofT)
- Sergio Casas (now PhD at UofT)
- Yuwen Xiong (now PhD at UofT)
- Domnic Cheng (now software engineer at Microsoft)

Interns:
- Hengshuang Zhao (now postdoc at MIT)
- Ajay Jain (now PhD at UC Berkeley)
- Anzo Teh (now undergrad at Waterloo)
- Katie Luo (now AI resident at Uber)
- Jenifer Guo (now intern at Uber)