Renjie Liao

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Research Overview

Machine Learning (Deep Learning on Graphs, Deep Generative Models, 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 *2015–2021*
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

Google Brain
Visiting Faculty Researcher (Mentors: Geoffrey Hinton and David Fleet) *2021-Now*

Uber Advanced Technology Group
Research Scientist (17-19), Senior Research Scientist (19-21, Mentor: Raquel Urtasun) *2017–2021*

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

Chinese University of Hong Kong
Research Assistant (Mentor: Jiaya Jia) *2012*

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

Sony China Research Lab
Research Intern (Mentor: Yuyu Liu) *2010*

Awards and Hornors

2020: Top Reviewer, ICML 2020
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. **Renjie Liao**, Raquel Urtasun, Richard S. Zemel
   A PAC-Bayesian Approach to Generalization Bounds for Graph Neural Networks
   International Conference on Learning Representations (**ICLR**), 2021

2. Avishek Joey Bose, Ariella Smofsky, **Renjie Liao**, Prakash Panangaden, William L. Hamilton
Latent Variable Modelling with Hyperbolic Normalizing Flows
International Conference on Machine Learning (**ICML**), 2020 **Code Link**

3. Xiaojuan Qi, Zhengzhe Liu, **Renjie Liao**, Philip H. S. Torr, Raquel Urtasun, Jiaya Jia
GeoNet++: Iterative Geometric Neural Network with Edge-Aware Refinement for Joint Depth and Surface Normal Estimation
IEEE Transactions on Pattern Analysis and Machine Intelligence (**TPAMI**), 2020 **Code Link**

4. Ming Liang, Bin Yang, Rui Hu, Yun Chen, **Renjie Liao**, Song Feng, Raquel Urtasun
Learning Lane Graph Representations for Motion Forecasting
European Conference in Computer Vision (**ECCV**), 2020 **Oral 104/5025 (2%)** **Code Link**

5. Wenyuan Zeng, Shenlong Wang, **Renjie Liao**, Yun Chen, Bin Yang, Raquel Urtasun
DSDNet: Deep Structured Self-Driving Network
European Conference in Computer Vision (**ECCV**), 2020

6. Sergio Casas, Cole Gulino, Simon Suo, Katie Luo, **Renjie Liao**, Raquel Urtasun
Implicit Latent Variable Model for Scene-Consistent Motion Forecasting
European Conference in Computer Vision (**ECCV**), 2020

7. Kelvin Wong, Qiang Zhang, Ming Liang, Bin Yang, **Renjie Liao**, Abbas Sadat, Raquel Urtasun
Testing the Safety of Self-driving Vehicles by Simulating Perception and Prediction
European Conference in Computer Vision (**ECCV**), 2020

8. 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

9. **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**

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

11. **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**

12. 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**

13. 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**

14. 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**

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

16. 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**

17. 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

18. **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**

19. 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**

20. **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**

21. 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**

22. 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**

23. 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**

24. 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**

25. 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**

26. 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**

27. 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**

28. 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**

29. 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

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

31. **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**

32. Xiaojuan Qi, Jianping Shi, Shu Liu, **Renjie Liao**, Jiaya Jia
Semantic Segmentation With Object Clique Potential

International Conference on Computer Vision (**ICCV**), 2015

33. 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**

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

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

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

37. 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

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

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

40. 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

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

42. 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. Wenyuan Zeng, Ming Liang, **Renjie Liao**, Raquel Urtasun
LaneRCNN: Distributed Representations for Graph-Centric Motion Forecasting
arXiv preprint arXiv:2101.06653 (2021)

2. Alexander Cui, Abbas Sadat, Sergio Casas, **Renjie Liao**, Raquel Urtasun
LookOut: Diverse Multi-Future Prediction and Planning for Self-Driving
arXiv preprint arXiv:2101.06547 (2021)

3. Katie Luo, Sergio Casas, **Renjie Liao**, Xinchen Yan, Yuwen Xiong, Wenyuan Zeng, Raquel Urtasun
Safety-Oriented Pedestrian Motion and Scene Occupancy Forecasting
arXiv preprint arXiv:2101.02385 (2021)

4. Beier Zhu, Chunze Lin, Quan Wang, **Renjie Liao**, Chen Qian
Fast and Accurate: Structure Coherence Component for Face Alignment
arXiv preprint arXiv:2006.11697 (2020)

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

6. Yuwen Xiong, Mengye Ren, **Renjie Liao**, Kelvin Wong, Raquel Urtasun
   Deformable filter convolution for point cloud reasoning
   arXiv preprint arXiv:1907.13079

7. 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

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

Academic Service

Organizer, ICML 2020 Workshop: Bridge Between Perception and Reasoning: Graph Neural Networks & Beyond
Organizer, ICML 2020 Workshop: Graph Representation Learning and Beyond
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: Nature Communications, JMLR, IEEE TPAMI, IJCV, IEEE TIP, IEEE TNNLS, IEEE TCSVT, IEEE MM, CVIU, PLOS One
Conference reviewer/program committee: NeurIPS/NIPS (2016 - 2020), ICML (2017 - 2021), ICLR (2017 - 2021), CVPR (2018 - 2021), ICCV (2017, 2019), ECCV (2018, 2020), UAI (2018 - 2020), AISTATS (2020 - 2021), AAAI (2018), IJCAI (2019), BMVC (2019)

Invited Talks

Jan 2021: *Improving Deep Learning on Graphs*, Google Brain, Toronto (Virtual)
Nov 2020: *Deep Learning on Graphs*, Tencent AI Lab Seattle (Virtual)
Oct 2020: *Deep Learning on Graphs*, VALSE (Virtual)
Oct 2020: *Deep Learning on Graphs*, NVIDIA Research (Virtual)
Mar 2020: *Deep Learning on Graphs*, Google Brain, Toronto
Oct 2019: *Efficient Graph Generation with Graph Recurrent Attention Networks*, Uber AI Lab (Virtual)
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

Yale S&DS 567: Topics in Deep Learning: Methods and Biomedical Applications, Guest Lecture (2020 Winter)
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 Assistant Professor at HKU)
- 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 Univ. of Oxford)
- Ajay Jain (now PhD at UC Berkeley)
- Anzo Teh (now undergrad at Waterloo)
- Jeffrey Liu (now undergrad at Waterloo)
- Katie Luo (now PhD at Cornell)
- Jenifer Guo (now intern at Uber)