

Mengye Ren

PERSONAL INFORMATION

Mengye Ren
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Canada, M4W 0A8

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RESEARCH INTERESTS

Areas: Machine learning, computer vision, meta learning, representation learning, few-shot learning, brain & cognitively inspired learning, robot learning, self-driving vehicles

My key research question is: how do we enable human-like, agent-based machine intelligence to continually learn, adapt, and reason in naturalistic environments? Towards this goal of building a more general and flexible AI, my research has centered on developing *meta-learning* and *representation learning* algorithms.

EDUCATION

University of Toronto

Department of Computer Science 2017/01 – 2021/10
PhD, Supervisors: Richard Zemel and Raquel Urtasun
Thesis: “Open World Machine Learning with Limited Labeled Data”
Committee: Roger Grosse, Geoffrey Hinton, Yee Whye Teh

Department of Computer Science 2015/09 – 2017/01
MSc, Supervisor: Richard Zemel

Department of Engineering Science, ECE Option 2011/09 – 2015/06
BASc, CGPA 3.90/4.00, with high honours

PROFESSIONAL EXPERIENCE

Google Brain, Toronto, ON, Canada 2022/01 – Present
Visiting Researcher

Waabi Innovation, Toronto, ON, Canada 2021/03 – 2021/12
Senior Researcher II

Uber ATG, Toronto, ON, Canada 2017/05 – 2021/02
Senior Research Scientist I 2018/09 – 2021/02
Research Scientist II 2017/05 – 2018/09

Twitter, Cambridge, MA, USA 2016/06 – 2016/08
SWE Intern

Google Brain, Mountain View, CA, USA 2015/06 – 2015/08
SWE Intern

Google, Mountain View, CA, USA 2014/06 – 2014/08
SWE Intern

Microsoft, Redmond, WA, USA 2013/06 – 2013/08
SDET Intern

Microsoft, Redmond, WA, USA 2012/06 – 2012/08
SDET Intern

TEACHING

Vector Institute

• Deep Learning II 2020 Fall

University of Toronto

- CSC 411: Machine Learning and Data Mining

2019 Winter

PEER-REVIEWED
CONFERENCE
PUBLICATIONS

(*=equal contribution)

2021

- C1 Yuwen Xiong, **Mengye Ren**, Wenyuan Zeng, Raquel Urtasun. Self-supervised representation learning from flow equivariance. In *International Conference on Computer Vision (ICCV)*, 2021.
- C2 James Tu*, Tsun-Hsuan Wang*, Jingkang Wang, Sivabalan Manivasagam, **Mengye Ren**, Raquel Urtasun. Adversarial attacks on multi-agent communication. In *International Conference on Computer Vision (ICCV)*, 2021.
- C3 Sean Segal*, Nishanth Kumar*, Sergio Casas, Wenyuan Zeng, **Mengye Ren**, Jingkang Wang, Raquel Urtasun. Just label what you need: Fine-grained active selection for perception and prediction through partially labeled scenes. In *Conference on Robot Learning (CoRL)*, London, United Kingdom, 2021.
- C4 James Tu, Huichen Li, Xinchun Yan, **Mengye Ren**, Yun Chen, Ming Liang, Eilyan Bitar, Ersin Yumer, Raquel Urtasun. Exploring adversarial robustness of multi-sensor perception systems in self driving. In *Conference on Robot Learning (CoRL)*, London, United Kingdom, 2021.
- C5 Alexander Wang*, **Mengye Ren***, Richard S. Zemel. SketchEmbedNet: Learning novel concepts by imitating drawings. In *38th International Conference on Machine Learning (ICML)*, 2021.
- C6 **Mengye Ren**, Michael L. Iuzzolino, Michael C. Mozer, Richard S. Zemel. Wandering within a world: Online contextualized few-shot learning. In *9th International Conference on Learning Representations (ICLR)*, 2021.
- C7 James Lucas, **Mengye Ren**, Irene Kameni, Toniann Pitassi, Richard S. Zemel. Theoretical bounds on estimation error for meta learning. In *9th International Conference on Learning Representations (ICLR)*, 2021.
- C8 Bob Wei*, **Mengye Ren***, Wenyuan Zeng, Ming Liang, Bin Yang, Raquel Urtasun. Perceive, attend and drive: Learning spatial attention for safe self-driving. In *IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, 2021. (oral)
- C9 Shuhan Tan*, Kelvin Wong*, Shenlong Wang, Sivabalan Manivasagam, **Mengye Ren**, Raquel Urtasun. SceneGen: Learning to simulate realistic traffic scenes. *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021.
- C10 Jingkang Wang, Ava Pun, James Tu, Abbas Sadat, Sergio Casas, Sivabalan Manivasagam, **Mengye Ren**, Raquel Urtasun. AdvSim: Generating safety-critical scenarios for self-driving vehicles. *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021.

2020

- C11 Yuwen Xiong, **Mengye Ren**, Raquel Urtasun. LoCo: Local contrastive representation learning. In *Advances in Neural Information Processing Systems 33 (NeurIPS)*, Vancouver, British Columbia, Canada, 2020.
- C12 Nicholas Vadivelu, **Mengye Ren**, James Tu, Jingkang Wang, Raquel Urtasun. Learning to communicate and correct pose errors. In *Conference on Robot Learning (CoRL)*, Cambridge, Massachusetts, USA, 2020.
- C13 Lingyun (Luke) Li, Bin Yang, Ming Liang, Wenyuan Zeng, **Mengye Ren**, Sean Segal, Raquel Urtasun. End-to-end contextual perception and prediction with interaction transformer. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Las Vegas, Nevada, USA, 2020. (oral)
- C14 Abbas Sadat*, Sergio Casas Romero*, **Mengye Ren**, Xinyu Wu, Pranaab Dhawan, Raquel Urtasun. Perceive, predict, and plan: Safe motion planning through interpretable semantic

representations. In *16th European Conference on Computer Vision (ECCV)*, Glasgow, United Kingdom, 2020.

C15 Quinlan Sykora*, **Mengye Ren***, Raquel Urtasun. Multi-agent routing value iteration network. In *37th International Conference on Machine Learning (ICML)*, Vienna, Austria, 2020.

C16 James Tu, **Mengye Ren**, Sivabalan Manivasagam, Ming Liang, Bin Yang, Richard Du, Frank Cheng, Raquel Urtasun. Physically realizable adversarial examples for LiDAR object detection. In *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, Seattle, Washington, USA, 2020.

2019

C17 **Mengye Ren**, Renjie Liao, Ethan Fetaya, Richard S. Zemel. Incremental few-shot learning with attention attractor networks. In *Advances in Neural Information Processing Systems 32 (NeurIPS)*, Vancouver, British Columbia, Canada, 2019.

C18 Kelvin Wong, Shenlong Wang, **Mengye Ren**, Ming Liang, Raquel Urtasun. Identifying unknown instances for autonomous driving. In *Conference on Robot Learning (CoRL)*, Osaka, Japan, 2019. (**spotlight**)

C19 Abbas Sadat*, **Mengye Ren***, Andrei Pokrovsky, Yen-Chen Lin, Ersin Yumer, Raquel Urtasun. Jointly learnable behavior and trajectory planner for self-driving vehicles. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Macau, China, 2019. (**oral**)

C20 Chris Zhang, **Mengye Ren**, Raquel Urtasun. Graph hypernetworks for neural architecture search. In *7th International Conference on Learning Representations (ICLR)*, New Orleans, Louisiana, USA, 2019.

2018

C21 **Mengye Ren**, Wenyuan Zeng, Bin Yang, Raquel Urtasun. Learning to reweight examples for robust deep learning. In *35th International Conference on Machine Learning (ICML)*, Stockholm, Sweden, 2018.

C22 **Mengye Ren***, Andrei Pokrovsky*, Bin Yang*, Raquel Urtasun. SBNet: Sparse blocks network for fast inference. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Salt Lake City, Utah, USA, 2018. (**spotlight**)

C23 **Mengye Ren**, Eleni Triantafillou*, Sachin Ravi*, Jake Snell, Kevin Swersky, Joshua B. Tenenbaum, Hugo Larochelle, Richard S. Zemel. Meta-learning for semi-supervised few-shot classification. In *6th International Conference on Learning Representations (ICLR)*, Vancouver, British Columbia, Canada, 2018.

C24 Yuhuai Wu*, **Mengye Ren***, Renjie Liao, Roger B. Grosse. Understanding short-horizon bias in meta optimization. In *6th International Conference on Learning Representations (ICLR)*, Vancouver, British Columbia, Canada, 2018.

2017

C25 Aidan N. Gomez*, **Mengye Ren***, Raquel Urtasun, Roger B. Grosse. The reversible residual network: Backpropagation without storing activations. In *Advances in Neural Information Processing Systems 30 (NIPS)*, Long Beach, California, USA, 2017.

C26 **Mengye Ren**, Richard S. Zemel. End-to-end instance segmentation with recurrent attention. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Honolulu, Hawaii, USA, 2017. (**spotlight**)

C27 **Mengye Ren***, Renjie Liao*, Raquel Urtasun, Fabian H. Sinz, Richard S. Zemel. Normalizing the normalizers: Comparing and extending network normalization schemes. In *5th International Conference on Learning Representations (ICLR)*, Toulon, France, 2017.

2015

- C28 **Mengye Ren**, Ryan Kiros, Richard S. Zemel. Exploring models and data for image question answering. In *Advances in Neural Information Processing Systems 28 (NIPS)*, Montréal, Québec, Canada, 2015.

PEER-REVIEWED 2020

WORKSHOP PAPERS

- W1 **Mengye Ren***, Eleni Triantafillou*, Kuan-Chieh Wang*, James Lucas*, Jake Snell, Xaq Pitkow, Andreas S. Tolias, Richard S. Zemel. Flexible few-shot learning of contextual similarity. In *NeurIPS Meta-Learning Workshop*, Vancouver, BC, Canada, 2020.
- W2 Laleh Seyyed-Kalantari, Karsten Roth, **Mengye Ren**, Parsa Torabian, Joseph P. Cohen, Marzyeh Ghassemi. Multi-label incremental few-shot learning for medical image pathology classifiers. In *Medical Imaging Meets NeurIPS Workshop*, Vancouver, BC, Canada, 2020.
- W3 **Mengye Ren**, Michael L. Iuzzolino, Michael C. Mozer, Richard S. Zemel. Wandering within a world: Online contextualized few-shot learning. In *ICML Continual Learning Workshop & Lifelong Learning Workshop & Workshop on Learning in Artificial Open Worlds*, Vienna, Austria, 2020. (oral)
- W4 Jingkang Wang*, **Mengye Ren***, Ilija Bogunovic, Yuwen Xiong, Raquel Urtasun. Cost-efficient online hyperparameter optimization. In *ICML RealML Workshop*, Vienna, Austria, 2020.

2019

- W5 James Lucas, **Mengye Ren**, Richard S. Zemel. Information-theoretic limitations on novel task generalization. In *NeurIPS Workshop on Machine Learning with Guarantees*, Vancouver British Columbia, Canada, 2019. (oral)
- W6 Yuwen Xiong*, **Mengye Ren***, Renjie Liao, Kelvin Wong, Raquel Urtasun. Deformable filter convolution for point cloud reasoning. *arXiv preprint arXiv:1907.13079*. In *NeurIPS Workshop on Sets & Partitions*, Vancouver, British Columbia, Canada, 2019.

2018

- W7 **Mengye Ren**, Renjie Liao, Ethan Fetaya, Richard S. Zemel. Incremental few-shot learning with attention attractor networks. In *NeurIPS Meta-Learning Workshop*, Montréal, Québec, Canada, 2018.
- W8 Chris Zhang, **Mengye Ren**, Raquel Urtasun. Graph hypernetworks for neural architecture search. In *NeurIPS Meta-Learning Workshop*, Montréal, Québec, Canada, 2018.

2017

- W9 **Mengye Ren**, Eleni Triantafillou*, Sachin Ravi*, Jake Snell, Kevin Swersky, Joshua B. Tenenbaum, Hugo Larochelle, Richard S. Zemel. Meta-learning for semi-supervised few-shot classification. In *NIPS Meta-Learning Workshop & Learning with Limited Data Workshop*, Long Beach, California, USA, 2017.
- W10 Yuhuai Wu*, **Mengye Ren***, Renjie Liao, Roger B. Grosse. Understanding short-horizon bias in meta optimization. In *NIPS Meta-Learning Workshop*, Long Beach, California, USA, 2017.

2015

- W11 **Mengye Ren**, Ryan Kiros, Richard Zemel. Exploring models and data for image question answering. In *ICML Deep Learning Workshop*, Lille, France, 2015. (oral)

PREPRINTS & TECH
REPORTS

- R1 **Mengye Ren**, Tyler R. Scott, Michael L. Iuzzolino, Michael C. Mozer, Richard Zemel. Online unsupervised learning of visual representations and categories. *arXiv preprint arXiv:2109.05675*, 2021.

- R2 **Mengye Ren***, Eleni Triantafillou*, Kuan-Chieh Wang*, James Lucas*, Jake Snell, Xaq Pitkow, Andreas S. Tolias, Richard S. Zemel. Flexible few-shot learning of contextual similarity. *arXiv preprint arXiv:2012.05895*, 2020.
- R3 Yuwen Xiong*, **Mengye Ren***, Raquel Urtasun. Learning to remember from a multi-task teacher. *arXiv preprint arXiv:1910.04650*, 2019.

PATENTS

- P1 Raquel Urtasun, **Mengye Ren**, Andrei Pokrovsky, Bin Yang. Sparse convolutional neural networks, US 11,061,402 B2, *US Patent*, 2021.

AWARDS & HONORS

- NSERC Postdoctoral Fellowship, \$90,000 CAD (declined) 2021 – 2023
- Facebook Fellowship Finalist (91 out of 1876 PhD applicants worldwide) 2020
- NSERC Alexander Graham Bell Scholarship, \$105,000 CAD 2018 – 2021
- NVIDIA Research Pioneer Award 2018
- NVIDIA Research Pioneer Award 2017
- NIPS 2017 Travel Award \$800 USD 2017
- ICLR 2017 Travel Award \$1,250 USD 2017
- MLSS 2015 Kyoto Travel Support ¥140,000 JPY 2015
- U of T Quantathon 2nd Place \$5,000 CAD 2015
- U of T Undergraduate Mathematics Competition, Honourable Mention 2015
- Wallberg Undergraduate Scholarship \$1,500 CAD 2014
- International 5th place in Windward AI Challenge, 1st in U of T 2014
- Dean’s List for all semesters in undergraduate studies 2011 – 2015
- Entrance Scholarship from the University of Toronto \$5,000 CAD 2011
- Meritorious Award in Mathematical Contest of Modeling (MCM) 2011

PROFESSIONAL SERVICE

Area Chair:

- NeurIPS Workshop on Meta-Learning (MetaLearn) 2020 - 2021

Journal Reviewer:

- Journal of Machine Learning Research (JMLR)
- International Journal of Computer Vision (IJCV)
- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- IEEE Transactions on Image Processing (TIP)
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
- IEEE Transactions on Computational Imaging (TCI)
- Neural Networks
- Machine Learning
- Optimization Methods and Software

Conference Reviewer:

- Conference on Neural Information Processing Systems (NeurIPS) 2016 – 2021
- International Conference on Machine Learning (ICML) 2017 – 2022
- International Conference on Learning Representations (ICLR) 2018 – 2022
- Conference on Computer Vision and Pattern Recognition (CVPR) 2018 – 2022
- International Conference on Computer Vision (ICCV) 2019 – 2021
- European Conference on Computer Vision (ECCV) 2020
- International Conference on Robotics and Automation (ICRA) 2021
- International Conference on Intelligent Robots and Systems (IROS) 2020
- Association for the Advancement of Artificial Intelligence Conference (AAAI) 2018
- Uncertainty in Artificial Intelligence (UAI) 2018

Seminar Organizer:

- Self-Supervised Learning Weekly Seminars (with E. Triantafillou) 2021 – Present
- Meta-Learning Weekly Seminars (with E. Triantafillou) 2019 – 2021
- Uber ATG R&D Weekly Paper Reading Seminars 2018 – 2019

OPEN SOURCE SOFTWARES

- Forward-mode automatic differentiation for TensorFlow.
GitHub: <https://github.com/renmengye/tensorflow-forward-ad>
- DeepDashboard: Real-time web-based training visualizer.
GitHub: <https://github.com/renmengye/deep-dashboard>

INVITED TALKS

- T1 Visual learning in the open world. University of Oxford. Oxford, UK. Nov 2021.
- T2 Visual learning in the open world. Google Brain. Toronto, Ontario, Canada. Nov 2021.
- T3 Visual learning in the open world. Stanford University. Stanford, California, USA. Oct 2021.
- T4 Steps towards making machine learning more natural. École Polytechnique Fédérale de Lausanne. Lausanne, Switzerland. Apr 2021.
- T5 Steps towards making machine learning more natural. University of Michigan. Ann Arbor, Michigan, USA. Mar 2021.
- T6 Steps towards making machine learning more natural. Université de Montréal. Montréal, Québec, Canada. Mar 2021.
- T7 Steps towards making machine learning more natural. University of North Carolina, Chapel Hill. Chapel Hill, North Carolina, USA. Mar 2021.
- T8 Steps towards making machine learning more natural. University of Chicago. Chicago, Illinois, USA. Mar 2021.
- T9 Steps towards making machine learning more natural. University of British Columbia. Vancouver, British Columbia, Canada. Mar 2021.
- T10 Steps towards making machine learning more natural. University of Waterloo. Waterloo, Ontario, Canada. Mar 2021.
- T11 Steps towards making machine learning more natural. New York University. New York, New York, USA. Mar 2021.
- T12 Steps towards making machine learning more natural. University of Edinburgh. Edinburgh, UK. Mar 2021.
- T13 Steps towards making machine learning more natural. University of Maryland, College Park. College Park, Maryland, USA. Feb 2021.
- T14 A tutorial on few-shot learning and unsupervised representation learning. Vector Institute. Toronto, Ontario, Canada. Jan 2021.
- T15 How can we apply few-shot learning? Vector Institute. Toronto, Ontario, Canada. Oct 2020.
- T16 Towards continual and compositional few-shot learning. Stanford University. Stanford, California, USA. Oct 2020.
- T17 Towards continual and compositional few-shot learning. Brown University. Providence, Rhode Island, USA. Sept 2020.
- T18 Towards continual and compositional few-shot learning. MIT. Cambridge, Massachusetts, USA. Sept 2020.
- T19 Towards continual and compositional few-shot learning. Mila. Montréal, Québec, Canada. Aug 2020.
- T20 Towards continual and compositional few-shot learning. Uber ATG. Toronto, Ontario, Canada. Aug 2020.

- T21 Wandering within a world: Online contextualized few-shot learning. Google Brain. Montréal, Québec, Canada. Aug 2020.
- T22 Wandering within a world: Online contextualized few-shot learning. ICML 2020 Lifelong Learning Workshop. July 2020.
- T23 Wandering within a world: Online contextualized few-shot learning. ICML 2020 Continual Learning Workshop. July 2020.
- T24 Jointly learnable behavior and trajectory planner for autonomous driving. IROS 2019. Macau, China. Nov 2019.
- T25 Meta-learning for more human-like learning algorithms. Columbia University. New York, New York, USA. Oct 2019.
- T26 Learning to reweight examples for robust deep learning. CIFAR deep learning and reinforcement learning summer school. Toronto, Ontario, Canada. Aug 2018.
- T27 Meta-learning for weakly supervised learning. INRIA Grenoble - Rhône-Alpes. Grenoble, France. July 2018.
- T28 Learning to reweight examples for robust deep learning. ICML 2018. Stockholm, Sweden. July 2018.
- T29 Meta-learning and learning to reweight examples. Max Planck Institute for Intelligent Systems. Tübingen, Germany. June 2018.
- T30 SBNNet: Sparse blocks network for fast inference. CVPR 2018. Salt Lake City, Utah, USA. June 2018.
- T31 Meta-learning for weakly supervised learning. NEC Laboratories America. Princeton, New Jersey, USA. June 2018.
- T32 SBNNet: Sparse blocks network for fast inference. Borealis AI Lab (RBC Research). Toronto, Ontario, Canada. Feb 2018.
- T33 Meta-learning for semi-supervised few-shot classification. Vector Institute. Toronto, Ontario, Canada. Nov 2017.
- T34 End-to-end instance segmentation with recurrent attention. CVPR 2017. Honolulu, Hawaii, USA. July 2017.
- T35 Sequence-to-sequence deep learning with recurrent attention. Queen's University. Kingston, Ontario, Canada. May 2017.
- T36 Recurrent neural networks. CSC 2541: Sport Analytics Guest Lecture. University of Toronto. Toronto, Ontario, Canada. Jan 2017.
- T37 Deep dashboard tutorial. University of Guelph. Guelph, Ontario, Canada. Mar 2016.
- T38 Deep dashboard tutorial. University of Toronto. Toronto, Ontario, Canada. Feb 2016.
- T39 Exploring data and models for image question answering. ICML 2015 Deep Learning Workshop. Lille, France. July 2015.

STUDENT
SUPERVISION

University of Toronto Undergraduate Thesis:

- Alexander Li
- Jason Sun
- Alexander Wang
- Yatu Zhang

Uber ATG & Waabi Interns:

- Richard Du
- Alexander Li
- Yen-chen Lin
- Mengfei Liu

- Stephen Liu
- Ava Pun
- Quinlan Sykora
- James Tu
- Nicholas Vadivelu
- Jingkang Wang
- Bob Wei
- Xinkai Wei
- Chris Zhang
- Lunjun Zhang

- MEDIA COVERAGE
- Researchers from University of Toronto proposed attention attractor networks and implemented incremental few-shot learning. Synced. [[link](#)]. 2019/11/03.
 - Autonomous vehicles: U of T researchers make advances with new algorithm. Nina Haikara. U of T News. [[link](#)]. 2018/06/21.
 - Industry — Uber proposed SBNet: Leveraging activation block sparsity for speeding up convolutional neural networks. Synced. [[link](#)]. 2018/01/18.
 - SBNet: Leveraging activation block sparsity for speeding up convolutional neural networks. Uber Engineering Blog. [[link](#)]. 2018/01/16.