Marcus A. Brubaker - Curriculum Vitae

CONTACT INFORMATION	Marcus A. Brubaker *E-mail:* mab@eecs.yorku.ca *Website:* mbrubake.github.io

EDUCATION

University of Toronto, Toronto, Ontario, Canada

- Ph.D. in Computer Science (Supervisor: David J. Fleet) **2011**
  Thesis Title: *Physical Models of Human Motion for Estimation and Scene Understanding*
- M.Sc. in Computer Science (Supervisor: David J. Fleet) **2006**
  Thesis Title: *Physics-based Priors for Human Pose Tracking*
- Honours B.Sc. in Computer Science with Minor in Mathematics **2004**

EMPLOYMENT HISTORY

YORK UNIVERSITY
Assistant Professor **2016 -**

- Department of Electrical Engineering and Computer Science

STRUCTURA BIOTECHNOLOGY INC STRUCTURA.BIO
Co-Founder **2016 -**

- Developing state-of-the-art algorithms and software for biomolecular structure determination

BOREALIS AI BOREALISAI.COM
Academic Advisor **2020 -**
Research Director **2018 - 2020**

- Leading machine learning research for use in products and financial services at the Royal Bank of Canada. As a director I also managed research teams in Toronto, Montreal and Waterloo

CADRE RESEARCH LABS CADRERESEARCH.COM
Research Associate **2011 - 2018**

- Theoretical and applied consulting in computer vision, machine learning and statistics

UNIVERSITY OF TORONTO, SCARBOROUGH
Postdoctoral Fellow (Supervisor: David J. Fleet) **2014 - 2016**
Sessional Lecturer (*CSCD11/CSCC11: Intro to Machine Learning*) **2012 - 2015**

TTI-CHICAGO TTIC.EDU
Postdoctoral Fellow (Supervisor: Raquel Urtasun) **2011 - 2014**

OTHER AFFILIATIONS

- Vector Institute. Faculty Affiliate (2018-)
- Department of Computer Science, University of Toronto. Assistant Professor, Status-only (2017-)
- Vision: Science to Applications (VISTA), York University. Core Faculty (2016-)
- Centre for Vision Research, York University. Faculty Member (2016-)
- NEXT Canada. Faculty Member (2018-)
- Computer Vision Foundation. Member (2013-)
- IEEE. Member (2007-)

FUNDING AND AWARDS

Grants

- *"Inference and Model Building for Vision-based Estimation of Transmissive Objects,"* **Natural Science and Engineering Research Council (NSERC) Discovery Grant**, $195,000CAD, 2017-2022.
- *"Tools and Techniques for Advanced Single Particle Electron Cryomicroscopy: Accelerating the Push for Rational Drug Design,"* **FedDev Ontario Health Ecosphere Project**, $100,000CAD, 2017.
- *"Firearm Forensics Black-Box Studies for Examiners and Algorithms using Measured 3D Surface Topographies,"* **National Institute of Justice (NIJ) Applied R&D in Forensic Science for Criminal Justice Purposes**, with Ryan H. Lilien, $200,000USD, 2017.

- *"Applied Research, Development, and Method Validation of Toolmark Imaging, Virtual Casing Comparison, and In-Lab Verification for Firearms Forensics,"* **National Institute of Justice (NIJ) Applied R&D in Forensic Science for Criminal Justice Purposes**, with Ryan H. Lilien, $217,450USD, 2016.
- *"Applied Research, Development and Method Validation for a Statistically Based Comparison of Tool Marks using GelSight-Based Three Dimensional Imaging and Novel Comparison Algorithms for Firearm Forensics,"* **NIJ Applied R&D in Forensic Science for Criminal Justice Purposes**, with Ryan H. Lilien, $190,400USD, 2015.
- *"Applied Research and Development of a Three-dimensional Topography System for Imaging and Analysis of Striated and Impressed Tool Marks for Firearm Identification using GelSight,"* **NIJ Applied R&D in Forensic Science for Criminal Justice Purposes**, with Ryan H. Lilien, $193,000USD, 2014.
- *"Applied Research and Development of a Three-dimensional Topography System for Firearm Identification using GelSight,"* **NIJ Applied R&D in Forensic Science for Criminal Justice Purposes**, with Ryan H. Lilien and Todd Weller, $200,000USD, 2013.
- *"Three-dimensional Topography System for Firearm Identification using GelSight,"* **National Institute of Standards and Technology, Measurement Science and Engineering Research Grants Program,** with Ryan H. Lilien and Todd Weller, $174,000USD, 2013.

Scholarships and Awards

- **Top Reviewer, International Conference on Machine Learning**   **2020**
- **Workshop on Computer Vision for Fashion, Art and Design at ECCV**   **2018**
  ◇ Shortlisted Artwork [23]

- **BioImage Computing Workshop at IEEE CVPR**   **2015**
  ◇ Winner of Best Poster for [43]

- **IEEE Conference on Computer Vision and Pattern Recognition**   **2013**
  ◇ Winner of Best Paper Runner-Up for [31]

- **Natural Science and Engineering Research Council**   **2012 - 2014**
  ◇ Postdoctoral Fellowship, $40,000CAD per year

- **Natural Science and Engineering Research Council**   **2008 - 2010**
  ◇ Canadian Graduate Scholarship, $35,000CAD per year

- **Ontario Graduate Scholarship**   **2006 - 2007**
  ◇ $15,000CAD per year

- **Ray Reiter Graduate Award in Computer Science**   **2005 - 2006**
  ◇ $500CAD

PUBLICATIONS

Journal Articles

[1] Ivan Kobyzev, Simon J.D. Prince, and Marcus A. Brubaker. Normalizing flows: An introduction and review of current methods. *IEEE Transactions on Pattern Analysis and Machine Intelligence (**PAMI**)*, 2020, arXiv:1908.09257 [stat.ML].

[2] Saeed Ghorbani, Calden Wloka, Ali Etemad, Marcus A. Brubaker, and Nikolaus F. Troje. Probabilistic character motion synthesis using a hierarchical deep latent variable model. *Computer Graphics Forum*, 39(8), 2020.

[3] Ali Punjani, John L. Rubinstein, David J. Fleet, and Marcus A. Brubaker. cryoSPARC: algorithms for rapid unsupervised cryo-EM structure determination. *Nature Methods*, 14(3):290 – 296, 2017.

[4] Bob Carpenter, Andrew Gelman, Matt Hoffman, Daniel Lee, Ben Goodrich, Michael Betancourt, Marcus A. Brubaker, Jiqiang Guo, Peter Li, and Allen Riddell. Stan: A Probabilistic Programming Language. *Journal of Statistical Software*, 76(1), 2017.

[5] Pierre Duez, Todd Weller, Marcus A. Brubaker, Richard E. Hockensmith, and Ryan Lilien. Development and validation of a virtual examination tool for firearm forensics. *Journal of Forensic Sciences*, 2017.

[6] Ali Punjani, Marcus A. Brubaker, and David J. Fleet. Building Proteins in a Day: Efficient 3D Molecular Structure Estimation with Electron Cryomicroscopy. *IEEE Transactions on Pattern Analysis and Machine Intelligence (**PAMI**)*, 2016.

[7] Marcus A. Brubaker, Andreas Geiger, and Raquel Urtasun. Map-based Probabilistic Visual Self-Localization. *IEEE Transactions on Pattern Analysis and Machine Intelligence (**PAMI**)*, 2016.

[8] Todd Weller, Marcus A. Brubaker, Pierre Duez, and Ryan Lilien. Introduction and Initial Evaluation of a Novel Three-Dimensional Imaging and Analysis System for Firearm Forensics. *Association of Firearm and Tool Mark Examiners (AFTE) Journal*, 47(4):198 – 208, 2015.

[9] John L. Rubinstein and Marcus A. Brubaker. Alignment of cryo-EM movies of individual particles by optimization of image translations. *Journal of Structural Biology*, 192(2):188 – 195, 2015, arXiv:1409.6789 [q-bio.QM].

[10] Jianhua Zhao, Marcus A. Brubaker, Samir Benlekbir, and John L. Rubinstein. Description and comparison of algorithms for correcting anisotropic magnification in cryo-EM images. *Journal of Structural Biology*, 192(2):209 – 215, 2015, arXiv:1501.05928 [physics.ins-det].

[11] Yanshuai Cao, Marcus A. Brubaker, David J. Fleet, and Aaron Hertzmann. Efficient Optimization for Sparse Gaussian Process Regression. *IEEE Transactions on Pattern Analysis and Machine Intelligence (**PAMI**)*, 37(12):2415 – 2427, 2015.

[12] Jianhua Zhao, Marcus A. Brubaker, and John L. Rubinstein. TMaCS: A hybrid template matching and classification system for partially-automated particle selection. *Journal of Structural Biology*, 181(3):234 – 242, 2013.

[13] Marcus A. Brubaker, David J. Fleet, and Aaron Hertzmann. Physics-based Person Tracking using the Anthropomorphic Walker. *International Journal of Computer Vision (**IJCV**)*, 87(1):140–155, 2010.

[14] Navdeep Jaitly, Marcus A. Brubaker, John Rubinstein, and Ryan H. Lilien. A Bayesian Method for 3-D Macromolecular Structure Inference using Class Average Images from Single Particle Electron Microscopy. *Bioinformatics*, 26:2406–2415, 2010.

Peer-Reviewed Conference Papers

[15] Jason J. Yu, Konstantinos Derpanis, and Marcus A. Brubaker. Wavelet Flow: Fast Training of High Resolution Normalizing Flows. In *Neural Information Processing Systems (**NeurIPS**)*, 2020, arXiv:2010.13821 [cs.CV].

[16] Ruizhi Deng, Bo Chang, Marcus A. Brubaker, Greg Mori, and Andreas Lehrmann. Modeling Continuous Stochastic Processes with Dynamic Normalizing Flows. In *Neural Information Processing Systems (**NeurIPS**)*, 2020, arXiv:2002.10516 [cs.LG].

[17] Priyank Jaini, Ivan Kobyzev, Marcus A. Brubaker, and Yaoliang Yu. Tails of lipschitz triangular flows. In *Proceedings of the International Conference on Machine Learning (**ICML**)*, 2020, arXiv:1907.04481 [math.ST].

[18] Rishab Goel, Seyed Mehran Kazemi, Marcus A. Brubaker, and Pascal Poupart. Diachronic Embedding for Temporal Knowledge Graph Completion. In *Proceedings of the AAAI Conference on Artificial Intelligence (**AAAI**)*, 2020, arXiv:1907.03143 [cs.LG].

[19] Abdelrahman Abdelhamed, Marcus A. Brubaker, and Michael S. Brown. Noise Flow: Noise Modeling with Conditional Normalizing Flows. In *Proceedings of the International Conference on Computer Vision (**ICCV**)*, 2019, arXiv:1908.08453 [cs.CV].

[20] Abbas Masoumzadeh and Marcus A. Brubaker. HydraPicker: Fully Automated Particle Picking in Cryo-EM by Utilizing Dataset Bias in Single Shot Detection. In *Proceedings of the British Machine Vision Conference (**BMVC**)*, 2019.

[21] Karen Ullrich, Rianne van den Berg, Marcus A. Brubaker, David J. Fleet, and Max Welling. Differentiable probabilistic models of scientific imaging with the Fourier slice theorem. In *Proceedings of Conference on Uncertainty in Artificial Intelligence (**UAI**)*, 2019, arXiv:1906.07582 [cs.LG].

[22] Yash Sharma, Gavin Weiguang Ding, and Marcus A. Brubaker. On the Effectiveness of Low Frequency Perturbations. In *Proceedings of the International Joint Conference on Artificial Intelligence (**IJCAI**)*, 2019, arXiv:1903.00073 [cs.CV].

[23] Matthew Tesfaldet, Marcus A. Brubaker, and Konstantinos G. Derpanis. Two-Stream Convolutional Networks for Dynamic Texture Synthesis. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2018, arXiv:1706.06982 [cs.CV].

[24] Micha Livne, Leonid Sigal, Marcus A. Brubaker, and David J. Fleet. Walking on Thin Air: Environment-Free Physics-based Markerless Motion Capture. In *Proceedings of the Conference on Computer and Robot Vision (**CRV**)*, 2018, arXiv:1812.01203 [cs.CV].

[25] Wei-Chiu Ma, Shenlong Wang, Marcus A. Brubaker, Sanja Fidler, and Raquel Urtasun. Find your Way by Observing the Sun and Other Semantic Cues. In *Proceedings of the IEEE International Conference on Robotics and Automation (**ICRA**)*, 2017, arXiv:1606.07415 [cs.CV].

[26] Zhi Hao Luo, Marcus A. Brubaker, and Michael Brudno. Size and Texture-based Classification of Lung Tumors with 3D CNNs. In *Proceedings of the IEEE Workshop on Applications of Computer Vision (**WACV**)*, 2017.

[27] Yali Wang, Marcus A. Brubaker, Brahim Chaib-draa, and Raquel Urtasun. Sequential Inference for Deep Gaussian Process. In *International Conference on Artificial Intelligence and Statistics (**AISTATS**)*, 2016.

[28] Marcus A. Brubaker, Ali Punjani, and David J. Fleet. Building Proteins in a Day: Efficient 3D Molecular Reconstruction. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2015, arXiv:1504.03573 [cs.CV].

[29] Yali Wang, Marcus A. Brubaker, Brahim Chaib-draa, and Raquel Urtasun. Bayesian Filtering with Online Gaussian Process Latent Variable Models. In *Proceedings of Conference on Uncertainty in Artificial Intelligence (**UAI**)*, 2014.

[30] Yanshuai Cao, Marcus A. Brubaker, Aaron Hertzmann, and David J. Fleet. Efficient Optimization for Sparse Gaussian Process Regression. In *Neural Information Processing Systems (**NeurIPS**)*, 2013, arXiv:1310.6007 [cs.LG].

[31] Marcus A. Brubaker, Andreas Geiger, and Raquel Urtasun. Lost! Leveraging the Crowd for Probabilistic Visual Self-Localization. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2013.

[32] Marcus A. Brubaker, Mathieu Salzmann, and Raquel Urtasun. A Family of MCMC Methods on Implicitly Defined Manifolds. In *International Conference on Artificial Intelligence and Statistics (**AISTATS**)*, 2012.

[33] Marcus A. Brubaker, Leonid Sigal, and David J. Fleet. Estimating Contact Dynamics. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2009.

[34] Marcus A. Brubaker and David J. Fleet. The Kneed Walker for Human Pose Tracking. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2008.

[35] Marcus A. Brubaker, David J. Fleet, and Aaron Hertzmann. Physics-based person tracking using simplified lower-body dynamics. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2007.

Peer-Reviewed Workshop Papers

[36] Ruizhi Deng, Bo Chang, Marcus A. Brubaker, Greg Mori, and Andreas Lehrmann. Modeling continuous stochastic processes with dynamic normalizing flows. In *ICML Workshop on Invertible Neural Networks, Normalizing Flows, and Explicit Likelihood Models*, 2020, arXiv:2002.10516 [cs.LG].

[37] Rishab Goel, Seyed Mehran Kazemi, Marcus A. Brubaker, and Pascal Poupart. Diachronic Embedding for Temporal Knowledge Graph Completion. In *NeurIPS Workshop on Graph Representation Learning*, December 2019, arXiv:1907.03143 [cs.LG].

[38] Nazanin Mehrasa, Ruizhi Deng, Jiawei He, Bo Chang, Thibaut Durand, Mohamed Osama Ahmed, Marcus A. Brubaker, and Greg Mori. Point Process Flows. In *NeurIPS Workshop on Learning with Temporal Point Processes*, December 2019, arXiv:1910.08281 [cs.LG].

[39] Matthew Tesfaldet, Nariman Saftarli, Marcus A. Brubaker, and Konstantinos G. Derpanis. Convolutional Photomosaic Generation via Multi-scale Perceptual Losses. In *ECCV Workshop on Computer Vision for Fashion, Art and Design*, 2018.

[40] Ali Punjani, Haowei Zhang, John Rubinstein, Marcus A. Brubaker, and David J. Fleet. Algorithmic advances in single particle cryo-em data processing. *Microscopy and Microanalysis*, 24(S1):868–869, 2018.

[41] Christopher Blake, Luyu Wang, Giuseppe Castiglione, Christopher Srinivasa, and Marcus A. Brubaker. On learning wire-length efficient neural networks. In *NeurIPS 2018 Workshop on Compact Deep Neural Network Representation with Industrial Applications*, December 2018.

[42] Bob Carpenter, Matthew D. Hoffman, Marcus A. Brubaker, Daniel Lee, Michael Betancourt, Sebastian Weber, and Rob Trangucci. Algorithmic Differentiation in the Stan Math C++ Library. In *ADMB Developers Workshop*, June 2016.

[43] Marcus A. Brubaker, Ali Punjani, and David J. Fleet. Efficient 3D Macromolecular Reconstruction with Electron Cryomicroscopy. In *BioImage Computing Workshop at IEEE Conference on Computer Vision and Pattern Recognition*, June 2015.

[44] Ali Punjani and Marcus A. Brubaker. Microscopic Advances with Large-Scale Learning: Stochastic Optimization for Cryo-EM. In *Neural Information Processing Systems Workshop: Machine Learning in Computational Biology (MLCB)*, December 2014, 1501.04656.

[45] Marcus A. Brubaker, Andreas Geiger, and Raquel Urtasun. Probabilistic Map Localization Through Visual Odometry. In *Proceedings of SUNw: Scene Understanding Workshop at IEEE Conference on Computer Vision and Pattern Recognition (CVPRW)*, 2013.

[46] Navdeep Jaitly, Marcus A. Brubaker, John Rubinstein, and Ryan Lilien. A Bayesian method for 3D reconstruction of macromolecular structure using class averages from single particle electron microscopy. In *Neural Information Processing Systems Workshop: Machine Learning in Computational Biology (MLCB)*, December 2009.

[47] Marcus A. Brubaker, David J. Fleet, and Aaron Hertzmann. Physics-based Human Pose Tracking. In *Neural Information Processing Systems Workshop: Evaluation of Articulated Human Motion and Pose Estimation (EHuM)*, December 2006.

Theses, Book Chapters and Other Contributions

[48] Ruizhi Deng, Yanshuai Cao, Bo Chang, Leonid Sigal, Greg Mori, and Marcus A. Brubaker. Variational hyper rnn for sequence modeling, 2020, arXiv:2002.10501 [cs.LG].

[49] Seyed Mehran Kazemi, Rishab Goel, Sepehr Eghbali, Janahan Ramanan, Jaspreet Sahota, Sanjay Thakur, Stella Wu, Cathal Smyth, Pascal Poupart, and Marcus Brubaker. Time2vec: Learning a vector representation of time, 2019, arXiv:1907.05321 [cs.LG].

[50] Marcus A. Brubaker. The Integral Cross-Discipline Approach to Pushing AI Research. *techvibes.com*, February 2018.

[51] Ali Punjani, John Rubinstein, David J. Fleet, and Marcus A. Brubaker. New algorithms in cryoSPARC. In *Three Dimensionl Electron Microscopy Gordon Research Conference*, June 2017.

[52] Bob Carpenter, Matthew D. Hoffman, Marcus A. Brubaker, Daniel Lee, Peter Li, and Michael Betancourt. The Stan Math Library: Reverse-Mode Automatic Differentiation in C++, 2015, arXiv:1509.07164 [cs.MS].

[53] Ryan Lilien, Marcus A. Brubaker, and Todd Weller. Progress Towards a Novel 3D-Topography Imaging and Analysis System for Firearm Identification, TopMatch-GS, and Results of a Large-Scale Study. In *The Association of Firearm and Tool Mark Examiners Annual Training Seminar*, May 2014.

[54] Ryan Lilien, Marcus A. Brubaker, and Todd Weller. Development of a 3D-Topography Imaging and Analysis System for Firearm Identification using GelSight and Feature Based Case Matching. In *The Association of Firearm and Tool Mark Examiners Annual Training Seminar*, June 2013.

[55] Ryan Lilien, Marcus A. Brubaker, Todd Weller, and Micah Johnson. Three-Dimensional Topography System for Firearm Identification using GelSight. In *NIJ and FBI Impression and Pattern Evidence Symposium, Clearwater, Florida*, August 2012.

[56] Marcus A. Brubaker, Ryan Lilien, Todd Weller, and Micah Johnson. Surface Topography Measurement using GelSight Elastomeric Sensor for Firearm Forensics. In *NIST Conference on Measurement Science and Standards in Forensic Firearms Analysis, Gaithersburg, Maryland*, July 2012.

[57] Marcus A. Brubaker. *Physical Models of Human Motion for Estimation and Scene Analysis*. PhD thesis, University of Toronto, 2011.

[58] Marcus A. Brubaker, Leonid Sigal, and David J. Fleet. Video-based People Tracking. In H. Nakashima, H. Aghajan, and J.C. Augusto, editors, *Handbook on Ambient Intelligence and Smart Environments*. Springer Verlag, 2009.

[59] Marcus A. Brubaker, Leonid Sigal, and David J. Fleet. Physics-based Human Motion Modelling for people tracking: A short tutorial. Tutorial at IEEE International Conference of Computer Vision, Kyoto, Japan, 2009.

[60] Marcus A. Brubaker. Physics-based priors for human pose tracking. Master's thesis, University of Toronto, 2006.

Patents

[61] Nazanin Mehrasa, Akash Abdu Jyothi, Thibaut Durand, Jiawei He, Gregory Mori, Mohamed Ahmed, and Marcus Anthony Brubaker. System and method for generative model for stochastic point processes, May 21 2020. US Patent 16,685,327.

[62] Ryan Lilien, Marcus Anthony Brubaker, and Pierre Duez. Method and system for three dimensional imaging and analysis, June 12 2018. US Patent 9,998,729.

[63] Ali Punjani, Marcus Anthony Brubaker, and David James Fleet. Methods and systems for image alignment of at least one image to a model, November 28 2017. US Patent 9,830,732.

[64] Marcus Anthony Brubaker, Ali Punjani, and David James Fleet. Methods and systems for 3d structure estimation, April 13 2017. US Patent App. 15/292,520.

TEACHING AND SUPERVISION

Graduate Students

Name	Degree	Tenure	Thesis Title	Next Position
Ali Maleky[1]	MSc (York)	2021/01 -		
Shayan Shekarforoush[3]	PhD (UofT)	2020/09 -		
Xavier Snelgrove	MSc (UofT)	2020/09 -		
Jason Yu	PhD (York)	2020/09 -		
Shayan Kousha	MSc (York)	2020/09 -		
Vincent Sham	MSc (York)	2020/09 -		
Shane Segal[1]	MSc (York)	2018/09 - 2021/01	Learned Exposure Selection for High Dynamic Range Image Synthesis	
Jason Yu	MSc (York)	2018/09 - 2020/08	Wavelet Flow: Fast Training of High Resolution Normalizing Flows	PhD at York University
Abbas Masoumzadeh Tork	MSc (York)	2017/09 - 2019/08	Object Detection Frameworks for Fully Automated Particle Picking in Cryo-EM	PhD at University of Alberta
Matthew Tesfaldet[2]	MSc (York)	2016/09 - 2018/08	Two-Stream Convolutional Networks for Dynamic Texture Synthesis	PhD at McGill University

[1]Co-supervised with Michael Brown. [2]Co-supervised with Kosta Derpanis. [3]Co-supervised with David Fleet. [*]Anticipated start/end date

Other Students

Name	Degree	Tenure	Thesis/Project Title	Program	Last Seen
Ridam Loomba	BASc, UofT	2020/04 - 2020/08	High Resolution Image Datasets for Probabilistic Generative Modelling	RA	
Nadav Gasner	BSc, York	2018/01 - 2018/08	Particle Counting for Electron Cryomicroscopy	USRA	Medical School, McMaster University
Ekram Bhuiyan	BSc, York	2017/04 - 2017/08	Detailed Visual Face Tracking	RA	Software Engineer, Ezoic
Steven (Szu-Han) Chen	BSc, York	2017/04 - 2017/08	Volumetric Super-resolution for Learning Detailed Protein Structure	LURA	Scientist, Zero Gravity Labs
Kristen McIntosh	BSc, York	2017/04 - 2017/08	Object Detection in Low SNR Settings for Cryo-EM Particle Picking	LURA	Data Engineer, Royal Bank of Canada

Student Supervision Before 2016
- Yanshuai Cao (PhD, University of Toronto, with David J. Fleet)
  Currently: Research Team Lead, Borealis AI
- Martin Hjelm (MSc, TTI-Chicago, with Raquel Urtasun)
  Currently: PhD Student, KTH Royal Institute of Technology
- Hubert Lin (BSc, University of Toronto, with David J. Fleet)
  Currently: PhD Student, Cornell University
- Micha Livne (PhD, University of Toronto, with David J. Fleet)
  Currently: Postdoctoral Fellow, University of Toronto
- Zhi Hao (Perry) Luo (BSc, University of Toronto, with Michael Brudno)
  Currently: PhD Student, MILA (Montreal Polytechnique)
- Ali Punjani (PhD, University of Toronto, with David J. Fleet)
  Currently: PhD Student, University of Toronto/CEO Structura Biotechnology
- Yali Wang (PhD, TTI-Chicago, with Raquel Urtasun)
  Currently: Assistant Professor, Chinese Academy of Sciences
- Jianhua Zhao (PhD, University of Toronto with John Rubinstein)
  Currently: Postdoctoral Fellow, University of California, San Francisco
- Yadi Zhao (BSc, University of Toronto)
  Currently: Senior Software Engineer, Microsoft

Supervisory and Examination Committees

Name	Degree	University	Status
Abdullah Abuolaim	PhD	York University	Current
Chao Wang	PhD	York University	Current
Mahmoud Afifi	PhD	York University	Current
Rezaul Karim	PhD	York University	Current
Saeed Ghorbani	PhD	York University	Current
Farzanah Mahdisoltani	PhD	University of Toronto	Current

Abdelrahman Abdelhamed	PhD	York University	Graduated 2020/11
Micha Livne	PhD	University of Toronto	Graduated 2020/04
Mahdi Biparva	PhD	York University	Graduated 2019/09
Hakki Karaimer	PhD	York University	Graduated 2019/08
Soo Min Kang	PhD	York University	Graduated 2019/08
Calden Wloka	PhD	York University	Graduated 2019/08
Masoud Hoveidar-Sefid	MSc	York University	Graduated 2017/11

Courses Taught
- York University

  ◇ EECS1028: Discrete Mathematics for Engineers (Winter 2021)
  ◇ EECS6322: Neural Networks and Deep Learning (Winter 2021)
  ◇ EECS6323: Advanced Topics in Computer Vision (Winter 2018)
  ◇ EECS3121: Numerical Methods I (Fall 2017)
  ◇ EECS4404/5327: Introduction to Machine Learning and Pattern Recognition (Winter 2017)
  ◇ EECS1710: Introduction to Programming for Digital Media (Fall 2016)

- NextAI: Deep Learning in Computer Vision (2018 - 2020)
  ◇ Co-taught 2 day intensive course with Dr. Kosta Derpanis

- University of Toronto, Scarborough
  ◇ CSCC11/D11: Machine Learning and Data Mining (2012 - 2015)

Other Teaching
- Tutorial at IEEE Conference on Computer Vision and Pattern Recognition (2021)
  ◇ *Normalizing Flows and Invertible Neural Networks in Computer Vision.* With Ullrich Koethe.

- Guest Lecturer at Vector Institute (2021)
  ◇ *Unsupervised Learning and Generative Models.* Part of a Computer Vision Special Project.

- Tutorial at European Conference on Computer Vision (2020)
  ◇ *Normalizing Flows and Invertible Neural Networks in Computer Vision.* With Ullrich Koethe and Carsten Rother.

- Guest Lecturer at Toyota Technological Institute at Chicago (2013)
  ◇ Graduate Course on Computer Vision

- Guest Lecturer at University of Toronto (2012, 2014)
  ◇ CSC2431: Topics in Computational Biology: Computational Methods in Medicine
  ◇ CSC2539: Topics in Computer Vision: Detection, Tracking and Analysis of People

- Tutorial at IEEE International Conference on Computer Vision (2009)
  ◇ *Physics-based Human Motion Modelling for People Tracking: A Short Tutorial.* With Leonid Sigal and David Fleet.

- Teaching Assistant at University of Toronto (2004 - 2010)
  ◇ CSC320: Introduction to Visual Computing (2006 - 2010)
  ◇ CSC2503: Foundations of Computer Vision (Graduate Course) (2007, 2010)
  ◇ CSCD18: Computer Graphics (2004 - 2006)
  ◇ CSC192: Computer Programming, Algorithms, Data Structures and Languages (2005)
  ◇ CSC263: Data Structures and Analysis (2004)

SERVICE

Academic

- Area Chair: *European Conference on Computer Vision* 2018, *IEEE Winter Conference on Applications of Computer Vision* 2019, *Conference on Uncertainty in Artificial Intelligence* 2019, *IEEE Conference on Computer Vision and Pattern Recognition* 2021, *AAAI Conference on Artificial Intelligence* 2021.
- Student Volunteer Chair, *IEEE Conference on Computer Vision and Pattern Recognition* 2018.
- Associate Editor: *IET Computer Vision* (2016-).
- Review Editor: Frontiers in Computer Vision
- Selected Reviewer Service: *IEEE Conference on Computer Vision and Pattern Recognition, IEEE International Conference on Computer Vision, European Conference on Computer Vision, Neural Information Processing Systems, International Conference on Machine Learning, International Conference on Artificial Intelligence and Statistics, Conference on Uncertainty in Artificial Intelligence, IEEE International Conference on Robotics and Automation, Journal of Structural Biology, Nature Communications,* SIGGRAPH, *IEEE Transactions on Pattern Analysis and Machine Intelligence, Springer International Journal of Computer Vision, Journal of Machine Learning Research, IEEE Transactions on Image Processing, Eurographics*

Departmental and University

- Department of Electrical Engineering and Computer Science, York University

  ◇ Masters of Science, AI Specialization Program Coordinator (2020 -)
  ◇ Graduate Executive Committee (2020 -)
  ◇ Technical Support and Infrastructure Committee (2017 - 2018, 2020 -)
  ◇ Workload Document Review Committee (2017 - 2018, 2020 -)
  ◇ Computer Vision Reading Group Founder and Organizer (2016 - 2018)
  ◇ Center for Vision Research Seminar Coordinator (2017 - 2018, with James Elder)

- Department of Computer Science, University of Toronto

  ◇ Computer Vision Reading Group Founder and Organizer (2012 - 2016)
  ◇ Departmental Computing Committee (2004 - 2011)
  ◇ Graduate Student Representative, Annual Departmental Retreat (2006 - 2007)
  ◇ M.Sc. Program Restructuring Committee (2005 - 2006)
  ◇ Departmental Computing Transition Committee (2005 - 2006)
  ◇ Graduate Student Representative for External Departmental Review (2005)

- University of Toronto

  ◇ Graduate Education Council, School of Graduate Studies (2007 - 2009)
  ◇ Committee on Student Matters, School of Graduate Studies (2008 - 2009)
  ◇ Advisory Committee to the Provost for Appointment of Dean of Graduate Studies & Vice-Provost Graduate Education (2008 - 2009)
  ◇ Working Group on Interdisciplinarity in Graduate Education, School of Graduate Studies (2008)
  ◇ Committee on Program Matters, School of Graduate Studies (2007 - 2008)

INVITED
TALKS

1. *Having Impact with AI.* Invited Keynote, Vector Masters AI Summit and Career Fair in Toronto, ON. September 2019.

2. *Atomic Scale Computer Vision: Rapid Reconstruction of 3D Structures for CryoEM.* Invited Seminar at the Vector Institute in Toronto, ON. July 2019.

3. *Bayesian Methods and Optimization in Cryo-EM.* Invited Speaker, CryoEM Workshop at the American Crystallographic Association Annual Meeting in Toronto, ON. July 2018.

4. *cryoSPARC: Algorithms for Reducing the Computational Burden of CryoEM.* Invited Seminar at the Vollum Institute, Oregon Health and Science University, Portland, OR. December 2017.

5. *Bayesian Methods in Cryo-EM.* Invited Speaker, NRAMM Workshop on Advanced Topics in EM Structure Determination: Challenges and Opportunities in New York, NY. November 2017.

6. *Algorithms for Reducing the Computational Burden of CryoEM.* Invited Seminar at the National Centre for Biotechnology, Madrid, Spain. October 2017.

7. *Atomic Scale Computer Vision: Rapid Estimation of 3D Protein Structures with Electron Cryomicroscopy.* Invited Speaker, Conference on Big Data and Information Analytics in Toronto, ON. September 2017.

8. *Algorithms for Reducing the Computational Burden of CryoEM.* Invited Speaker, Canadian Microscopy and Cytometry Symposium, Montreal, QC. May 2017.

9. *Algorithms for Reducing the Computational Burden of CryoEM.* Invited Speaker, CryoEM Workshop at Ecole Polytechnique Federale de Lausanne, Switzerland. May 2017.

10. *Algorithms for Reducing the Computational Burden of CryoEM.* Invited Speaker, IDeAS Seminar at Princeton University, Princeton, NJ. April 2017.

11. *Start Me Up UTSC.* Panelist, UTSC Entrepreneurship, University of Toronto Scarborough, Toronto ON. March 2017.

12. *Algorithms for Reducing the Computational Burden of CryoEM.* Invited Seminar at the Vollum Institute, Oregon Health and Science University, Portland, OR. December 2016.

13. *Algorithms for Reducing the Computational Burden of CryoEM.* Invited Talk at Simons Electron Microscopy Workshop on Computational Methods for CryoEM, New York Structural Biology Center, New York, NY. October 2016.

14. *Reducing the Burden of Computation for CryoEM.* Three Dimensional Electron Microscopy Gordon Research Conference, Hong Kong, China. June 2016.

15. *Efficient 3D Molecular Structure Estimation with Electron Cryomicroscopy.* IEEE Toronto Section, Computer Chapter, Toronto, ON. November 2015.

16. *Efficient 3D Molecular Structure Estimation with Electron Cryomicroscopy.* Invited Symposium at 12th Conference on Computer and Robot Vision, Halifax, NS. June 2015.

17. *Lost! Leveraging the Crowd for Probabilistic Visual Self-Localization.* York University, Toronto, ON. January 2014.

18. *Lost! Leveraging the Crowd for Probabilistic Visual Self-Localization.* IEEE Toronto Section, Computer Chapter, Toronto, ON. September 2013.

19. *Physics in Human Motion Estimation and Scene Understanding.* University of Ontario Institute of Technology. September 2012.

20. *Physics in Human Motion Estimation and Scene Understanding.* University of Toronto. November 2011.

21. *Human Motion and Ground Contact from Video.* Carnegie Mellon University/Disney Research, Pittsburgh. May 2011.

22. *Human Motion and Ground Contact from Video.* Bellairs Workshop on Computer Animation: GRAND Challenges, Animation and Geometry, Holetown, Barbados. February 2011.

23. *Physics in Human Motion Estimation and Scene Understanding.* Toyota Technological Institute at Chicago. January 2011.

24. *Physics in Human Motion Estimation and Scene Understanding.* Dartmouth College. December 2010.

25. *Physics in Human Motion Estimation and Scene Understanding.* Boston University. December 2010.

26. *Human Motion Estimation with Physics.* Trends in Computing, Department of Computer Science, University of Toronto, July 2010. (Runner up for Best Talk)

27. *Estimating Contact Dynamics*. Canadian Institute for Advanced Research: Neural Computation & Adaptive Perception Summer School, Toronto, ON. August 2009.

28. *Physics-Based Human Motion Understanding*. Rutgers University. April 2009.

29. *Bayesian Density Estimation from Cryo-EM*. University of Toronto. September 2008.

30. *Physics-Based Models for Human Pose Tracking*. Queens University. April 2008.

31. *The Kneed Walker for Human Pose Tracking*. Canadian Institute for Advanced Research Workshop on Neural Computation and Adaptive Perception, Vancouver, BC. December 2007.

32. *Physics-Based Person Tracking Using Simplified Lower-Body Dynamics*. Ecole Polytechnique Federale de Lausanne. August 2007.

33. *Dynamical Priors for People Tracking*. Canadian Institute for Advanced Research: Neural Computation & Adaptive Perception Summer School, Toronto, ON. August 2006.

(Updated: February 5, 2021)