

# Ryan Szeto

Computer Science and Engineering Ph.D.




## Research Areas

Computer vision, deep learning, video inpainting, generative video models

## Programming

PyTorch	●●●●●●
TensorFlow	●●●●●○
OpenCV	●●●●●○
Python	●●●●●●
Bash	●●●●●○
MATLAB	●●●●●○
JavaScript	●●●●●○

## Web

	ryanszeto.com
	szetor@umich.edu
	rszeto

## Education

**University of Michigan** Ann Arbor, MI  
Ph.D. in Computer Science and Engineering Sep 2015 – Aug 2021  
M.S. in Computer Science and Engineering Sep 2015 – Aug 2017  
Dissertation: *Enforcing Realism and Temporal Consistency for Large-Scale Video Inpainting*  
Advisors: Prof. Jason J. Corso, Prof. Honglak Lee

**University of Massachusetts** Amherst, MA  
B.S. in Computer Science Sep 2011 – May 2015  
B.S. in Mathematics Sep 2011 – May 2015

## Publications

**Ryan Szeto**. “Enforcing Realism and Temporal Consistency for Large-Scale Video Inpainting.” *University of Michigan Ph.D. Dissertation*, 2021.

**Ryan Szeto**, Mostafa El-Khamy, Jungwon Lee, and Jason J. Corso. “HyperCon: Image-To-Video Model Transfer for Video-To-Video Translation Tasks.” *IEEE Winter Conference on Applications of Computer Vision*, 2021.

**Ryan Szeto**, Ximeng Sun, Kunyi Lu, and Jason J. Corso. “A Temporally-Aware Interpolation Network for Video Frame Inpainting.” *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 2020.

Ximeng Sun\*, **Ryan Szeto**\*, and Jason J. Corso. “A Temporally-Aware Interpolation Network for Video Frame Inpainting.” *Asian Conference on Computer Vision*, 2018.

**Ryan Szeto**, Simon Stent, German Ros, and Jason J. Corso. “A Dataset To Evaluate The Representations Learned By Video Prediction Models.” *International Conference on Learning Representations (Workshop Track)*, 2018.

**Ryan Szeto** and Jason J. Corso. “Click Here: Human-Localized Keypoints as Guidance for Viewpoint Estimation.” *IEEE International Conference on Computer Vision*, 2017.

Paul E. Dickson, Chris Kondrat, **Ryan B. Szeto**, W. Richards Adrion, Tung T. Pham, and Tim D. Richards. “Portable Lecture Capture That Captures the Complete Lecture.” *IEEE International Symposium on Multimedia*, 2015.

Ellysha Raelen Recto, Brendan Murphy, **Ryan Szeto**, and Tung Pham. “PAOL and Lecture-Viewer.” *ASEE Zone 1 Conference*, 2014.

## Awards and Distinctions

<b>NSF Graduate Research Fellowship – Honorable Mention</b> <i>National Science Foundation</i>	2017
<b>Outstanding Achievement in Artificial Intelligence Award</b> <i>UMass School of Computer Science</i>	2015
<b>Honors Dean’s Award for Outstanding Honors Thesis</b> <i>UMass Commonwealth Honors College</i>	2015

<b>Honors Research Grant – \$1000</b> <i>UMass Commonwealth Honors College</i>	2014
<b>Phi Beta Kappa</b> <i>Phi Beta Kappa</i>	2014
<b>Research Assistant Fellowship – \$500</b> <i>UMass Commonwealth Honors College</i>	2013
<b>Cisco Award for Outstanding Achievement</b> <i>UMass School of Computer Science</i>	2012

## Research and Industrial Experience

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**Graduate Student Research Assistant** Ann Arbor, MI  
 Vision and Robotics Lab, University of Michigan Sep 2015 – Aug 2021  
*Advisors: Prof. Jason J. Corso, Prof. Honglak Lee*

- *Video Inpainting Benchmark.* We developed a benchmark to diagnose important failure modes of video inpainting methods at a large scale. We collected videos and occlusion masks stratified by certain attributes of their content, and we evaluated visual quality via realism, temporal consistency, and reconstruction performance measures. Our experiments demonstrated that inpainting models react to input attributes in ways that trace back to their specific design, highlighting the importance of diagnostic evaluation.
- *Video Frame Inpainting.* We proposed a deep learning solution to video frame inpainting composed of a bidirectional prediction module and a temporally-aware frame blending module. Our approach produces more accurate and qualitatively satisfying results than prior techniques in video inpainting, frame interpolation, and video prediction.
- *Viewpoint Estimation with Human Guidance.* Our Click-Here CNN estimates the location of the camera relative to an object by using a 2D image and the location of a semantic keypoint on the image, provided by a human, as guidance. Our evaluation demonstrated that keypoint information can help models obtain better viewpoint estimates than those that only use information from the image.

**Assistant Engineer, Machine Learning Intern** San Diego, CA  
 Samsung Semiconductor, Inc. May 2019 – Aug 2019  
*Mentor: Dr. Mostafa El-Khamy*

- *Hyperconsistency for Video-to-Video Translation Tasks.* We proposed a solution called hyperconsistency (HyperCon) to reduce the flickering effects that result from applying image processing to video frames independently. To accomplish this goal, HyperCon identifies consistencies in high frame rate space and propagates them into the post-processed result. Our method reduces flickering effects more reliably than prior video consistency work for tasks as disparate as video inpainting and style transfer.

**Research Intern** Cambridge, MA  
 Toyota Research Institute Jun 2017 – Sep 2017  
*Mentor: Dr. Simon Stent*

- *Evaluating the Generality of Video Prediction Models.* We investigated the robustness of existing video prediction models to unseen objects and rates of motion. Our experiments revealed that during prediction, certain models reconstruct objects seen during training at inference time, and all that tested models fail to generalize to faster rates of motion.

**Software Engineering Intern** Littleton, MA  
 IBM May 2015 – Aug 2015

- *IBM Guardium.* Designed and implemented an interface to manage permissions through an access manager, and reduced page load times by 80% by consolidating remote database queries.

**Undergraduate Research Assistant** Amherst, MA  
 RIPPLES Lab, University of Massachusetts Jan 2013 – May 2015  
*Advisors: Prof. Rick Adrion, Prof. Paul Dickson*

- *Presentations Automatically Organized from Lectures.* Implemented a portable lecture capture system that processes video feeds of the lecturer, the whiteboard, and the computer screen in real-time.
- *Honors Thesis: Whiteboard Marker Detection.* Proposed a real-time whiteboard marker segmentation algorithm that generates marker stroke candidates by connecting components from a Difference-of-Gaussians edge detector, then filtering them with a sparse stroke detector.

**Software Engineering Intern**  
The MathWorks, Inc.

Natick, MA  
May 2014 – August 2014

- *MATLAB Online*. Improved the Variable Editor by writing QUnit tests and implementing cut/copy/paste functionality.

**Undergraduate Research Assistant**  
Center for e-Design, University of Massachusetts  
Advisors: Prof. Jack Wileden, Prof. Sundar Krishnamurthy

Amherst, MA  
Jan 2012 – Dec 2012

- *Computer-Aided Design (CAD) Data Exchange*. Developed a system that translated CAD part files between PTC Creo and SolidWorks while preserving dimensions and constraints by following a translation protocol inspired by programming language theory.

## Teaching Experience

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**Graduate Student Instructor for EECS 542: Advanced Topics in Computer Vision**  
*University of Michigan, Department of Electrical Engineering and Computer Science*

Sep 2020 – Dec 2020

**Grader for CMPSCI 670: Graduate Computer Vision**  
*University of Massachusetts, School of Computer Science*

Sep 2014 – Dec 2014

**Grader for CMPSCI 220: Programming Methodology**  
*University of Massachusetts, School of Computer Science*

Jan 2012 – Dec 2012

## Academic Service

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Student reviewer for IEEE Winter Conference on Applications of Computer Vision (WACV)

2020

Student reviewer for Signal Processing Letters (SPL)

2020

Student reviewer for International Conference on Machine Learning (ICML)

2018

Student reviewer for IEEE Conference on Computer Vision and Pattern Recognition (CVPR)

2018

Student reviewer for Robotics and Autonomous Systems (RAS)

2017

Student reviewer for IEEE International Conference on Robotics and Automation (ICRA)

2016

## Mentorship Experience

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Lumiere Education

Jun 2021 – Sep 2021

- *Recyclable Object Classification and Detection*. Mentored an international high school student on an independent research project for identifying and localizing recyclable items in photographs with state-of-the-art deep neural networks.

Vision and Robotics Lab, University of Michigan

Jun 2016 – Aug 2016

- *Vehicle Crash Analysis*. Mentored three U-M undergraduate students by helping them conduct summer-long projects related to object tracking, annotation collection, and physical simulations, as well as prepare written progress reports and oral presentations to their project sponsors.