

## RESEARCH INTERESTS

- **Robotic Learning:** semantic visual navigation, visual exploration, learning-based control
- **Robotic Vision:** real world adversarial examples for robotics, object tracking, video summarization

## RESEARCH EXPERIENCE

**Research Assistant (supervised by Prof. Florian Shkurti)** Jan 2022-Present  
*Robot Vision and Learning Lab at University of Toronto, Toronto ON*

- Research in robotics and machine learning, particularly in **unsupervised video summarization**

**M.Sc. Candidate (supervised by Prof. Liam Paull)** Sep 2019-Dec 2021  
*Robotics and Embodied AI Lab at Mila & University of Montréal, Montréal QC*

- Research in robotics and machine learning, particularly in **semantic visual navigation** for mobile indoor robots

**Research Intern (supervised by Dr. Anqi Xu)** Jan 2018-Oct 2020  
*Element AI, Montréal QC*

- Conducted research on **semantic visual navigation** for mobile indoor robots (fundamental research)
- Developed and prepared multiple **visual anomaly detection demos** (applied research)
- Conducted research on the applications of **adversarial examples in robotics** (fundamental research)
- Investigated state of the art **adversarial attack and defence methods** in machine learning (fundamental research)

**Research Assistant (supervised by Prof. Jeff Orchard)** Sep 2017-Dec 2017  
*Neurocognitive Computing Lab at the University of Waterloo, Waterloo ON*

- Researched various **biologically inspired learning algorithms** for neural networks

## PUBLICATIONS

### Refereed Conference Publications

- Physical Adversarial Textures That Fool Visual Object Tracking. [Rey Wiyatno](#) and Anqi Xu, in *International Conference on Computer Vision (ICCV'19)*, 8 pages, 2019, arXiv:1904.11042.
- Maximal Jacobian-based Saliency Map Attack. [Rey Wiyatno](#) and Anqi Xu, in *Montréal Artificial Intelligence Symposium (MAIS'18)*, 5 pages, 2018, arXiv:1808.07945.
- Style Memory: Making a Classifier Network Generative. [Rey Wiyatno](#) and Jeff Orchard, in *IEEE International Conference on Cognitive Informatics and Cognitive Computing (ICCI\*CC'18)*, 6 pages, 2018, arXiv:1803.01900.

### Preprints

- Lifelong Topological Visual Navigation. [Rey Wiyatno](#), Anqi Xu, and Liam Paull, 6 pages, 2021, arXiv:2110.08488.
- Adversarial Examples in Modern Machine Learning: A Review. [Rey Wiyatno](#), Anqi Xu, Ousmane Dia, and Archy de Berker, 97 pages, 2019, arXiv:1911.05268.

### Scientific Blogs

- Various Robotics and Machine Learning Paper Summaries. [Rey Wiyatno](#), in *Rey's Paper Summaries*, 2022.
- Lifelong Topological Visual Navigation. [Rey Wiyatno](#), in *Robotics and Embodied AI Lab Blog*, 2021.
- Robotik: A Series About Robotics and Machine Learning. [Rey Wiyatno](#), in *Rey's Blog*, 2020.
- Physical Adversarial Textures That Fool Visual Object Tracking. [Rey Wiyatno](#), in *Element AI Lab Blog*, 2019.
- Securing Machine Learning Models Against Adversarial Attacks. [Rey Wiyatno](#), in *Element AI Lab Blog*, 2019.
- Tricking a Machine into Thinking You're Milla Jovovich. [Rey Wiyatno](#), in *Element AI Lab Blog*, 2018.

## PRESENTATIONS

- **Science Talk: Lifelong Topological Visual Navigation** Oct 2021  
 IVADO Digital October, Montréal QC
- **Guest Lecture (CS489/698 - Neural Networks): Adversarial Examples for Neural Networks** Mar 2019  
 David R. Cheriton School of Computer Science at the University of Waterloo, Waterloo ON

- **Science Talk: Adversarial Examples in Machine Learning** Dec 2018  
Neurocognitive Computing Lab at the University of Waterloo, Waterloo ON
- **Science Talk: Physical Adversarial Examples for Drone Tracking** Aug 2018  
Mobile Robotics Lab at McGill University, Montréal QC
- **Conference Talk: Style Memory - Making a Classifier Network Generative** Jul 2018  
IEEE International Conference on Cognitive Informatics and Cognitive Computing 2018, Berkeley CA
- **Guest Lecture (CS489/698 - Neural Networks): Long Short-Term Memory** Mar 2018  
David R. Cheriton School of Computer Science at the University of Waterloo, Waterloo ON

## EDUCATION

- M.Sc., Computer Science, Specialization in Artificial Intelligence** University of Montréal & Mila  
*Advisor: Prof. Liam Paull*  
*Thesis: Lifelong Topological Visual Navigation*  
*Cumulative GPA: 4.3 out of 4.3*  
 Sep 2019 - Dec 2021
- B.ASc., Honours, Mechatronics Engineering, Co-operative Program** University of Waterloo  
*Graduation Awards: Dean's Honours List, With Distinction*  
*Cumulative GPA: 80.41 (approximately 3.7 out of 4.0)*  
 Class of 2019

## GRANTS, FUNDINGS, AND AWARDS

- Microsoft Diversity Award** Feb 2021  
*Microsoft + Mila*
- IVADO Excellence Scholarship for M.Sc.** Apr 2020-Apr 2022  
*IVADO*
- Mitacs Accelerate** Feb 2020-Sep 2020  
*Mitacs with Element AI as partner organization*
- Tuition Fee Exemption Scholarship for International Students** Sep 2019-Sep 2020  
*University of Montréal*
- Undergraduate Graduation Award: Dean's Honours List, With Distinction** Jun 2019  
*University of Waterloo*
- Autodesk Canada Capstone Design Award** Mar 2019  
*University of Waterloo & Autodesk Canada*

## RELEVANT INDUSTRIAL EXPERIENCE (INTERN/CO-OP)

- Hacker/Maker (Backend and Deep Learning Engineer)** May 2017-Aug 2017  
*Canon Innovation Lab, Waterloo ON*
  - Designed and implemented backend and algorithms for various photography and printing services prototypes
- Mechatronics Engineer** May 2016-Dec 2016  
*OpenROV (now Sofar Ocean), Berkeley CA*
  - Designed the mechanical, electrical, and software of an underwater drone external payload
  - Conducted rapid prototype and tested various parts of Trident ROV for production purpose
- Computer Vision, Human Machine Interface, and Test Engineer** May 2015-Aug 2015 & Jan 2016-Apr 2016  
*Flex (formerly Flextronics) - Automotive Division, Toronto ON*
  - Designed and evaluated various computer vision algorithms for advanced driving assistance systems
  - Characterized and tested various cameras and other optical sensors

## TEACHING EXPERIENCE

- Teaching Assistant for Duckietown (Autonomous Vehicles)** Oct 2020-Dec 2020  
*University of Montréal, Montréal QC*
  - Developed and presented interactive Jupyter notebooks of various robotics concepts for in-class tutorials

## APPLIED PROJECTS PLEASE VISIT [ORRWIYATN.GITHUB.IO](https://ORRWIYATN.GITHUB.IO) FOR MORE DETAILS (E.G., VIDEOS, ETC.)

### Lifelong Topological Visual Navigation

Jun 2021-Dec 2021

- Developed software to run our proposed visual navigation algorithm on a real robot (LoCoBot)

### Lane Following with Other Vehicles and Obstacles

Nov 2019-Dec 2019

- Developed lane following and collision avoidance systems using light-weight semantic segmentation model and pure pursuit controller for Duckietown AI Driving Olympics 2019

### Visual Anomaly Detection

May 2019-Jun 2019

- Integrated systems to perform learning-based visual anomaly detection with the team at Element AI
- Demoed live at the International Conference on Robotics and Automation (ICRA'19)

### Intelligent Manufacturing Visual Inspection Tool

Oct 2018-Feb 2019

- Designed and built a low-cost solution for high quality automated visual inspection tool that incorporates an enclosure, a four degrees-of-freedom robot arm, and a camera attached at the end effector of the arm
- Integrated Mask R-CNN (He et al., 2017) to detect surface defects on the inspected object
- Winner of Autodesk Canada Capstone Design Award 2019

### Autonomous Drone Tracking

Jul 2018

- Implemented object detection and tracking models which include Single Shot Multibox Detector (Liu et al., 2015), GOTURN (Held et al., 2016), and SiamFC (Bertinetto et al., 2016)
- Developed autonomous drone tracker software with exponential filter and PID controller using ROS

### Reimplementation of Methods from Various Machine Learning Papers

Jun 2017-Present

- Implemented Sigma-VAE (Rybkin et al., 2021), Visual Navigation with Goals (Shah et al., 2021), Semi-parametric Topological Memory for Navigation (Savinov et al., 2018), Proximal Policy Optimization (Schulman et al., 2017), Deep Q-Networks (Mnih et al., 2015), Analysis by Synthesis (Schott et al., 2018), Expectation Over Transformation (Athalye et al., 2018), Adversarial Transformation Networks (Baluja et al., 2017), Photo Image Synthesis with Cascaded Refinement Networks (Chen et al., 2017), Adversarial Eyeglasses (Sharif et al., 2016), The One Hundred Layers Tiramisu (Jégou et al., 2016), Generative Adversarial Nets (GAN) (Goodfellow et al., 2014), DCGAN (Radford et al., 2015), Variational RNN (Chung et al., 2015), Super Resolution with Perceptual Losses (Johnson et al., 2016), Neural Style Transfer (Gatys et al., 2015), Fast Gradient Sign Method (Goodfellow et al., 2014), VAE (Kingma et al., 2013)

### Auto Photo Enhancing and Dehazing

Jul 2017

- Experimented and trained neural networks for image enhancing and dehazing using  $L_2$  loss in feature space as perceptual similarity objective on MIT-Adobe FiveK and NYU Dehazing datasets

### Suitcase Robot

Aug 2015

- Designed and built a RaspberryPi-powered person-following suitcase using color-based tracking

## ROBOTICS AND MACHINE LEARNING KNOWLEDGE

- **Robotics:** visual navigation, topological navigation, optimal control (e.g., linear quadratic regulator (LQR), proportional-integral-derivative (PID) controller, controller-plant discretization, controller emulation, pole placement designs, direct design of digital controller), state estimation (e.g., Bayes filter, particle filter, Kalman filter), motion planning (e.g., probabilistic roadmaps, rapidly-exploring random tree)
- **Machine Learning:** convolutional neural networks (CNN), recurrent neural networks (RNN), variational autoencoders (VAE), generative adversarial networks (GAN), sim-to-real transfer, adversarial attacks and defences, explainability, meta learning, continual learning, reinforcement learning, probabilistic graphical models, sampling methods, Gaussian processes
- **Computer Vision:** object detection, object tracking, image segmentation, pose estimation, video summarization, camera relocalization, classical vision algorithms, stereo geometry

## SKILLS

- **Software Tools:** Python (advance), C/C++ (beginner-intermediate), Keras, TensorFlow, PyTorch, ROS, PyRobot, PyBullet, Gym, Gibson, Habitat AI, AI2-THOR, Gazebo, MoveIt, NumPy, SciPy, OpenCV, Scikit-Learn, Arduino, Docker, Flask, MATLAB, Linux,  $\LaTeX$
- **Hardware Tools:** Autodesk Inventor, OpenSCAD, SolidWorks, ANSYS AIM, Eagle, Altium Designer, LTSpice
- **Firmware/Electrical:** Microcontrollers & SoC (e.g., Arduino, RaspberryPi, etc.), Wi-Fi microcontrollers, circuits design, PCB layout, electronics troubleshooting, SMD soldering, rework

- **Mechanical:** CAD, product design, design for manufacturing (e.g., injection molding), design for assembly, finite element analysis, rapid prototyping, additive manufacturing (e.g., 3D printing), laser cutting

## SERVICES

**Reviewer for Journal of Field Robotics (JFR), IEEE Robotics and Automation Letters (RA-L), and IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)**

*Reviewed and provided feedback for papers submitted to the conference or journal.*

**Facilitator for Open Dialogue on AI Ethics**

Jul 2020

*Led an online discussion about the social implications of AI as part of UNESCO's initiative on open dialogue on AI ethics*

**Mentor at Technovation Montréal**

Nov 2019-Apr 2020

*Supported girls from age 10 to 18 in developing technology and entrepreneurship skills*

**Volunteer at the International Conference on Robotics and Automation (ICRA) 2019**

May 2019

*Assisted conference organizer to ensure a smooth event*

**Co-founder at Diaspora E-Class**

Jan 2014-Aug 2015

*Created a platform for Indonesian Diaspora to provide underprivileged children in Indonesia with free English lessons*