

Rey Reza Wiyatno

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RESEARCH INTERESTS

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

RESEARCH EXPERIENCE

M.Sc. Candidate (supervised by Prof. Liam Paull)

Sep 2019-Present

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

- 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

- 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

- **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

ROBOTICS AND MACHINE LEARNING KNOWLEDGE

- **Robotics:** 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., rapidly-exploring random tree (RRT), RRT*)
- **Machine Learning:** convolutional neural networks (CNN), recurrent neural networks (RNN), generative adversarial networks (GAN), sim-to-real transfer, adversarial attacks and defences, semantic visual navigation, explainability, meta learning, continual learning, reinforcement learning, probabilistic graphical models
- **Computer Vision:** object detection, object tracking, image segmentation, pose estimation, camera relocalization, classical vision algorithms, stereo geometry

EDUCATION

M.Sc., Computer Science

Advisor: Prof. Liam Paull

Current GPA: 4.3 out of 4.3

Mila & University of Montreal

Started in Fall 2019

B.ASc., Honours, Mechatronics Engineering, Co-operative Program

Graduation Awards: Dean's Honours List, With Distinction

University of Waterloo

Class of 2019

TEACHING EXPERIENCE

Teaching Assistant for Autonomous Vehicles (Duckietown) Class

University of Montreal, Montréal QC

Oct 2020-Present

- Develop interactive Jupyter notebooks of various robotics concepts for in-class tutorials

APPLIED PROJECTS PLEASE VISIT ORRWIYATN.GITHUB.IO FOR MORE DETAILS (E.G., VIDEOS, ETC.)

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 and evaluated 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), Super Resolution with Perceptual Losses (Johnson et al., 2016), Neural Style Transfer (Gatys et al., 2015), Fast Gradient Sign Method (Goodfellow et al., 2014)

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

SKILLS

- **Software Tools:** Python, C++, Lua, 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, NVIDIA Jetson, etc.), Wi-Fi microcontrollers, circuits design, PCB layout, electronics troubleshooting, SMD soldering, rework
- **Mechanical:** CAD, product design, design for manufacturing, design for assembly, finite element analysis, injection molding, rapid prototyping, additive manufacturing, laser cutting

INDUSTRIAL EXPERIENCE (INTERN/CO-OP)

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

Sofar Ocean (formerly OpenROV), 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

Electrical Engineer

Sep 2014-Dec 2014

Kiewit, Vaughan ON

- Assisted superintendent to monitor subcontractor in the field and ensure all work was built correctly

Provisioner of Engine Parts

Jan 2014-Apr 2014

Pratt & Whitney, Saint-Hubert QC

- Analyzed urgencies related with procurement of engine parts to avoid potential line stoppage

GRANTS, FUNDINGS, AND AWARDS

IVADO Excellence Scholarship for M.Sc.

Apr 2020-Sep 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

SERVICES

Mentor at Technovation Montréal

Nov 2019-Apr 2020

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

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

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

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

May 2019

Assisted conference organizer to ensure a smooth event