Rey Reza Wiyatno

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RESEARCH INTERESTS

- **Robotic Learning**: semantic visual navigation, visual exploration, meta-continual learning, 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-Present

Element AI, Montréal QC

- Conducts 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)
- Implemented deep learning based **autonomous drone tracking** software with **ROS**
- Investigated state of the art **adversarial attack and defence** methods in machine learning

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.

Non-refereed Scientific Articles

- 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, object pose estimation, human pose estimation, camera relocalization, classical vision algorithms (e.g., edge detectors, Hough transform, optical flow, etc.), stereo geometry

EDUCATION

M.Sc., Computer Science — Mila & University of Montreal
Advisor: Prof. Liam Paull — Started in Fall 2019
Current GPA: 4.3 out of 4.3

B.ASc., Honours, Mechatronics Engineering, Co-operative Program — University of Waterloo
Graduation Awards: Dean's Honours List, With Distinction — Class of 2019

APPLIED PROJECTS PLEASE VISIT RRWIYATN.GITHUB.IO FOR MORE DETAILS

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

Machine Learning Papers Reproducibility — Jun 2017-Present

- Implemented and evaluated 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), WGAN (Arjovsky et al., 2017), Super Resolution with Perceptual Losses (Johnson et al., 2016), Neural Style Transfer (Gatys et al., 2015), Fast Gradient Sign Method (Goodfellow et al., 2014), and DenseNet (Huang et al., 2016)

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, OpenAI Gym, Habitat AI, AI2-THOR, Gazebo, MoveIt, NumPy, SciPy, OpenCV, Scikit-Learn, Arduino, Processing, Docker, Flask, MATLAB, Linux, LabVIEW, 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

Backend and Deep Learning Engineer — May 2017-Aug 2017
Canon Innovation Lab, Waterloo ON

- Designed and implemented backend and algorithms using **Docker, Flask, OpenCV, Keras, and TensorFlow** for various photography and printing services prototypes

Mechatronics Engineer — May 2016-Dec 2016
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 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 electrical superintendent to supervise electrical subcontractor in the field and **ensure all electrical work was built according to specifications**

Provisioner of Engine Parts — Jan 2014-Apr 2014
Pratt & Whitney, Saint-Hubert QC

- Analyzed any urgencies related with the engine line in order to **avoid potential line stoppage**, including procurement of parts coming from external and internal suppliers

GRANTS, FUNDINGS, AND AWARDS

Mitacs Accelerate — Feb 2020-Oct 2020
Mitacs with Element AI as partner organization, total amount of $30,000.00

Tuition Fee Exemption Scholarships for International Students — Sep 2019-Sep 2020
University of Montréal, total amount of $22,315.59 per year

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, total amount of $5,000

SERVICES

Mentor at Technovation Montréal — Nov 2019-Present
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

OTHER VOLUNTEER ACTIVITIES

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