

Christopher Agia

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EDUCATION	B.A.Sc in Engineering Science, University of Toronto (exp.) May 2021 Robotics Major, Artificial Intelligence Minor, Professional Experience Year (2020) <i>President's Scholarship Program, Dean's Honour List, NSERC USRA Grant</i>
SKILLS	Programming (Proficient) Python, Rust, C/C++, MATLAB - (Working) Java, Assembly, Bash, Latex Software Tools Git, Linux/Unix, Docker, Wasmtime (WebAssembly), Kubernetes Libraries PyTorch, TensorFlow, ROS, NumPy, PCL, OpenCV, SciPy, scikit-learn, Pandas, Jupyter
EXPERIENCE	Software Engineering Intern, Google May 2020 - Aug 2020 <i>Extending service mesh proxy solutions, Istio Networking Team, Google Cloud</i> <ul style="list-style-type: none">Architected a Proxy-Wasm ABI test harness and simulator to enable proxy extensions written in any language (delivered as WebAssembly modules) to be tested in a safe and controlled environmentCode will be donated and adopted as the official ABI test harness for WASI - serves to benefit the Istio, Envoy and Proxy-Wasm open-source communities for rapid testing of language agnostic plugins Deep Learning Research Intern, Huawei - Noah's Ark Lab May 2019 - May 2020 <i>Research and development for Autonomous Vehicles, Perception and Localization Team</i> <ul style="list-style-type: none">Project lead for a novel sparse CNN based on the Minkowski Engine achieving state-of-the-art performance for 2D/3D Semantic Scene Completion. Patent pending, paper accepted [2], CoRL2020Designed an F-CNN model that learns (end-to-end) to segment roads and predict surface elevation from sequential LiDAR scans at real-time speeds with over 95% accuracy. Patent pending, 2020Supported the development of a dynamic semantic-enhanced LiDAR localization system that outperforms traditional non-semantic methods by a 20% margin. Patent pending, under review [3], 2020.Created a custom PyTorch pipeline to construct, modify and train virtually any encoder/decoder deep CNN on three open source data sets. Used to improve over 10 leading LiDAR segmentation networks Autonomy Engineer - Object Detection, aUToronto Aug 2019 - May 2020 <i>UofT Self-Driving Vehicle Group, Object Detection Team, SAE/GM AutoDrive Challenge</i> <ul style="list-style-type: none">Lead the development of a PointPillars 3D LiDAR detection pipeline (vehicle-pedestrian)Worked collaboratively in deploying computer vision systems to reach standard level-4 autonomy
RESEARCH	Machine Learning Researcher Vector Institute, University of Toronto May 2020 - Present <i>Advised by Prof. Florian Shkurti, Robot Vision and Learning Group</i> <ul style="list-style-type: none">Thesis on task-driven perception; learning scene graph (hierarchical map) representations suited for downstream robot planning and control tasks with graph neural networksInvestigated the use of attention state representations in Deep Reinforcement Learning architectures (DDPG, DQN) for optimal self-driving control. Under review [1], 2021 Machine Learning Researcher Mila AI Institute, McGill University Jan 2020 - May 2020 <i>Co-Supervised by Prof. David Meger & Prof. Gregory Dudek, Mobile Robotics Lab</i> <ul style="list-style-type: none">Explored the benefit of dense depth prediction for direct visual odometry. Paper accepted [4], CRV2020 Robotics Researcher University of Toronto May 2018 - Aug 2018 <i>Advised by Prof. Goldie Nejat, Autonomous Systems and Biomechatronics Lab</i> <ul style="list-style-type: none">Worked with a team of graduate researchers to bridge the Simulation-to-Reality gap in Deep Reinforcement Learning (A3C) for autonomous rough terrain navigation. Under review [5], 2020

PROJECTS	IntelliCare Ontario Engineering Competition (OEC) Feb 2019
	<ul style="list-style-type: none"> Full hospital ER software suite including a deep neural network for prediction of patient triage score, algorithms for allocation of resources to patients, and tracking of key hospital performance metrics
	eBotics University of Toronto Engineering Competition (UTEK) Jan 2019
	<ul style="list-style-type: none"> Created a logistics planning algorithm that assigns mobile robots to efficiently retrieve warehouse packages - approximated solution to Travelling Salesman Problem with A* Path Planning, Clustering
	Autonomous Packing Robot Engineering Science Robotics Competition Jan 2018 - May 2018
	<ul style="list-style-type: none"> Designed, fabricated and programmed a robot that systematically sorts and packs up to 50 pills/minute to assist those suffering from dementia. Features an efficient UI for inputting packing instructions
PUBLICATIONS	[1] C. Agia , R. Cheng, D. Meger, F. Shkurti, G. Dudek, "Abstraction Augmentation: Attention-based Representations in Deep Reinforcement Learning for Autonomous Driving," <i>Paper under review, 2021</i>
	[2] C. Agia , R. Cheng, Y. Ren, B. Liu, "S3CNet: A Sparse Semantic Scene Completion Network for LiDAR Point Clouds," <i>Conference on Robot Learning (CoRL)</i> , Massachusetts, BOS, US, 2020
	[3] Y. Ren, R. Cheng, C. Agia , B. Liu, "Lightweight Semantic-aided Localization with Spinning LiDAR Sensor," <i>Manuscript under review at IEEE Transactions on Intelligent Vehicles (T-IV)</i> , 2020
	[4] R. Cheng, C. Agia , D. Meger, G. Dudek, "Depth Prediction for Monocular Direct Visual Odometry," <i>IEEE 2020 17th Conference on Computer and Robot Vision (CRV)</i> , Ottawa, ON, Canada, 2020, pp. 70-77, doi: 10.1109/CRV50864.2020.00018
	[5] K. Zhang, H. Hu, A.H. Tan, M. Ruan, C. Agia , G. Nejat, "A Sim-to-Real Pipeline for Deep Reinforcement Learning for Autonomous Robot Navigation in Cluttered Rough Terrain," <i>Manuscript under review, 2020</i>
AWARDS	Dean's Honour List, 2018-2019.
	1 st Place Programming, Ontario Engineering Competition (\$2,500), 2019.
	1 st Place Programming, University of Toronto Engineering Competition, 2019.
	NSERC Undergraduate Student Research Award (\$6,000), 2018.
	3 rd /50 Place, Engineering Science Robotics Competition, 2018.
	President's Scholarship Program (\$6,000), 2016.
	Patents
	1. "A Sparse Convolution based Semantic Scene Completion method for LiDAR Point Clouds," 2020.
	2. "Road Surface Semantic Segmentation from LiDAR Point Clouds," 2020.
INTERESTS	Initiatives ML4Good, Sustainability . Building an open source, machine learning powered tool that provides practitioners with carbon footprint estimates associated with training their ML/AI models
	Extracurricular NSight Student Mentorship Program, Academic Teaching/Counselling, Reading (Philosophy & Finance), Varsity Blues Soccer, Health and Fitness, Music (Guitar, Bass, Drums)