

# JULIA CHAE

Computer Vision, Machine Learning, Autonomous Robotics & Perception

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## EDUCATION

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- BASc University of Toronto, St. George Campus** Sept 2018-April 2023  
Engineering Science, Robotics Major, Machine Intelligence Minor
- CGPA: 3.97/4.00, Dean's Honor List 2018-2022
  - Courses: Robotics, Control Systems, Deep Learning, Artificial Intelligence, Bayesian Modelling and Inference, Probability & Statistics, Natural Language Computing, Dynamics, Data Structure & Algorithms

## WORK & RESEARCH EXPERIENCES

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- University of Toronto & Vector Institute, Machine Learning Group** May 2022-Present  
**Machine Learning Research Student + Thesis Student**, advised by Prof Sanja Fidler
- Investigating context-aware unsupervised dense representation learning pipeline for dense downstream tasks such as object detection and semantic segmentation for **BASc Thesis; preparing a first-author submission for ICCV 2023**
  - Led a thorough visualization and analysis of existing part-based unsupervised representation learning baselines

- Epson Canada, Algorithms and Robotics R&D** May 2021-April 2022  
**Robotics Software Developer Intern (ML)**
- Developed a deep learning algorithm for vision-based tasks in Epson's end-to-end service robotics solution; **filed two patents and published work on RA-L**
  - Analyzed model weaknesses and spearheaded the architecture modifications to improve network generalizability and optimization; **reduced model parameters by 80%** while retaining performance

- University of Toronto, Robot Vision & Learning Lab (RVL)** Summer 2019, May 2021-April 2022  
**Machine Learning Research Student**, advised by Prof Florian Shkurti
- Investigated a multimodal unsupervised representation learning pipeline for robot controls, to leverage massive unlabeled image and LiDAR data to improve performance in imitation learning tasks
  - Led the implementation of multi-modal object detection neural networks to state-of-art performance using PyTorch

- Robotics for Space Exploration (University, Canadian and European Rover Challenge)** Oct 2018-April 2022  
**Software Lead**
- **Led a team of 10+ graduate and undergraduate students** to design and develop an autonomous space rover
  - Spearheaded the design of overall system software architecture, control interface and multi-sensor integration using Python, C++ and ROS; handled perception from LiDAR, stereo cameras and IMUs
  - RSX Rover design **received top design review score** at the University Rover Challenge with no weaknesses identified

- University of Toronto Robotics Institute, Toronto Robotics & AI Lab (TRAIL)** May 2020-Nov 2020  
**Machine Learning Research Student**, advised by Prof Steven Waslander
- Collaborated with graduate researchers to develop a novel network which **placed 1<sup>st</sup> place on KITTI and Waymo leaderboards** for Monocular 3D Object Detection (3DOD) at time of publication; work selected for **Oral Presentation at CVPR 2021**
  - Proposed and led a solo project on analysis of multi-view datasets on monocular 3DOD; presented research on strategies to improve 3D object detection performance utilizing multi-view datasets at the end of term

## PUBLICATIONS

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### Journal Paper (Peer Reviewed):

Z. Luo, W. Xue, J. Chae and G. Fu, "**SKP: Semantic 3D Keypoint Detection for Category-Level Robotic Manipulation**," in *IEEE Robotics and Automation Letters*, vol. 7, no. 2, pp. 5437-5444, April 2022, doi: 10.1109/LRA.2022.3157438.

### Conference Paper (Peer Reviewed):

C. Reading, A. Harakeh, J. Chae, and S. L. Waslander, “*Categorical depth distribution network for monocular 3d object detection*”, in IEEE Conference on Computer Vision and Pattern Recognition (**CVPR 2021**), selected for **Oral Presentation**

## AWARDS & FELLOWSHIPS

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<b>Adobe Research Women in Tech Scholarship (\$13,000)</b>	2022
Selected as 1 of 16 recipients from a highly competitive North American pool of undergraduate and master’s students studying CV, AI/ML, data science and CS	
<b>James And Adele Quail Memorial Award</b> , awarded by the Faculty of Applied Science & Engineering	2022
<b>Nat. Sciences and Eng. Research Council of Canada Undergraduate Student Research Award (\$7500 x 2)</b>	2020, 2022
<b>Ryn Pudden Memorial Award</b> , awarded by the Faculty of Applied Science & Engineering	2021
<b>2 Canadian Army University Course Award</b> , awarded by the University of Toronto	2021
<b>Robotics, Science and Systems (RSS) Inclusion Fellow</b>	2021
Selected to be in a global cohort of 44 BSc, MSc and PhD students as part of DEI initiative at RSS. Fellowship included conference fee and a mentor assignment in the robotics community for general research and conference guidance	
<b>Cachra Family Scholarship in Engineering Science</b> , awarded by the Faculty of Engineering Science	2020
<b>U of T In-Course Scholarships</b> , awarded by the Faculty of Applied Science & Engineering	2020
<b>Dr. Allison MacKay Engineering Science Research Fellowship (\$6,500)</b>	2019
Awarded to the top research candidate in Engineering Science First Year	
<b>Class of 5t1 Bursary</b> , awarded by the Faculty of Applied Science & Engineering	2019
<b>Dean’s Merit Award</b> , awarded by the Faculty of Applied Science & Engineering	2018
<b>University of Toronto Scholar (\$7,500)</b>	2018
Awarded to outstanding incoming undergraduate students at the University of Toronto	

## SKILLS

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**Languages (Proficient):** Python, C/C++, MATLAB, Latex (**Working**): Assembly, Bash, Java  
**Tools:** Git, ROS, Docker, Linux/Unix, Gazebo Simulator, Blender  
**Libraries:** PyTorch, Tensorflow, NumPy, PCL, OpenCV, scikit-learn, SciPy, Jupyter, Matplotlib

## LEADERSHIP AND TEACHING

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<b>Global Spark</b> Managing Director of Speaker Panel	2018-2022
<ul style="list-style-type: none"><li>Led the organization of three global panels with internationally renowned speakers and attendees from over 40 countries to educate students on the importance of multidisciplinary approach when it comes to tackling global problems; events accumulated over 1k attendees</li><li>Over the course of the years, grew the event attendance by 3x and the organizing team by 3x</li></ul>	
<b>University of Toronto</b> Guided Engineering Academic Review Session Tutor	2020-2021
<ul style="list-style-type: none"><li>Prepared &amp; led academic review sessions by answering student questions and summarizing key course concepts in CS, Math and Physics, assisting first year Engineering Science students in their transition into university</li></ul>	
<b>University of Toronto</b> Engineering Orientation Leader	2019-2021
<ul style="list-style-type: none"><li>Served as orientation group leader to welcome incoming first year class – led various frosh activities and answered questions, volunteered at Engineering club fair, Pre-Frosh and Welcome to Engineering events</li></ul>	

## MEMBERSHIPS & COMMUNITY SERVICE

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### **University of Toronto** Engineering Ambassador

2019-2022

- Attended various Faculty of Applied Science and Engineering events including the Engineering Science Information Night, Engineering Welcome Orientation and Engineering Club Fair to represent the faculty and my Engineering Science class
- Answered parents' and students' questions about the university and the program, and assisted with preparation and execution of the events

### **Hack the Globe** Hackathon Volunteer

2019

- Helped with the execution of Annual Hack the Globe, a multidisciplinary Hackathon that brings ~100 international students to Toronto
- Assisted with registration, preparation and serving of food, room allocation, and event flow

### **University of Toronto** Steinway Piano Club Member

2018-2020

- Member of Steinway Piano Club at Hart House (U of T), where I performed on Hart House pianos during my breaks at U of T and attended performances by other student musicians

### **St Johns Rehabilitation Hospital** Piano Performer

2018-2019

- Performed a solo hour-long piano program to rehab patients in the lobby of the hospital monthly
- The program was a mixture of classical and modern repertoire and at times included guest performances by other instruments
- The program was unfortunately halted due to the COVID-19 pandemic at the end of 2019

## HOBBIES & INTERESTS

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Avid hiker & nature photography enthusiast, bird watcher, piano performer, amateur cook (cooking page owner)