JULIA **CHAE**

Computer Vision, Machine Learning, Biodiversity and Sustainability

chaenayo@mit.edu · juliachae.github.io · linkedin.com/in/julia-chae/ · github.com/JuliaChae

EDUCATION

PhD **Massachusetts Institute of Technology** Sept 2023 – Present

Electrical Engineering and Computer Science (EECS), Computer Science and Artificial Intelligence Lab (CSAIL)

- CGPA: 5.00/5.00
- Research Interest: Applied Computer Vision / Machine Learning (focus: Biodiversity Monitoring); Funded by: MIT EECS, NSERC, Google
- Advisor: Sara Beery

BASc **University of Toronto** Sept 2018-April 2023

Engineering Science, Robotics Major, Machine Intelligence Minor

- CGPA: 3.97/4.00, Dean's Honor List 2018-2022
- Thesis title: Investigation of Inter-Image Relationships in Self-Supervised Representation Learning

RESEARCH EXPERIENCES

MIT CSAIL, BeeryLab Sept 2023 – Present

Graduate Research Assistant

- Synthetic data generation for long-tailed and fine-grained classification, to improve identification of rare and out-of-distribution species for biodiversity monitoring
- Collaborating with researchers at Google to investigate the feasibility of using synthetic data as a model training source for more accurate and robust models at deployment

University of Toronto & Vector Institute, Machine Learning Group May 2022-May 2023

Machine Learning Research Student + Thesis Student, advised by Prof Sanja Fidler

- Led research of context-aware unsupervised dense representation learning pipeline for dense downstream tasks such as object detection and semantic segmentation for BASc Thesis
- Conducted 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

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 1st 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

RESEARCH INTERESTS

My research focus is on enhancing the **practical applicability and robustness of computer vision systems**, with a particular focus on leveraging this technology for **deployable downstream tasks**.

Some of my current interests are:

- Synthetic data generation and augmentation techniques to rectify data gaps in data-scarce
- Fine-grained generation and classification
- Dense unsupervised learning

Previously, I have applied the above interests in perception for robotics.

AWARDS & FELLOWSHIPS

Nat. Sciences and Eng. Research Council of Canada (NSERC) PGS-D ($120,000) 2024

MIT Andrew and Erna Viterbi Fellowship ($101,751) 2023

MIT Presidential Graduate Fellowship ($101,751, declined) 2023

Fulbright Canada Student Awards ($25,000, declined) 2023

Adobe Research Women in Tech Scholarship ($13,000) 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

James And Adele Quail Memorial Award, awarded by the Faculty of Applied Science & Engineering 2022

Nat. Sciences and Eng. Research Council of Canada Undergraduate Student Research Award ($7500 x 2) 2020, 2022

Ryn Pudden Memorial Award, awarded by the Faculty of Applied Science & Engineering 2021

2 Canadian Army University Course Award, awarded by the University of Toronto 2021

Robotics, Science and Systems (RSS) Inclusion Fellow 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

Cachra Family Scholarship in Engineering Science, awarded by the Faculty of Engineering Science 2020

U of T In-Course Scholarships, awarded by the Faculty of Applied Science & Engineering 2020

Dr. Allison MacKay Engineering Science Research Fellowship ($6,500) 2019
Awarded to the top research candidate in Engineering Science First Year

Dean's Merit Award, awarded by the Faculty of Applied Science & Engineering 2018

University of Toronto Scholar ($7,500) 2018
Awarded to outstanding incoming undergraduate students at the University of Toronto

PUBLICATIONS

Under Review:
J. Chae, S. Sundaram, Y. Tian, S. Beery, P. Isola, *"**Personalized Representation from Personalized Generation**"*

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**

Thesis Paper:
J. Chae, and S. Fidler, "***Investigation of Inter-Image Relationships in Self-Supervised Representation Learning***", Engineering Science BASc Thesis (2023)

SKILLS

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 MENTORSHIP

Caltech Resnick Sustainability Institute Computer Vision for Ecology Workshop, Instructor January 2025
- Taught computer vision lectures and mentored 20+ ecologists in an interdisciplinary program, guiding them to build scalable machine learning solutions for diverse environmental challenges using their own data.

MIT Graduate Women in Course 6, Board Member (Event Coordinator) 2023-Present
- Coordinating diverse community events for women in Course 6 (EECS), including planning, organizing, and executing activities.
- Managing a mentorship initiative aimed at fostering knowledge exchange and mutual support among the graduate women community

MIT Graduate Application Assistance Program, EECS Application Mentor 2023
- Supported two first-generation female students with their application materials, offering guidance, sharing resources and providing feedback through calls and emails to enhance application quality

Global Spark, Managing Director of Speaker Panel 2018-2022
- 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
- Over the course of the years, grew the event attendance by 3x and the organizing team by 3x

Robotics for Space Exploration (University, Canadian and European Rover Challenge), Oct 2018-Apri 2022
Software Lead
- Led a team of 10+ graduate and undergraduate students to design and develop an autonomous space rover
- RSX Rover design received top design review score at the University Rover Challenge with no weaknesses identified

University of Toronto, Guided Engineering Academic Review Session Tutor 2020-2021
- Prepared & 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

University of Toronto, Engineering Orientation Leader 2019-2021
- 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

MEMBERSHIPS & COMMUNITY SERVICE

MIT Outings Club (MITOC) 2023-Present
- Member of MITOC to actively participate in nature outings and hiking expeditions across New England

University of Toronto Engineering Ambassador 2019-2022

- Attended various Faculty of Applied Science and Engineering events including the Information Night, Welcome Orientation and Engineering Club Fair to represent the faculty and the 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

ACADEMIC SERVICE

International Conference on Learning Representations (ICLR) (Reviewer) 2024

AAAI Imageomics Workshop (Reviewer) 2023,2024

Conference on Neural Information Processing Systems (NeuRIPS) (Reviewer) 2024

Computer Vision for Ecology Workshop at ECCV (Organizing Team, Reviewer) 2024

European Conference for Computer Vision (ECCV) (Reviewer) 2024

CVPR Fine-Grained Visual Classification(FGVC) Workshop (Reviewer) 2024

HOBBIES & INTERESTS

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