# Krishna Murthy JATAVALLABHULA

# PhD candidate | Mila, Université de Montréal

Research interests: Interplay of robotics, computer vision, deep learning, computer graphics, and physics (at least three of the five)

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<b>EDUCATION</b>	

2018-Present	PhD. in Computer Science, Université de Montréal, Montréal, Canada.	GPA: 4.15/4.00
2015-2017	MS by research in Computer Science and Engineering, International Institute of Infor-	GPA: 10.00/10.00
	mation Technology, Hyderabad, India	
2011-2015	M.Sc. (Tech.) Information Systems (Bachelor's degree), Birla Institute of Science and	GPA: 6.71/10.00

Technology (BITS), Pilani, India.

### ■ Work

May 2019 | Deep Learning Research Intern | NVIDIA, Токонто, Canada

August 2019 Intern with Prof. Sanja Fidler's group. Interplay of computer vision, deep learning, and computer graphics research. Led the development of Kaolin, a 3D deep learning library for PyTorch.

November 2017 | Research Assistant | Robotics Research Center, IIIT HYDERABAD, India

June 2015 Conducted research in perception for autonomous driving and SLAM, taught graduate classes.

Autonomous Driving Computer Vision Robotics Deep Learning SLAM

May 2015 | Research Assistant | INSPIRE lab, BITS PILANI, India

August 2014 Developed distributed/asynchronous techniques for multi-robot terrain coverage.

Multi-robot systems Fault-tolerant distributed networks

# HONORS AND AWARDS

- 2021 **NVIDIA graduate fellowship**. Awarded one of five PhD fellowships worldwide.
- 2021 Google PhD fellowship North America Machine perception, Speech technology, and Computer vision (declined)
- 2020 **RSS pioneer 2020**. Selected to the *Robotics Science and Systems pioneers* cohort of 2020, a group of 22 leading senior PhD students and postdocs in the field.
- 2020 **Best paper award**. Our paper titled *Maplite: Autonomous intersection navigation without a detailed prior map* won the best paper award for 2020, announced by *Robotics and Automation Letters*.
- 2020 **Top reviewer** for the *European Conference on Computer Vision* (ECCV), 2020. Awarded to the top 215 reviewers.
- 2019 **DIRO Excellence Award**. Received the award for the second consecutive year, for academic and research excellence.
- 2018 ICRA PhD Forum. Selected to present my work at the PhD Forum, ICRA 2018, right in the first semester of my PhD. Received generous travel support. (
- 2018 **DIRO Excellence Award**. Received an award of excellence from DIRO, Université de Montréal for academic and research excellence.
- 2017 **Graduated top of class**. Graduated with a GPA of 10.00/10.00 during my Masters at IIIT Hyderabad.
- 2017 RAS travel grant. Awarded to cover my travel expenses for ICRA 2017, the premier robotics conference.
- 2017-2018 **Qualcomm Innovation Fellowship Finalist**. A spin-off of my work on Shape Priors for Road-Scene Understanding has been shortlisted as a finalist for the Qualcomm Innovation Fellowship (QINF), India.
- 2015-2018 IIIT Hyderabad research fellowship. Awarded a fellowship to cover tuition and living expenses during my Masters. Total value (approx.):
- 2012-2015 **Hackatronics**. Won the annual electronics hack contest for three years in a row. Conducted anually at BITS Pilani, Rajasthan India.



### Successful Grant Proposals

- IVADO fundamental research grant. "Differentiable perception, graphics, and optimization for weakly supervised 3D perception". Co-written with 3 principal investigators: Liam Paull, James Forbes, Derek Nowrouzezahrai.
- 2014 L K Maheshwari Grant. Awarded a seed grant for a proposal involving cooperative navigation of a heterogeneous swarm of aerial and ground robots.



### PUBLICATIONS

#### GRADSIM: DIFFERENTIABLE SIMULATION FOR SYSTEM IDENTIFICATION AND VISUOMOTOR CONTROL

ICLR 2021

Krishna Murthy Jatavallabhula\*, Miles Macklin\*, Florian Golemo, Vikram Voleti, Linda Petrini, Martin Weiss, Breandan Considine, Jérôme Parent-Lévesque, Kevin Xie, Kenny Erleben, Liam Paull, Florian Shkurti, Derek Nowrouzezahrai 🗗 Video 💢 OpenReview

#### GRADSLAM: Dense SLAM meets automatic differentiation

ICRA 2020

Krishna Murthy Jatavallabhula, Ganesh Iyer, Liam Paull Video Project page

#### MAPLITE: AUTONOMOUS INTERSECTION NAVIGATION WITHOUT A DETAILED PRIOR MAP (BEST PAPER AWARD)

**RAL 2020** 

Teddy Ort, Krishna Murthy Jatavallabhula, Rohan Banerjee, Sai Krishna Gottipati, Dhaivat Bhatt, Igor Gilitschenski, Liam Paull, Daniela Rus ✓ Video ✓ Paper

#### KAOLIN: A PyTorch Library for Accelerating 3D Deep Learning Research

WHITEPAPER

Krishna Murthy Jatavallabhula, Edward Smith, Jean-Francois Lafleche, Clement Fuji Tsang, Artem Rozantsev, Wenzheng Chen, Tommy Xiang, Rev Lebaredian, Sanja Fidler Paper Code

#### MONOLAYOUT: AMODAL SCENE LAYOUT FROM A SINGLE IMAGE

WACV 2020

Kaustubh Mani, Swapnil Daga, Shubhika Garg, N. Sai Shankar, **Krishna Murthy Jatavallabhula**, K. Madhava Krishna 🗹 Video

#### AUTOLAY: BENCHMARKING MONOCULAR LAYOUT ESTIMATION

**IROS 2020** 

Kaustubh Mani, N. Sai Shankar, Krishna Murthy Jatavallabhula, K. Madhava Krishna 🗹 Project page

#### PROBABILISTIC OBJECT DETECTION: STRENGTHS, WEAKNESSES, OPPORTUNITIES

**ICML WORKSHOPS 2020** 

Dhaivat Bhatt, Dishank Bansal, Gunshi Gupta, Hanju Lee, Krishna Murthy Jatavallabhula, Liam Paull

#### MULTI-OBJECT MONOCULAR SLAM FOR DYNAMIC ENVIRONMENTS

IV 2020

Gokul Nair, Swapnil Daga, Rahul Sajnani, Anirudha Ramesh, Junaid Ahmed Ansari, Krishna Murthy Jatavallabhula, K. Madhava Krishna

#### RECONSTRUCT, RASTERIZE AND BACKPROP: DENSE SHAPE AND POSE ESTIMATION FROM A SINGLE IMAGE

CVPR Workshops 2020

Aniket Pokale, Aditya Aggarwal Krishna Murthy Jatavallabhula, K. Madhava Krishna

#### GRADSLAM: AUTOMAGICALLY DIFFERENTIABLE SLAM

CVPR Workshops 2020, RSS Workshops 2020

Krishna Murthy Jatavallabhula, Ganesh Iyer, Soroush Saryazdi, Liam Paull 🗗 Video 🛮 🗗 Project page

#### INFER: INTERMEDIATE REPRESENTATIONS FOR FUTURE PREDICTION

IROS 2019

Shashank Srikanth, Junaid Ahmed Ansari, Karnik Ram R, Sarthak Sharma, Krishna Murthy Jatavallabhula, Madhava Krishna K 🕜 Paper (PDF)

Project Page

#### **DEEP ACTIVE LOCALIZATION**

**RAL 2019** 

Sai Krishna\*, Keehong Seo\*, Dhaivat Bhatt, Vincent Mai, Krishna Murthy Jatavallabhula, Liam Paull 🗗 Paper (PDF) 📑 Code

# GEOMETRIC CONSISTENCY FOR SELF-SUPERVISED END-TO-END VISUAL ODOMETRY **CVPR Workshops 2018** Ganesh Iyer\*, Krishna Murthy Jatavallabhula\*, Gunshi Gupta, K. Madhava Krishna, and Liam Paull. 🗗 Paper (PDF) 📑 Project page CALIBNET: GEOMETRICALLY-SUPERVISED EXTRINSIC CALIBRATION USING 3D SPATIAL TRANSFORMER NETWORKS IROS 2018 Ganesh Iyer, Karnik Ram R., Krishna Murthy atavallabhula, K. Madhava Krishna 🗹 Paper(PDF) 📝 Project page THE EARTH AIN'T FLAT: RECONSTRUTION OF VEHICLES ON STEEP AND BUMPY ROADS FROM A MONOCULAR CAMERA **IROS 2018** Junaid Ahmed Ansari, Sarthak Sharma, Anshuman Majumdar, Krishna Murthy Jatavallabhula, K. Madhava Krishna 🗹 Paper(PDF) Project page CONSTRUCTING CATEGORY-SPECIFIC MODELS FOR MONOCULAR OBJECT SLAM ICRA 2018 Parv Parkhiya, Rishabh Khawad, Krishna Murthy Jatavallabhula, Brojeshwar Bhowmick, K. Madhava Krishna 🚰 Paper(PDF) BEYOND PIXELS: LEVERAGING GEOMETRY AND SHAPE CUES FOR MULTI-OBJECT TRACKING ICRA 2018 Sarthak Sharma, Junaid Ahmed Ansari, Krishna Murthy Jatavallabhula, K. Madhava Krishna 🗹 Paper(PDF) 📑 Code SHAPE PRIORS FOR REAL-TIME MONOCULAR OBJECT LOCALIZATION IN DYNAMIC ENVIRONMENTS IROS 2017 Krishna Murthy Jatavallabhula, Sarthak Sharma, and K. Madhava Krishna 🗗 Paper(PDF) RECONSTRUCTING VEHICLES FROM A SINGLE IMAGE: SHAPE PRIORS FOR ROAD SCENE UNDERSTANDING ICRA 2017 Krishna Murthy Jatavallabhula, G.V. Sai Krishna, Falak Chhaya, and K. Madhava Krishna 🗗 Paper(PDF) FAST: SYNCHRONOUS FRONTIER ALLOCATION FOR SCALABLE ONLINE MULTI-ROBOT TERRAIN COVERAGE JIRS 2017 Avinash Gautam, Bhargav Jha, Gourav Kumar, Krishna Murthy Jatavallabhula, SP Arjun Ram, and Sudeept Mohan CLUSTER, ALLOCATE, COVER: AN EFFICIENT APPROACH FOR MULTI-ROBOT COVERAGE SMC 2015 Avinash Gautam, Krishna Murthy Jatavallabhula, Gourav Kumar, SP Arjun Ram, Bhargav Jha, and Sudeept Mohan MAXXYT: AN AUTONOMOUS WEARABLE DEVICE FOR REAL-TIME TRACKING OF A WIDE RANGE OF EXERCISES **UKSIM 2015** Danish Pruthi, Ayush Jain, Krishna Murthy Jatavallabhula, Ruppesh Nalwaya, and Puneet Teja



DRACO: WEAKLY SUPERVISED DENSE RECONSTRUCTION AND CANONICALIZATION OF OBJECTS

Rahul Sajnani, AadilMehdi Sanchawala, Krishna Murthy Jatavallabhula, Srinath Sridhar, K. Madhava Krishna Paper

Video

Project page

ROBUSTPOINTSET: A DATASET FOR BENCHMARKING ROBUSTNESS OF POINT CLOUD CLASSIFIERS

Saeid Asgari Taghanaki, Jieliang Luo, Ran Zhang, Ye Wang, Pradeep Kumar Jayaraman, Krishna Murthy Jatavallabhula Paper

Code

# PROFESSIONAL SERVICE AND VOLUNTEERING

- 2017-Present Reviewer for ICRA, IROS, RAL, AAAI, CVPR, ICCV, ECCV, ACCV, ICVGIP, CRV, CoRL, ICLR, Neurips, ICML
  - 2020 Student Volunteer, ICML (International Conference on Machine Learning)
  - 2020 Student Volunteer, RSS (Robotics Science and Systems)
  - 2020 Student Volunteer, ICLR (International Conference on Learning Representations)

### OUTREACH AND INCLUSION

- 2020 Mentor, Neurips workshop (DiffCVGP)
- 2020 Diversity and inclusion panel, RSS (Robotics Science and Systems)
- 2018 Mentor, Al for social good workshop. McGill University.

## **WORKSHOPS AND SESSIONS CO-ORGANIZED**

- 2021 *Program co-chair*, Beyond the research paper: Rethinking how we share scientific understanding in ML (ICML 2021 workshop, scheduled).
- 2021 Program co-chair, Robotics Science and systems pioneers workshop (RSS 2021, scheduled).
- 2021 Organizer, Robot learning seminar series: Mila and REAL Winter 2021.
- 2020 *Program co-chair*, Differentiable vision, graphics, and physics applied to machine learning (Neurips 2020, scheduled). Webpage
- 2020 Organizer, Robot learning seminar series: Mila and REAL Fall 2020. Webpage
- 2019 Breakout session organizer, Pan-Canadian SOCMLx.

# TALKS

- Feb 2021 (Scheduled) KUIS AI (Istanbul) Building differentiable models of the 3D world
- Jan 2021 MIT Vision seminar Building differentiable models of the 3D world
- Oct 2020 IEEE chapter, Indonesia Deep learning for robot perception
- Sep 2020 Cornell robotics group gradSLAM: Dense SLAM meets automatic differentiation
- Aug 2020 CV Talks, India: Computer vision talks gradSLAM: Automagically differentiable SLAM
- Jul 2020 Robotics Science and Systems pioneers gradSLAM: Dense SLAM meets automatic differentiation
- Jul 2020 Robotics Science and Systems: structured approaches to robot learning workshop gradSLAM: Automagically differentiable SLAM
- Jun 2020 CVPR: Deep declarative networks workshop gradSLAM: Automagically differentiable SLAM
- Feb 2019 NVIDIA Webinar 3D deep learning with Kaolin

## STUDENTS MENTORED

- 3 Students at their PhD level or equivalent.
- 8 Students pursuing Masters programs (Mila, Université de Montréal and IIIT Hyderabad, India)
- 23 Students at their undergraduate level of study (includes visitors / interns at Mila, Université de Montréal and IIIT Hyderabad, India)

# Courses (Co-)Taught or Assisted

- 2021 Representation Learning at Mila and Université de Montréal, with Aaron Courville.
- 2020 Advanced projects in deep learning at Mila, with Pierre-Luc Carrier and Journana Ghosn.
- 2017 Mobile Robotics and Computer Vision at IIIT Hyderabad, with Prof. K. Madhava Krishna.
- 2016 Mobile Robotics at IIIT Hyderabad, with Prof. K. Madhava Krishna.

# **66** REFERENCES

References provided upon request