Krishna Murthy JATAVALLABHULA

Postdoc | Massachusetts Institute of Technology

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Cambridge, MA USA

Research objectives: Build *invertible world models* for intelligent perception, reasoning, and action

Education

2018-2022	**PhD. in Computer Science**, Université de Montréal, Montréal, Canada. Thesis (letter) grade: **exceptional**.	**GPA: 4.15/4.00**
2015-2017	**MS by research in Computer Science and Engineering**, *International Institute of Information Technology, Hyderabad, India*.	**GPA: 10.00/10.00**
2011-2015	**M.Sc. (Tech.) Information Systems** (Bachelor's degree), *Birla Institute of Science and Technology (BITS), Pilani, India.*	**GPA: 6.71/10.00**

Work

March 2022 – Present | **Postdoctoral associate | MIT, (CoCoSci and CSAIL),**
With Josh Tenenbaum and Antonio Torralba
Differentiable programming | Probabilistic programming | Physical understanding | Robotics

September 2022 – December 2022 | **Course instructor | McGill University, Montreal, Canada,**
Co-designed and taught *Advanced Image Synthesis* (ECSE 446/546)
Computer graphics | Rendering | Differentiable programming

May 2021 – August 2021 | **Research intern | NVIDIA, Seattle Robotics Group, (Remote)**
With Prof. Dieter Fox, Prof. Animesh Garg, and Prof. Fabio Ramos.
Robotics | Deep learning | Computer graphics | Computer vision

May 2019 – August 2019 | **Deep Learning Research Intern | NVIDIA, Toronto AI Lab, Canada**
With Prof. Sanja Fidler. Led the development of Kaolin, a 3D deep learning library for PyTorch.
Deep learning | Computer vision | Computer graphics

November 2017 – June 2015 | **Research Assistant | Robotics Research Center, IIIT Hyderabad, India**
Conducted research in perception for autonomous driving and SLAM, taught graduate classes.
Autonomous Driving | Computer Vision | Robotics | Deep Learning | SLAM

Honors and Awards

2021 **NVIDIA graduate fellowship** One of *5* fellowships awarded worldwide
2021 **Google PhD fellowship** North America - Machine perception, Speech technology, and Computer vision (**declined**) *3* awards in North America, *10* worldwide
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*.
2021 **Outstanding reviewer** for the IEEE Robotics and Automation Letters, 2020.
2021 **Outstanding reviewer** for the International Conference on Learning Representations
2021 **Outstanding reviewer** for the IEEE international conference on Computer Vision and Pattern Recognition
2020 **Top reviewer** for the *European Conference on Computer Vision* (ECCV), 2020 (1 out of 215 awards)
2019 **DIRO Excellence Award** for research and academic (second consecutive year)
2018 **ICRA PhD Forum**. Selected to present my work at the PhD Forum, ICRA 2018, in my first semester as a PhD student. Received generous travel support.
2018 **DIRO Excellence Award** for research and academic excellence from DIRO, Université de Montréal.
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

2020 **IVADO fundamental research grant**. "*Differentiable perception, graphics, and optimization for weakly supervised 3D perception*". Co-written with 3 principal investigators (PI): Liam Paull, James Forbes, Derek Nowrouzezahrai.

2021 **Facebook - unrestricted research gift**. "*Bridging Bayesian optimization and differentiable simulation*". Co-written with Jeannette Bohg (PI) and Rika Antonova (co-PI).

2014 **L K Maheshwari Grant**. Awarded a seed grant for a proposal involving cooperative navigation of a heterogeneous swarm of aerial and ground robots.

Featured publications

Taskography: Evaluating robot task planning over large 3D scene graphs CoRL 2021

Christopher Agia*, **Krishna Murthy Jatavallabhula***, Mohamed Khodeir, Ondra Miksik, Vibhav Vineet, Mustafa Mukadam, Liam Paull, Florian Shkurti

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

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

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)

Other refereed conference publications

f-Cal: Variational calibration of aleatoric uncertainty in regression ICRA 2022
Dhaivat Bhatt, Kaustubh Mani, Dishank Bansal, Hanju Lee, **Krishna Murthy Jatavallabhula**, Liam Paull

DRACO: Weakly Supervised Dense Reconstruction And Canonicalization of Objects ICRA 2021
Rahul Sajnani, AadilMehdi Sanchawala, **Krishna Murthy Jatavallabhula**, Srinath Sridhar, K. Madhava Krishna Paper Video
Project page

AutoLay: Benchmarking monocular layout estimation IROS 2020
Kaustubh Mani, N. Sai Shankar, **Krishna Murthy Jatavallabhula**, K. Madhava Krishna Project page

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

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 FutureE pRediction IROS 2019
Shashank Srikanth, Junaid Ahmed Ansari, Karnik Ram R, Sarthak Sharma, **Krishna Murthy Jatavallabhula**, Madhava Krishna K 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)

Shape Priors for Real-Time Monocular Object Localization in Dynamic Environments IROS 2017
Krishna Murthy Jatavallabhula, Sarthak Sharma, and K. Madhava Krishna Paper(PDF)

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

Refereed journal publications

Deep Active Localization RAL 2019
Sai Krishna*, Keehong Seo*, Dhaivat Bhatt, Vincent Mai, **Krishna Murthy Jatavallabhula**, Liam Paull Paper (PDF) Code

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

Refereed workshop publications

RobustPointSet: A Dataset for Benchmarking Robustness of Point Cloud Classifiers ICLR Workshops 2021
Saeid Asgari Taghanaki, Jieliang Luo, Ran Zhang, Ye Wang, Pradeep Kumar Jayaraman, **Krishna Murthy Jatavallabhula** Paper Code

Probabilistic object detection: Strengths, Weaknesses, Opportunities ICML Workshops 2020
Dhaivat Bhatt, Dishank Bansal, Gunshi Gupta, Hanju Lee, **Krishna Murthy Jatavallabhula**, Liam Paull

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

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

Professional Service and Volunteering

2017-Present	Reviewer for ICRA, IROS, RAL, AAAI, CVPR, ICCV, ECCV, ACCV, ICVGIP, CRV, CoRL, ICLR, Neurips, ICML, WACV
2020-2021	Student Volunteer, ICML (International Conference on Machine Learning)
2020	Student Volunteer, RSS (Robotics Science and Systems)
2020-2021	Student Volunteer, ICLR (International Conference on Learning Representations)

Outreach and Inclusion

2021	Student member, Mila equity, diversity, and inclusion (EDI) committee (1 of 7 student representatives)
2020	Mentor, Neurips workshop (DiffCVGP)
2020	Diversity and inclusion panel, RSS (Robotics Science and Systems)
2018	Mentor, AI for social good workshop. McGill University.

Workshops and Sessions Co-organized

Dec 2021	*Program co-chair*, Physical reasoning and inductive biases for the real world (Neurips 2021 workshop) Webpage
Oct 2021	*Program co-chair*, Differentiable 3D computer vision and graphics (ICCV 2021 workshop). Webpage
Jul 2021	*Program co-chair*, Robotics Science and systems pioneers workshop (RSS 2021). Webpage
May 2021	*Program co-chair*, Beyond the research paper: Rethinking how we share scientific understanding in ML (ICLR 2021 workshop). Webpage
Jan-May 2021	*Lead Organizer*, Robot learning seminar series: Mila and REAL - Winter 2021. Webpage
Dec 2020	*Program co-chair*, Differentiable vision, graphics, and physics applied to machine learning (Neurips 2020). Webpage
Sep-Dec 2020	*Lead Organizer*, Robot learning seminar series: Mila and REAL - Fall 2020. Webpage
Nov 2019	*Breakout session organizer*, Pan-Canadian SOCMLx.

Talks

Dec 2021	Invited talk - Talking robotics series [video]
Nov 2021	Guest lecture - Introduction to autonomous vehicles (Duckietown) - Université de Montréal
Oct 2021	Structural and Compositional Learning on 3D Data, ICCV 2021 Workshop - **Taskography: Task planning over large 3D scene graphs**
Aug 2021	AI for Autonomous Driving workshop, IJCAI 2021 - [video]
July 2021	Tartan SLAM series - Carnegie Mellon University - [video]
June 23 2021	Invited talk - ML reading group at the University of Sydney
June 15 2021	Invited talk - Dynamical systems reading group, Mila
Apr 7 2021	Microsoft autonomous systems - **gradSim: A differentiable simulation framework**
Mar 26 2021	AI in robotics (University of Toronto) - **gradSLAM + gradSIM** [video]
Feb 23 2021	KUIS AI (Istanbul) - **Building differentiable models of the 3D world** [video]
Jan 19 2021	MIT Vision seminar - **Building differentiable models of the 3D world** [video]
Oct 11 2020	IEEE chapter, Indonesia - **Deep learning for robot perception**
Sep 22 2020	Cornell robotics group - **gradSLAM: Dense SLAM meets automatic differentiation**
Aug 29 2020	CV Talks, India: Computer vision talks - **gradSLAM: Automagically differentiable SLAM** [video]
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**

Teaching

2021	(Instructor) **Realistic / Advanced image synthesis** (ECSE 446/546) at McGill, Montreal.
2021	(Teaching assistant) **Representation Learning** at Mila and Université de Montréal, with Aaron Courville.
2020	(Teaching assistant) **Advanced projects in deep learning** at Mila, with Pierre-Luc Carrier and Joumana Ghosn.
2017	(Designed and co-taught) **Mobile Robotics and Computer Vision** at IIIT Hyderabad, with Prof. K. Madhava Krishna.
2016	(Teaching assistant) **Mobile Robotics** at IIIT Hyderabad, with Prof. K. Madhava Krishna.

Students Mentored

A list of students I have closely mentored (e.g. on a research or technical project). (Criteria: Mentorship lasted 3 months or longer)

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