Mathematical & Computational Sciences
UNIVERSITY OF TORONTO
MISSISSAUGA

Computer Science
UNIVERSITY OF TORONTO

CV of the researcher

1.PERSONAL DATA

Surname	Pore
Name	Ameya
Date of Birth	11/01/1996
Email	amey.pore@utoronto.ca
Current Status	Postdoctoral fellow
Department	Computer Science, University of Toronto, Canada
Group	MEDCVR, Dr. Lueder Kahrs

2. ACADEMIC QUALIFICATIONS

2.1. Doctoral degrees

Degree	Ph.D. in Computer Science
Institute	Department of Computer Science, University of Verona, Verona
Country	Italy
Date	10/2019 – 07/2023
Date of defence	27/07/2023
Supervisor	Prof Paolo Fiorini
Project	Deep Reinforcement learning control for robotic manipulation of deformable objects
Details	The project was part of a dual degree MSCA-ITN program. The University of Verona served as a primary host institute where the majority of the research was carried out.
Grade	*cum laude* distinction

Degree	Ph.D. in Biomedical Engineering
Institute	Research Centre for Biomedical Engineering, Universitat Politècnica de Catalunya (UPC), Barcelona
Country	Spain
Date	10/2019 – 07/2023
Date of defence	27/07/2023
Supervisor	Prof Alicia Casals
Project	Deep Reinforcement learning control for robotic manipulation of deformable objects
Details	The project was part of a dual degree MSCA-ITN program. UPC served as a secondary institute where a part of the research was carried out.
Grade	*cum laude* distinction

2.2. Master's degree

Degree	MS in Computer Science
Institute	University of Glasgow, UK
Country	United Kingdom
Date	05/2018 – 05/2019
Date of defence	04/05/2019
Details	Research based master's thesis carried out in robotic learning.
Grade	9.1/10

2.3. Bachelor's degree

Degree	BS in Life Science
Institute	Indian Institute of Science Education and Research (IISER), Pune

Country	India
Date	08/2014 – 04/2018
Details	In the first two years of the course, all the fundamental courses in Physics, Chemistry, Mathematics and Biology are offered. After second year, Biology was chosen as a major subject.
Grade	8.4/10

3. RESEARCH ACTIVITIES

3.1. Postdoctoral research

Institute	Department of Computer Science, University of Toronto, Canada
Domain	Surgical Robotics
Date	08/2024 - now
Project details	Developing foundational models for robotic learning and control tasks for surgery. This involves providing novel contributions in imitation learning approaches such as diffusion policy and language models for surgical application. Also involves bridging the sim2real gap of training Reinforcement Learning (RL) policies in simulation and then translating to the real robotic system.

Institute	Department of Surgery, University of Verona, Italy
Domain	Surgical Computer Vision
Date	08/2023 – 07/2024
Project details	Developed weakly supervised learning approaches for segmentation and detection of anomalous tissue during endoscopy. This involves finetuning foundational models on endoscopy data with weak annotations such as scribble, box and text. The models were trained on clinical data collected from patients during the project and deployed in real-time for proof-of-concept demonstration.

3.2. Doctoral research (Refer to Sec 2.1 for more details)

Domain	Surgical RL and safety
Project details	1) Developed autonomous control methods for flexible robots using RL to operate in constrained workspaces. One of the main contributions of his thesis was Constrained-RL approaches to formally guarantee safety in applications such as surgery. Furthermore, he proposed novel representation learning approach to make image-based RL sample efficient and robust. 2) Open-sourced two realistic simulators with deformable physics in which RL agents were trained: (1) *UnityFlexML*: first modular frameworks based on the Unity game engine, which supports deformable tissue; (2) Colonoscopy simulator with realistic mechanical and visual properties. The simulator was evaluated using a user study involving clinicians.

3.3. Master's research

Supervisor	Dr. Gerardo Aragon-Camarasa
Title	Behaviour-based RL for robotic manipulation
Domain	Robotic RL
Project details	Developed a hierarchical RL approach for robotic pick and place tasks. This method could decompose long-time horizon tasks into simpler

subtasks and learn them separately. A high-level RL agent then learned to sequence these subtasks to create a complex behaviour. The research outcome showed a drastic reduction in the number of training episodes required compared to state-of-the-art algorithms.

3.4. Bachelor's research

Institute	IISER
Country	India
Date	05/2016 – 04/2018
Supervisor	Prof Sanjeev Galande
Title	Early Embryogenesis
Details	The research aim was to investigate the changes in biophysical properties during tissue regeneration. For that, *Hydra*, which is a freshwater polyp with regeneration capability, was used as a model organism. Body incisions were made and probed using atomic force microscopy to detect stiffness changes during regeneration.

Institute	Mechanobiology Institute, National University of Singapore
Country	Singapore
Date	05/2017 – 09/2017
Supervisor	Dr. Ronen Zaidel Bar
Title	Biophysics of regeneration
Details	This research aimed to understand the importance of cell-cell adhesions during early embryo development. For that, *C-elegans* was used as a model organism to carry out gene mutations, and the phenotype was studied.

4. FELLOWSHIPS

Fellowship name	Eric and Wendy Schmidt AI in Science Postdoctoral Fellowship
Awarded by	University of Toronto
Project Name/code	Autonomous Surgical robotics
Date	10/2024 – 09/2026
Details	Award of $85,000 CDN/year, plus benefits for developing Autonomous robotic surgery.

Fellowship name	Umberto-Veronesi Postdoctoral fellowship
Awarded by	Umberto Veronesi foundation, Italy
Project Name/code	ARTEFACT
Date	10/2023 – 09/2024
Details	Award of 35k Euros for developing AI systems for detecting early-stage gastric cancer.

Fellowship name	MSCA-ITN
Awarded by	European Commission
Project Name/code	ATLAS, 813782
Date	10/2019 – 09/2023
Details	Awarded 220k Euros for a dual degree doctoral program for developing autonomous surgical robots

Fellowship name	ERASMUS + ICM
Awarded by	European Commission
Project code	KA 107
Date	05/2018 – 04/2019

Details	Awarded 10k Euros to carry out the master's thesis at the University of Glasgow. This fellowship covered the travel, tuition fees and living expenses for the study duration.
Fellowship name	MBI Internship program
Awarded by	National University of Singapore
Date	05/2017 – 09/2017
Details	Awarded the MBI internship fellowship (6k SGD) to conduct a research Internship at the National University of Singapore, Singapore, for four months. This fellowship covered the tuition fees and living expenses.
Fellowship name	INSPIRE Fellowship
Awarded by	Department of Science and Technology, Govt. of India
Date	08/2014 – 05/2019
Details	Awarded the fellowship for undergraduate studies (Stipend amount of 8k INR per month for four years along with 200k INR for travel and other expenses.)

5. TEACHING AND MINI-COURSES

Course name	Reinforcement learning (Master's level)
Year	2024 (Spring Semester, 2 credits)
Institute	University of Verona
Hours	12 Lectures
Course name	Introduction to Robotics and its application in Surgery (Bachelor level, Teaching Assistant + 2 lectures)
Year	2023 (Spring Semester)
Institute	University of Verona
Hours	12 hrs
Course name	Robotics, Vision and Control (Master's level, Teaching Assistant + 2 lectures)
Year	2023 (Fall Semester)
Institute	University of Verona
Hours	4 hrs

6. MENTORING/SUPERVISION

Course name	Computer Science (CSC 499Y), Research Opportunity Program (ROP)
No. of students	5
Institute	University of Toronto
Duration	4 months (May 2025-August 2025)
Project details	Projects related to Large language models for surgical robotic learning.
Course name	Engineering Science (ESC 499Y)
No. of students	3
Institute	University of Toronto
Duration	10 months (August 2024-May 2025)
Project details	Projects related to sim2real gap for robotic RL and transformer based imitation learning architecture such as Action Chunking Transformers for surgical tasks such as suturing, tissue lifting.

Course name	Computer Science (CSC 494)
No. of students	3
Institute	University of Toronto
Duration	4 months + 4 months volunteering (August 2024-April 2025)
Project details	Projects related to Vision Language Models (VLM) for robotic control.
Course name	Computer Science (CSC 392)
No. of students	1
Institute	University of Toronto
Duration	4 months (January 2024 - April 2025)
Project details	Multi-modal RL
Course name	Unofficial Volunteering
No. of students	2
Institute	University of Verona
Duration	6 months (January 2024 - June 2024)
Project details	Polyp segmentation and surgical phase analysis. Currently in the manuscript preparation stage for a potential IJCARS publication.
Course name	Artificial Intelligence
No. of students	2
Institute	University of Verona
Duration	6 months (January 2022 - June 2024)
Project details	Robotic RL for pick and place task using the Franka robot, which resulted in an ICAR publication.

7. ACADEMIC EVENTS AND SERVICES

Conference	British Machine Vision Conference (BMVC) 2024, Glasgow
Role	Technical Program Chair
Summer School	Control of Surgical Robots (COSUR) 2024
Venue	University of Verona
Role	Organizer
Conference	International Conference for Robotics and Automation (ICRA) 2023, London
Role	Financial Organisation committee (Supported the Financial chair, Prof. Paolo Fiorini)
Workshop	Autonomous Flexible Surgical Robots
Venue	Hamlyn Symposium on Medical Robotics (HSMR) 2023
Role	Lead organiser
Conference	Conference on New Technologies for Computer and Robot Assisted Surgery (CRAS) 2022, Napoli
Role	Local organisation
Services	Frequent reviewer of RA-L, ICRA, IROS, ICAR, ISMR and IJCARS, T-MRB and T-RO

8. PUBLICATIONS

Table 1: Publications table; C – Conference J – Journal A - Abstract

J1	**Pore, Ameya**, Zhen Li, Diego Dall'Alba, Albert Hernansanz, Elena De Momi, Arianna Menciassi, Alicia Casals Gelpí, Jenny Dankelman, Paolo Fiorini, and Emmanuel Vander Poorten. "Autonomous Navigation for Robot-Assisted Intraluminal and Endovascular Procedures: A Systematic Review." *IEEE Transactions on Robotics* (2023), pages 2529-2548
J2	Wu, Di, Renchi Zhang; **Ameya Pore**; Diego Dall'Alba; Xuan Thao Ha; Zhen Li; Yao Zhang; Fernando Herrera; Mouloud Ourak; Wojtek Kowalczyk; Elena De Momi; Alicia Casals; Jenny Dankelman; Jens Kober; Arianna Menciassi; Paolo Fiorini; Emmanuel Vander Poorten. "A review on machine learning in flexible surgical and interventional robots: where we are and where we are going", Biomedical Signal Processing and Control (2024), vol 93, pages 106179
J3	**Ameya Pore**, Diego Dall'Alba, Riccardo Muradore "PD-SRL: Parallel and Differentiable Simulator for Robotic Surgery" Accepted in IEEE Robotics and Automation Letters.
C1	**Pore, Ameya**, Riccardo Muradore, and Diego Dall'Alba. "DEAR: Disentangled Environment and Agent Representations for Reinforcement Learning without Reconstruction." In *2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 650-655. IEEE, 2024.*
C2	Corsi*, Davide, Luca Marzari*, **Ameya Pore***, Alessandro Farinelli, Alicia Casals, Paolo Fiorini and Diego Dall'Alba (2023).“Constrained reinforcement learning and formal verification for safe colonoscopy navigation.” In *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 10289-10294. IEEE, 2023.* *-equal contribution
C3	**Pore, Ameya**, Martina Finocchiaro, Diego Dall'Alba, Albert Hernansanz, Gastone Ciuti, Alberto Arezzo, Arianna Menciassi, Alicia Casals, and Paolo Fiorini. "Colonoscopy navigation using end-to-end deep visuomotor control: A user study." In *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 9582-9588. IEEE, 2022.
C4	Marzari, Luca, **Ameya Pore**, Diego Dall'Alba, Gerardo Aragon-Camarasa, Alessandro Farinelli, and Paolo Fiorini. "Towards hierarchical task decomposition using deep reinforcement learning for pick and place subtasks." In *2021 20th International Conference on Advanced Robotics (ICAR)*, pp. 640-645. IEEE, 2021.
C5	**Pore, Ameya**, Eleonora Tagliabue, Marco Piccinelli, Diego Dall'Alba, Alicia Casals, and Paolo Fiorini. "Learning from demonstrations for autonomous soft-tissue retraction." In *2021 International Symposium on Medical Robotics (ISMR)*, pp. 1-7. IEEE, 2021.
C6	**Pore, Ameya**, Davide Corsi, Enrico Marchesini, Diego Dall'Alba, Alicia Casals, Alessandro Farinelli, and Paolo Fiorini. "Safe reinforcement learning using formal verification for tissue retraction in autonomous robotic-assisted surgery." In *2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 4025-4031. IEEE, 2021.
C7	Pitsillos, Nikos, **Ameya Pore**, Bjørn Sand Jensen, and Gerardo Aragon-Camarasa. "Intrinsic Robotic Introspection: Learning Internal States From Neuron Activations." In *2021 IEEE International Conference on Development and Learning (ICDL)*, pp. 1-7. IEEE, 2021.
C8	Tagliabue, Eleonora*, **Ameya Pore***, Diego Dall'Alba, Enrico Magnabosco, Marco Piccinelli, and Paolo Fiorini. "Soft tissue simulation environment to learn manipulation tasks in autonomous robotic surgery." In *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 3261-3266. IEEE, 2020. *-equal contribution
C9	**Pore, Ameya**, and Gerardo Aragon-Camarasa. "On simple reactive neural networks for behaviour-based reinforcement learning." In *2020 IEEE International Conference on Robotics and Automation (ICRA)*, pp. 7477-7483. IEEE, 2020.

A3	Pore, Ameya, Eleonora Tagliabue, Diego Dall'Alba, and Paolo Fiorini. "Framework for soft tissue manipulation and control using Deep Reinforcement Learning." In *Proceedings of the 10th Joint Workshop on New Technologies for Computer/Robot Assisted Surgery*, pp. 0-1. 2020.
A4	Liao, Guiqiu, Fernando Gonzalez Herrera, Zhongkai Zhang, Ameya Pore, Luca Sestini, Sujit Kumar Sahu, Oscar Caravaca-Mora et al. "Autonomous OCT volumetric scanning with robotic endoscope." In *Clinical Biophotonics II*, p. PC1214602. SPIE, 2022.
A5	Tagliabue, Eleonora, Ameya Pore, Diego Dall'Alba, Marco Piccinelli, and Paolo Fiorini. "UnityFlexML: Training Reinforcement Learning Agents in a Simulated Surgical Environment." In *I-RIM Conf.* 2020.

9. PRESENTATIONS

Presentation	**Venue**	**Place**	**Date**
Presenter	Robotics, Perception and Control Summer School, KTH Royal Institute of Technology	Stockholm	06/2024
Paper	IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)	Detroit	10/2023
Poster	Reinforcement Learning Summer School	Barcelona	05/2023
Paper	IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)	Kyoto	10/2022
Paper	Hamlyn Symposium on Medical Robotics (HSMR)	London	06/2022
Paper	Conference on Computer and Robot Assisted Surgery (CRAS)	Naples	04/2022
Paper	IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)	Virtual (Prague)	10/2021
Paper	International Symposium on Medical Robotics	Virtual (Atlanta)	11/2021
Poster	ETH Robotics Summer School and Symposium	Zurich	07/2021
Paper	IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)	Virtual (Las Vegas)	10/2020
Paper	International Conference on Robotics and Automation	Virtual (Paris)	06/2020
Best project award	Summer School on Tissue segmentation, modelling and deformation	Virtual (Milan)	07/2020
Runner-up	Hamlyn Winter School, Imperial College London	London	12/2019
Poster	Summer School on Surgical Robotics	Montpellier	09/2019
Lead Organiser	Startup Weekend, Coffee with a startup, Design thinking workshop, rural innovation workshop	Pune	05/2016-05/2018
Invited talk	24hr Chrono Entrepreneurship Challenge	Pune	12/2017

10. SKILLS

Robotic Platforms	Da Vinci Robotic system, Franka Emika Panda, STRAS platform, Baxter Robot, Search and rescue robot (ETH Zurich)
Libraries Used	ROS, ROS2, Pytorch, Gymnasium, Stable-baselines3, tensorflow, OpenCV, Scikit-learn, Numpy, Pandas, matplotlib
Simulators used	Unity3d, Mujoco, SOFA, Deepmind control, Metaworld, Franka Kitchen
Writing skills	EU project management, deliverable and milestone completion documents, postdoctoral grants

Communication	Academic conference presentation, Undergraduate hands-on presentations for the open-day, school talk about translational research, general audience talks
Social media	Managed the ATLAS project website (https://atlas-itn.eu) and the twitter page, with more than 550k views.

11. OTHER ACHIEVEMENTS

Title	Incubation centre
Place	Pune
Significance	Led the team to secure a grant of 1 million USD under the government of India's scheme, NITI aayog, to set up an incubator.
Date	02/2018

Title	Invited by the office of the President of India
Place	New Delhi
Significance	One among the top ten leaders selected across India to talk about entrepreneurship-based education.
Date	02/2018

12. LANGUAGES

Native	Marathi, English
Additional languages	Italian, assessment: Intermediate, B1 level Spanish, assessment: Beginner, A2 level

13. REFERENCES

Prof Paolo Fiorini
Retired Professor at University of Verona, Italy
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Prof Alicia Casals
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