Alaa Eldin Abdelaal

The Collaborative Haptics and Robotics in Medicine (CHARM) Lab, Mechanical Engineering Department, Stanford University, Building 660-126, 418 Panama Mall, Stanford CA 94305-2203

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EDUCATION

University of British Columbia — Vancouver, Canada
Ph.D., in Electrical and Computer Engineering — September 2017 – December 2022
Advisors: Prof. Tim Salcudean and Prof. Gregory Hager (at Johns Hopkins University)

Simon Fraser University — Burnaby, Canada
M.Sc., in Computing Science — September 2015 – August 2017
Thesis: Event-based Control as a Cloud Service
Advisor: Prof. Mohamed Hefeeda
Cumulative GPA: 4.0

Mansoura University — Mansoura, Egypt
B.Sc., in Computers and Systems Engineering — September 2007 - June 2012
Distinction with honor degree, Total grade: (90.68% - ranked 1st)
Thesis/Graduation Project: One-Eyed Self-Learning Arm Robot.

ACADEMIC HONORS & AWARDS

- Stanford Emerging Technology Review Fellow, at Stanford University — 2023 - 2025
- Medical Robotics Pioneer: I was selected as one of two rising stars in medical robotics during a workshop at the 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2023). — October 2023
- RSS Pioneer: I was selected to participate in the Robotics: Science and Systems (RSS) Pioneers Workshop, a highly selective workshop, bringing together a cohort of the world's top early career researchers in robotics. — 2023
- NSERC Postdoctoral Fellowship, held at Stanford University: my application received the highest ranking in Computer Science in Canada ($90,000 CAD) — January 2023 – December 2024
- Canada Graduate Scholarships – Michael Smith Foreign Study Supplements ($6,000 CAD) — Spring 2022
- Vanier Canada Graduate Scholarship, the most prestigious scholarship for PhD students in Canada ($50,000 CAD per year for three years) — 2019 - 2022
- President's Academic Excellence Initiative PhD Award at the University of British Columbia — 2020 – 2022
- HRI Pioneer: I was selected to participate in the Human-Robot Interaction (HRI) Pioneers Workshop, a highly selective workshop, bringing together a cohort of the world's top student researchers in this area. — 2020
- ACM SIGCHI travel award to attend the ACM/IEEE International Conference on Human-Robot Interaction (HRI) in Cambridge, UK. — 2020
- Best Bench-to-Bedside Paper Award at the 10th International Conference on Information Processing in Computer-Assisted Interventions (IPCAI), Rennes, France — 2019
- The IEEE Robotics and Automation Society Travel Grant to attend the International Conference on Robotics and Automation (ICRA) — 2019
- The Faculty of Applied Science Graduate Award at the University of British Columbia, three times — 2017, 2018 and 2022
- The International Tuition Award at the University of British Columbia — 2017 - 2019
- The School of Computing Science Travel Award at Simon Fraser University — Summer 2017
- The School of Computing Science Graduate Fellowship at Simon Fraser University — Fall 2015
- Graduate Scholarship at Carnegie Mellon University ($42,750 USD per year) (declined) — Fall 2015
- Laboratory Instruction Graduate Fellowship at the American University in Cairo (declined) — Spring 2015
- Sponsored Research Tuition Award at the University of Louisville ($22,742 USD) (declined) — 08/2014 – 07/2015
- Distinguished Graduate Award from the Egyptian Engineers Syndicate — 2012
- My graduation project was one of the winning projects in the 6th Annual Egypt's Young Entrepreneurs Competition of Injaz Egypt and we received a seed fund of 60,000 Egyptian pounds form ExxonMobil Egypt — 2012
- The Young Innovator award from Nahdet El Mahrousa Association and a prize of 6,000 Egyptian Pounds, which is given to the best bachelor theses in Egypt — 2012
- Distinction Award from the Faculty of Engineering, Mansoura University, Egypt, five times — 2007 – 2012

RESEARCH EXPERIENCE

Stanford University — Stanford, CA, USA
Mechanical Engineering Dept. — February 2023 – Present

NSERC Postdoctoral Scholar
Working with Prof. Allison Okamura at the Collaborative Haptics in Robotics and Medicine Laboratory. Collaborating with Prof. Jeannette Bohg. Conducting research in robot learning and robotic surgery.

University of British Columbia   Vancouver, BC, Canada
Electrical and Computer Engineering Dept.   September 2017 – December 2022
Research Assistant
Working with Prof. Tim Salcudean at the Robotics and Control Lab and Prof. Gregory Hager at Johns Hopkins University. Conducting research at the intersection of Autonomy and Human-Robot Interaction with application to surgical robotics.

Johns Hopkins University   Baltimore, MD, USA
Computer Science Dept.   July 2021– June 2022
Visiting Graduate Scholar
Working with Prof. Gregory Hager at Computational Interaction and Robotics Lab (CIRL), Prof. Masaru Ishii at Johns Hopkins School of Medicine and Prof. Tim Salcudean at UBC. Conducting research in the area of surgical training and skill assessment in minimally invasive surgery.

Simon Fraser University   Burnaby, BC, Canada
School of Computing Science   March 2015– August 2017
Research Assistant
Working with Prof. Mohamed Hefeeda at the Network Systems Lab. Conducting research in the area of Automation and Control systems, Cloud Computing and Distributed Systems.

JOURNAL ARTICLES

- Zhaoyang Jacopo Hu, Alex Ranne, **Alaa Eldin Abdelaal**, Etienne Burdet, Allison M. Okamura, Ferdinando Rodriguez y Baena. *"How are my stitches? Model selection and real-time skill assessment for suturing in robotic surgery"*. Submitted 2025.
- Alexandre Banks, Randy Moore, Sayem Zaman, **Alaa Eldin Abdelaal**, Septimiu E. Salcudean "*AutoCam: Hierarchical Path Planning for an Autonomous Auxiliary Camera in Surgical Robotics*". Submitted 2025.
- **Alaa Eldin Abdelaal**, Jiaying Fang, Tim N. Reinhart, Jacob A. Mejia, Tony Z. Zhao, Jeannette Bohg, Allison Okamura, "*Force-Aware Autonomous Robotic Surgery*". Submitted 2025.
- **Alaa Eldin Abdelaal,** Rachelle Van Rumpt, Sayem Zaman, Irene Tong, Anthony Jarc, Gary L. Gallia, Masaru Ishii, Gregory D. Hager, Septimiu E. Salcudean. *"The Quiet Eye Phenomenon in Minimally Invasive Surgery"*. In the International Journal of Computer Assisted Radiology and Surgery, 2025. (*in press*)
- Alexandre Banks, **Alaa Eldin Abdelaal**, Septimiu E. Salcudean, "*Head Motion-Corrected Eye Gaze Tracking with the da Vinci Surgical System*". In the International Journal of Computer Assisted Radiology and Surgery, pp. 1459-1467, 2024.
- Kenneth Perrone, **Alaa Eldin Abdelaal**, Carla Pugh, Allison Okamura, "*Haptics: The Science of Touch as a Foundational Pathway to Precision Medical Education and Assessment*". In Academic Medicine, pp. S84-S88, 2024.
- **Alaa Eldin Abdelaal,** Jordan Liu, Nancy Hong, Gregory D. Hager, Septimiu E. Salcudean. *"Parallelism in Autonomous Robotic Surgery"*. In IEEE Robotics and Automation Letters, 6.2:1824–1831, 2021. [Also presented at the IEEE International Conference on Robotics and Automation (ICRA), Xi'an, China, May 2021].
- **Alaa Eldin Abdelaal,** Apeksha Avinash, Megha Kalia, Gregory D. Hager, Septimiu E. Salcudean. *"A multi-camera, multi-view system for training and skill assessment for robot-assisted surgery".* In the International Journal of Computer Assisted Radiology and Surgery, 15:1369–1377, 2020.
- **Alaa Eldin Abdelaal,** Prateek Mathur**,** Septimiu E. Salcudean. "*Robotics in Vivo: A Perspective on Human-Robot Interaction in Surgical Robotics*". In Annual Review of Control, Robotics, and Autonomous Systems, 3:221–242, 2020.
- Apeksha Avinash, **Alaa Eldin Abdelaal,** Prateek Mathur**,** Septimiu E. Salcudean. "*A "pickup" stereoscopic camera with visual-motor aligned control for the da Vinci surgical system: a preliminary study*". In the International Journal of Computer Assisted Radiology and Surgery, 14.7:1197– 1206, 2019. [Winner of Best Bench-to-Bedside Award at the 10th International Conference on Information Processing in Computer-Assisted Interventions (IPCAI), Rennes, France 2019].
- **Alaa Eldin Abdelaal**, Maram Sakr, Apeksha Avinash, Shahed K. Mohammed, Armaan. K. Bajwa, Mohakta Sahni, Soheil Hor, Sideny Fels, Septimiu E. Salcudean. "*Play Me Back: A Unified Training Platform for Robotic and Laparoscopic Surgery*". In IEEE Robotics and Automation Letters, 4.2:554–561, 2018. [Also presented at the IEEE International Conference on Robotics and Automation (ICRA), Montreal, QC, Canada, May 2019].

PEER-REVIEWED CONFERENCE PUBLICATIONS

- **Alaa Eldin Abdelaal,** Nancy Hong, Apeksha Avinash, Divya Budihal, Maram Sakr, Gregory D. Hager, Septimiu E. Salcudean, *"Orientation Matters: 6-DoF Autonomous Camera Movement for Video-based Skill Assessment in Robot-Assisted Surgery"*. In Proc. of the IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob), Seoul, Korea, August 2022.
- Apeksha Avinash, **Alaa Eldin Abdelaal,** Septimiu E. Salcudean. "*Evaluation of Increasing Camera Baseline on Depth*

Perception in Surgical Robotics". In Proc. of the IEEE International Conference on Robotics and Automation (ICRA), Paris, France, May 2020.

- **Alaa Eldin Abdelaal**, Tamir Hegazy, Mohamed Hefeeda. *"Event-based Control as a Cloud Service"*. In Proc. of the American Control Conference (ACC), Seattle, WA, May 2017.
- **Alaa Eldin Abdelaal,** Maram Sakr, Richard Vaughan. *"LOST Highway: a Multiple-Lane Ant-Trail Algorithm to Reduce Congestion in Large-Population Multi-Robot Systems"*. In Proc. of the 14th Conference on Computer and Robot Vision (CRV), Edmonton, Alberta, May 2017.

PEER-REVIEWED WORKSHOP PUBLICATIONS

- **Alaa Eldin Abdelaal**, Gregory D. Hager, Septimiu E. Salcudean. "*Multimodal Training by Demonstration for Robot-Assisted Surgery.*" In Proc. of the ACM/IEEE International Conference on Human-Robot Interaction (HRI), HRI Pioneers Workshop, Cambridge, UK, March 2020. (**Acceptance rate: ~24%**)

PATENTS

- Septimiu E. Salcudean, Omid Mohareri, Prateek Mathur, Apeksha Avinash, **Alaa Eldin Abdelaal**. "*Imaging device for use with surgical instrument*". U.S. Patent Application No 16/862,371, 2020.

THESES

- **Alaa Eldin Abdelaal**, "*Human Skill Augmentation in Robot-Assisted Surgery*". Ph.D. Thesis, Electrical and Computer Engineering Department, University of British Columbia, Vancouver, BC, Canada. December 2022.
- **Alaa Eldin Abdelaal**, "*Event-based Control as a Cloud Service*". M.Sc. Thesis, School of Computing Science, Faculty of Applied Sciences, Simon Fraser University, Burnaby, BC, Canada. April 2017.
- **Alaa Eldin Abdelaal** *et. al*, "*One-Eyed Self-Learning Arm Robot*". B.Sc. Thesis, Computers and systems Engineering Department, Faculty of Engineering, Mansoura University, Mansoura, Egypt. June 2012.

GRANTS

Seed Grant from the Stanford Institute for Human-Centered Artificial Intelligence (HAI)   January - December 2025
Co-Principal Investigator with Profs. Allison Okamura, Carla Pugh and Jeannette Bohg $75,000 USD
Title: "*Towards Collaborative Autonomous Surgical Assistant: A Case Study on Automating an Auxiliary Robotic Arm in Robot-Assisted Surgery*"

Seed Grant from the Stanford Institute for Human-Centered Artificial Intelligence (HAI)   January - December 2023
Co-Principal Investigator with Profs. Allison Okamura, Carla Pugh and Jeannette Bohg $75,000 USD
Title: "*Force-based Robot Learning from Demonstration for Soft Tissue Manipulation*"

Intuitive Technology Research Grant, from Intuitive Surgical Inc.   January - December 2023
Co-Principal Investigator with Profs. Allison Okamura, Carla Pugh and Jeannette Bohg $60,000 USD
Title: "*Towards Understanding the Role of Tool-Tissue Interaction Forces in Autonomous Robotic Surgery*"

Intuitive Foundation Clinical Research Grant, a subsidiary from Intuitive Surgical Inc.   August 2021 - July 2022
Co-Principal Investigator with Profs. Tim Salcudean, Gregory Hager and Masaru Ishii $60,000 USD
Title: "*Quiet Eye Training in Minimally Invasive Surgery*"

TEACHING EXPERIENCE

State University of New York (SUNY) Upstate Medical University   Syracuse, New York, USA
Guest Lecturer   February 2024
Discovery Science to Patient Care

Stanford University   Stanford, CA, USA
Bioengineering Dept.   March 2023
Guest Lecturer
BIOE 301B: Clinical Needs and Technology

University of Prince Edward Island, Cairo Campus   Cairo, Egypt
Faculty of Sustainable Design   October 2021
Guest Lecturer
ENG-4330: Innovations in Biomedical Engineering

University of British Columbia   Vancouver, BC Canada
Electrical and Computer Engineering Dept.   January 2021 – April 2021

Teaching Assistant
EECE 589/MECH 464/MECH 563: Introduction to Robotics

Simon Fraser University Burnaby, BC Canada
School of Computing Science May 2017 – August 2017
Teaching Assistant
CMPT376W: Technical Writing and Group Dynamics

Mansoura University Mansoura, Egypt
Computers and Systems Engineering Dept. September 2012 – February 2015
Teaching Assistant
CSE 3116: Introduction to Control Engineering, CSE 3413: Machine Learning, and MUR 112: Introduction to Programming

MENTORSHIP

- Jiaqi Shao, MS student, Mechanical Engineering, Stanford University	April 2025 – June 2025
- Chetan Narayanaswamy, MS student, Mechanical Engineering, Stanford University	January 2025 – June 2025
- Joonwon Kang, MS student, Mechanical Engineering, Stanford University	January 2025 – March 2025
- Amber Xie, PhD Student, Computer Science, Stanford University	April 2024 – June 2024
- Tim Niklaus Reinhart, MS Student, Computer Science, Stanford University	January 2024 – June 2024
- Jiaying Fang, MS Student, Electrical Engineering, Stanford University	September 2023 – December 2023
- Jacob A. Mejia, MS Student, Computer Science, Stanford University	June 2023 – August 2023
- Mihir Rao, Undergraduate student, EECS, UC Berkeley	May 2023 – July 2023
- Mary Kate Gale, PhD student, Bioengineering, Stanford University	January 2023 – May 2023
- Brian Vuong, PhD student, Mechanical Engineering, Stanford University	January 2023 – May 2023
- Paula Stocco, MSc Student, Mechanical Engineering, Stanford University	January 2023 – March 2023
- Huilin (Lin) Xu, Undergraduate student, Computer Science, Johns Hopkins University Topic: "A Multi-Modal, Multi-Institutional Data Set for Autonomous Robotic Surgery"	May 2022 – December 2022
- Rachelle Van Rumpt, Undergraduate student, ECE, UBC Topic: "Quiet Eye Training in Minimally-Invasive Surgery"	January 2022 – August 2022
- Sayem Zaman, Undergraduate student, Engineering Physics, UBC Topic: "Gaze-based Learning from Demonstration for Autonomous Robotic Surgery"	May 2021 – August 2022
- Isabelle Andre, Undergraduate student, ECE, UBC Topic: "Integrated Task and Motion Planning for Parallelism in Autonomous Robotic Surgery"	May 2021 – December 2021
- Kritika Joshi, Undergraduate student, Engineering Physics, UBC Topic: "Trilateral Manipulation in Autonomous Robotic Surgery"	January 2021 – August 2021
- Jason Lee, Undergraduate student, Computer Science, UBC Topic: "An Optimization-based Method for Camera Viewpoint Automation in Robotic Surgery"	May 2021 - August 2021
- Kareem Alaswad, Undergraduate student, Mechanical Engineering, UBC Topic: "A Simulation Interface for the da Vinci Surgical Robot"	May 2021 - September 2021
- Nancy Hong, Undergraduate student, ECE, UBC Topic: "Optimization-based Viewpoint Guidance for a 6-DoF Endoscope"	May 2020 - March 2021
- Jordan Liu, Undergraduate student, Computer Science, UBC Topic: "Parallelism in Autonomous Robotic Surgery"	May 2020 - September 2020
- Linghao Lyu, Undergraduate student, ECE, UBC Topic: "Eye gaze Tracking for Robot-Assisted Surgery"	May 2019 - December 2020
- Divya Budihal, Undergraduate student, ECE, UBC Topic: "Autonomous Surgical Camera Movement in 3D: A Learning from Demonstration Approach"	September 2019 - April 2020
- Apeksha Avinash, MASc student, ECE, UBC Topic: "A Stereoscopic "Pickup" Camera for the da Vinci Surgical System"	May 2018 – January 2020

INVITED TALKS

- *"Human Skill Augmentation in Robot-Assisted Surgery"*
  - The Hybrid Human-Machine Interaction in Surgery Workshop at the Hamlyn Symposium on Medical Robotics, London, UK, June 2024.
  - Carnegie Mellon University, the Electrical and Computer Engineering Dept., Pittsburgh, Pennsylvania, March 2024.
  - The University of Illinois Chicago, the Dept. of Electrical and Computer Engineering, Chicago, Illinois, February 2024.
  - The University of Texas at San Antonio, the Dept. of Mechanical Engineering, San Antonio, Texas, February 2024.
  - Houston Methodist Institute for Robotics, Imaging & Navigation Symposium, Houston, Texas, USA, October 2023.
  - University of Alberta, the Electrical and Computer Engineering Department, Edmonton, Alberta, Canada, June 2023.
  - Queensland University of Technology, School of Electrical Engineering and Robotics, Brisbane, Australia, May 2022.
  - University of California, Santa Cruz, the Electrical and Computer Engineering Dept., Santa Cruz, California, May 2022.
  - Carnegie Mellon University, the Robotics Institute, Pittsburgh, Pennsylvania, USA, March 2022.

- Rice University, the Electrical and Computer Engineering Department, Houston, Texas, USA, March 2022.
- *"Parallelism in Autonomous Robotic Surgery"*. The 2022 IEEE International Conference on Robotics and Automation (ICRA) Workshop on Intelligent Control Methods and Machine Learning Algorithms for Human-Robot Interaction and Assistive Robotics, Philadelphia, Pennsylvania, USA, May 2022.
- *"An "Additional View" on Human-Robot Interaction and Autonomy in Robot-Assisted Surgery"*. Disney Research, Los Angeles, USA, March 2022.
- *"An "Additional View" on Human-Robot Interaction and Autonomy in Robot-Assisted Surgery"*. Johns Hopkins University, Baltimore, Maryland, USA, November 2021.
- *"An "Additional View" on Human-Robot Interaction and Autonomy in Robot-Assisted Surgery"*. Cornell University, Ithaca, New York, USA, November 2020.
- *"Training by Demonstration for Robot-Assisted Surgery"*. Intuitive Surgical Research Symposium, Sunnyvale, CA, USA, January 2020.

SERVICE

- Program committee member at the Robotics: Science and Systems (RSS) Pioneers Workshop which was held in conjunction with the 2024 RSS Conference.
- Panel Chair at the 16th annual Human-Robot Interaction (HRI) Pioneers Workshop which was held in conjunction with the 2021 ACM/IEEE International Conference on Human-Robot Interaction.
- Program committee member at the 11th IEEE International Conference on Healthcare Informatics (ICHI) 2023
- Reviewer at:
  - npj Digital Medicine (2022)
  - IEEE/ASME Transactions on Mechatronics (2021)
  - IEEE Transactions on Control Systems Technology (2019)
  - IEEE Robotics and Automation Letters (2020, 2021, 2022, 2023)
  - The International Journal of Computer Assisted Radiology and Surgery (2021)
  - IEEE Control Systems Letters (2020)
  - The International Conference on Robotics and Automation (ICRA) (2021, 2022, 2023, 2024)
  - The IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (2021, 2022, 2023, 2025)
  - International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI) (2020, 2021, 2022, 2023)
  - The IEEE International Conference on Automation Science and Engineering (CASE) 2021
  - International Conference for Biomedical Robotics and Bio-mechatronics (BioRob) 2020
  - The 29th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN) 2020.
  - The American Control Conference (ACC) (2018, 2021, 2022)
  - The International Symposium on Medical Robotics (ISMR) 2023
  - MICCAI 2019 Workshop on Augmented Environments for Computer Assisted Interventions
- Poster session committee member at the Grace Hopper Celebration of Women in Computing Conference (GHC) 2019.
- Volunteer team leader at the organization of the 2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2017).
- Volunteer at the organization of ROSCon 2017 (the main conference for the developers of Robot Operating System (ROS)).

ADDITIONAL TRAINING

Stanford University   Stanford, CA, USA
Preparing for Faculty Careers   April - June 2023
An intensive course on how to obtain a faculty job and thrive as a professor.

Imperial College London   London, The United Kingdom
The Hamlyn Winter School on Surgical Imaging and Vision   December 2019
The Hamlyn Winter School focuses on both the technical and clinical aspects of Surgical Imaging and Vision. Through invited lectures, hands-on demonstrations, workshops, and mini-projects, the purpose of this winter school is to help researchers familiarize with the cutting edge research of this field.

University of British Columbia   Vancouver, Canada
The Centre for the Integration of Research, Teaching and Learning (CIRTL) Summer Institute   Summer 2018
This summer institute was a five-day, hands-on, intensive teaching course that combines an emphasis on learning evidence and theory-based approaches to teaching and learning.

University of Montpellier   Montpellier, France
The 8th Surgical Robotics Summer School   September 2017

This summer school was a two-week intensive course in different areas of surgical robotics including the fundamental aspects, different applications and future trends.

VOLUNTEERING AND OUTREACH

- Mentor at the Fatima Fellowship program, which is an international mentorship program for aspiring researchers in computer science. It provides participants with research experience and guidance in preparing strong applications for PhD programs in computer science and machine learning. September 2024 - Present
- Mentor at Africa STEM Network (Afrisnet), a nonprofit organization that seeks to increase the overall participation of Africans in global and modern research in science, technology, engineering, and mathematics. August 2023 - Present
- Counselor at the counselling team at Egypt Scholars Inc. where we provide mentorship to current and prospective students regarding studying abroad and seeking financial support through scholarships. June 2016 - Present
- Judge at the Three Minute Thesis (3MT) Competition, Electrical and Computer Engineering Department, University of British Columbia February 2021
- Coordinator of the Pathways to Professorship program at the Faculty of Applied Science at UBC which aims to prepare PhD students for the rigors of applying to, and holding, an academic position. August 2019 - April 2020
- Cultural ambassador for the Vancouver Summer Program at the Faculty of Education at UBC. Summer 2018