Alberta Longhini

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RESEARCH STATEMENT

I envision a future where robots are ubiquitous and capable of complex reasoning and manipulation tasks in unstructured, highly-variable environments. My research lies at the intersection of robotics and machine learning, focusing on the adaptive manipulation of Cloth-like Deformable Objects (CDO). This under-explored area requires novel approaches for the characterization, perception, modeling, and control of CDOs. I develop methods to characterize and categorize these objects, learning representations that account for their physical properties and advancing generalization techniques for learning-based dynamics and planning suitable for robotic manipulation. Additionally, I am currently exploring the use of foundation models to enhance the perception and manipulation of cloth-like objects, aiming to equip robots with enhanced adaptive skills.

Keywords: Deformable Object Manipulation · Representation Learning · Robotic Perception

SELECTED PUBLICATIONS

[S1] Alberta Longhini, Michael C Welle, Ioanna Mitsioni, and Danica Kragic. *Textile taxonomy and classification using pulling and twisting*. In: 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE. 2021, pp. 7564–7571 [pdf]

[S2] Alberta Longhini[†], Marco Moletta[†], Alfredo Reichlin, Michael C Welle, David Held, Zackory Erickson, and Danica Kragic. *EDO-Net: Learning Elastic Properties of Deformable Objects from Graph Dynamics*. In: 2023 IEEE International Conference on Robotics and Automation (ICRA). 2023 [pdf]

[S3] Alberta Longhini, Michael C Welle, Zackory Erickson, and Danica Kragic. *AdaFold: Adapting Folding Trajectories of Cloths via Feedback-loop Manipulation*. In: IEEE Robotics and Automation Letters, 2024

[S4] Alberta Longhini, Marcel Büsching, Bardienus Pieter Duisterhof, Jens Lundell, Jeffrey Ichnowski, Mårten Björkman, and Danica Kragic. *Cloth-Splatting: 3D State Estimation from RGB Supervision for Deformable Objects*. In: 8th Annual Conference on Robot Learning

Note: The symbol [†] denotes shared first-authorship.

EXPERIENCE

- Teaching Assistant — 2021–now
  KTH Royal Institute of Technology — *Sweden*
- Ph.D. Candidate — 2021–(expected 02/25)
  KTH Royal Institute of Technology — *Sweden*
- Visiting Researcher — 2023
  Carnegie Mellon University — *USA*

EDUCATION

- Ph.D. Computer Science — 2021–now
  Division of Robotic Perception and Learning (RPL), KTH Royal Institute of Technology, Sweden
  · *Supervisors*: Prof. Danica Kragic, Michael C. Welle, Jens Lundell
- Degree Project Abroad — fall 2020
  Division of Robotic Perception and Learning (RPL), KTH Royal Institute of Technology, Sweden
  · *Scholarship*: Erasmus Mundus.
- M.Sc. Automation Engineering — 2018–2021
  Department of Information Engineering (DEI), University of Padua, Italy
  · *Thesis Title*: Fabric Material Classification by Combining Force Sensing and Vision.
  · *Supervisors*: Prof. Alessandro Chiuso, Prof. Danica Kragic.
- International Studies — fall 2017
  Facultat Informatica de Barcelona (FIB), Universitat Politecnica de Catalunya (UPC), Spain

- *Scholarship*: Erasmus Mundus.

- B.Sc. Information Engineering 2015–2018
  Department of Information Engineering (DEI), University of Padua, Italy
  - *Thesis Title*: Experimental and computational applications of semantic networks.
  - *Supervisor*: Prof. Leonardo Badia.

PUBLICATIONS

Note: The symbol † denotes shared first-authorship.

PEER-REVIEWED CONFERENCE PAPERS (6)

[C6] Alberta Longhini, Marcel Büsching, Bardienus Pieter Duisterhof, Jens Lundell, Jeffrey Ichnowski, Mårten Björkman, and Danica Kragic. *Cloth-Splatting: 3D State Estimation from RGB Supervision for Deformable Objects*. In: 8th Annual Conference on Robot Learning

[C5] Irene Garcia-Camacho, Alberta Longhini, Michael C Welle, Guillem Alenyà, Danica Kragic, and Júlia Borràs. *Standardization of cloth objects and its relevance in robotic manipulation*. In: 2023 IEEE International Conference on Robotics and Automation (ICRA). 2024

[C4] Alberta Longhini†, Marco Moletta†, Alfredo Reichlin, Michael C Welle, David Held, Zackory Erickson, and Danica Kragic. *EDO-Net: Learning Elastic Properties of Deformable Objects from Graph Dynamics*. In: 2023 IEEE International Conference on Robotics and Automation (ICRA). 2023 [pdf]

[C3] Alberta Longhini, Marco Moletta, Alfredo Reichlin, Michael C Welle, Alexander Kravberg, Yufei Wang, David Held, Zackory Erickson, and Danica Kragic. *Elastic Context: Encoding Elasticity for Data-driven Models of Textiles*. In: 2023 IEEE International Conference on Robotics and Automation (ICRA). 2023 [pdf]

[C2] Alberta Longhini, Michael C Welle, Ioanna Mitsioni, and Danica Kragic. *Textile taxonomy and classification using pulling and twisting*. In: 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE. 2021, pp. 7564–7571 [pdf]

[C1] Alberta Longhini, Michele Perbellini, Stefano Gottardi, Shenglun Yi, Hao Liu, and Mattia Zorzi. *Learning the tuned liquid damper dynamics by means of a robust EKF*. in: 2021 American Control Conference (ACC). IEEE. 2021, pp. 60–65 [pdf]

JOURNAL ARTICLES (2)

[J2] Alberta Longhini, Yufei Wang, Irene Garcia-Camacho, David Blanco-Mulero, Marco Moletta, Michael Welle, Guillem Alenyà, Hang Yin, Zackory Erickson, David Held, et al. *Unfolding the Literature: A Review of Robotic Cloth Manipulation*. In: Annual Review of Control, Robotics, and Autonomous Systems, 2024 [pdf]

[J1] Alberta Longhini, Michael C Welle, Zackory Erickson, and Danica Kragic. *AdaFold: Adapting Folding Trajectories of Cloths via Feedback-loop Manipulation*. In: IEEE Robotics and Automation Letters, 2024 [pdf]

PEER-REVIEWED WORKSHOP PAPERS (3)

[W3] Alberta Longhini, Marcel Büsching, Bardienus Pieter Duisterhof, Jeffrey Ichnowski, Mårten Björkman, and Danica Kragic. *Distilling Semantic Features for 3D Cloth Representations from Vision Foundation Models*. In: ICRA 2024 Workshop on 3D Visual Representations for Robot Manipulation [pdf]

[W2] Robert Gieselmann, Alberta Longhini, Alfredo Reichlin, Danica Kragic, and Florian T. Pokorny. *DLO@Scale - A Large-Scale Meta Dataset for Learning Non-Rigid Object Pushing Dynamics*. In: Workshop on Physical Reasoning and Inductive Biases for the Real World, NeurIPS, 2021 [pdf]

[W1] Alberta Longhini, Marco Moletta, Michael C Welle, Ioanna Mitsioni, and Danica Kragic. *Perceiving and Handling Textiles: a Robotics Perspective*. In: Workshop on Representing and Manipulating Deformable Objects, ICRA, 2021 [pdf]

HONORS AND DISTINCTIONS

- "Mille e una lode" Award 2017
  Awarded a selective scholarship by the University of Padova to excellent students in each degree programme.

TEACHING AND SUPERVISION

COURSES

- Introduction to Robotics — 2022–now
  School of Electrical Engineering and Computer Science — *KTH Royal Institute of Technology*
- Image Analysis and Computer Vision — 2021–2023
  School of Electrical Engineering and Computer Science — *KTH Royal Institute of Technology*

M.SC. STUDENTS

- Noel Johansson, "*Benchmarking Sentence-Transformers for Duplicate Bug Detection on Novel Dataset*" — 2024
  M.Sc. Computer Science, *KTH Royal Institute of Technology*
- Mark Bergrahm, "*Explanation methods on a partially trained model*" — 2024
  M.Sc. Computer Science, *KTH Royal Institute of Technology*

PROGRAMMING LANGUAGES

- Python — *Proficient*
- ROS — *Proficient*
- C++ — *Competent*

LANGUAGES

- Italian — *Native*
- English — *Fluent*
- Spanish — *Conversational*

PROFESSIONAL SERVICE

RESEARCH COMMUNITY SERVICE

- PhD Representative - Member of the EECS PhD school council. — 2023-

ORGANIZATIONAL ROLES

- Fourth workshop on Representing and Manipulating Deformable Objects (ICRA) — 2024-

REVIEWER

- Conference on Robot Learning (CoRL) — 2024-Now
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) — 2021-2Now
- IEEE International Conference on Robotics and Automation (ICRA) — 2022-Now
- IEEE Robotics and Automation Letters (RA-L) — 2024

REFERENCES

- Danica Kragic, *KTH Royal Institute of Technology, Sweden* — dani@kth.se
- Zackory Erickson, *Carnegie Mellon University, USA* — zerickso@andrew.cmu.edu
- Michael C. Welle, *KTH Royal Institute of Technology, Sweden* — mwelle@kth.se
- Jense Lundell, *KTH Royal Institute of Technology, Sweden* — jelundel@kth.se