

Mine Sarac Stroppa

Contact

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- o <https://profiles.stanford.edu/intranet/mine-sarac-stroppa>

Education

- July '17 **Doctor of Philosophy (PhD)**, *Perceptual Robotics, Scuola Superiore Sant'Anna, Pisa, Italy, 110/110.*
- o **Thesis Title:** Design, Implementation and Control of an Underactuated Hand Exoskeleton
 - o **Supervisor:** Assoc. Prof. Dr. Antonio Frisoli
 - o **Committee:** Prof. Dr. Yiorgos Chrysanthou, Prof. Dr. Bruno Rossi, and Assist. Prof. Dr. Franco Tecchia
 - o **Abstract:** I presented the design, implementation and control of a linkage-based, underactuated hand exoskeleton to assist patients with hand disabilities during grasping tasks for robot assisted physical rehabilitation or robot assisted activities of daily living. Novel underactuated structure allows fingers to automatically adjust the pose based on the contact forces acting on the phalanges, so that the glove can assist user's hand grasp objects with any size and shape with no prior information. I implemented active backdriveability using force control and bilateral exercises using Electromyography (EMG) sensors or squeezable objects equipped with force sensors. I have also explored the use of the presented glove for virtual manipulation or teleoperation applications through Jacobian based control strategies.
- Oct. '13 **Master of Science (M.S.)**, *Mechatronics, Sabanci University, Istanbul, Turkey, 3.74/4.00.*
- o **Thesis Title:** Design, Implementation and BCI-Based Control of a Series Elastic Mobile Robot for Home-Based Physical Rehabilitation
 - o **Supervisor:** Assoc. Prof. Dr. Volkan Patoglu
 - o **Co-advisor:** Assoc. Prof. Dr. Mujdat Cetin
 - o **Committee:** Assoc. Prof. Dr. Kemalettin Erbatur, Assoc. Prof. Ali Kosar, Assist. Prof. Dr. Naime Ozben Onhon
 - o **Abstract:** I presented the design, implementation and control of a series elastic holonomic mobile platform, AssistOnMobile, to administer therapeutic table-top exercises to patients who have suffered injuries that affect the function of their upper extremities. Series elastic interface allows the device to achieve transparency over control, as much as assist-as-needed rehabilitation protocols for patients with certain physical abilities. For patients with severe disabilities, I implemented a systematic, novel approach for online modification of robot assisted rehabilitation exercises by continuously monitoring intention levels of patients utilizing an electroencephalogram (EEG) based Brain-Computer Interface (BCI).
- June '11 **Bachelor degree (B.S.)**, *Electrical and Electronics Engineering, Yeditepe University, Istanbul, Turkey, 3.34/4.00.*
- o **Thesis Title:** Impedance Control of a Robot-Assisted Rehabilitation System RehabRoby
 - o **Supervisor:** Assoc. Prof. Dr. Duygun Erol Barkana
 - o **Abstract:** I implemented an impedance control algorithm for a upper-limb robot-assisted rehabilitation system, RehabRoby, which has been developed in Yeditepe University. Thanks to the impedance control structure, RehabRoby can detect the performance of the user during a trajectory tracking task and assist them to complete the given task. The control parameters can also be adjusted to allow the therapist decide the difficulty level of therapy exercises based on the clinical status of the patient.

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Research and Engineering Experience

Research

Jan '19 – present **Postdoctoral Scholar**, *CHARM Laboratory, Mechanical Engineering, Stanford University*, Stanford (CA), USA.

Supervisor: Prof. Dr. Allison M. Okamura

- Design and experimentation of wrist haptic devices.
- psycho-physical experiments with healthy participants for virtual manipulation, and
- psycho-physical experiments with healthy participants for medical training applications.

July '17 – Dec '18 **Postdoctoral Scholar**, *Perceptual Robotics Laboratory, Scuola Superiore Sant'Anna*, Pisa, Italy.

Supervisor: Prof. Dr. Antonio Frisoli

- Teleoperation scenarios using the hand exoskeleton,
- clinical studies using the hand exoskeleton, and
- user studies for haptic perception using the hand exoskeleton.

Nov. '13 – July '17 **Doctoral Research Assistant**, *Perceptual Robotics Laboratory, Scuola Superiore Sant'Anna*, Pisa, Italy.

Supervisor: Assoc. Prof. Dr. Antonio Frisoli

- Design and implementation of a novel underactuated hand exoskeleton for 4 fingers,
- Kinematics analysis of the device to reach pose estimation for finger joints,
- Force control strategies and proxy based rendering control strategies for haptic use, and
- EMG based assist-as-needed control strategies.

Apr. '16 – Dec. '16 **Visiting PhD Fellow**, *Virtual Reality Modelling Group, Universidad Rey Juan Carlos*, Madrid, Spain.

Supervisor: Assoc. Prof. Dr. Miguel A. Otaduy

- Development of proxy-based control strategies to overcome the underactuation,
- Experimental validation of the developed control strategies, and
- Implementing a soft hand haptic rendering simulation using the underactuated hand exoskeleton.

Sept. '11 – Oct. '13 **Graduate Student Research Assistant**, *Human Machine Interaction Laboratory, Sabanci University*, Istanbul, Turkey, Mechatronics.

Supervisor: Assoc. Prof. Dr. Volkan Patoglu

- Design and implementation of series elastic based rehabilitation device called AssistOn-Mobile,
- Design and implementation of the force sensing interface based on compliant mechanisms
- Posture correction algorithm of users while operating AssisOn-Mobile through a motion sensing device Kinect,
- Pose correction algorithm for the device through optic sensors and Kalman filter techniques,
- assist-as-needed exercise scenarios for patients through control, and
- online adaptation of the device's velocity based on the brain activity of users using a BCI system.

June '10 – June '11 **Undergraduate Researcher**, *Robotics Development Laboratory, Yeditepe University*, Istanbul, Turkey, Electrical and Electronics Engineering.

Supervisor: Assoc. Prof. Dr. Duygun Erol Barkana

- Design and implementation of the power system of the rehabilitation system called RehabRoby,
- Position based control techniques to assist users during trajectory following tasks,
- Implementation of the impedance control algorithm with adjustable assistance behavior.

Work

Aug. '10 – Sept. '10 **Undergraduate Intern**, *Military Application Department, NETAS*, Istanbul, Turkey.

Feasibility tests of communication chips and the basic communication tests within each other to be used for military devices.

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June '09 – **Undergraduate Intern**, *SMS Gateway, Mtel Telecommunication Operator*, Banja Luka, Bosnia&Herzegovina, IAESTE Internship.
Aug. '09 Feasibility tests of various communication protocols used for messaging services by Mtel telecommunication operator company.

Awards

- Best Student Paper Award at IEEE World Haptics Conference 2017 held in Munich for the paper "Proxy-based haptic rendering for underactuated haptic devices" by Daniel Lobo, Mine Sarac, Micheal Verschoor, Massimiliano Solazzi, Antonio Frisoli, and Miguel A. Otaduy [C4].

Teaching

- Sept. '11 – **Teaching Assistant**, *Faculty of Engineering and Natural Sciences, Sabanci University*, Istanbul, Turkey.
- June '13
- **(ENS 209) Introduction to Computer Aided Drafting and Solid Modeling:** This course is concerned with the basic and important principles in engineering drawing, computer-aided drafting and design (CADD), geometric models, 3D solid modeling and assembly modeling. My duties were grading exams and homeworks, proctoring, interviewing students about their term projects, attending office hours, and most importantly teaching SOLIDWORKS throughout the semester as a CADD tool. I actively taught SOLIDWORKS for 3 semesters in a classroom of 30 students.
 - **(ME 403) Introduction to Robotics:** This course is designed to teach students how to analytically formulate kinematic and dynamic equations for robot manipulators, how to synthesize trajectory and force tracking controllers, as well as how to utilize numerical algorithms to simulate and real-time hardware-in-the-loop controllers to implement such closed-loop control systems. My duties were preparing homeworks, grading exams and homeworks, proctoring, interviewing students about their term projects, attending office hours, and organizing problem solving sessions before the exams.
- Sept. '10 – **Teaching Assistant**, *Electrical and Electronics Engineering, Yeditepe University*, Istanbul, Turkey.
- June '11
- **(EE 211) Electrical Circuits:** The motivation of this course is to introduce basic circuitry elements, definitions and concepts, such as current and voltage measurements, Kirchhoff's current and voltage equations, time domain circuit analyses and circuit theorems. Most of these concepts are tested as laboratory experiments. My duties were attending the laboratory sessions to assist students performing the tasks and to answer their questions instantly.
 - **(EE 333) Analog Electronic Circuits:** This course is designed to introduce analog electronic concepts such as frequency response, feedback, stability and compensation. To develop ability to analyze and design analog electronic circuits using these concepts and PSpice or MultiSim programs. To conduct related experiments in the laboratory. To develop ability to design an experiment. My duties were attending the laboratory sessions to assist students performing the tasks and to answer their questions instantly.
 - **(EE 354) Communication Systems 1 & 2** The aim of this course is to introduce students the fundamental transmitter and receiver components in a digital communication system. We develop the necessary theoretical background for the students who continue to work on technical elective communications related courses. My duties were attending the laboratory sessions to assist students performing the tasks and to answer their questions instantly.

Mentoring

- Sept. '19 - **Pembe Gizem Ozdil**, *Undergrad Student at Bogazici University, Istanbul, Turkey.*, PhD program
Present applications and final decisions..
Now a PhD student at EPFL, Switzerland.

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- Sept. '19 - **Jasmin Palmar**, *PhD Student at Stanford University, Stanford, CA, USA.*, Lab Rotation - Implementation and validation of a haptic bracelet actuated by servos.
 Jan. '20
 Now a permanent member of Charm Lab to complete her thesis under the supervision of Prof. Dr. Allison M. Okamura.
- June '19 - **Nicole Sabrina Salz**, *Undergrad Student at Stanford University, Stanford, CA, USA.*, SURI Summer project - Implementation and validation of a haptic bracelet actuated by linear DC actuators.
 July '19
- Apr. '19 - **Elizabeth Bibit**, *Master's Student at Stanford University, Stanford, CA, USA.*, Lab Rotation - Implementation and validation of a haptic bracelet actuated by voice coils..
 June '19
 Now a PhD student at University of Pennsylvania.
- Oct. '17 - **Antonio di Guardo**, *Master's Student at Scuola Superiore Sant'Anna.*, Master's Thesis - Design and validation of a telemanipulation architecture for controlling a Schunk robotic hand through an underactuated exoskeleton.
 June '18
 Now software engineer at MMI SpA, Pisa, Italy.

Outreach

- Aug. '19 **Stanford University, CA, USA**, I discussed my research on relocated haptic feedback for virtual manipulation tasks with students from the Stanford Science, Technology and Medicine Summer Program. The discussion was accompanied with hands-on-demonstration for all students. The event was in English.
- May '17, May '18 **Scuola Superiore Sant'Anna, Pisa, Italy**, I discussed the university resources, my academic experience and my research on robot-assisted rehabilitation with last year high school students. The discussion was accompanied with hands-on-demonstration for the students who are interested with engineering. The events were in Italian.
- May '12 **Sabanci University, Istanbul, Turkey**, I discussed the university resources, social life on campus, my academic experience, and my research with last year high school students and their parents. The event was in Turkish.
- May '10 **Yeditepe University, Istanbul, Turkey**, I discussed the university resources, social life on campus, my academic experience, and my research with last year high school students and their parents. The event was in Turkish.

Demonstrations

- 2019 **WHYSKER Grant Meeting**, *Stanford University, CA, USA*, Haptic bracelet during virtual manipulation tasks.
- 2019 **Outreach event**, *Stanford University, CA, USA*, Haptic bracelet during virtual manipulation tasks.
- 2018 **Outreach event**, *Scuola Superiore Sant'Anna, Pisa, Italy*, EMG based bilateral control of an underactuated hand exoskeleton.
- 2018 **Centauro Meeting**, *Karlsruhe, Germany*, Underactuated hand exoskeleton with active backdriveability for teleoperation.
- 2018 **Centauro Meeting**, *Genoa, Italy*, Underactuated hand exoskeleton with active backdriveability for teleoperation.

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- 2017 **Outreach event**, *Scuola Superiore Sant'Anna, Pisa, Italy*, Underactuated hand exoskeleton with active backdriveability.
- 2017 **Centauro Meeting**, *Pisa, Italy*, Underactuated hand exoskeleton with active backdriveability for teleoperation.
- 2017 **Human Machine Interaction Summer School (HMISS)**, *Maratea, Italy*, Underactuated hand exoskeleton with active backdriveability.
- 2017 **World Haptics Conference (WHC)**, *Munich, Germany*, Underactuated hand exoskeleton with active backdriveability.
- 2017 **International Robotic Festival**, *Pisa, Italy*, Underactuated hand exoskeleton with active backdriveability.
- 2016 **Wearhap meeting**, *Genoa, Italy*, Underactuated hand exoskeleton with active backdriveability for teleoperation.
- 2016 **Internet Festival**, *Florence, Italy*, Underactuated hand exoskeleton for physical rehabilitation.
- 2016 **Wearhap meeting**, *Siena, Italy*, Underactuated hand exoskeleton with active backdriveability for teleoperation.
- 2015 **Human Machine Interaction Summer School (HMISS)**, *Monopoli, Italy*, Underactuated hand exoskeleton for physical rehabilitation.
- 2015 **Wearhap meeting**, *Pisa, Italy*, Underactuated hand exoskeleton with active backdriveability for teleoperation.

Funding Supports and Scholarships

- WHYSKER Project, Army grant W81XWH-20-C-0008 via Triton Systems, Inc. (2020 - present)
- Facebook Reality Labs: Analysis and Perception of Apparent Mass Resulting from Skin Stretch Haptic Feedback (2019)
- Industrial Project with Trenitalia (2017 - 2018)
- Centauro Project, grant agreement no 644839 (2016 - 2017)
- EU Project WEARHAP, grant agreement no 601165 (2013 - 2016)
- TUBITAK Project, Brain-Human Interaction for Physical Rehabilitation (2011 - 2013)
- Full education Scholarship, Sabanci University (2011 - 2013)
- NETAS Scholarship, NETAS (2009 - 2010)
- IAESTE Internship Funding, Mobi's (2009)
- Full education Scholarship, Yeditepe University (2006 - 2011)

Professional Service

Reviewer

- IEEE World Haptics Conference (WHC), 2013, 2017, 2019
- IEEE International Conference on Rehabilitation Robotics, 2013
- IEEE International Conference on Robotics and Automation, 2015, 2017

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- IEEE International Conference on Intelligent Robots and Systems (IROS), 2015, 2019
- Transactions on Neural Systems & Rehabilitation Engineering, 2017, 2018, 2019
- Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine, 2019
- MDPI, Sensors, 2019, 2020
- PLOS ONE, 2019, 2020

Organization Committees

- Program Committee Member, International Conference on Intelligent Computing (ICIC), 2020

Professional Workshops and Certificates

2-Day Teaching Workshop for Postdocs, *Stanford University, 2020*, This two-day teaching improvement workshop about learning climate, control of session, communication of goals, promotion of understanding and retention, evaluation of learners, feedback to learners, and promotion of self-directed learning.

Learning How to Learn: Powerful mental tools to help you master tough subjects, *McMaster University, 2020*, This course gives an easy access to the invaluable learning techniques used by experts in art, music, literature, math, science, sports, and many other disciplines.

Professional & Academic Writing, *Stanford University, 2019*, This course focuses on academic writing for publication, with particular attention to learning to write coherently, clearly, and concisely.

Accent Reduction, *Stanford University, 2019*, This class is designed for those whose native language is not English to recognize and practice American English sounds, stress, and intonation patterns in order to improve comprehension and intelligibility.

Skills

- **Programming:** C, QT
- **Working Environment:** MATLAB, Simulink, CHAI3D
- **CAD Environment:** SolidWorks, Creo, Pro/E
- **Writing Environment:** Microsoft Office, LaTeX
- **Adobe Products:** Illustrator, Photoshop, After Effects, Lightroom

Publications

Thesis

[T1], Mine Sarac Stroppa (2017), **Design, Implementation and Control of an Underactuated Hand Exoskeleton**, *PhD Thesis, Scuola Superiore Sant'Anna, Pisa, Italy*.

[T2], Mine Sarac (2013), **Design, Implementation and BCI-Based Control of a Series Elastic Mobile Robot for Home-Based Physical Rehabilitation**, *Master's Thesis, Sabanci University, Istanbul, Turkey*.

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Journals

[J1], Mine Sarac, Tae Myung Huh, Hojung Choi, Mark R. Cutkosky, Massimiliano Di Luca, and Allison M. Okamura **Comparing Perceived Intensities of Normal and Shear Skin Stimuli using a Wearable Haptic Bracelet**, *IN PROGRESS - IEEE Transactions on Haptics (ToH Short Paper)*, 2020.

[J2], Mine Sarac, Massimiliano Solazzi, and Antonio Frisoli **Design Requirements of Generic Hand Exoskeletons and Survey of Hand Exoskeletons for Rehabilitation, Assistive, or Haptic Use**, *IEEE Transactions on Haptics (ToH)*, 12(4), pages 400 - 413, 2019.

[J3], Mine Sarac, Massimiliano Solazzi, Miguel A Otaduy, and Antonio Frisoli **Rendering strategies for underactuated hand exoskeletons**, *IEEE Robotic Automation Letters (RA-L)*, 3, pages 2087–2092, 2018.

[J4], Mine Sarac, Massimiliano Solazzi, Edoardo Sotgiu, Massimo Bergamasco, and Antonio Frisoli **Design and kinematic optimization of a novel underactuated robotic hand exoskeleton**, *Meccanica*, pages 1–13, 2016.

[J5], Mine Sarac, Mehmet Alper Ergin, and Volkan Patoglu **AssistOn-Mobile: A series elastic holonomic mobile platform for upper extremity rehabilitation**, *ROBOTICA*, 32:1433 – 1459, 2014.

Peer-Reviewed Conferences

[C1], Mine Sarac, Daniele Leonardis, Massimiliano Gabardi, Massimiliano Solazzi, Antonio Frisoli **Bilateral Rehabilitation of Hand Grasping with an Underactuated Hand Exoskeleton**, In *International Conference on Neurorehabilitation: Converging Clinical and Engineering Research on Neurorehabilitation III*, pp:205-209, 2018 .

[C2], Antonio Di Guardo, Mine Sarac, Massimiliano Gabardi, Daniele Leonardis, Massimiliano Solazzi, and Antonio Frisoli **Sensitivity analysis and identification of human parameters for an adaptive, underactuated hand exoskeleton**, In *International Symposium on Advances in Robot Kinematics (ARK)*, pp 449-457, 2018 .

[C3], Mine Sarac, Massimiliano Solazzi, Miguel A Otaduy, and Antonio Frisoli **Rendering strategies for underactuated hand exoskeletons**, *IEEE International Conference on Robotics and Automation (ICRA)*, 2018 .

[C4], Daniel Lobo, Mine Sarac, Micheal Verschoor, Massimiliano Solazzi, Antonio Frisoli, and Miguel A. Otaduy . **Proxy-based haptic rendering for underactuated haptic devices**, In *IEEE World Haptics Conference (WHC)*, pages 1–6, 2017 .

[C5], Mine Sarac, Massimiliano Solazzi, Daniele Leonardis, Edoardo Sotgiu, Massimo Bergamasco, and Antonio Frisoli **Design of an Underactuated Hand Exoskeleton with Joint Estimation**, In *Advances in Italian Mechanism Science (pp. 97-105)*. Springer, Cham, 2017 .

[C6], Michele Barsotti, Eduardo Sotgiu, Daniele Leonardis, Mine Sarac, Giada Sgherri, Giuseppe Lamola, Fanciullacci Chiara, Caterina Procopio, Carmelo Chisari, and Antonio Frisoli **A novel approach for upper limb robotic rehabilitation for stroke patients**, In *International Conference on Human Haptic Sensing and Touch Enabled Computer Applications (pp. 459-469)*. Springer, Cham., 2016 .

[C7], Ela Koyas, Mine Sarac, Ahmetcan Erdogan, Mujdat Cetin, and Volkan Patoglu **Design and comparative evaluation of a BCI-based upper extremity robotic rehabilitation protocol**, In *IEEE International Conference on Rehabilitation Robotics (ICORR)*, pages 1–6, 2015 .

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[C8], Mustafa Yalcin, Mine Sarac, and Volkan Patoglu **Ust ekstremite fiziksel rehabilitasyonu için seri elastik holonomik gezgin robot**, In *Türkiye Robotbilim Konferansı (ToRK)*, 2015 .

[C9], Mine Sarac, Ela Koyas, Ahmetcan Erdogan, Mujdat Cetin, and Volkan Patoglu **Brain computer interface based robotic rehabilitation with online modification of task speed**, In *IEEE International Conference on Rehabilitation Robotics (ICORR)*, pages 1–6, 2013 .

[C10], Ela Koyas, Mine Sarac, Ahmetcan Erdogan, Volkan Patoglu, and Mujdat Cetin **Control of a BCI-based upper limb rehabilitation system with posterior probabilities**, In *IEEE Sinyal İşleme ve İletişim Uygulamaları Kurultayı*, 2013 .

[C11], Mine Sarac, Mehmet Alper Ergin, and Volkan Patoglu **AssistOn-Mobile: A series elastic holonomic mobile platform for upper extremity rehabilitation.**, In *IEEE World Haptics Conference (WHC)*, pages 1–6, 2013 .

Book Chapters

[B1], Fabio Stroppa, Mine Sarac Stroppa, Simone Marcheschi, Claudio Loconsole, Eduardo Sotgiu, Massimiliano Solazzi, Domenico Buongiorno, and Antonio Frisoli **Real-time 3D tracker in robot-based neurorehabilitation**, In *Assistive Computer Vision*, Elsevier, 2018.

Work In Progress

[WIP1], Mine Sarac, Allison M. Okamura, and Massimiliano Di Luca **Haptic Sketches on the Arm for Manipulation in Virtual Reality**, In *World Haptics Conference (WHC)*, 2019.

[WIP2], Mine Sarac, Allison M. Okamura, and Massimiliano Di Luca **Effects of Haptic Feedback on the Wrist during Virtual Manipulation**, In *Haptics Symposium*, 2020.

Patents

WO2017145136-A1, Mine Sarac Stroppa, Massimiliano Solazzi, Massimiliano Gabardi, Eduardo Sotgiu, Massimo Bergamasco, and Antonio Frisoli. "Exoskeleton device for the hand".

Personal

- o Married
- o Dual citizen (Turkey and Italy)
- o Multi lingual (native in *Turkish*, fluent in *English*, and intermediate in *Italian*)

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