

# Nili Krausz

I am an early-career assistant professor, motivated to use my knowledge, experience, and expertise to help improve quality of life for individuals with disabilities. My research interests include robotics and neurophysiology for rehabilitation and assistive wearable devices, with emphasis on mechanical design, shared and semi-autonomous control, computer vision, and neural control of human movements, for improved intent recognition and human-machine interaction. Finally, I am passionate about the ability of STEM to help foster social change, personal growth and community development.

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## EDUCATION

### PostDoc, Applied Math and Computer Science

Weizmann Institute of Science

Advisor: Tamar Flash

October 2023

Rehovot, Israel

### PhD, Biomedical Engineering

Northwestern University

Neural Engineering Track, Advisor: Levi J. Hargrove

December 2019

Chicago, IL

### MS, Mechanical Engineering

University of Colorado Denver

Solid Mechanics Track, Advisors: Richard F. ff. Weir & Ronald A.L. Rorrer

May 2013

Denver, CO

### BS, Mechanical Engineering

University of Colorado Denver

Highest Honors

May 2011

Denver, CO

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## ACADEMIC APPOINTMENTS

### Assistant Professor, Department of Mechanical Engineering

Technion, Israel Institute of Technology

Director, Neurobotics and Bionics Lab (NABL)

2024-Present

Haifa, Israel

Brenda and Russell L. Frank Endowed Faculty Fellow

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## RESEARCH EXPERIENCE

### Technion, Israel Institute of Technology

Neurobotics and Bionics Laboratory (NABL): Director

Exploring how insights from robotics and neural control of movement can be used to increase autonomy, coordination, and ease of use of assistive and rehabilitation devices, in particular prostheses and exoskeletons.

Haifa, Israel

2024-Present

### Weizmann Institute Of Science

Motor Control in Humans and Robotics Systems Laboratory: Post Doctoral Researcher

Supervisor: Dr. Tamar Flash

Investigating human motor control and movement coordination to better understand how the nervous system directs the limbs and how impairments result in pathologies of human movement, such as Parkinson's Disease or Cerebellar Ataxia, to ultimately provide assistance or rehabilitation to improve quality of life for individuals with physical disabilities.

Rehovot, Israel

2019-2023

### Shirley Ryan AbilityLab (formerly RIC)

Neural Engineering for Prosthetics and Orthotics Laboratory (NEPOL): PhD Student

Supervisor: Dr. Levi Hargrove, Co-Supervisor: Dr. Todd Kuiken

Investigated the addition of extra-sensing technologies, such as vision and depth, to improve accuracy and safety of existing intent recognition and control algorithms for lower limb prostheses, along with subject-based EMG, kinetics, and kinematics.

Chicago, IL

2013-2019

### École polytechnique fédérale de Lausanne (EPFL)

Learning Algorithms and Systems Laboratory (LASA): Visiting Scholar

Supervisor: Dr. Aude Billard, Co-Supervisor: Dr. Silvestro Micera

Investigated the fusion of gaze and vision with EMG-based predictions of reaching motion targets during pick-and-place tasks for use with upper limb prosthetics. This was a collaboration with the Translational Neural Engineering Lab (TNE) for the Swiss NCCR Grand Challenge on Wearable Robotics.

Lausanne, Switzerland

2015-2016

### Rehabilitation Institute of Chicago (RIC)

Prosthetics Design and Controls Laboratory: Research Intern

Supervisor: Dr. Jon Sensinger

Development of a haptic feedback device for use with upper-limb amputees using a novel mechanism, embedded electronics and an admittance controller for driver-driven teleoperation.

Chicago, IL

Summer 2013

**University of Colorado Denver Anschutz Medical Campus**  
**Biomechatronics Development Laboratory (BDL):** Master's Student  
Supervisor: Dr. Richard Weir

Aurora, CO  
2011-2013

Master's thesis research toward the control and design of articulated upper-limb prostheses, including the design and fabrication of an open source 6 DOF mechatronic hand, a powered thumb for the Bebionic® hand, and development of a testing interface for novel multifunctional prosthesis control algorithms.

**University of Colorado Denver**  
**Tribology and Microfabrication Research Laboratory:** Research Assistant  
Supervisor: Dr. Ronald Rorrer

Denver, CO  
2011-2012

Designed, fabricated, and tested inexpensive nanoparticle-driven microfluidic devices for early detection of heart attacks.

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## HONORS, AWARDS & FELLOWSHIPS

- Brenda and Russell L. Frank Endowed Faculty Fellowship 2024-2026
- Zuckerman STEM Leadership Post Doctoral Fellowship 2019-2023
- Selected for BME Midwest Student Speaker Exchange Program 2018
- Travel Award for IEEE Winter Conference on Applications of Computer Vision (WACV) 2018
- NIH T32 PRND Training Grant 2016-2018
- Swiss National Center of Competence in Research (NCCR) Robotics PhD Exchange Fellowship 2015-2016
- Walter P. Murphy PhD Fellowship 2013-2014
- NSF GK-12 Transforming Experiences Fellowship 2012-2013
- UC Denver Outstanding Graduate Research and Creative Activities Award Winner 2013
- UC Denver Mechanical Engineering Graduate Scholarship 2011-2012
- Finalist for Colorado Engineering Council (CEC) Outstanding Engineering Senior Award 2011
- UC Denver College of Engineering Overall Second Place Senior Design Award 2011
- American Council of Engineering Companies (ACEC) CO First Place Engineering Award 2011
- UC Denver College of Engineering Dean's List 2008-2011
- National Smart Grant Undergraduate Scholarship 2008-2010
- UC Denver Pinnacle Undergraduate Scholarship 2007-2009
- Colorado School of Mines Medal of Achievement in Math and Science 2006

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## JOURNAL PUBLICATIONS

- **N.E. Krausz**, T. Flash, "Movement Coordination during Transfemoral Amputee Gait on Passive and Powered Knee-Ankle Prostheses and Implications for Energetic Cost of Walking," *in preparation*
- **N.E. Krausz**, E.J. Earley, E. Mastinu, "Perspectives and Future Directions in Design, Control, and Biomechanics of Prosthetic Limbs", editorial, *Prosthesis*, Special Issue on "Design, Control, and Biomechanics of Prosthetic Limbs", *in preparation*
- \*A. Barliya, \***N.E. Krausz**, H. Naaman, L. Omlor, M. A. Giese, T. Flash, "The Human Arm Redundancy Problem - A New Approach for the Inverse Kinematic Problem", available on bioRxiv, *in review* (\*co first authors)
- **N.E. Krausz**, L.J. Hargrove, "Sensor Fusion of Vision, Kinetics and Kinematics for Forward Prediction During Walking with a Transfemoral Prosthesis," in *IEEE Transactions on Medical Robotics and Bionics (TMRB)*, Aug. 2021, Vol. 3, No. 3, 813-824
- **N.E. Krausz**, D.M.H. Lamotte, I. Batzionoulis, L.J. Hargrove, S. Micera, A. Billard, "Intent Prediction Based on Biomechanical Coordination Between EMG and Gaze for End-Point Control of an Arm Prosthesis," in *IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE)*, June 2020, Vol. 28, No. 6, 1471-1480
- **N.E. Krausz**, L.J. Hargrove, "A survey of teleceptive sensing for wearable assistive and rehabilitation robotics," in *Sensors*, Special Issue on Sensor Fusion in Assistive and Rehabilitation Robotics, Nov. 2019, Vol. 19, No. 23, 5238
- **N.E. Krausz**, B. Hu, L.J. Hargrove, "Subject-and Environment-Based Sensor Variability for Wearable Lower-Limb Assistive Devices," in *Sensors*, Special Issue on Sensor Fusion in Assistive and Rehabilitation Robotics, Nov. 2019, Vol. 19, No. 22, 4887
- I. Batzionoulis, **N.E. Krausz**, L.J. Hargrove, A. Simon, A. Billard, "Decoding Grasping Intention from Electromyography During Reaching Motions," *Journal of NeuroEngineering and Rehabilitation (JNER)*, Vol 15, No. 57, Jun. 2018
- **N. E. Krausz**, T. Lenzi, L.J. Hargrove, "Depth Sensing for Improved Control of Lower Limb Prostheses", in *IEEE/EMBS Transactions on Biomedical Engineering (TBME)*, Special Issue on Wearable Technology, Vol. 62, No. 11, Nov. 2015, p. 2576 - 2587
- **N.E. Krausz**, R.A.L. Rorrer, R.F. Weir, "Design and Fabrication of a Six Degree-of-Freedom Open Source Hand", in *IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE)*, Vol. 24, No. 5, May 2016, 562-572

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## CONFERENCE PROCEEDINGS

- **N.E. Krausz**, T. Flash, "Asymmetric Changes in Intersegmental Covariation Across Ambulation Levels and Prosthetic Devices for Transfemoral Amputee Gait", *IEEE/EMBS Conference on Neural Engineering (NER)*, Baltimore, MD, 2023
- \*B. Hu, \***N.E. Krausz**, L.J. Hargrove, "A novel method for bilateral gait segmentation and locomotion mode recognition using a single thigh-mounted depth sensor and IMU," *IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob)*, Twente, Netherlands, 2018, Podium Session (**\*co-first authors**)
- **N.E. Krausz**, L.J. Hargrove, "Recognition of Ascending Stairs from 2D Images for Control of Lower Limb Prostheses", in *IEEE/EMBS Conference on Neural Engineering (NER)*, Montpellier, France, 2015

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## ABSTRACTS SELECTED FOR ORAL PRESENTATION

- **N.E. Krausz**, T. Flash, "Improving control of powered prosthetic legs using insights from neural control of movement and robotic vision", *Israel Conference on Robotics*, Herzliya, Israel, 2023
- **N.E. Krausz**, "Environmental Sensing for Improving Performance of Assistive Wearable Robots", *Batsheva de Rothschild conference on Active Sensing*, Rehovot, Israel, 2023
- **N.E. Krausz**, "Novel Control and Intent Recognition Approaches for Lower Limb Prostheses based on Computer Vision," *2018 Midwest Robotics Workshop (MWRW)*, Chicago, IL, 2018
- **N.E. Krausz**, L. J. Hargrove, "Using Vision for Improved Control of Powered Lower Limb Prostheses" in *RIC-IIT Workshop on Robotics & Interactive Technologies for Neuroscience and Rehabilitation*, Arenzano, Italy, 2015
- **N.E. Krausz**, R.A.L. Rorrer, R.F.ff. Weir, "A Six Degree of Freedom Open Source Hand for Evaluating Myoelectric Controls", in *Myoelectric Controls Symposium (MEC)*, Fredericton, NB, Canada, 2014
- T. Hraha, **N.E. Krausz**, J. Reinkensmeyer, "Using Technology to Promote Interdisciplinary Learning in Colorado Middle Schools", *University of Colorado Denver Research & Creative Activities Symposium (RaCAS)*, Denver, CO, 2013

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## ABSTRACTS SELECTED FOR POSTER PRESENTATION

- **N.E. Krausz**, T. Flash, "The effect of power on intersegmental coordination while walking on a knee-ankle prostheses", *IROS 2023 Workshop on "State of the Art in Robotic Leg Prostheses"*, *International Conference on Intelligent Robots and Systems (IROS)*, Detroit, MI, 2023
- **N.E. Krausz**, T. Flash, "Intersegmental Coordination Asymmetries for K2 and K3 Level Transfemoral Amputees walking on Microprocessor Knee-Ankle Prostheses", *Annual Meeting of Society for Neural Control of Movement (NCM)*, Victoria, Canada, 2023
- **N.E. Krausz**, T. Flash, "Motor strategies for resolving kinematic redundancies and preferred coordinate frames in human 3D arm movement tasks", *Batsheva de Rothschild Seminar on Multisensory Integration in Action*, Maalot Tarshiha, Israel, 2022
- **N.E. Krausz**, "Understanding the coordination of gaze, EMG, and motion during targeted pick-and-place tasks for upper-limb prosthesis control", *Neural Control of Movement Annual Meeting, 2020*, Cancelled due to COVID-19
- **N.E. Krausz**, L.J. Hargrove, "Powered Prosthesis Control and Intent Recognition Based on Novel Computer Vision Algorithms," *The Neuromechanics of Rehabilitation for Limb Loss Symposium*, Northwestern University Prosthetics and Orthotics Center (NUPOC), Chicago, IL, 2018
- **N.E. Krausz**, L.J. Hargrove, "Computer Vision for Control and Intent Recognition for Powered Prostheses and Exoskeletons," *IEEE Winter Conference on Applications of Computer Vision (WACV 2018)*, Lake Tahoe, NV, 2018
- **N.E. Krausz**, L. J. Hargrove, " Fusion of Depth Sensing, Kinetics and Kinematics for Intent Prediction of Lower Limb Prostheses," in *IEEE/EMBS Conference of the Engineering in Medicine and Biology Society (EMBC)*, Jeju, South Korea, 2017
- **N.E. Krausz**, D.M.H. Lamotte, I. Batzionoulis, L.J. Hargrove, S. Micera, A. Billard, "Gaze and EMG Coordination During Pick-and-Place Tasks for Improving Upper-Limb Prosthetics Control," in *IEEE/EMBS Conference of the Engineering in Medicine and Biology Society (EMBC)*, Orlando, Florida, 2016
- **N.E. Krausz**, "Gaze and EMG Coordination for Improving Upper-Limb Prosthetics," in *School and Symposium on Advanced Neurorehabilitation (SSNR)*, Baiona, Spain, 2016
- **N.E. Krausz**, T. Lenzi, L.J. Hargrove, "Ascending Stair Recognition using Depth Sensing for Control of Lower Limb Prostheses", in *IEEE/EMBS Conference of the Engineering in Medicine and Biology Society (EMBC)*, Milan, Italy, 2015
- **N.E. Krausz**, L.J. Hargrove, "Comparison of Image Processing Methods for Detection of Ascending Stair Edges for Control of Assistive Devices" in *IEEE/EMBS Conference of the Engineering in Medicine and Biology Society (EMBC)*, Chicago, IL, 2014
- **N.E. Krausz**, R.A.L. Rorrer, R.F.ff. Weir, "A Brief Review of Recently Developed Open Source Prosthetic Hands Using Additive Manufacturing", in *IEEE/EMBS Conference of the Engineering in Medicine and Biology Society (EMBC)*, Chicago, IL, 2014
- **N.E. Krausz**, R.A.L. Rorrer, R.F.ff. Weir, "Six Degree of Freedom Open Source Hand", *University of Colorado Denver Research and Creative Activities Symposium (RaCAS)*, Denver, CO, 2013

- **N.E. Krausz**, et al. "ReadyO<sub>2</sub> Robotic Wheelchair Assistant", *University of Colorado Denver Research and Creative Activities Symposium (RaCAS)*, Denver, CO, 2011

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## PROFESSIONAL/EDITORIAL AFFILIATIONS

- Co-Guest Editor, *Prosthesis Journal*, Special Issue "Design, Control, and Biomechanics of Prosthetic Limbs", [link](#)
- Member of Reviewer Board for *Prosthesis Journal*
- Ad-hoc Reviewer, *Robotics and Automation Letters Journal (RA-L)* 2016-present
- Ad-hoc Reviewer, *Transactions on Neural Systems and Rehabilitation Engineering Journal (TNSRE)*
- Ad-hoc Reviewer, *Transactions on Biomedical Engineering Journal (TBME)*
- Ad-hoc Reviewer, *Transactions on Systems, Man, and Cybernetics Journal (SMCA)*
- Ad-hoc Reviewer, *International Conference on Robotics and Automation (ICRA)*
- Ad-hoc Reviewer, *International Conference on Intelligent Robotics and Systems (IROS)*
- Ad-hoc Reviewer, *Neural Engineering and Rehabilitation (NER)*
- Ad-hoc Reviewer, *Engineering in Medicine and Biology Conference (EMBC)*
- Ad-hoc Reviewer, *Biorobotics Conference (Biorob)*
- Member of *Institute of Electrical and Electronics Engineers (IEEE)*
- Member of *Engineering in Medicine and Biology Society (EMBS)*
- Member of *Robotics and Automation Society (RAS)*
- Member of *International Society of Electrophysiology and Kinesiology (ISEK)*
- *National Engineering Honor Society Tau Beta Pi* Member

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## SKILLS

**Computer:** Python, Matlab/Simulink, Keras/TensorFlow, Solidworks, OpenCV, Arduino, Labview, Some C/C++, Java, Unity

**Engineering/Design:** Machine Learning, Computer Vision, Mid/Low Level Controls, Mechanical Design, FEA, CAD/CAM

**Languages:** Proficient in Hebrew, Conversant in French and Italian, Levantine Arabic, Basic Knowledge of Spanish, Korean

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## VOLUNTEER AND SERVICE EXPERIENCE

- |   |              |
|---|--------------|
| - Code Kevudah Advisory Board   | 2020-Present |
| - Speaker at Evanston Township High School Girls in STEM                                | 2019         |
| - Career Day Speaker at Ida Crown Jewish Academy High School                            | 2017         |
| - Head of the Bnos Tzion Young Women's Learning Group                                   | 2016-2019    |
| - Coordinator of CBM Graduate Student Journal Club and Academic Meetings                | 2016-2018    |
| - Volunteer and Mentor for Get a Grip Outreach Program                                  | 2015-2016    |
| - Science Project Presenter/Mentor at Bernard Zell Anshe Emet Day School                | 2015         |
| - STEAM (Science, Technology, Engineering, Arts, and Math) Summer Camp Presenter        | 2014         |
| - Robert Crown Centers for Health Education Science/Engineering Presenter               | 2014         |
| - Mentor for Dunstan Middle School Science Olympiad Team                                | 2013         |
| - Director for Englewood Leadership Academy Robotics Club                               | 2013         |
| - Volunteer Judge at Colorado MESA (Math, Engineering, Science Achievement) Day         | 2012         |
| - President of UC Denver Chapter of the American Society of Mechanical Engineers (ASME) | 2010-2011    |
| - Secretary of UC Denver Chapter of Engineering Honor Society Tau Beta Pi               | 2010-2011    |

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## PRESS COVERAGE

<https://www.sralab.org/research/labs/bionic-medicine/news/nili-krausz-successfully-defends-phd>

<https://www.icia.org/live-inspired-life-profession-love/>

<http://www.ucdenver.edu/about/newsroom/spotlight/students/Pages/New-Bioengineering-Bachelor's-Degree.aspx>

<http://ucdenverengineeringnews.com/rethinking-prosthetics/>

<https://news.ucdenver.edu/program-makes-science-and-math-fun-for-middle-schoolers/?amp>