
Contact Information	<u>Address:</u> Advanced Platform Technology Center 10701 East Blvd. Louis Stokes Cleveland VA Medical Center Cleveland, OH 44106 Office: Room B-AC 273, T: 216-791-3800 x62926	<u>Email:</u> skh63@case.edu <u>Web:</u> VA , Scholar
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Education	Cleveland State University (CSU) , Cleveland, Ohio, USA Washkewicz College of Engineering Doctor of Engineering (D. Engr.) in Mechanical Engineering <ul style="list-style-type: none"> • Thesis: Neuromuscular Reflex Control for Prostheses and Exoskeletons • Advisor: Antonie J. van den Bogert, Ph. D. B. Sc. In Mechanical Engineering	2013-2018 2010-2013 2006-2010
	Cuyahoga Community College , Parma, Ohio, USA A. S.	

Research Experience and Appointments	Research Associate School of Medicine Case Western Reserve University Cleveland, Ohio, USA	Mar. 2023 – Present
	Investigator Advanced Platform Technology Center Louis Stokes Cleveland VA Medical Center Cleveland, Ohio, USA	Oct. 2021 – Present
	Postdoctoral Fellow NIH T32 Musculoskeletal Health Postdoctoral Training Grant School of Medicine Case Western Reserve University Cleveland, Ohio, USA	Apr. 2021 – Mar. 2023
	Postdoctoral Scholar Department of Biomedical Engineering Case Western Reserve University Cleveland, OH, USA	July 2018 – Mar. 2020

Grants and Funding	Surface Stimulation System to Augment Exoskeleton-based Rehabilitation Craig H. Neilsen Foundation, SCIRTS Postdoctoral Fellowship Budget: \$200,000 Role: PI	July 2023 – July 2025
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**Grants and
Funding
(continued)**

**Surface Stimulation System to Augment Exoskeleton-based
Rehabilitation**

Aug. 2022 – Aug.
2023

Awarded By: Advanced Platform Technology Center
Steven A. Garverick Innovation Incentive Program
Budget: \$10,000
Role: PI

**Investigating Fall Mitigation and Recovery Strategies when Walking
with an Exoskeleton for Users with Spinal Cord Injuries**

April 2021 – Mar.
2023

Awarded By: NIH T32 Musculoskeletal Health Postdoctoral Training Grant
PI: Ronald J. Triolo
Budget: \$55,000 Stipend
Role: Postdoctoral Trainee

**Peer-Reviewed
Journal
Publications**

1. **S. K. Hnat** and R. Nataraj. *Muscle model control of knee joint torque in a powered lower-body orthosis*. Part H: Journal of Engineering in Medicine. 237(3): 348-358, 2023.
2. A. D. Koelewijn, M. Audu, A. J. del-Ama, A. Colucci, J. M. Font-Llagunes, A. Gogeoascoechea, **S. K. Hnat**, N. Makowski, J. C. Moreno, M. Nandor, R. Quinn, M. Reichenbach, R.-D. Reyes, M. Sartori, S. R. Soekadar, R. Triolo, M. Vermehren, C. Wenger, U. S. Yavuz, D. Fey, P. Beckerle. *Adaption Strategies for Personalized Gait Gait Neuroprosthetics*. Frontiers in Neurorobotics. 2021; 15.
3. **S. K. Hnat**, M. L. Audu, R. J. Triolo, and Roger D. Quinn. *Estimating COM Kinematics during Perturbed Standing using Accelerometers*. Journal of Applied Biomechanics. 37(5): 415-424, 2021.
4. **S. K. Hnat**, B. J. H. van Basten, and A. J. van den Bogert. *Compensation for Inertial and Gravity Effects in a Moving Force Platform*. Journal of Biomechanics, 75: 96-101, 2018.
5. J. K. Moore, **S. K. Hnat**, and A. J. van den Bogert. *An elaborate data set on human gait and the effect of mechanical perturbations*. PeerJ 3:e918, 2015.
6. **S. K. Hnat** and A. J. van den Bogert. *Inertial Compensation for Belt Acceleration in an Instrumented Treadmill*. Journal of Biomechanics, 47(15): 3758 – 3761, 2014.

**Invited Talks,
Conference
Presentations,
and Seminars**

1. **S. K. Hnat**, *Balance Control and Fall Mitigation for Powered Exoskeletons*. Advanced Platform Technology Center Monthly Town Hall, February 7, 2022.
2. **S. K. Hnat**. *Balance Control for a Hybrid Neuroprosthesis for Users with Spinal Cord Injury*. Zoom. T32 Musculoskeletal Research Program Seminar Series, Case Western Reserve University, February 9, 2022.
3. **S. K. Hnat**. *Suggestions for Writing User-Friendly Code*. Motion Study Laboratory Seminar, Louis Stokes Cleveland VA Medical Center, March 8, 2022.
4. **S. K. Hnat**. *Surface Stimulation System to Augment Exoskeleton-based Rehabilitation*. Advanced Platform Technology Center, Steven Garverick Innovation Incentive Proposal, July 11, 2022.
5. **S. K. Hnat**. *Balance Control Strategies for a Hybrid Neuroprosthesis*. Zoom. NEC Seminar, Case Western Reserve University, August 5, 2022.

**Invited Talks,
Conference
Presentations,
and Seminars
(continued)**

6. **S. K. Hnat.** *A Muscle-First Motor-Assisted Hybrid Neuroprosthesis (MAHNP) to Restore Gait and Balance for Users with Paralysis.* MetroHealth Center for Rehabilitation Research Seminar, Brooklyn, OH. October 5, 2022.
7. **S. K. Hnat.** *A Muscle-First Motor-Assisted Hybrid Neuroprosthesis (MAHNP) to Restore Gait and Balance for Users with Paralysis.* Center for Human-Machine Systems Seminar. Cleveland State University, November 30, 2021.
8. **S. K. Hnat,** *A Muscles-First Motor-Assisted Neuroprosthesis (MAHNP) to Restore Gait for Users with Spinal Cord Injury.* Breakthroughs in Orthopedic Rehabilitation. Cleveland, OH, USA, October 2021.
9. **S. K. Hnat.** *Balance Control and Fall Prevention in a Hybrid Exoskeleton.* Motion Study Laboratory Seminar, Louis Stokes Cleveland VA Medical Center, May 11, 2021.
10. **S. K. Hnat.** *A Muscle-First Motor-Assisted Hybrid Neuroprosthesis (MAHNP) to Restore Gait for Users with Paralysis.* NEC Seminar, Case Western Reserve University, May 7, 2021.
11. **S. K. Hnat,** Ryan-David Reyes, Mark Nandor, Nathan Makowski, Rudolf Kobetic, Musa Audu, Ronald Triolo, Roger Quinn. *A Muscle-First Motor-Assisted Hybrid Neuroprosthesis to Restore Gait for Users with Paralysis.* International IEEE EMBS Conference on Neural Engineering. Virtual, May 4, 2021.
12. **S. K. Hnat.** *Investigating Fall Mitigation and Recovery Strategies when Walking with an Exoskeleton for Users with Spinal Cord Injuries.* T32 Musculoskeletal Research Program Seminar Series, Case Western Reserve University, February 3, 2021.
13. **S. K. Hnat.** *Estimating Center of Mass Kinematics during Human Standing using Inertial Measurement Units.* NEC Seminar, Case Western Reserve University, May 17, 2019.
14. **S. K. Hnat.** *Estimating Center of Mass using Accelerometers.* Motion Study Laboratory Seminar, Louis Stokes Cleveland VA Medical Center, April 16, 2018.

**Conference
Papers,
Abstracts, and
Posters**

1. John Niezgod, Musa L. Audu, **Sandra K. Hnat.** *Developing a Preliminary Fall Classification Algorithm for Detecting and Classifying Incipient Falls for a Hybrid Exoskeleton.* American Society of Biomechanics Midwest Meeting, Cleveland State University, Cleveland, OH, September 2023.
2. Sydney Mountcastle, Ronald Triolo, Roger Quinn, and **Sandra Hnat.** *Crash Test Exoskeleton for Assessing Potential Fall Injury.* Biomedical Engineering Society, San Antonio, TX, USA October 2022.
3. **Sandra K. Hnat,** Musa L. Audu, Ronald J. Triolo, Roger D. Quinn. *Balance Control Strategies for a Hybrid Neuroprosthesis.* Northeast Ohio Musculoskeletal Research Summer Symposium. Cleveland, OH, August 2022.
4. **Sandra K. Hnat,** Ryan-David Reyes, Mark Nandor, Nathan Makowski, Musa Audu, Ronald Triolo, Roger Quinn. *Iterative Learning Control and Balance Control for Walking in a "Muscles-First" Motor-Assisted Hybrid Neuroprosthesis.* 50th Annual Meeting, Neuroscience 2021. Virtual, November 2021.
5. **Sandra K. Hnat,** Ryan-David Reyes, Mark Nandor, Nathan Makowski, Rudolf Kobetic, Musa Audu, Ronald Triolo, Roger Quinn. *A Muscle-First Motor-Assisted Hybrid Neuroprosthesis to Restore Gait for Users with Paralysis.* International IEEE EMBS Conference on Neural

Engineering. Virtual, May 2021.

**Conference
Papers,
Abstracts, and
Posters
(Continued)**

6. R. Quinn, M. Audu, R. Triolo, R.-D. Reyes, M. Nandor, **S. Hnat**, C. Liu, N. Makowski. *Integrated Control of Biological and Mechanical Power for Standing Balance and Gait Stability after Paralysis*. NSF Cyber-Physical Walking Systems Principal Investigators' Meeting. Virtual, June 2021.
7. **S. K. Hnat**, M. L. Audu, R. J. Triolo. Estimating Center of Mass Kinematics during Human Walking using Accelerometers. Dynamic Walking. Virtual, May 2020.
8. **S. K. Hnat**, M. L. Audu, and R. J. Triolo. *Estimating Center of Mass Kinematics during Human Standing using Inertial Measurement Units*. Biomedical Engineering Society, Philadelphia, PA, USA, October 2019.
9. R. Quinn, M. Audu, R. Triolo, M. Nandor, **S. Hnat**, C. Liu. *Integrated Control of Biological and Mechanical Power for Standing Balance and Gait Stability after Paralysis*. NSF Cyber-Physical Walking Systems Principal Investigators' Meeting. Arlington, VA, USA, November 2019.
10. **S. K. Hnat** and A. J. van den Bogert. *Are Virtual Muscles and Reflex Control Capable of Describing Variations within the Human Gait Cycle?* American Society of Biomechanics Midwest Meeting, Grand Valley State University, Grand Rapids, Michigan USA, February 2017.
11. **S. K. Hnat** and A. J. van den Bogert. *Virtual Muscles and Reflex Controllers are Capable of Describing Human Gait and Responses to Perturbation*. Dynamic Walking, Camp Ohiyesa, Holly, Michigan, USA, June 2016.
12. **S. K. Hnat** and A. J. van den Bogert. *A Real-Time Virtual Muscle System for Prosthesis Control*. Dynamic Walking, The Ohio State University, Columbus, Ohio USA, July 2015.
13. **S. K. Hnat** and A. J. van den Bogert. *Real-Time Virtual Muscle Control for Prostheses and Exoskeletons*. 25th Congress of the International Society of Biomechanics, The Scottish Exhibition and Conference Center, Glasgow, Scotland, July 2015.
14. **S. K. Hnat** and A. J. van den Bogert. *A Real-Time Virtual Muscle Controller for Powered Prostheses*. American Society of Biomechanics Midwest Meeting, The University of Akron, Akron, Ohio USA, February 2015.
15. **S. K. Hnat** and A. J. van den Bogert. *Inertial Compensation in Moving Force Plates*. World Congress of Biomechanics, Hynes Convention Center, Boston, Massachusetts, USA, July 2014.
16. J. K. Moore, **S. K. Hnat**, and A. J. van den Bogert. *Identification of Human Control during Walking*. Dynamic Walking, ETH Zurich, Zurich, Switzerland, June 2014.
17. **S. K. Hnat** and A. J. van den Bogert. *Inertial Compensation in Moving Force Plates*. American Society of Biomechanics Midwest Meeting, The University of Akron, Akron, Ohio USA, February 2014.

**Honors and
Awards**

Wen Ko Summer Internship Program, 2023

Advanced Platform Technology Center

Louis Stokes Cleveland VA Medical Center

Mentored student John Niezgoda received 1st place in Poster

Title: *Developing a Preliminary Fall Classification Algorithm for Detecting and Classifying Incipient Falls for a Hybrid Exoskeleton*

Sandra K. Hnat

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Honors and Awards (continued)

Poster Award for Postdoctoral Researchers, 2022
Northeast Ohio Musculoskeletal Research Summer Symposium
Case Western Reserve University
2nd Place in Poster Competition
Title: *Balance Control Strategies for a Hybrid Neuroprosthesis*

Wen Ko Summer Internship Program, 2022
Advanced Platform Technology Center
Louis Stokes Cleveland VA Medical Center
Mentored student Sydney Mountcastle received 2nd place in Poster Competition
Title: *Crash Test Exoskeleton For Assessing Potential Fall Injury*

Kefka Research Award, 2017
Cleveland State University
1st Place Mechanical Engineering Research Poster, \$300
Title: *Neuromuscular Reflex Controllers can Describe Human Gait and Responses to Perturbation*

Research Day Poster Competition, 2016
Cleveland State University
2nd Place in Poster Competition, \$200
Title: *A Real-Time Virtual Muscle System for Prosthesis Control*

David A. Winter Young Investigator Award, 2015
International Society of Biomechanics Conference, Glasgow, Scotland
(One of three finalists)

Parker Hannifin Graduate Research Fellowship, 2013
Cleveland State University, Annual Stipend \$25,000
Dissertation: *Virtual Muscle and Reflex Control for Prostheses*

Teaching

S. K. Hnat. *Biomechanical Prosthetic Systems.* Department of Biomedical Engineering. Case Western Reserve University. April 2023. (Guest Lecture)

S. K. Hnat. *Gait and Biomechanics Lecture.* MetroHealth Center for Rehabilitation, Brooklyn, OH. December 2021. Physical Medicine and Rehabilitation Residents.

S. K. Hnat. *Gait and Biomechanics Lecture.* MetroHealth Center for Rehabilitation, Brooklyn, OH. June 2020. Physical Medicine and Rehabilitation Residents.

Differential Equations for Engineers
Cleveland State University
Fall 2019 – Spring 2020

Mentorship

John Niezgoda
Mechanical Engineering Undergraduate Student
Wen Ko Summer Internship, 2022
Advanced Platform Technology Center, Louis Stokes Cleveland VA Medical Center

- *Project:* Developing a Preliminary Fall Classification Algorithm for Detecting and Classifying Incipient Falls for a Hybrid Exoskeleton

Nathan O’Gara
Mechanical Engineering Undergraduate Student
Case Western Reserve University

**Mentorship
(continued)**

- *Project:* Development of an Actuated Orthosis for a Hybrid Exoskeleton for Users with High-Level Spinal Cord Injury

Yawad Sbihi Mohammad

Biomedical Engineering Undergraduate Student
Case Western Reserve University

- *Project:* Surface Stimulation System to Augment Exoskeleton-based Rehabilitation

Anaya Hertzler

Biomedical Engineering Undergraduate Student
Case Western Reserve University

- *Project:* Powered Ankles for Restoring Upright Posture in a Motor-Assisted Hybrid Neuroprosthesis

Sydney Mountcastle

Biomedical Undergraduate Student
Wen Ko Summer Internship, 2022
Advanced Platform Technology Center, Louis Stokes Cleveland VA Medical Center

- *Project:* Crash Test Exoskeleton for Assessing Potential Fall Injury

Women in Stem Research (WISR) Mentorship Program (2020)

- Christina Dang

Women in Science and Humanities Earning Doctorates (WISHED) Connect Her Mentorship Program (2019)

- Natalie Mueller

**Professional
Service**

Conference Service:

- Northeast Ohio Musculoskeletal Research Summer Symposium Organizer (2022)
- T32 Musculoskeletal Seminar Schedule Organizer (2021-2023)

Served as Judge:

- Wen Ko Summer Research Symposium (2022)
- Senior Projects SOURCE Intersections Judge and Moderator (2019 –)
Case Western Reserve University

Invited Manuscript Reviewer:

- Journal of Biomechanics
- IEEE Access
- BMC Musculoskeletal Disorders
- Journal of Neuroengineering and Rehabilitation (JNER)
- PLOS One
- Journal of Rehabilitation and Assistive Technologies Engineering (RATE)
- Archives of Physical Medicine and Rehabilitation (PMR)

Served as Reviewer

VA SPiRE Program (2018—)
VA CDA Program (2019—)
VA Merit Review Program

Organizations and Committees

- Reproductive Health Retention and Recruitment Working Group (2022-)
Case Western Reserve University
Postdoctoral Representative

**Professional
Service
(Continued)**

- PostDoctoral Association (2019—2020)
Case Western Reserve University
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**Professional
Memberships**

American Society of Biomechanics, 2015—
International Society of Biomechanics, 2014—
Biomedical Engineering Society, 2019—