

VARUN NALAM

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EDUCATION

Arizona State University
PhD in Mechanical Engineering

August 2015 - May 2020
CGPA: 4.0/4.0

Indian Institute of Technology, Madras
B.Tech and M.Tech in Mechanical Engineering.

July 2009 - May 2014
CGPA: 7.89/10.00

RESEARCH EXPERIENCE

Neuromuscular Modeling of Human Ankle

August 2015 - May 2020

- Developed a neuromuscular model of the ankle using a robotic platform that would serve as a basis for lower limb exoskeletons and rehabilitation protocols
- Developed a robotic platform capable of simulating various environments and analyzing ankle behavior while humans interact with these environments.

Ankle Rehabilitation in Stroke Survivors

August 2018 - December 2018

- Conceptualized, implemented and validated a robotic training protocol aimed at improving paretic ankle motor control in stroke survivors.
- The 6 week study resulted in improvements in both the test subjects as observed in kinematic and clinical evaluations.

Flexible Robotic Endoscope for Cardiac Surgery

October 2014 - July 2015

- Developed the embedded system and control algorithm of a novel flexible endoscope designed to reduce recovery time and complexity of cardiac surgeries.

Intelligent Continuous Monitoring and Remote Diagnostic System for the Elderly at Risk of Falls

January 2015 - July 2015

- Developed a sensor network and a pattern recognition algorithm that can predict falls in elderly populations of Singapore.

Development of Motion Adaptation Device

May 2013 - May 2014

- Developed a device that can analyze, record and adapt human hand motion to different robotic systems. Demonstrated the utility of the system by controlling a 6 DoF Robotic Arm.

Portable Gait Analysis and Rehabilitation System

May 2013 - May 2014

- Developed an economic device costing \$40 for gait rehabilitation in low income countries by implementing the embedded system and a learning algorithm for abnormality detection.

FIRA Robosoccer

May 2011 - May 2013

- Represented the country and Led a Team of 11 members at FIRA, an International Robosoccer competition by leading the development of a multi-agent system including embedded systems, controllers and decision making algorithms

TECHNICAL EXPERTISE

Embedded Systems
Software
Languages

STM32, ATMEGA, Simulink Real Time Systems, RTOS
Solidworks, EAGLE, SIMULINK, MATLAB, LabVIEW
C, C++, Python

JOURNAL PUBLICATIONS

- V. Nalam and H. Lee, “Development of a two-axis robotic platform for the characterization of two-dimensional ankle mechanics,” *IEEE/ASME Transactions on Mechatronics*, vol. 24, no. 2, pp. 459–470, 2019.
- L. Hennington, V. Nalam, M. C. Eikenberry, C. L. Kinney, and H. Lee, “Visuomotor ankle training on a stiffness-controlled robotic platform improves ankle motor control and lower extremity function in chronic stroke survivors,” *IEEE Transactions on Medical Robotics and Bionics*, vol. 1, no. 4, pp. 237–246, 2019.
- Z. Li, M. Zin Oo, V. Nalam, V. Duc Thang, H. Ren, T. Kofidis, and H. Yu, “Design of a novel flexible endoscope—cardioscope,” *Journal of Mechanisms and Robotics*, vol. 8, no. 5, 2016.
- E. Adjei, V. Nalam, and H. Lee, “Sex differences in human ankle stiffness during standing balance,” *IEEE Transactions on Biomedical Engineering*, submitted, 2020.
- V. Nalam, E. Adjei, and H. Lee, “Modeling of 2d human ankle stiffness during standing balance,” To be submitted, 2020.
- V. Nalam and H. Lee, “Development of a task and environment independent model of human ankle stiffness along sagittal plane,” To be submitted, 2020.

CONFERENCES

- L. Hennington, V. Nalam, M. C. Eikenberry, C. L. Kinney, and H. Lee, “Robotic ankle training during standing on a compliant surface improves paretic ankle motor control, postural balance, and walking in chronic stroke survivors,” in *The 27th Congress of the International Society of Biomechanics (ISB 2019) / The 43rd Annual Meeting of the American Society of Biomechanics (ASB 2019)*, Calgary, Aug. 2019.
- V. Nalam and H. Lee, “Environment-dependent modulation of ankle impedance during the stance phase of walking,” in *The 27th Congress of the International Society of Biomechanics (ISB 2019) / The 43rd Annual Meeting of the American Society of Biomechanics (ASB 2019)*, Calgary, Aug. 2019.
- V. Nalam, M. C. Eikenberry, C. L. Kinney, D. Wingerchuck, and H. Lee, “Robotic approach to characterize altered ankle mechanics affected by stroke and multiple sclerosis,” in *The 42nd Annual Meeting of the American Society of Biomechanics (ASB 2018)*, Minnesota, Aug. 2018.
- V. Nalam, T. Bitz, and H. Lee, “Environment-dependent modulation of human ankle stiffness during upright postural balance,” in *The 42nd Annual Meeting of the American Society of Biomechanics (ASB 2018)*, Minnesota, Aug. 2018.
- V. Nalam and H. Lee, “Environment-dependent modulation of human ankle stiffness and its implication for the design of lower extremity robots,” in *2018 15th International Conference on Ubiquitous Robots (UR)*, IEEE, 2018, pp. 112–118.
- V. Nalam, R. Lodes, D. Shah, and H. Lee, “Quantification of energetic passivity of the human ankle in 2 degrees-of-freedom,” in *2017 BMES Annual Meeting (BMES 2017)*, BMES, Phoenix, Oct. 2017.
- V. Nalam and H. Lee, “A new robotic approach to characterize mechanical impedance and energetic passivity of the human ankle during standing,” in *2017 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, IEEE, 2017, pp. 4123–4126.
- V. Nalam and H. Lee, “Design and validation of a multi-axis robotic platform for the characterization of ankle neuromechanics,” in *2017 IEEE International Conference on Robotics and Automation (ICRA)*, IEEE, Singapore, 2017, pp. 511–516.

V. Nalam and H. Lee, "Development of a multiple axis robotic platform for ankle studies," in *ASME 2016 Dynamic Systems and Control Conference*, American Society of Mechanical Engineers Digital Collection, 2016.

V. Nalam and P. Manivannan, "Development of a contact based human arm motion analysis system for virtual reality applications," in *Applied Mechanics and Materials*, Trans Tech Publ, vol. 592, 2014, pp. 2139–2144.

ACADEMIC ACHIEVEMENTS

- Awarded Outstanding Research Award for work on improving ankle motor control in patients affected by stroke by Graduate and Professional Student Association, ASU (2019).
- Best student paper at IEEE International Conference on Ubiquitous Robots, 2018.
- Awarded the ASU Athletics Research Grant for research on Neuromuscular Analysis of the Human Ankle (2018-2019).
- Awarded the Graduate College travel grant and multiple GPSA travel grants to present my research at ICRA 2017, ASB 2018 and ASB 2019.

LEADERSHIP ROLES

Co-founder, Sol Robotics

October 2019 - May 2020

- Co-Founder and technical lead for an early stage robotic venture incubated at Intel
- Part of a 4 member team which was selected into the final 8 out of 600 potential ventures

GPSA Assembly Member and Engineering Committee Chair

April 2018 - February 2020

- Elected to represent IRA Fulton Schools of Engineering as an assembly member in the graduate student government at ASU.
- Founded Engineering committee to better serve graduate engineering students and advocate for mental wellness initiatives for PhD students.

Research Engineer at SINAPSE, National University of Singapore

October 2014- July 2015

- The lead controls engineer for multiple robotic surgical devices in a team comprising of surgeons, engineers and designers.
- Developed a novel control mechanism that can be intuitively learned by surgeons with minimal training while mentoring 4 undergraduate interns.

CFI Administration and Student Relations Core

2011 - 2014

- CFI is a student run initiative which nurtures technical creativity and provides the necessary guidance and resources for the students of IIT Madras to pursue their endeavors in engineering.
- Coordinated a 3 phase strategy which increased the number of successful student driven innovative projects from 5 to 12 in 2014.

EXTRACURRICULAR ACTIVITIES

- Volunteered at ASU Rehabilitation Robotics Workshop and ASU Southwest Robotics Symposium, which is a platform for showcasing robotics research at ASU. (2016-2018)
- Volunteered as a student panelist at the International Students Orientation, to help international students get acclimatized to the university. (2017)
- Volunteered at the Carnival for MS, organized in Tempe for spreading awareness about Multiple Sclerosis. (2017)

REFERENCES

Dr. Hyunglae Lee

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Dr. Thomas Sugar

Professor,
The Polytechnic School
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Dr. Panagiotis Artemiadis

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Mechanical Engineering
University of Delaware
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