VARUN NALAM

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EDUCATION

Arizona State University *August 2015 - May 2020*
PhD in Mechanical Engineering CGPA: 4.0/4.0
Indian Institute of Technology, Madras *July 2009 - May 2014*
B.Tech and M.Tech in Mechanical Engineering. CGPA: 7.89/10.00

RESEARCH EXPERIENCE

Reinforcement Learning Based Gait Assistance using Hip Exoskeleton *September 2020 - present*

- Developing gait assistance algorithms for proprietary hip exoskeleton using Least Squares Policy Iteration
- The algorithms would reduce human exertion during walking without sacrificing efficiency.

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
- The model is shown to predict human ankle behavior during various tasks in a wide range of functional 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 Through 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 for cardiac surgeries.
- The device is expected to reduce the recovery time and complexity of micro invasive cardiac surgeries.

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 successfully 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.

TECHNICAL EXPERTISE

Embedded Systems	STM32,ATMEL,Simulink Real Time Systems,RTOS, TwinCAT
Software	Solidworks, EAGLE, SIMULINK, MATLAB, LabVIEW
Languages	C,C++,Python

JOURNAL PUBLICATIONS

V. Nalam, E. Adjei, and H. Lee, "Quantification and modeling of ankle stiffness during standing balance," *IEEE Transactions on Biomedical Engineering*, 2020.

E. Adjei, V. Nalam, and H. Lee, "Sex differences in human ankle stiffness during standing balance," *Frontiers in Sports and Active Living*, vol. 2, 2020.

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.

V. Nalam and H. Lee, "Development of a task and environment independent model of human ankle stiffness along sagittal plane," To be submitted, 2021.

CONFERENCES

V. Nalam, E. Adjei, J. Russel, M. C. Eikenberry, D. Wingerchuck, and H. Lee, "Robotic approach to characterize ankle stiffness in multiple sclerosis patients during standing and walking," in *International Conference on Neurorehabilitation (ICNR 2020)*, Virtual, Oct. 2020.

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 Ubiqutous 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 to12 in 2014.

REFERENCE CONTACT DETAILS

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