NIVEDITHA CHANDRASEKAR KALAVAKONDA

www.nivedithakalavakonda.com
E-mail: nkalavak@uw.edu

SUMMARY OF QUALIFICATIONS

- Researcher in the field of robotics and computer vision, focusing on human-machine interaction
- Other skills include virtual/augmented/mixed reality development and prototyping haptic devices
- Acquired funding of $100,000 for starting research on collaborative robotics for surgery
- Worked with diverse teams at research labs in Italy, Japan, India and the United States

INTERESTS

- Computer Vision
- Robotics
- Virtual Reality/Augmented Reality
- Sequence Modelling

SOFTWARE SKILLS

Languages (Fluent): Python, C++, C#, MATLAB, Git, C, LaTeX, Mathematica
Languages (Familiar): CUDA, Node.js, CSS, HTML, Java, Assembly
Frameworks and tools: Unity3D, TensorFlow, PyTorch, OpenGL, Robot Operating System (ROS), Maya3D, Blender, SolidWorks, Gazebo, Photoshop, Illustrator
Fabrication: 3D printing, laser cutting, PCB etching

EDUCATION

University of Washington, School of Engineering, Seattle, WA (Expected June, 2021)
Doctor of Philosophy, Electrical and Computer Engineering (GPA: 3.87/4)
University of Washington, School of Engineering, Seattle, WA (June, 2017)
Master of Science in Engineering, Electrical Engineering (GPA: 3.84/4)
Dissertation: *Isosurface visualization using augmented reality for improving tumor resection outcomes*
Amrita School of Engineering, Coimbatore, India (May, 2014)
Bachelor of Technology, Electronics and Communication Engineering (GPA: 8.31/10)
Dissertation: *Digitization of linearized thermistor output using dual slope Analog to Digital Converter*

RELEVANT RESEARCH EXPERIENCE

Research Intern, New Experiences Group, NVIDIA Research, Durham – NC (June, 2018 – Sept, 2018)

- Developing an alternative input mechanism on augmented reality headsets by understanding spatial and temporal dependencies in human-object interaction
- Devised design parameters for synthetic object pose estimation dataset generated using Unreal Engine and a custom plugin

Graduate Research Assistant, Biorobotics Lab, University of Washington – Seattle (March, 2017 – Present)

- **Amazon Catalyst Fellow**; Project: Intelligent Surgical Assistant
- Generated neurosurgical instrument segmentation dataset (currently open source) and instrument tracking dataset (video and audio) for robot learning from human-human collaboration
- Developed a custom U-net convolutional neural network architecture for surgical instrument segmentation and identification. (Language: Python)
- Implemented and performed a comparative analysis on automated audio transcription of surgeon utterances using three different speech APIs

Lead Developer, Kaiho Pasu, Chennai, India **(Oct, 2016 – Present)**

- Performed research analysis on government school curriculum and learning outcomes for children in shelter homes
- Develop interactive games to run on kiosk for children in shelter home, bridging learning gap in Mathematics and Science. (Github: Link)

Graduate Research Student, Biorobotics Lab, University of Washington - Seattle **(Jan, 2016 – March, 2017)**

- Designed a surgical simulator for intraoperative volume registration of Skull Base using HoloLens
- Evaluated low-cost real-time tracking of multiple instruments for Skull Base Surgery using lighthouse tracking system from Valve

Summer Student, Altair Robotics Lab, University of Verona, Italy **(Sept, 2016)**

- Prototyped haptic interface to differentiate tumor tissue from healthy tissue in virtual simulator developed on Gazebo
- Developed module to semi-autonomously segment tumor in B-mode ultrasound images

Summer Student, Human-Robot Informatics Lab, Tohoku University, Japan **(July, 2016 – Aug, 2016)**

- Devised and demonstrated haptic module for real-time feedback during upper limb rehabilitation exercise
- Updated visual feedback feature on Unity Game Engine using C# (Github)

Project Associate, Robotics Lab, Indian Institute of Technology – Madras **(Aug, 2014 – Sept, 2015)**

- Developed virtual reality based simulator for teleoperation in surgical robots using Unity Game Engine
- Successfully integrated Phantom Haptic device with virtual environment for laparoscopic surgery
- Programmed an interface between slave arm of custom surgical robot and Phantom Haptic Device

Research Intern, Robotics Lab, Indian Institute of Technology – Madras **(June, 2014 – July, 2015)**

- Implemented scenes in Simulation Open Framework Architecture (SOFA) for laparoscopic procedures
- Designed User Interface (UI) for simulator using Qt and C++

TEACHING & MENTORSHIP EXPERIENCE

Teaching Assistant, College of Engineering, University of Washington - Seattle

- Course: EE447 Control System Analysis I (Sept, 2016 – Dec, 2016; Sept, 2018 - Present)
- Course: EE271 Digital Circuits and Systems (Mar, 2018 – June, 2018)
- Course: EE448-9 Controls Capstone (Jan, 2016 – June, 2016; Jan, 2017 – Mar, 2017)
- Course: ENGR202 Introduction to Engineering (June, 2016 – July, 2016)

Undergraduate Research Mentor, University of Washington - Seattle

- Generate projects of appropriate scope for undergraduate students; meet regularly to provide technical and logistical guidance for students; assist students in learning to properly propose research objectives, track their progress, and document their results. (Undergraduate Researchers: Yicheng Wang, Aman Dutta, Shaobin Wang)

Undergraduate Research Mentor, R.M.K Engineering College, Chennai – India

- Mentor 6 undergraduate women in Computer Science with interests in Robotics and Virtual Reality by introducing relevant literature to projects of interest, tracking progress and collaborating on publications. (Sreeja Vaddi, S. Varsha, Arthi Jennifer, Lakshmipriya Selvaraj, P. Preethi, Chadipiralla Sai Varsha)

RELEVANT PROJECTS

1. A platform for evaluating the benefit of virtual travel for Alzheimer patients
    - Developed three scenes modeling levels of difficulty for evaluating travel for patients with Alzheimer's in collaboration with Booz-Allen Hamilton

- Integrated a passive Brain-Computer Interface for patient evaluation using MUSE Electroencephalography (EEG) device
- Developed analysis of EEG response on Tableau for studying stimuli-response correlation

2. Biofeedback design for myoelectric prosthesis training
    - Prototyped and tested three types of haptic devices to train new myoelectric arm users on gripping tasks while using prosthesis
    - Integrated vibrotactile haptic device with raw Electromyography (EMG) data from Myo Gesture Control Armband
    - Scheduled to perform user study by testing on able-bodied subjects
3. Touch-free Navigation system for assisting surgeon in operation theater
    - Project developed for enabling interaction with CT and MRI scans intraoperatively (Language: C++, MATLAB)
    - Worked on training Haar cascade classifier for gesture recognition and interfaced with display device
    - Tested with other types of classifiers (SVM, HOG, Boosting) for static gesture classification
4. Haptics for texture recognition using prosthesis
    - Developed a texture identification algorithm for identifying standard terrains through vibrational feedback
    - Implemented haptics module to use as interface for prosthesis users to realize texture by a peak detection algorithm
5. Robots for constrained environments
    - Self-Projects while pursuing undergraduate degree (Language: Embedded C, Python and Arduino)
    - Experimented with mobile robots (Follower robot, obstacle avoidance robot)
    - Built pick and place robot that lifted a cube of known dimension and placed at designated location
    - Programmed touchscreen interface for controlling mobile robot
6. Displays at bus stands for real time monitoring of bus transport in Chennai, India
    - Project chosen and funded by Ministry of MSME (Micro, Small & Medium Enterprises), Govt. of India
    - Collected bus route information and schedules for public buses for city of Chennai (India)
    - Worked on GPS-tracking for use on buses to determine location in real-time

PUBLICATIONS

1. Lindgren, Kyle, **Niveditha Kalavakonda**, David Caballero, Kevin Huang, Blake Hannaford. *Learned Hand Gesture Classification through Synthetically Generated Training Samples*, 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems; 2018 Oct 01-05; Madrid, Spain.
2. Pattery, John Jose, **Niveditha Kalavakonda**, Jitu Verghese Kurian, Lekha Mohan, Jippu Jacob. *Design and Development of Robot for Borewell Rescue*, Proceedings of the 14th IFToMM World Congress; 2015 Oct 25-30; Taipei, Taiwan. doi:10.6567/IFToMM.14TH.WC.OS13.103
3. **Kalavakonda, Niveditha**, Sourav Chandra, Asokan Thondiyath. *Development of Virtual Reality Based Robotic Surgical Trainer for Patient-specific Deformable Anatomy*, Proceedings of the 2nd International Conference of Robotics Society of India: Advances in Robotics; 2015 July 2-4; Goa, India (ACM Publication). doi: 10.1145/2783449.2783465
4. **Kalavakonda, Niveditha**, Pooja Ramesh Nair, Sugirtha R., Swapna S., Swetha K., N. Kayalvizhi, *Digitization of Linearized Thermistor Output Using Dual Slope ADC*, International Journal of Innovative Technology and Exploring Engineering*, Vol. 3 Issue 11, April 2014*

In Progress:

1. **Kalavakonda, Niveditha**, Nava Aghdasi, Blake Hannaford. *Gesture-based Control of Display Devices for Surgical Procedures*, Journal of Medical Robotics Research

2. **Kalavakonda, Niveditha**, Blake Hannaford, Laligam Sekhar, Eric Seibel. *Robotics in Neurosurgery.* (Article for Medical journal)

PRESENTATIONS

Presentations

- "*A new Tech Consciousness: Social Responsibility and Ethics ".* Panel. Grace Hopper Celebration 2018, Houston, Texas. 26 – 28 September, 2018.
- "*Robotic and Neurosurgical Instrument Segmentation for Development of Intelligent Surgical Assitant".* Poster Presentation. ACM Student Research competition at Grace Hopper Celebration 2018, Houston, Texas. 26 – 28 September, 2018.
- "Social Responsibility and Ethics in Artificial Intelligence and Extended Reality". Birds of Feather Moderator. ACM Richard Tapia Celebration of Diversity in Computing, Orlando, Florida. 21 September, 2018.
- "*Isosurface visualization using augmented reality for improving tumor resection outcomes".* Poster Presentation. ACM Student Research competition at Tapia 2018, Orlando, Florida. 19 – 20 September, 2018.
- "*Gesture-based Control of Display Devices for Surgical Procedures".* Presentation. International Conference on Cyber-Physical Systems, Chennai, India. 21 April, 2018.
- "*Developing AR/VR Applications on Android*". Workshop. ChickTech Seattle. 17 February, 2018.
- "*Get Your VR Game On!".* Workshop. Pratyusha Engineering College, Chennai, Tamil Nadu, India. 20 December, 2017.
- "*Get Your VR Game On!*". Workshop. Women Who Code, Chennai, Tamil Nadu, India. 16 December, 2017.
- "*Introduction to AR/VR Development Using Unity3D*". Workshop. ACT-W Conference, Seattle, Washington. 23 September, 2017.
- "*Introduction to AR/VR Development Using Unity3D*". Workshop. Women Who Code Tech Spark, Seattle, Washington. 09 September, 2017.
- "*Isosurface visualization using augmented reality for improving tumor resection outcomes*". Poster Presentation. International Computer Vision Summer School, Sicily, Italy. 09-15 July, 2017.
- "*Surgical Assistant for Neurosurgical Procedures*". Poster Presentation. Robotics and Automation for Humanitarian Applications Conference, Amrita University, Kollam, India. 18-20 December, 2016.
- *"Touch-free navigation system for assisting surgeons*". Presentation. 6th Joint Workshop on Computer/Robot Assisted Surgery, Pisa, Italy. 13 September, 2016.
- *"Development of Virtual Reality Based Robotic Surgical Trainer for Patient-specific Deformable Anatomy".* Presentation. 2nd International Conference of Robotics Society of India: Advances in Robotics, Goa, India. 4 July, 2015.

Invited talks

- "*Robotics in Neurosurgery*". Guest Lecture. Seminar on Engineering Research for Transitioning Freshman, University of Washington, Seattle. 04 April, 2018.
- "*Navigating the Balancing Act of Priorities and Time*". Panel. 27th Women in Science and Engineering Conference, University of Washington, Seattle. 03 March, 2018.
- "*Surgical Robotics: A Developing Country's Perspective*". Guest Lecture. R.M.K Engineering College, Chennai, India. 28 December, 2016.
- "*Surgical Robotics: A Developing Country's Perspective*". Guest Lecture. R.M.K College of Engineering and Technology, Chennai, India. 28 December, 2016.
- "*Importance of Robotics in Today's World".* Guest Lecture. R.M.K Engineering College, Chennai, India. 16 August, 2014.

AWARDS AND PROFESSIONAL MEMBERSHIPS

Awards

- 1st Place, ACM Student Research Competition (GHC 2018) 2018
- 1st Place, Overall Graduate Student Poster Category (Tapia 2018) 2018
- 1st Place, ACM Student Research Competition (Tapia 2018) 2018
- Tapia 2018 Student Scholar 2018
- AnitaB.org Student Scholar, Grace Hopper Celebration 2018
- Women Techmakers Travel Grant, TensorFlow Dev Summit 2018
- Outstanding Female Engineer Award, UW - Society of Women Engineers 2018
- Pacific Science Center Communication Fellowship 2017
- Pacific Science Center Scholarship 2017
- Department Scholarship, Grace Hopper Celebration – Orlando (USA) 2017
- NSF Travel Grant, Cognitive Robotics Summer School – MIT (USA) 2017
- Storytelling Fellow, University of Washington 2017
- Amazon Catalyst Fellow 2017
- Fellow, Laboratory for Analysis of Motion and Performance, University of Washington 2017
- Department Scholarship, Women in Science and Engineering Conference, Seattle, WA 2017, 2016
- IEEE-RAS Scholarship, University of Verona - Italy 2016

RELEVANT LEADERSHIP

Founding Chair, Women in Engineering – Electrical Engineering, University of Washington (2017– Present)

- Organize social events to build a supportive community for women in Electrical and Computer Engineering
- Plan presentations and panel sessions for students of different concentrations in ECE

Robotics Workshop Leader, ChickTech - Seattle (2016 – Present)

- Organize robotics and Augmented/Virtual Reality workshops for high school girls
- Mentor students after workshop to provide guidance with hobby projects

Time To Invent (TTI) Lead, **Society of Women Engineers** – University of Washington (2015 – Present)

- Teach science concepts to elementary school girls through interactive and engaging hands-on activities
- Design activities for a group of 25-30 girl students at monthly programs

Regional Student Representative, Region 1-7 – IEEE Robotics and Automation Society (2017 – Present)

- Represent students in the Robotics and Automation at IEEE-RAS meetings and conferences
- Ensure relevant talks and workshops for students at conferences and events in North America
- Communicate information from leadership team to all IEEE-RAS chapters in regions 1-7

Officer, Institute of Electrical and Electronics Engineers – University of Washington-Seattle (2015 – 2018)

- Organized events to enhance relations between students, professionals, and faculty
- Spearheaded workshops to teach programming skills to members (Languages: Python, C++, C)

Officer, Graduate Student Association – University of Washington - Seattle (2015 – 2017)

- Coordinate graduate student efforts, events, and budget in the Electrical Engineering department
- Represent ~250 graduate students in department meetings
- Work as a liaison for IEEE to include opportunities for graduate student

Regional Graduate Representative, Region J, GradSWE – Society of Women Engineers (2016 – 2018)

- Represent graduate students from the section at region meetings and conferences
- Ensure relevant talks and workshops for graduate students at local conferences and events