

Nazmus Sahadat

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Objective

Over the years, I have learned multiple skills such as Printed Circuit Board design, Embedded systems, Machine learning, Signal processing, User Interface design, Clinical study design, Statistical analysis, and so forth. My research has been oriented to solve problems that touch lives and enables people to achieve their ability that wouldn't be possible otherwise. Motivated by the impact and enormous potential of this field and by applying my skills, I want to devote myself to pursue a research and development career that will bring positive impacts on peoples' lives.

Education

Georgia Institute of Technology, Atlanta, Georgia

PHD IN ELECTRICAL AND COMPUTER ENGINEERING

GPA: 3.81/4.00

Aug. 2014 - May 2019

University of Memphis, Memphis, Tennessee

MS IN ELECTRICAL AND COMPUTER ENGINEERING

GPA: 4.00/4.00

Aug. 2012 - May 2014

Bangladesh University of Engineering and Technology, Dhaka, Bangladesh

BSC IN ELECTRICAL AND ELECTRONIC ENGINEERING

GPA: 3.61/4.00

Dec. 2004 - Oct. 2009

Skills

System Design: Embedded system (ADC, UART, USB, SPI, I2C, EEPROM, DMA, BLE, RF), Multi-sensor interface, PCB Antenna, Power management (system level), Analog Front End, Analog Filter, Sensor Design, Human-Computer Interaction.

Instrumentation: Oscilloscope, Signal Generator, Power Supply, Multi-meter, Soldering (Soldering iron, Air flow soldering), Impedance Analyzer, Microscope, FPGA (Xilinx Spartan 6)(Elementary), Micro-controller Development Board (Arduino MEGA, CY8CKIT-001, PSoC 3 & 5), ARM M4(Adafruit Feather nRF52, STM32 Neucleo), Embedded Linux (Beagle Bone Black, Raspberry PI), 3D Printer (Prusa i3, Monoprice Maker Select V2).

Signal Processing: Digital filter design (LPF, HPF, Notch, Kalman), LPC, MFCC, Speech Signal Processing, Biosignal Processing (EEG, ECG), Statistical data analysis.

Machine Learning: SVM, LR, KNN, GMM, NN, DNN, Regression, scikit-learn, TensorFlow, Numpy, Keras, Pandas, Matplotlib.

Software: Allegro PCB editor, Orcad (Spice, Capture and Layout), KiCAD, Eagle (Elementary), Altium (Elementary), Simulink, COMSOL, SolidWorks, LT spice, Sigma Plot, LabVIEW.

Programming: C, C++, BLE stack & RF programming (CC254x, CC251x), WiFi (ESP 8266), Verilog (Elementary), Python.

IDE: Visual Studio, Eclipse, Qt, IAR systems, TI Code Composer Studio, Atmel Studio, PSoc Programming, Arduino.

Bio-Engineering: Multi-physics Modeling, ECG, EEG, CNT sensor design.

Experiences

Advanced Development Team, Starkey Hearing Technologies

Eden Prairie, Minnesota

MACHINE LEARNING ENGINEER II

June 2019 - Present

- Developed machine learning algorithm to detect respiratory sounds such as cough, sneeze, and so forth.
- Algorithms are developed using traditional techniques such as feature extraction such as MFCC, LPC along with HMM, GMM, LR, KNN, and SVM for power efficient implementation in the hearing aid.

GT-Bionics Lab, Georgia Institute of Technology

Atlanta, Georgia

GRADUATE RESEARCH ASSISTANT (PHD)

June. 2014 - Present

- Ph.D. with a focus on multimodal Tongue drive system (mTDS), a next-generation human-computer interaction system for the people with tetraplegia which incorporates multiple remaining abilities such as speech recognition, tongue, and head motion to control computers, smartphones, wheelchair, and so forth.
- Developed ARM M4, CC251X, and CC254X based firmware for multi-sensor (magnetometers, accelerometer, and gyroscope) communication to find user gestures (tongue, head movements) as commands. Wireless interfaces (BLE, RF) for seamless interaction with devices.
- Developed SVM based algorithm to process tongue gesture in the wearable unit (ARM, CC2510) and Kalman filter based sensor fusion algorithm for head tracking.
- Developed touchscreen UIs (Qt-based) for ARM A8 (Beaglebone Black) to train tongue commands using machine learning algorithm and an option to switch between devices under control. Also, designed human experiments to evaluate user interaction efficacy with computers, smartphones, and wheelchair. Also involved in collecting experimental data and statistical analysis.
- Involved in electronic systems and PCB design (wearable unit, wheelchair, and PC interfaces), debugging, and testing.

Think Tank Team, Samsung Research America

Mountain View, California

EE INTERN

May 2015 - Jul. 2015

- Involved in PCB design for high-speed communication of Samsung 360 camera, OLED display interface, flexible PCB design for next generation Samsung touchscreen. Also, involved with other confidential projects.

ESARP Lab, University of Memphis

Memphis, Tennessee

GRADUATE RESEARCH ASSISTANT (MS)

Aug. 2012 - May. 2014

- Pursued MS with a thesis on smart drug delivery system using a chitosan-based carrier. Finite element modeling of the drug delivery system was done using COMSOL Multiphysics. In vitro experiments were done to verify the modeling accuracy. Experimental results were statistically verified
- Involved in modeling and designing a microfluidic device design for cancer cell separation.
- Involved in design of custom built EEG and ECG monitoring device (NeuroMonitor).
- Developed an algorithm for the bio-metric identification from one lead ECG signal.
- Designed, modeled a new vertically aligned CNT based dry Bio-sensor to capture ECG and EEG signal.

Shahjalal University of Science & Technology

Sylhet, Bangladesh

LECTURER

Mar. 2011 - Jul. 2012

- Worked as a lecturer in the Department of Electrical & Electronic Engineering.
- Involved mostly in several laboratory developments (Electrical Circuit Lab, Electronics Lab, Electrical Electronics circuit simulation lab, Machine Lab), Teaching (Electrical Circuits, Analog & Digital Electronic Circuits, Electrical Machines).
- Was a mentor of several student projects (Wireless controlled robotic car development, Home automation system).

International Islamic University Chittagong

Dhaka, Bangladesh

LECTURER

Nov. 2009 - Feb. 2011

- Involved mostly in teaching (Control system, Electronic circuit simulation, Power systems, Power plant engineering and Microprocessor system design) and Student research projects (Design and implementation of a sinusoidal interrupted power supply, Galvanic skin response design).

Publications & Patent

- [1] F. Kong, M. N. Sahadat, M. Ghovanloo, and G. D. Durgin, "A stand-alone intraoral tongue-controlled computer interface for people with tetraplegia," *IEEE transactions on biomedical circuits and systems*, vol. 13, no. 5, pp. 848–857, 2019.

- [2] N. Sebkhi, N. Sahadat, S. Hersek, A. Bhavsar, S. Siahpoushan, M. Ghovanloo, and O. T. Inan, "A deep neural network-based permanent magnet localization for tongue tracking," *IEEE Sensors Journal*, vol. 19, no. 20, pp. 9324–9331, 2019.
- [3] M. N. Sahadat, N. Sebkhi, D. Anderson, and M. Ghovanloo, "Optimization of tongue gesture processing algorithm for standalone multimodal tongue drive system," *IEEE Sensors Journal*, vol. 19, no. 7, pp. 2704–2712, 2018.
- [4] M. N. Sahadat, S. Dighe, F. Islam, and M. Ghovanloo, "An independent tongue-operated assistive system for both access and mobility," *IEEE Sensors Journal*, vol. 18, no. 22, pp. 9401–9409, 2018.
- [5] M. N. Sahadat, N. Sebkhi, F. Kong, and M. Ghovanloo, "Standalone assistive system to employ multiple remaining abilities in people with tetraplegia," in *2018 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pp. 1–4, IEEE, 2018.
- [6] F. Kong, M. N. Sahadat, and M. Ghovanloo, "Development and preliminary assessment of an arch-shaped stand-alone intraoral tongue drive system for people with tetraplegia," in *2018 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pp. 1–4, IEEE, 2018.
- [7] N. Sahadat, N. Sebkhi, and M. Ghovanloo, "Simultaneous multimodal access to wheelchair and computer for people with tetraplegia," in *Proceedings of the 2018 on International Conference on Multimodal Interaction*, pp. 393–399, ACM, 2018.
- [8] M. N. Sahadat, A. Alreja, N. Mikail, and M. Ghovanloo, "Comparing the use of single versus multiple combined abilities in conducting complex computer tasks hands-free," *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, vol. 26, no. 9, pp. 1868–1877, 2018.
- [9] N. Sahadat and M. Ghovanloo, "Efficacy assessment of multimodal tongue drive system (mtds) in comparison to keyboard and mouse (knm)," *Archives of Physical Medicine and Rehabilitation*, vol. 98, no. 12, pp. e163–e164, 2017.
- [10] M. Ghovanloo, M. N. Sahadat, Z. Zhang, F. Kong, and N. Sebkhi, "Tapping into tongue motion to substitute or augment upper limbs," in *Micro-and Nanotechnology Sensors, Systems, and Applications IX*, vol. 10194, p. 1019413, International Society for Optics and Photonics, 2017.
- [11] B. I. Morshed, M. N. Sahadat, and S. Consul-pacareu, "Patterned carbon nanotube electrode," Dec. 24 2015. US Patent App. 14/725,885.
- [12] A. Jafari, N. Buswell, A. Page, T. Mohsenin, M. N. Sahadat, and M. Ghovanloo, "Live demonstration: Towards an ultra low power on-board processor for tongue drive system," in *2015 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pp. 1–1, IEEE, 2015.
- [13] Z. Zhang, S. Ostadabbas, M. N. Sahadat, N. Sebkhi, D. Wu, A. Butler, and M. Ghovanloo, "Enhancements of a tongue-operated robotic rehabilitation system," in *2015 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pp. 1–4, IEEE, 2015.
- [14] M. N. Sahadat, Z. Zhang, A. Alreja, P. Srikrishnan, S. Ostadabbas, N. Sebkhi, and M. Ghovanloo, "Live demonstration: A tongue-operated multimodal human computer interface and robotic rehabilitation system," in *2015 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pp. 1–1, IEEE, 2015.
- [15] M. N. Sahadat, A. Alreja, P. Srikrishnan, and M. Ghovanloo, "A multimodal human computer interface combining head movement, speech and tongue motion for people with severe disabilities," in *2015 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, pp. 1–4, IEEE, 2015.
- [16] S. Consul-Pacareu, R. Mahajan, M. Sahadat, and B. I. Morshed, "Wearable ambulatory 2-channel eeg neuromonitor platform for real-life engagement monitoring based on brain activities at the prefrontal cortex," in *4th IAJC/ISAM Joint Intl. Conf., FL*, p. 78, 2014.
- [17] M. N. Sahadat, E. L. Jacobs, and B. I. Morshed, "Hardware-efficient robust biometric identification from 0.58 second template and 12 features of limb (lead i) eeg signal using logistic regression

classifier,” in *Engineering in Medicine and Biology Society (EMBC), 2014 36th Annual International Conference of the IEEE*, pp. 1440–1443, IEEE, 2014.

- [18] M. N. Sahadat, A. P. Hoban, B. I. Morshed, and W. O. Haggard, “Investigation of electrical stimulus on chitosan film based dds,” in *2014 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, pp. 1424–1427, IEEE, 2014.
- [19] A. Mohapatra, N. Sahadat, B. I. Morshed, G. McGraw, A. P. Hoban, J. A. Jennings, W. O. Haggard, J. D. Bumgardner, and S. R. Mishra, “Stimuli-controlled drug delivery system development with implantable biocompatible chitosan microbeads,” in *IAJC-ISAM International Conference*, 2014.
- [20] M. N. Sahadat, S. Consul-Pacareu, and B. I. Morshed, “Wireless ambulatory ecg signal capture for hrv and cognitive load study using the neuromonitor platform,” in *2013 6th International IEEE/EMBS Conference on Neural Engineering (NER)*, pp. 497–500, IEEE, 2013.
- [21] R. Mahajan, S. Consul-Pacareu, M. Abusaud, M. N. Sahadat, and B. I. Morshed, “Ambulatory eeg neuromonitor platform for engagement studies of children with development delays,” in *Smart Biomedical and Physiological Sensor Technology X*, vol. 8719, p. 87190L, International Society for Optics and Photonics, 2013.
- [22] N. Sahadat, S. Hossain, A. Rahman, and S. T. Atique, “Power quality improvement of large power system using a conventional method,” *Engineering*, vol. 3, no. 08, p. 823, 2011.
- [23] M. Sahadat, S. Deeba, S. Ahmad, G. Biswas, A. Elahi, N. Zakaria, *et al.*, “Reliability evaluation of bangladesh power system using cumulant method,” in *2011 3rd International Conference on Electronics Computer Technology*, vol. 2, pp. 127–131, IEEE, 2011.
- [24] M. N. Sahadat, N. Al Masood, M. S. Hossain, G. Rashid, and A. H. Chowdhury, “Real power transfer capability enhancement of transmission lines using svc,” in *2011 Asia-Pacific Power and Energy Engineering Conference*, pp. 1–4, IEEE, 2011.

Honors & Awards

2018	BRCRC , Brooks Rehabilitation Collaborative Research Grant: \$100k	Jacksonville, FL
2018	ACM , ICMI Student Travel Support	Boulder, CO
2018	Gatech , BSAGT MC2 Rising Scientist Award	Atlanta, GA
2017	American Congress of Rehabilitation Medicine Conference , Best Poster Award (3rd place)	Atlanta, GA
2016	Gatech , BSAGT MC2 Rising Scientist Award	Atlanta, GA
2014	Gatech , Graduate Research Assistant	Atlanta, GA
2014	IEEE , EMBC Travel Award	Chicago, IL
2012	UofM , Graduate Research Assistant	Memphis, TN
2005	BUET , Undergraduate Merit Scholarship	Dhaka, Bangladesh
2004	Education Board , Higher Secondary School Board Scholarship	Raj., Bangladesh

License & Certifications

2019	Deep Learning Specialization , Coursera	C25CRLWDZF9N
2019	Neural Networks and Deep Learning , Coursera	HW79H924FW3R
2019	Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization , Coursera	RFWX88KEQSRP
2019	Structuring Machine Learning Projects , Coursera	8KGEWZAEYEMB
2019	Convolutional Neural Networks , Coursera	CYWY6MHT2Q5C
2019	Sequence Models , Coursera	BK59MAKLB4T
2019	Machine Learning , Coursera	4M3KEARLDDJP

Presentations

- ACM International Conference on Multimodal Interaction (ICMI 2018)** Boulder, CO
 POSTER PRESENTATION Oct. 2018
- Simultaneous Multimodal Access to Wheelchair and Computer for People with Tetraplegia
- IEEE/CAS-EMB Biomedical Circuits and Systems Conference (BioCAS 2018)** Cleveland, OH
 POSTER PRESENTATION Oct. 2018
- Standalone Assistive System to Employ Multiple Remaining Abilities in People with Tetraplegia
- American Congress of Rehabilitation Medicine Conference (ACRM 2017)** Atlanta, GA
 POSTER PRESENTATION Oct. 2017
- Efficacy Assessment of multimodal Tongue Drive System (mTDS) in Comparison to Keyboard and Mouse (KnM)
- IEEE/CAS-EMB Biomedical Circuits and Systems Conference (BioCAS 2015)** Atlanta, GA
 ORAL PRESENTATION Oct. 2015
- A multimodal human computer interface combining head movement, speech and tongue motion for people with severe disabilities
- IEEE/CAS-EMB Biomedical Circuits and Systems Conference (BioCAS 2015)** Atlanta, GA
 LIVE DEMO Oct. 2015
- A tongue-operated multimodal human computer interface and robotic rehabilitation system
- IEEE Engineering in Medicine and Biology Society Conference (EMBC 2014)** Chicago, IL
 ORAL PRESENTATION Aug. 2014
- Hardware-efficient robust biometric identification from 0.58 second template and 12 features of limb (Lead I) ECG signal using logistic regression classifier
- IEEE Engineering in Medicine and Biology Society Conference (EMBC 2014)** Chicago, IL
 POSTER PRESENTATION Aug. 2014
- Investigation of electrical stimulus on chitosan film based DDS
- IEEE/EMBS Conference on Neural Engineering (NER 2013)** San Diego, CA
 POSTER PRESENTATION Nov. 2013
- Wireless ambulatory ECG signal capture for HRV and cognitive load study using the NeuroMonitor platform

Activities

- ACM International Conference on Multimodal Interaction (ICMI)** Boulder, CO
 VOLUNTEER 2018
- Arranging poster and oral presentation session of the conference
- Bangladesh Student Association at Georgia Tech (BSA-GT)** Atlanta, GA
 SECRETARY Jan. 2017 - May 2018
- Involved in arranging different cultural and sports activities of the association
- IEEE Transactions on Biomedical Circuits and Systems (TBioCAS)** Atlanta, GA
 REVIEWER Aug. 2014 - PRESENT
- Reviewing scientific article and give feedback to help people contribute to scientific community
- IEEE Journal of Biomedical and Health Informatics (JBHI)** Atlanta, GA
 REVIEWER Aug. 2014 - PRESENT
- Reviewing scientific article and give feedback to help people contribute to scientific community
- IEEE Transactions on Biomedical Engineering (TBME)** Atlanta, GA
 REVIEWER Aug. 2014 - PRESENT
- Reviewing scientific article and give feedback to help people contribute to scientific community
- IEEE** Atlanta, GA
 GRADUATE STUDENT MEMBER Mar. 2013 - Present
- IEEE Engineering in Medicine and Biology Society (EMBS)** Atlanta, GA
 GRADUATE STUDENT MEMBER Mar. 2013 - Present
- American Congress of Rehabilitation Medicine (ACRM)** Atlanta, GA
 STUDENT MEMBER Oct. 2017 - Present

Georgia Tech Student Alumni Association (SAA)

MEMBER

Atlanta, GA

Aug. 2016 - Present

Fulton County Schools

JUDGE AT SCIENCE FAIR

Atlanta, GA

2015-Present

- reviewing different science projects, comment and score the quality of the projects

IEEE Engineering in Medicine and Biology Conference

VOLUNTEER

Chicago, IL

2014

- Arranging poster and oral presentation session of the conference

Media & News

09/01/2018 <https://mobilitymgmt.com/Articles/2018/09/01/Tongue-Drive-System.aspx?Page=1>

11/01/2017 <https://www.ece.gatech.edu/news/598197/gt-bionics-lab-selected-acrm-conference-honors>

08/01/2017 <http://blog.snapeda.com/2017/08/01/engineer-spotlight-nazmus-sahadat-from-georgia-institute-of-technology>