MORRIS VANEGAS

MorrisVanegas.com mvanegas@alum.mit.edu US Citizen

Education

Northeastern University, *Boston, MA* *expected* June 2020
Doctorate of Philosophy in BioEngineering

Massachusetts Institute of Technology, *Cambridge, MA* June 2016
Master of Science in Aerospace Engineering with Human Space Exploration GPA: 4.7/5.0
Master of Science in Mechanical Engineering with Product Design

Massachusetts Institute of Technology, *Cambridge, MA* June 2012
Bachelor of Science in Aeronautical and Astronautical Engineering with Information Technology GPA: 4.7/5.0

Experience

PhD Candidate, Northeastern University, *Boston, MA* Sep 2016-Present

- Developing hardware and firmware prototypes of portable, wearable, modular, wireless, and fiberless functional near-infrared spectroscopy (fNIRS) systems for use in natural environments.
- Designed and fabricated a compact, low-cost, low-power, mobile-based, wireless pulse oximeter and accompanying Android application designed for resource-poor regions. Designed and manufactured milled circuit boards as well as attachments.
- Designed and developed a combined optical and x-ray breast imaging system with 3 degrees of freedom. Manufactured mounts to couple linear, rotary, and elevation stages, designed circuitry for integrating multiple sensor inputs and outputs, as well as developed homing software scripts for use.

Director of TDC Fablab, *Cambridge, MA* Sep 2016-Present

- Run day-to-day operations of the TDC Makerspace, a residential based fablab focusing on (1) peer-based training and skill development, including initial and continual training, as well as methods for learning new fabrication techniques (student led workshops, documentation of project, teach through building, etc.), (2) exploring the use and fabrication of Internet of Things (IoT) devices for access and security, and (3) the design, build, and use of modular machines, especially in small spaces.

Voxel8, *Somerville, MA* Oct 2015-Aug 2016

- Head of applications engineering at a 3D electronics printing startup focused on creating tools to make personal fabrication intuitive for non-experts, culminating with a demo at the 2016 Consumer Electronics Show in Las Vegas, Nevada.
- I designed an in-house Voxduino, a 3D printed Arduino board with the ability to be programmed through the Arduino IDE. I also further developed our SolidWorks add-in, providing those familiar with designing circuits the ability to import circuits designed in Eagle software into SolidWorks models of 3D devices to create 3D printed embedded electronics.

Man-Vehicle Laboratory, *Cambridge, MA* Aug 2013-Aug 2016

- Researched human variability models using Vicon motion capture systems and inertial measurement units to determine algorithmic effects of human sensor misplacement and misalignment on sensor outputs.
- Created procedures and ran 2.5 hour experiments on 22 human subjects after being trained by the MIT Committee on the Use of Humans as Experimental Subjects.

Space Exploration Technologies (SpaceX), *Los Angeles, CA* Aug 2012-Aug 2013

- Researched, developed, implemented, built and tested components and material layers of an IVA space suit while interfacing with other crew systems including seats, environmental controls and life support systems, communications, and displays.
- Performed detailed space suit design, analysis, and development testing as part of design cycles.
- Prepared space suit qualification and acceptance test plans, test stands, and procedures.

Skills

Certifications

- Private Pilot, Student Instrument Pilot, Open Water Diver, CPR Certified

Fabrication

- CNC machining, Laser cutting, Electronics design and production, 3D Scanning and Printing, Molding and Casting, Embedded programming, Composites, Sewing

Computer Aided Design

- SolidWorks, NX7.5, Motion Studio, OpenSim, Nexus Motion Capture
- Visio, Vector-based Graphic Design (Inkscape), Mastercam, Eagle, Final Cut Pro

Programming Languages

- Python, Matlab, Java, Processing, Arduino, Latex
- HTML, CSS, JavaScript, Drupal, Mercurial (SVN), Git

Projects

OpenMind::OpenArt Art Gallery, MIT MindHandHeart Initiative, *Cambridge, MA* Nov 2016 – Mar 2017

- Co-directed an art gallery celebrating neurodiversity. Led workshops for 10 artists for 4 weeks leading to the two week, 24-hour access art gallery. Technical lead of the team setting up the art gallery with Internet-Of-Things devices. On opening night, I organized demos of local companies working on Brain-Computer Interfaces.
- Chosen as an artist, and created an "Empathy Filter," a Processing script that converted a user's drawing on a tablet into a filter applied to a photo of "The Alchemist" statue at MIT to represent how mindset changes an object.
- theartofy.com/OpenMind/; http://morrisvanegas.com/forart/omoa.html

RedWorks3D, *Los Angeles, CA* Jan 2017-Present

- Design consultant for RedWorks3d.com. Exploring designs for in-situ additive construction (ISAC) as an approach to building habitats on Mars. ISAC intersects the benefits of parametric design, 3d printing, and in-situ resource utilization to build conforming habitats on variable terrain, offering a hyper-local, sustainable, and inexpensive alternative to traditional building materials and methods. www.redworks3d.com

Chronic Intermittent Hypoxia Habitat Concept, *ALMA Observatory, Chile* Jan 2015 – Sep 2015

- Led a team of students, engineers, and an architect to the design and validation of a portable, inflatable habitat used to reduce the physiological effects of intermittent hypoxia affecting JAXA workers building antennas in Chile's Atacama Desert.
- In addition to creating CADs of the entire inflatable structure, I created a concept of operations, designed an environmental control and life support system, presented a novel helmet concept that maintains appropriate partial pressure of oxygen, and partnered with Chilean company Solunova to create a wearable sensor suite to be used by workers for real-time physiological data gathering to predict hypoxic events.

Fab-in-a-Box, MIT Center for Bits and Atoms, *Cambridge, MA* Jan 2015– July 2015

- Created a modular axes, personal fabrication machine with interchangeable heads to allow for milling (machine wax, copper boards), vinyl cutting, and 3D printing, and incorporated the open-source gestalt network for path planning with use of online modules.
- Presenting the machine at the 11th annual Fab Lab Conference in Boston in summer 2015. MorrisVanegas.com/forthem/corexy3.html

Activities & Awards

MIT Impact Fellow, *Massachusetts Institute of Technology* Jan 2018
Dent The Future Scholar, *Dent Conference* Nov 2017
Future Faculty Fellow, *Northeastern University* Oct 2017
Innovation and Creativity for Social Transformation – *Invited Talk, Cali, Colombia* Sep 2017
IDEA Ventures Accelerator Prototype Fund Recipient – *Northeastern University* Aug 2017
MIT Hacking Arts Finalist – *Massachusetts Institute of Technology* Nov 2016

Journals

Vanegas, M., Kotowick, K., Stankovic, A., Hoffman, J., *An Emergency Mitigation System for Safer Lunar Surface Exploration*, IEEE Transactions on Aerospace and Electronic Systems, (2018) [Submitted]

Samuel S. Schreiner, Timothy P. Setterfield, Morris D. Vanegas, Jeffrey Hoffman, *An overnight habitat for expanding lunar surface exploration*, Acta Astronautica, Volume 112, July 2015, Pages 158-170

Conferences

Vanegas, M., Carp, S., Fang, Q., *Mobile Phone Camera Based Near-Infrared Spectroscopy Measurements*, OSA Biophotonics Congress: Biomedical Optics, Hollywood, FL, (2018)

Vanegas, M., Zimmermann, B., Sahin, S., Carp, S., Fang, Q., A *Mobile Phone Based Reflectance Pulse Oximeter*, OSA Biophotonics Congress: Biomedical Optics, Hollywood, FL, (2018)

Vanegas, M., Stirling, L. *Characterization of Sensor Placement Variability on the Human Body Upon Repeated Donnings and Doffings*, IEEE Body Sensor Network, Cambridge, MA, (2015)

White papers

Schreiner, S., Setterfield, T., Sheerin, T., Vanegas, M., *Design and Simulation of an Integrated CMG and Thruster Control System*, (SSL2013-12), MIT Space Systems Laboratory, Cambridge, MA, (2013).

Thornburg, K.M., et al, *Operator Performance in Long Duration, Low Task Load Control Operations,* (HAL2011-04), MIT Humans and Automation Laboratory, Cambridge, MA, (2011).

Thesis

Vanegas, M. Stirling, L. *Characterization of inertial measurement unit placement on the human body upon repeated donnings,* Massachusetts Institute of Technology, Cambridge, MA, (2016).