

# Will Langford

langfordw@gmail.com

[willlangford.xyz](http://willlangford.xyz)

## ABOUT

I'm a multi-disciplinary engineer with a strong background in mechanical engineering, digital fabrication, and robotics. My broad technical knowledge enables me to insightfully architect complex systems and efficiently drive their bring-up and integration in both research and product-oriented environments.

I am a proactive and strategic leader who can balance attention to detail with a focus on the bigger picture. I create energized, supportive, and motivational team environments by listening to and learning from my team members and encouraging a sense of ownership and mutual support. I value taking initiative, continuously learning, and finding ways to leverage our collective strengths.

## EDUCATION

**Massachusetts Institute of Technology**, Cambridge MA *August 2012 - 2019*

Doctor of Philosophy — 2019, *Discrete Robotic Construction*: [Dissertation](#) ◊ [Defense](#)

Master of Science — 2014, *Electronic Digital Materials*: [Thesis](#)

Advisor: Neil Gershenfeld — Center for Bits and Atoms

**Tufts University**, Medford MA *August 2008 - May 2012*

Bachelor of Science in Mechanical Engineering Overall GPA: 3.81

Minor in Engineering Management

**Honors and Awards:** Vincent Manno Leadership Award, The Prize Scholarship of the Class of 1882, OLeary Design Award, Mead Jonathan Taylor Prize, Summa Cum Laude, Tau Beta Pi, Deans List (all semesters)

## EXPERIENCE

**Volta Labs Inc.**, *Co-founder & Head of Engineering* *2019 - 2023*

- Co-founded Volta Labs, raising \$25M in Seed and Series-A to bring to market novel electrowetting based benchtop tools to automate a wide range of workflows for DNA/RNA sequencing sample preparation.
- Designed and integrated the first prototypes capable of performing biological applications, leading the development of multiple critical IP and technology advancements in materials science, mechanical, electrical, firmware, and software domains that enable unique biological operations on the platform.
- Oversaw technical architecture development across mechanical, electrical, and software stacks, driving key product decisions that accelerated testing and iteration. Led the development of two major prototype generations, both of which resulted in multiple successful placements at collaborator sites.
- Played a pivotal role in scaling the team from 5 to 30 people, adapting the team's organizational structure and operating principles to suit the needs at each company stage along the way.
- Augmented the team's capacity and know-how through external engineering partnerships spanning materials science, electrical engineering and firmware, and mechanical design and manufacturing.
- Conducted voice of customer interviews, worked collaboratively with a cross-functional product team to refine user needs, and led a product summit to translate user needs into major product decisions.
- Fostered a culture of talent development, converting several interns and co-ops into high-performing full-time employees, through empathetic leadership and a highly collaborative environment centered on core values of bias towards action, continuous learning, and teamwork.

**Cardibo Inc., Hardware Developer**

*Summer 2011*

- Designed a suite of wireless sensor nodes for use in gym equipment monitoring services.

**Center for Engineering Education and Outreach, R&D Associate**

*2010 - 2011*

- Designed a circuit board that allows Lego NXT motors and sensors connected and controlled from an Arduino microcontroller.
- Developed a method of programming Arduino microcontrollers using Labview. Assisted in testing software, sourcing parts for a kid-friendly robotics kit, and web development.

**Makerbot Industries, Summer R&D Associate**

*Summers 2009 - 2011*

- Researched and prototyped Dual-Extrusion technologies for Makerbot 3D printers.
- Designed, tested, programmed, and launched the Unicorn pen plotter tool-head.
- Supported development, production, and distribution of first generation desktop 3D printers.

## RESEARCH PROJECTS

### **A Discrete Approach to Robotic Construction**

*2014 - 2019*

My research explores assembly-based fabrication methods that enable the construction of a wide variety of robots from a small set of millimeter-scale parts.

### **Digital Material Assembler**

*2014 - 2016*

I developed an automated assembly machine that is able to build electronic components by placing individual conductive and insulating building blocks. [Project link](#)

### **Desktop Digital Fabrication Tools**

*2014 - 2019*

I've designed and built a number of custom desktop-scale digital fabrication tools that I use in my research. [Desktop Wire EDM](#) ◊ [Micro-Materials Tester](#) ◊ [Punch Press](#) ◊ [Foldafab](#) ◊ [Handheld CNC](#)

### **Electronic Digital Materials**

*2012 - 2014*

My masters work demonstrated and characterized the assembly of complex electronic functionality from a standardized set of conductive, insulating, resistive, and semiconducting building blocks. [Project link](#)

### **FODHippo: Autonomous airport runway debris removal**

*2012*

As my senior design project, my team and I developed and prototyped a robotic debris removal system for airport runways. We were awarded second place in FAA Design Competition for Universities. [Project link](#)

## TECHNICAL SKILLS

<b>Fabrication</b>	CNC milling/turning (3/4/5-axis), wire-EDM, waterjet, laser micromachining, 3D printing (FDM, SLA), manual lathe & mill, HSMWorks, Fusion360 CAM
<b>Imaging/Measurement</b>	Materials strength testing (Instron), X-ray CT, SEM, confocal microscopy, 3D laser scanning
<b>Embedded Systems</b>	Atmel AVR (ATtiny, ATmega, Xmega), ARM, Arduino
<b>2D/3D Design</b>	Onshape, Fusion360, Solidworks, Inventor, Rhino, Altium, Eagle, KiCad, Illustrator
<b>Programming</b>	Python, Javascript/Typescript (incl. React, ThreeJS, Node, Electron), HTML/CSS, Labview, Google Script, Git
<b>Simulation/Modeling</b>	COMSOL Multiphysics (electromagnetics, electrostatics, structural, thermal), Numpy/Scipy, MATLAB (incl. Simulink)

## TEACHING & LEADERSHIP

Deployed [Fablabs](#) in Saudi Arabia, [Armenia](#), [Rwanda](#), and [Bhutan](#), 2014-2018

Teaching assistant for multiple graduate courses at MIT, 2013-2018

[How to Make \(Almost\) Anything](#), [How to Make Something That Makes \(Almost\) Anything](#),  
[The Nature of Mathematical Modeling](#), [The Physics of Information Technology](#)

Teaching assistant for multiple undergraduate courses at Tufts University, 2011

[Electronic Musical Instrument Design](#), [Intro to Robotics and Mechatronics](#)

Founder and president of Tufts Robotics Club, 2008-2012

Director of the Tufts Botlab, a student run robotics and fabrication lab

Led teams which placed 1st in the Trinity Firefighting Robotics Olympiad Exam twice

Granted Student Life Imagination Award for developing and conducting student robotics workshops including CNC Cupcake Frosting, Sumobot Competition, Friendly Robotics, and Toy-hacking Elmo

Mentored Medford High School and Melrose High School robotics teams

Led teams which developed an automated hydroponics gardening systems, 12lb Battlebots for Robot Conflict competitions, and a Mars rover robot

## PUBLICATIONS

Langford W, Gershenfeld N. [Discretely assembled walking machines](#), Journal of Micro-Bio Robotics, 2020

Langford W, Gershenfeld N. [A Discretely Assembled Walking Motor](#), MARSS Helsinki, 2019 (**Best Student Paper Award**)

Jolly S, Savidis N, Datta B, Karydis T, Langford W, Gershenfeld N, Bove M. [Progress in fabrication of anisotropic Bragg gratings fabricated in lithium niobate via femtosecond laser micromachining](#), Advanced Fabrication Technologies for Micro/Nano Optics and Photonics XI, 2018

Langford W, Gershenfeld N. [Discretely Assembled Compliant Mechanisms](#), Proceedings of the IUTAM Symposium Architected Materials Mechanics, 2018

Langford W, Ghassaei A, Jenett B, Gershenfeld N. [Hierarchical Assembly of a Self-Replicating Spacecraft](#), IEEE Aerospace, 2017

Langford W, Ghassaei A, Gershenfeld N. [Automated Assembly of Electronic Digital Materials](#), Proceedings of the Manufacturing Science and Engineering Conference, 2016

Trinh G, Cellucci D, Langford W, Im S, Luna A, Cheung K. [Modular Rapidly Manufactured Small Satellite \(MRMSS\)](#), AIAA 2015

## Patents

Hierarchical Assembly of Self-Replicating Spacecraft Using Distributed Mechanisms and Actuation in Digital Materials, [US20190077030A1](#), issued 2023

Discretely Assembled Logic Blocks [US20190190523A1](#), issued 2019

Discrete Assemblers Utilizing Conventional Motion Systems, [US10155313B2](#), issued 2018

Self-assembling assemblers built from a set of primitive blocks, [US10155314B2](#), issued 2018

Methods and systems for droplet manipulation, [WO2022187381A1](#), filed 2022

Diamond Rotors For MAS-NMR, [US20210146475](#), filed 2020

Discrete Motion System, [US20140300211A1](#), filed 2014

Electromagnetic Digital Materials, [US20140145522A1](#), filed 2013

Wireless sensor network for determining cardiovascular machine usage, [US20140300211A1](#), filed 2012

## SPEAKING EVENTS

[Manipulation Automation and Robotics at Small Scales \(MARSS\) Helsinki](#), Plenary Talk, *Discrete Robotic Construction*, July 2019

[Symposium on Computational Fabrication](#), *Assembly Fabrication*, June 2018

[Dimensions of Doctor Who](#), *Using Shape-Shifting Matter To Build the TARDIS*, April 2016

[FAB11 Symposium](#), *Digital Material Assembly*, August 2015

[The Science of Digital Fabrication](#), *Micro-Assembly*, May 2013

## MEDIA

[Volta Labs grabs \\$20 million to address a growing genomics bottleneck](#), Techcrunch 2022

[Volta Labs: Improving workflows for genetic applications](#), MIT News 2021 ◊ [MIT STEX Video Feature](#)

*Tiny motor can walk to carry out tasks*, [MIT News](#) ◊ [Digital Trends](#) ◊ [Techcrunch](#) 2019

[Adam Savage's Maker Tour](#), Tested.com 2017

[Fablabs](#), WONDROS 2016

[On GPS: Future of Digital Fabrication](#), CNN 2013

[Looking To Frost Cupcakes & Deal With the Economic Stimulus Plan? Tufts Has Some Robots For That](#), BostInno 2012

[If you build it...](#), Tufts E-News 2010

Make Magazine: [Dualstrusion](#) ◊ [Bloombot](#) ◊ [Bracelets](#) ◊ [Sumobots](#) ◊ [Glasses](#) ◊ [Braille](#)

[3-D Printers Make Manufacturing Accessible](#), Wired 2009