

## UC Irvine

### SSOE Research Symposium Dean's Awards

#### Title

Krobohand: A 3D Printed Robotic Prosthetic Hand

#### Permalink

<https://escholarship.org/uc/item/9jf8p248>

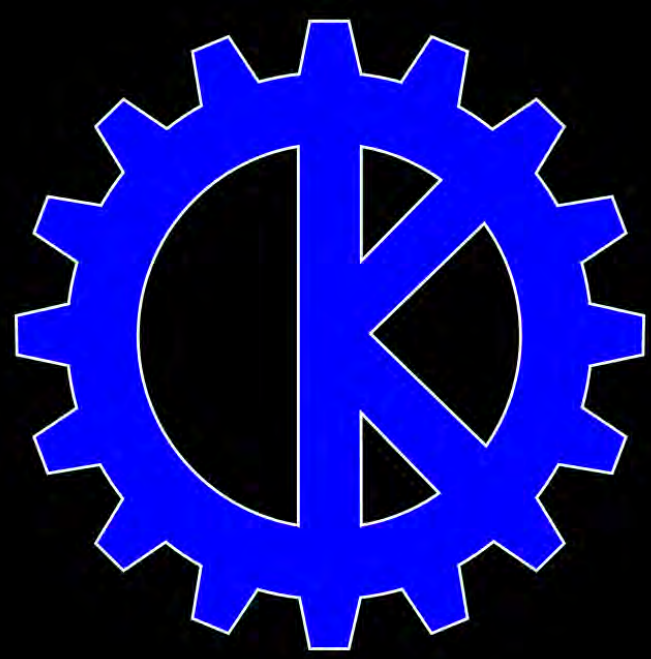
#### Authors

Kirkley, Ethan  
Hunt, Cameron  
Khechadorian, Zepoor  
[et al.](#)

#### Publication Date

2017-03-15

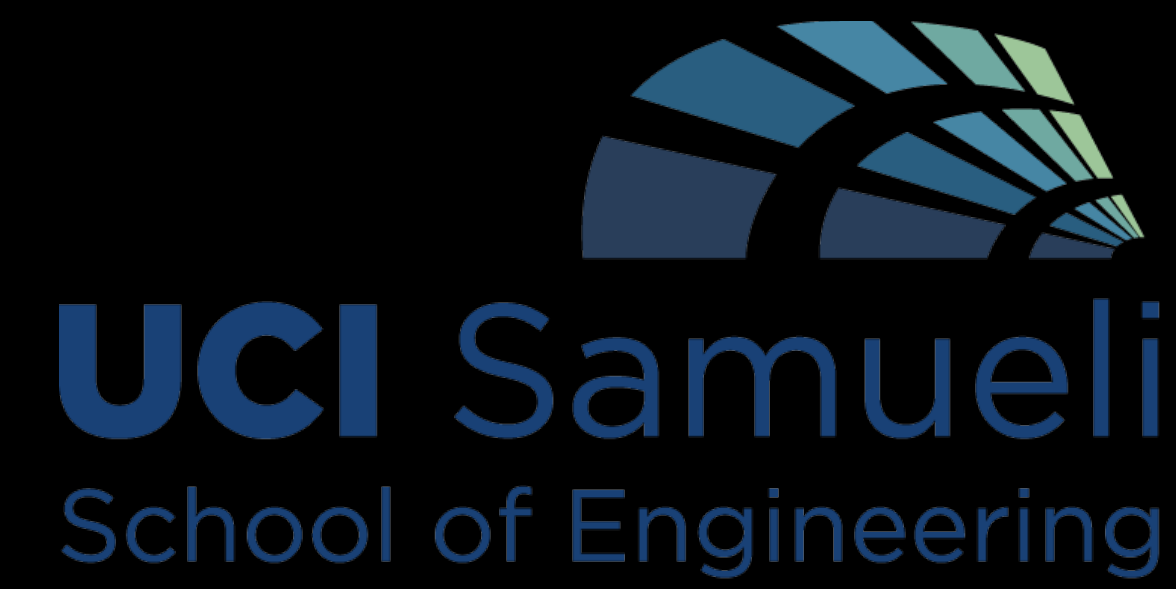
Peer reviewed



www.krobotech.com

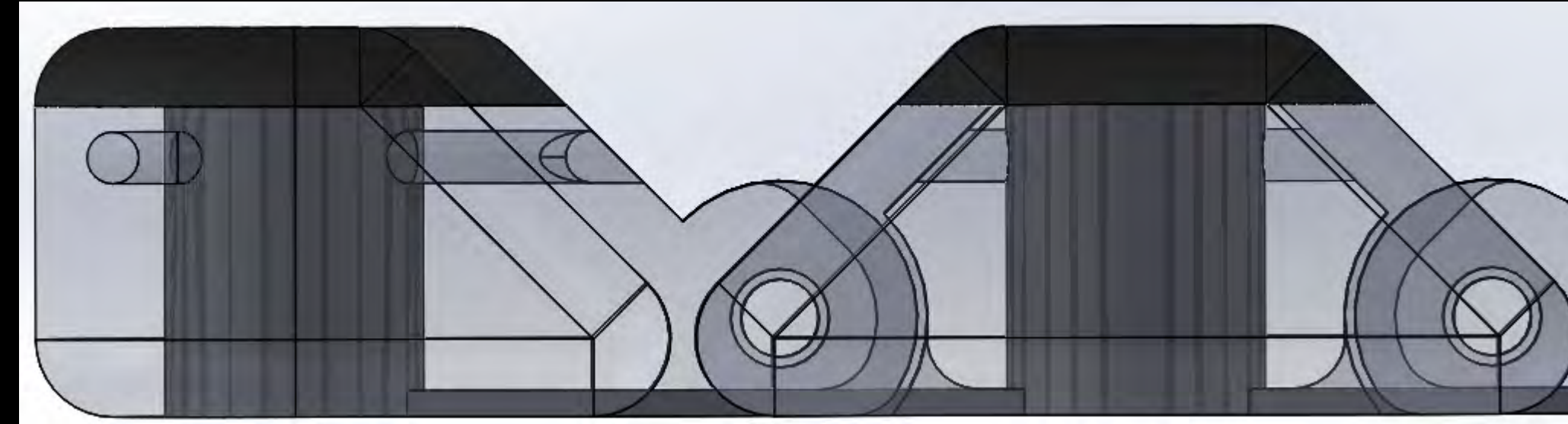
# Krobohand

## A 3D Printed, Robotic Prosthetic Hand



### Background

The Krobohand group recognized a significant gap in the upper limb prosthetic industry between cost and functionality of a prosthetic.



← Joint Detail  
- Side profile showing flexible tendon, grips, and core.

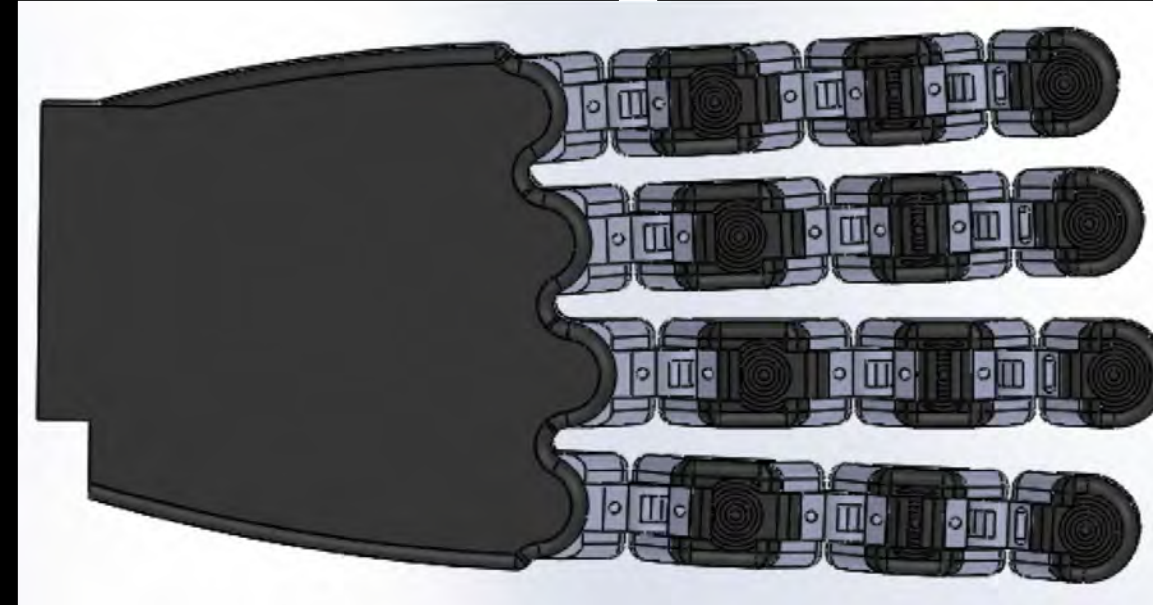
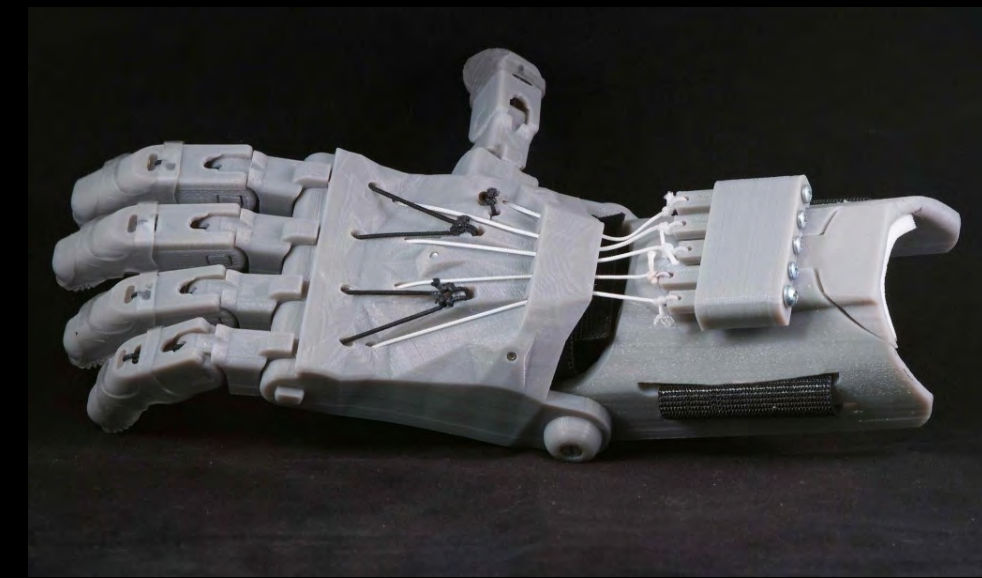
### Design

Krobohand is both cost effective, as well as functionally viable. Fabrication techniques, as well as unique designs yield an innovative upper limb prosthetic.

Raptor Hand - \$50

Krobohand - < \$1000

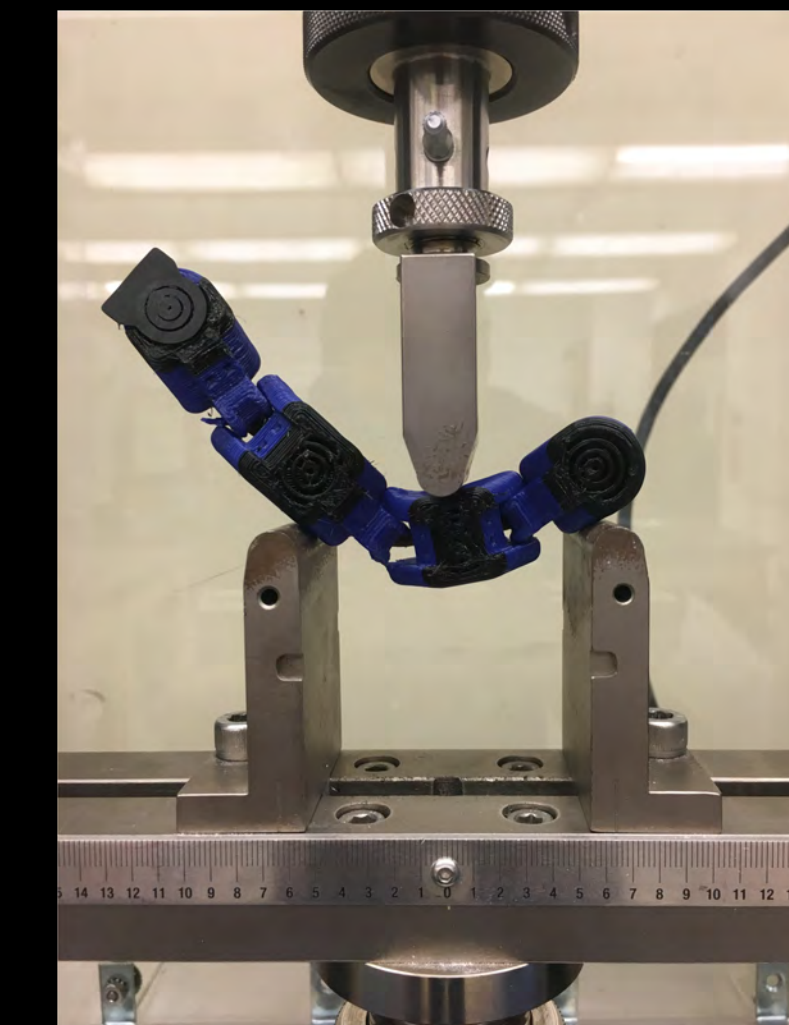
Split Hook - \$10,000



Tensile Test



3-Point Flexural Test



### Innovation

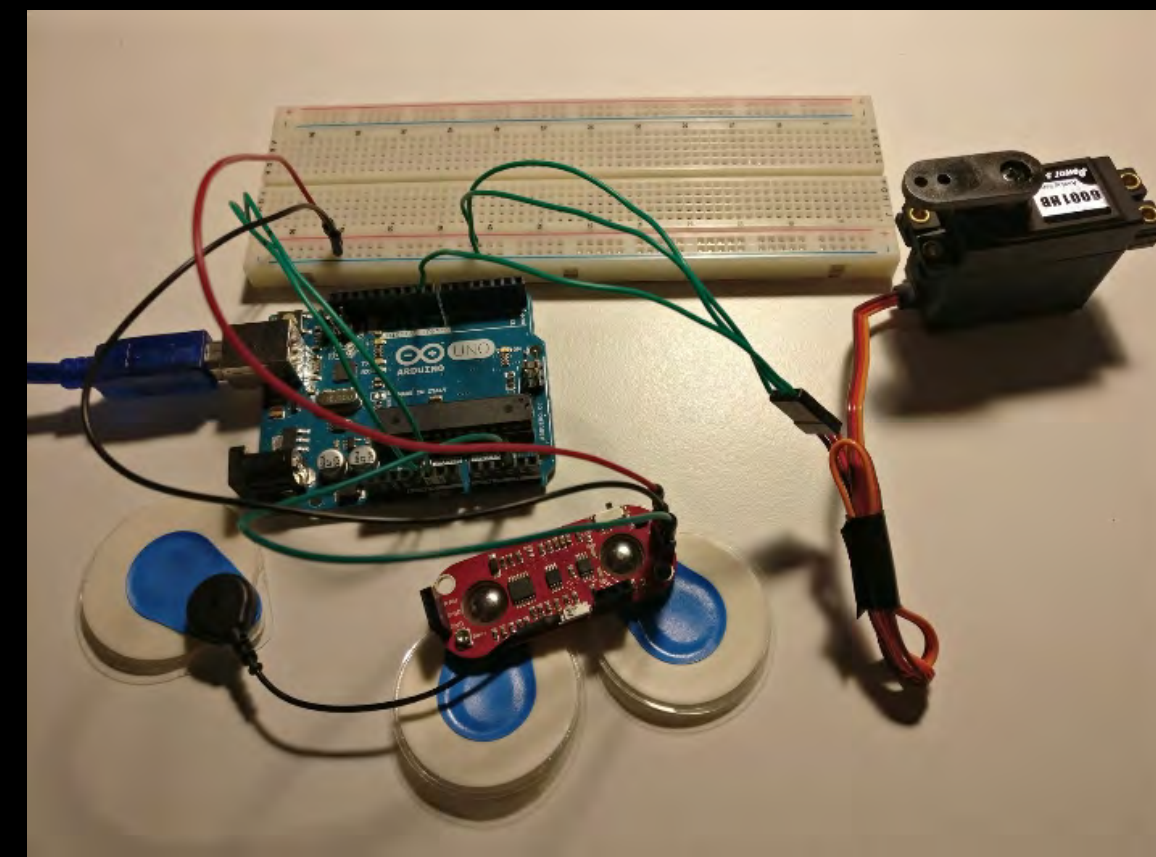
- 1.) Fully 3D Printed Joints, Lateral Joints.
- 2.) Flexible tendon as a stabilizing, restoring force, like the extensor tendon of a human.
- 3.) Grip on palm side printed from same material as the flexible tendon, finger pads.
- 4.) Electromyography for connection between prosthesis and amputee, to be non-invasive.

### Goal

Bridge the gap in the upper limb prosthesis industry between cost and functionality.

### Objectives

- 1.) Fabrication with dual material 3D Printing.
- 2.) Streamline process of connectivity between electromyographic sensors and amputee.
- 3.) Create a sleek, clean, and recognizable upper limb prosthesis.



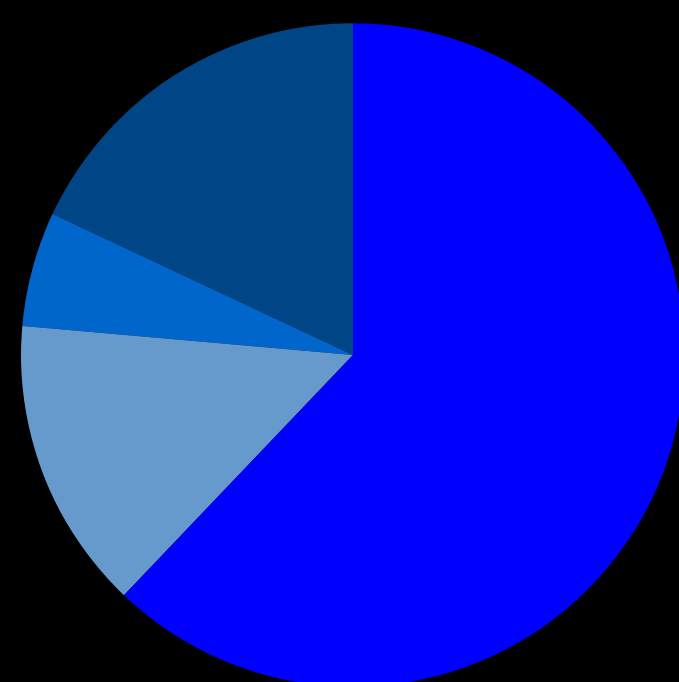
### Electromyography

- 1.) MyoWare sensor connected to existing muscle groups.
- 2.) Signal interpreted by Arduino microcontroller (Uno or Mega), actuates motor.

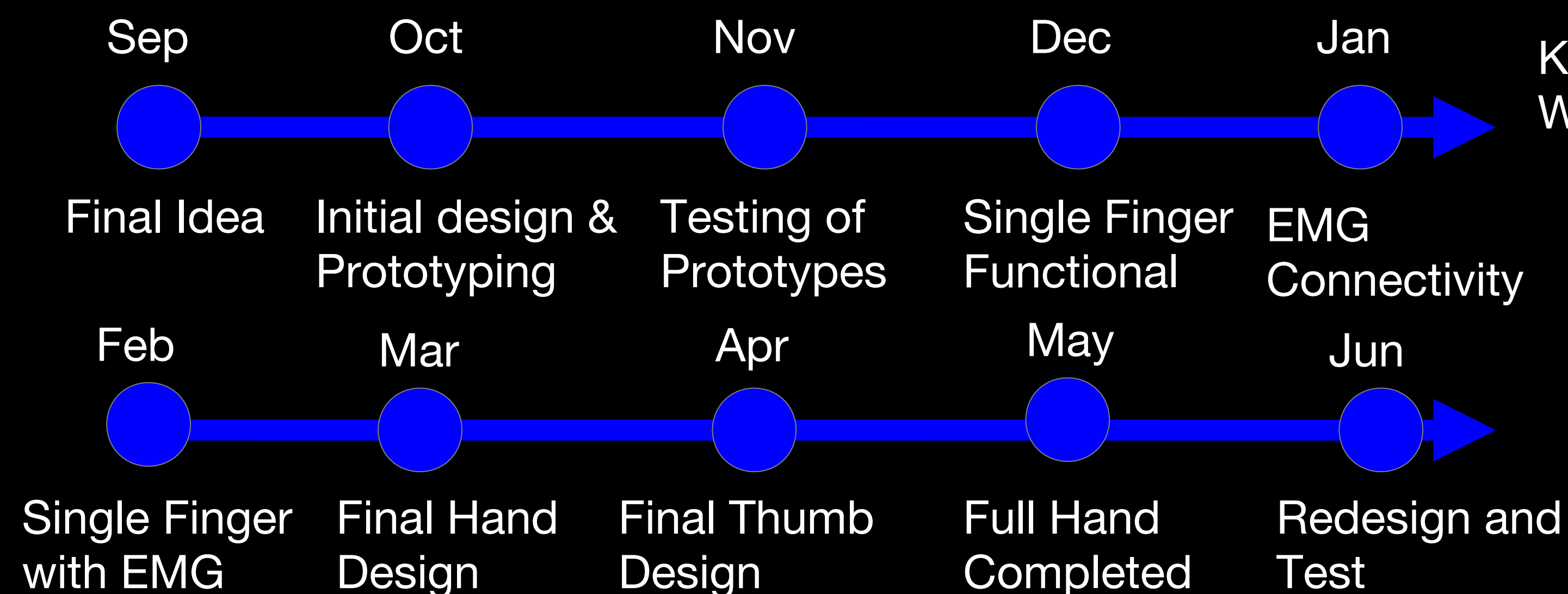
### Structural Testing

- 1.) Tensile Test – Avg. F before failure: 0.38kN or 85 lbf., 31.75mm (1.25in.) ext.
- 2.) 3-Point Flexural Test – Avg. F before failure: 0.83kN or ~180 lbf.

Budget: < \$1000 Total Cost



### Timeline: 2016-2017



Krobohand Workstation



### The Team

- Ethan Kirkley
- Zepoor Khechadorian
- Advisor: Dr. Reinkensmeyer
- Cameron Hunt
- Kevin Wong