

# Lilly Novak

She/hers

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[Tinyurl.com/LNovakPortfolio](http://Tinyurl.com/LNovakPortfolio)

## EDUCATION

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**Olin College of Engineering**      Needham, MA      May 2022  
Candidate for *Bachelor of Science, Robotics Engineering*      GPA: 3.70  
Recipient of four year 50% tuition merit scholarship

**Babson College**      Needham, MA      May 2022  
Cross registered to receive a minor in finance

## SKILLS

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**Programming:** Python, R, MATLAB, HTML, CSS, NetLogo, Javascript, Arduino, Jekyll, C++, C, C#,

**Software:** Git/Github, ROS, Gazebo, OpenCV, SIMULINK, Unity, Unreal Engine, Magic Leap

**Design:** Rapid Prototyping, Solidworks, Illustrator, Figma, Miro, Photoshop, Blender

**Machining:** 3D Printer, Drill Press, Band Saw, Belt Sander, Forge, Laser Cutter, Vinyl Cutter, Vacuum Former, Sheet Metal Sheer, Mill, MIG Welder, Heat Bender

**Heavy Equipment:** Tractor, Loading/Unloading heavy equipment, Driving a Trailer

**Collaborative:** Remote Teamwork, Leadership, Self-Directed Learning

**Languages:** English, Chinese

## WORK EXPERIENCE

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**OCAP Mechanical System Design**      January 2020 – August 2021

*Olin College of Engineering: Lair Robotics Lab*

<https://pages.olin.edu/jeff-dusek/OCAP>

Prototyped the mechanical systems for aquaculture monitoring robot as part of a seven person research lab

- Developed and prototyped a mechanical system for attaching a robot to existing underwater infrastructure for automatic traversal
- Designed a tunnel drive propulsion system
- Worked remotely while collaborating on a seven person team
- Manufactured components for remote team members
- Designed a rigid structure for interior support to the primary robot assembly.
- Designed and implemented an electrical system to monitor power draw and supply current to various sensors and propulsors
- Performed user feasibility interviews of fish farmers in eastern Maine, to assess the requirements of the project.

**Course Assistant**      September 2020 – December 2020

*Olin College of Engineering: Quantitative Engineering and Analysis*

Mentored ~80 students remotely as one of six assistants to a four professor teaching team

- Helped students learn MATLAB, differential equations, multivariable calculus, thermodynamics, Fourier transforms, and signal processing through regular check-ins and office hours

**CLEW User Interface and User Experience Designer**      June 2019 – August 2019

*Olin College of Engineering: OCCAM Lab*

Worked in a team of three to overhaul a navigational app designed for people with visual impairments through user experience design

- Conducted user research, co-design sessions, and user experience interviews with the visually impaired community around Boston MA
- Redesigned the user experience and navigation flow to provide proper signifiers and assistance for users of many different ability levels ranging from low vision to completely blind

**Information Technology technician and customer service provider:**      August 2021-Present

*Olin College of Engineering: I.T. Help Desk*

Worked in a team of nine to maintain technology systems for a several hundred student college and provide on demand repairs and support for the college community.

## PROJECT HIGHLIGHTS

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### **Swarm Robotics Simulation**

November 2020 - December 2020

*Olin College of Engineering: A Computational Introduction to Robotics*

<https://sandermler.github.io/CompRobo2020Swarms/>

Collaborated remotely with one person to implement a decentralized swarm robotics simulation

- Implemented a decentralized flocking algorithm based on past research
- Expanded upon an implementation for an existing algorithm by adding predator agents which disrupt the normal flocking behavior
- Replicated observed behavior in the natural world using robotics to further understanding of the underlying processes

### **Computer Vision Robotics Simulation**

October 2020 - November 2020

*Olin College of Engineering: A Computational Introduction to Robotics*

Collaborated remotely with one person to design a robotic algorithm capable of playing soccer.

- Used python and OpenCV to process camera feeds for localizing a robot in its environment and to identify the position of the soccer ball, and the goals
- Developed an algorithm to localize a ROS based robot and kick a ball towards the goal

### **Particle Filter Robot Localization**

September 2020 - November 2020

*Olin College of Engineering: A Computational Introduction to Robotics*

[https://github.com/EverardoG/robot\\_localization](https://github.com/EverardoG/robot_localization)

Remotely collaborated with one person to use a particle filter to localize a robot in a known space

- Implemented an algorithm which can localize a robot in its surroundings if provided a map of the environment and the robot's current sensor readings

### **Color Sensor Development**

November 2018 - December 2018

*Olin College of Engineering: Introduction to Sensors Instrumentation and Measurement*

Worked with two colleagues to design and fabricate a functional color sensor

- Used electrical filtering to design a circuit which returned a voltage output whose strength was dependent on the color of an observed object

### **Ultrasonic Range Finder Development**

November 2018

*Olin College of Engineering: Introduction to Sensors Instrumentation and Measurement*

Designed and fabricated a functional ultrasonic range finder to perform to specifications

- Used a combination of WaveGen, Matlab, and logic gates to perform signal processing and generate an ultrasonic signal
- Used active and passive electric filtering to process an ultrasonic return signal and return a voltage corresponding to the distance an object is away

### **Material Properties of Steel Through Heat Treatment**

April 2020 – May 2020

*Olin College of Engineering: Materials science and Solid State Chemistry*

Worked remotely with one person to develop a cheap material hardness testing device and use it to measure the change in hardness of steel at different stages of heat treatment.

- Designed and tested a cheap method of material hardness testing
- Performed experiments to confirm property changes of steel through hardening and tempering processes.
- Learned how the microstructures of steel affect the material properties and the processes required to control steel microstructures

### **Mechanical Sculpture Project**

April 2020 – May 2020

*Olin College of Engineering: Introduction to Mechanical Prototyping*

Worked remotely to design a Kinetic sculpture depicting the lifestyle of an early space colonist

- Used Solidworks to design linkages for a tripod walking mechanism and to create a transmission system to power the moving components of the sculpture
- Physically constructed the sculpture from the CAD design

### **Autonomous Sentry Turret**

October 2019 – December 2019

*Olin College of Engineering: Principles of Engineering*

<http://poe.olin.edu/2019/poetal-turret/>

Collaborated on a team of five to design and implement an autonomous sentry turret based off of the game Portal 2

- Helped design and implement an autonomous sentry turret capable of following a target and accurately launching nerf projectiles at them when in range.
- Used Solidworks to design the mechanical flywheel system for launching, storing and reloading nerf projectiles
- Designed and fabricated the casing for the robot using a vacuum former
- Collaborated on the design and implementation of the electrical systems to allow for ease of subsystem integration
- Used HTML and CSS to design a website to showcase the project
- Served the role of project manager aiding communication between team members and handling teaming issues when they arose.

**Bio-Inspired Play Experience Design Project**

Oct 2018 - December 2018

*Olin College of Engineering: Design Nature*

Collaborated on a team of four to design and fabricate a play experience for fourth graders based on the lifecycle of sea turtles

- Utilized user oriented design to revise the play experience based on user feedback
- Designed the experience to replicate the natural behaviors of Sea turtles to serve as both an educational and enjoyable experience

**Blacksmithing Mentor**

September 2018 - Present

*Olin College of Engineering: Machine Shop*

Received funding and educational credit to maintain the Olin College Blacksmithing Equipment and mentor Students in blacksmithing

- Maintained Blacksmithing equipment
- Mentored other students on the proper safety procedures when blacksmithing
- Mentored students on the blacksmithing trade processes of upsetting, drawing out, heat treating, folding Damascus steel, and beveling.

**Head Mechanical Director and Head Machinist**

January 2014 - May 2018

*FIRST Young Robotics Engineers*

Mentored a team of 24 in the construction and design of robotic systems, and proper machine shop procedures, while simultaneously organizing fundraising and team management

- Mentored team members on proper machining techniques and safety
- Used Solidworks to design robotic systems
- Organized fundraising and fund management
- Used a wide variety of machine shop tools to fabricate robotic components
- Designed and fabricated a rigid chain actuator for lifting containers
- Designed and fabricated a ratchet mechanism for a winch drive to protect against backdriving mechanical components

**Accessible Video Game Development**

November 2019 - December 2019

*Olin College of Engineering: Software Design*<https://sd19fall.github.io/Sound-Labyrinth/>

Collaborated on a team of three to design and implement an adventure video game which delivered the same user experience to users with audio or visual impairments

- Utilized design standards, user interviews, and testing/iteration loops to assure that the game was accessible and provided the same experience to people with audio or visual impairments.
- Performed graphical and audio design for game elements
- Used Jekyll and HTML to create an easily editable website where pages could be written in markdown

**Analysis of Formula 1 Racing Data**

November 2020 - December 2020

*Olin College of Engineering: Data Science*

Collaborated on a team of three to use the R language to analyze formula 1 racing data and determine if the performance of the car or the skill of the driver is more important in determining race results

- Used the R programming language to process formula racing data, create predictive models modeling final race position based on driver and car constructor normalized for course, and compare models to determine which aspect is more significant.
- Used the R programming language to generate compelling visuals to convey the conclusion that the driver and the constructor are of similar importance in determining race results.

**Modeling A Large Mass Driver Propulsion System**

November 2018 - December 2018

*Olin College of Engineering: Modeling and Simulation of the Physical World*

Collaborated on a team of two to create a model of a large mass driver capable of significantly accelerating the earth

- Simulated a model of a large mass driver.
- Simulated the effect of the mass driver on the orbital mechanics of earth5

**Modeling the Radiative Cooling of a White Dwarf Star**

October 2018

*Olin College of Engineering: Modeling and Simulation of the Physical World*

Collaborated on a team of two to use python to model the cooling of a white dwarf star via radiation

- Used python to model the thermal properties of a white dwarf star cooling via radiative cooling
- Confirmed scientific estimates for the time length for a white dwarf star to cool

**Modeling the propagation of a genetic disease in a population**

September 2018

*Olin college of engineering: Modeling and Simulation of the Physical World*

Collaborated on a team of two to use python to model the genetic transmission of type one diabetes in a population

- Used python to model type 1 diabetes transmission in human populations and compare with data to confirm research that type 1 diabetes is not exclusively propagated through genetics

### **Facial Recognition Algorithm**

February 2019-March 2019

*Olin College of Engineering: Quantitative Engineering and Analysis*

Designed and implemented a facial recognition algorithm to identify the person in an image and classify whether or not they were smiling.

- Designed and implemented a facial recognition algorithm using principle component analysis and eigenvector decomposition
- Designed a linear classifier to detect whether or not a face was smiling.

### **Robot Navigation in an unknown environment**

February 2019

*Olin College of Engineering: Quantitative Engineering and Analysis*

Designed and implemented a gradient descent path planning algorithm which would allow a robot to navigate an unknown obstacle course towards a goal based exclusively on sensor readings.

- Designed and implemented a gradient descent path planning algorithm to navigate a robot through an obstacle course towards a goal.
- Designed an algorithm to identify obstacles in the robot's environment by identifying features from a point cloud.

### **Passive Solar Energy for Heating a Building**

September 2019

*Olin College of Engineering: Quantitative Engineering and Analysis*

Collaborated on a team of three to design a model of the thermodynamic heat transfer of the Olin College Miller Academic Center building and propose feasible solutions to decrease the energy consumption of the building by harnessing passive solar energy.

- Used MATLAB to design a model of the thermodynamic system of the building
- Used the model to simulate possible modifications which could be made to make the building more energy efficient by harnessing the energy of the sun to heat and cool the building.
- Tested model predictions with real world experiments testing the proposed changes on sections of the building.

### **Redesigning the User Experience of Online Shopping**

September 2020 – December 2020

*Olin College of Engineering: User Experience Design*

<https://tnovak-olin.github.io/GroceryStoreUXDesignProject/>

Collaborated remotely with three colleagues to redesign the user interface and experience for online grocery store shopping.

- Remotely Performed User Oriented Design to determine what aspects of traditional experiences needed to be revised
- Performed remote codesign sessions to revise prototypes to reflect user's desires
- Revised designs using traditional design metrics to refine the user experience
- Used HTML and CSS to design a website to present the project in and display a functional figma prototype

### **User Group Collaborative Design Project**

January 2020 – May 2020

*Olin College of Engineering: User Oriented Collaborative Design*

Collaborated with three colleagues and the Needham, MA Firefighters, to design a robotic companion which could assist with extremely dangerous environments difficult for fire fighters, i.e. building collapses..

- Performed extensive collaboration with users to target the most significant painpoints/dangers/challenges of their jobs.
- Worked with users to design a solution which serviced multiple user needs

### **Augmented reality Assembly Visualizer User Interface Design**

September 2019 - December 2019

*Olin College of Engineering: AR/VR Lab*

Designed the user interface for an augmented reality CAD Assembly visualizer for the magic leap platform.

- Used Unity and C# to design user interface components and tool functionality

### **Volunteer Program director and Robotics Teacher**

June 2017-August 2018

*Washoe County School District, NV*

Taught at-risk populations of elementary school students around Reno NV programming and engineering skills through hands-on project-based learning

- Collaborated with local organizations, TEAM UP and the Boys and Girls Clubs, to provide materials and space for after school robotics programming classes for at-risk students
- Exposed at-risk students to programming, robotics, and STEM at a young age, in a fun way, to increase awareness of STEM as a viable career pathway regardless of socioeconomic status at birth.