

# Ahmed Khalil

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## Education

### University of Wisconsin-Madison

*B.S. Mechanical Engineering, GPA – 3.93/4*

**Madison, WI**

*2018–2022*

### Zhejiang University

*Study Abroad, GPA – 3.75/4*

**Hangzhou, China**

*Summer 2019*

## Research Experience

### University of Wisconsin-Madison

*Undergraduate Researcher, Reach Lab*

**Madison, WI**

*Aug 2021–May 2022*

- Designed an IMU-based 6 DOF robotic arm controller as part of NASA's ULI Project investigating how shared autonomy can assist skilled workers in completing injury prone tasks.

### University of Wisconsin-Madison

*Undergraduate Researcher, ARCs Lab*

**Madison, WI**

*Jan 2021–May 2021*

- Created a Flatness-based Model Predictive Controller for quadcopter trajectory tracking in MATLAB.

## Professional Experience

### Outvite

*Co-Founder*

**Madison, WI**

*Feb 2021–Apr 2022*

- Created a software startup for groups of people find (and agree on) something memorable to do together.
- Presented award-winning pitches, designed app's UI/UX on Figma, developed MVP web prototype using Django and React.js, and created value proposition through discovery interviews.
- Took part in gener8tor's CS Nest program and UW Madison's Innovation to Market program.

### Parker Hannifin

*Manufacturing Engineer*

**Mauston, WI**

*Jan 2021–Dec 2021*

- Designed an autonomous system for the assembly of handvalve stems for industrial scale refrigeration.
- The design included a GoFa from ABB robotics, a crimping press, a snap-ring press, multi-purpose grippers, feeding systems, and sensors for safety.

### Danfoss Power Solutions

*Design Intern*

**Minneapolis, MN**

*June 2020–Aug 2020*

- Modeled an autonomous romaine lettuce harvester in SolidWorks.
- Worked with the electrical and software teams to select and integrate the sensors into the model.

## Skills

### Programming

Python, Julia, C++, JavaScript, HTML/CSS

### Frameworks and Libraries

ROS, RViz, Gazebo, MoveIt, Django, React.js

### Software

MATLAB, Simulink, EES, LabView, SolidWorks

### Tools

Git, Docker, Figma,  $\LaTeX$

### Hardware and Prototyping

3D Printing, Raspberry Pi, Mill, Lathe, CNC Mill, IMUs, Crazyflie

## Selected Projects

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### LQ Solver for Multi-Agent Games

UW Seattle (Audit)

*CSE/AMATH 579: Intelligent Control Through Learning & Optimization*

- Implemented a general-sum differential game solver for nonlinear multi-agent settings using Linear-Quadratic approximations
- Tested solver's performance on 3-player point mass and 2-player quadcopter games.

### Augmented Lagrangian MPC Package

Open-source

*The Julia Ecosystem*

- Developing a convex Model Predictive Controller (MPC) package in Julia.
- Implemented an Augmented Lagrangian solver for convex quadratic programs.
- Wrote unit tests, set up CI pipeline, and code coverage using Github Actions.

### EKF and LQR on Differential Mobile Robot for Trajectory Tracking

UW Madison

*ME 439: Intro to Robotics*

- Improved a differential mobile robot's wheel-based state estimation by integrating an MPU6050 IMU sensor and fusing it with wheel encoders using an Extended Kalman Filter (EKF).
- Designed a Linear Quadratic Regulator (LQR) controller and compared it to the Proportional Integral Derivative (PID) controller designed in class.
- Utilized ROS networking to carryout all computations on an external computer for real-time control.

### Beep Band

Madison, WI

*Startup*

- Designed an anti-bullying smart band for kids in schools using a LoRa chip, an ESP 8266, and IFTTT software.
- Modeled injection molding process using Moldex3D and created a SolidWorks model of the smart band to carryout FEA stress analyses for identifying stress concentrations.

## Awards

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### Engineering Graduate Fellowship (Declined)

Vanderbilt University

- Awarded by Engineering department for outstanding scholarship.

2022

### George R. Werth Scholarship

UW Madison

- Awarded by Mechanical Engineering department for outstanding scholarship.

2021

### Best Pitch Award

Transcend UW

- Won Best Pitch Award for a startup called 'FeedForward' (eventually became Outvite).

2021

### Tau Beta Pi

UW Madison

- Awarded to the top 20% of students in the school of engineering.

2021

### M.M. El-Wakil Scholarship

UW Madison

- Awarded by Mechanical Engineering department for outstanding scholarship.

2020

## Volunteering

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### Tau Beta Pi

Web Developer

- Redesigned UW Madison's Tau Beta Pi Chapter website

2022

### Greater University Tutoring Service

Tutor

- Tutored various physics, mathematics, and engineering-related courses

2021