BILL YEN

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EDUCATION

Stanford University   Stanford, CA; Expected June 2028
Ph.D. Student in **Electrical Engineering**
Stanford Graduate Fellowship in Science & Engineering

Northwestern University   Evanston, IL; June 2023
Bachelor of Science in **Mechanical Engineering (Robotics and Controls Concentration)**
Minor in **Environmental Engineering** | Certificate in **Human-Centered Design** | Accreditation in **LEED AP BD+C**
Cumulative GPA: 3.90/4.00

ACADEMIC AWARDS

Featured by [Northwestern Magazine](#) and [Institute for Sustainability and Energy](#) as "Grad to Watch"
Ovid W. Eshbach Award, *6/2023*, given to 1 outstanding senior in the McCormick School of Engineering who "most closely typifies the ideal engineering student" and displays overall excellence in scholarship and leadership
Wildcat Impact Award for Discovery, *2/2023*, recognized for founding AutoAquaponics over COVID-19 and for significantly contributing to improving the quality of student life at Northwestern
Tau Beta Pi Engineering Honor Society Inductee, *11/2022*, for being in the top 20% of the mechanical eng. major
The Energy & Environmental Building Alliance NextGen Scholar, *9/2021*, one of seven students from all over the world selected to present at the 2021 EEBA High Performance Building conference in Denver, CO
1st Place Scholarship from Illinois Association of Environmental Professionals, *8/2021*, awarded for extracurricular and academic excellence and a winning essay on the business case for sustainability
Grand Winner in U.S. DOE Solar Decathlon Design Challenge, *4/2021*, placed first out of 50+ international teams in the Residential Building division with the design of a net-zero urban single family home
McCormick Design-A-Thon Finalist, *11/2020*, placed within the top 4 overall out of more than 40 undergraduate and graduate teams with a functional iOS app prototype aimed to connect students amidst the COVID-19 pandemic
5th Place Team in PDMA Global Student Innovation Challenge, *8/2020,* placed in the top 5 among undergraduate and graduate teams from all over the world with a smart air purifier that utilizes live moss to clean air
1st Place Team in White Space Product Development Challenge, *4/2020*, won the product design competition involving both undergraduate and graduate students from numerous Midwestern universities
1st Place in Launch Entrepreneurship Accelerator from The Garage at Northwestern, *3/2020*, won the startup accelerator with a prototype and business plan for an automatic fish feeder customers can trust
Segal Design Institute DTC Design Award, *12/2019*, recognized for creating the best prototype for the user in Northwestern's Design Thinking and Communication course

RESEARCH EXPERIENCES

Stanford Smart Sensing Systems Lab, *Graduate Researcher*; Stanford, CA   *September 2023 – Present*
- Developing ultra-low power wireless communication techniques for environmental sensing at the Stanford Smart Sensing Systems (S4) Lab with Prof. Zerina Kapetanovic
- Modulating Johnson noise for passive nearfield communication at 13.56 MHz using software-defined radio and low-noise amplifiers
- Designing custom retroreflectors for ground-to-satellite communication

Ka Moamoa Lab, *Research Assistant*; Evanston, IL   *September 2020 – August 2023*
- Designed resilient microbe-powered soil batteries to provide renewable energy supplies to distributed sensor networks using 3D printing and other rapid prototyping technologies
- Prototyped a low-power sensing platform to transmit moisture data wirelessly with < 1 µW of power
- Optimized a custom backscatter communication system by leveraging HackRF and GNU Radio
- Published a first-author paper on building practical soil microbial fuel cells for wireless sensor nodes in collaboration with Ph.D. students, postdoctoral scholars, and professors from 4 different universities

Wells Environmental Biotechnology Lab, *Research Assistant*; Evanston, IL   *June 2020 – August 2023*
- Built the QIIME Output Cleaner, an intuitive Python software with an integrated graphical user interface to convert 16s rRNA bioinformatics data into community composition plots for visualization purposes
- Conducted extensive literature reviews to benchmark existing microbial fuel cell designs and identify potential microbes that can generate electricity by breaking down organic carbon
- Second author to a poster presentation for the 2022 AEESP conference on terrestrial microbial fuel cells

PUBLICATIONS

Soil-Powered Computing: The Engineer's Guide to *Practical* Soil Microbial Fuel Cell Design
Bill Yen, Laura Jaliff, Louis Gutierrez, Philothei Sahinidis, Sadie Bernstein, John Madden, Stephen Taylor, Colleen Josephson, Pat Pannuto, Weitao Shuai, George Wells, Nivedita Arora, Josiah Hester
Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, Vol. 7, No. 4 (Dec. 2023)

Poster: Harnessing Power from the Soil
Weitao Shuai, ***Bill Yen***, Laura Jaliff, Abu Bakar, Jason Huang, Alex Curtiss, Colleen Josephson, Josiah Hester, Pat Pannuto, George Wells
2022 Association of Environmental Engineering and Science Professors Research and Education Conference

INDUSTRY EXPERIENCES

CNH Industrial, *Crop Production Innovation Intern*; Burr Ridge, IL   *June 2022 – August 2022*
- Designed and prototyped a mobile, multi-depth soil moisture and temperature sensor module, resulting in 3 separate IP filings
- Manufactured agriculture-grade ruggedized waterproof housings for sensitive electronics using sheet metal, stereolithography, and selective laser sintering technologies
- Built custom printed circuit boards to measure soil temperature and moisture levels in real time and transmit the data to users via CAN bus

General Motors, *Environmental Engineering Intern*; Bedford, IN   *June 2021 – September 2021*
- Automated chemical inventory workflow across GM plants globally by building a custom Python data processing application with a complete GUI and creating the necessary training material for GM's engineers
- Proposed and facilitated the acquisition of two novel bio-electrochemical sensors for real-time BOD measurements to create an outfall diversion system for Bedford GPS's industrial wastewater treatment plant
- Constructed 12+ standardized procedures for the operation and maintenance of a new Dissolved Air Flotation mixed liquor suspended solid removal system and a turbidity sensor module to aid in their installation

PROJECT EXPERIENCES

Engineers for a Sustainable World, *Co-President*; Evanston, IL   *September 2019 – June 2023*
- Led a multidisciplinary team of 20+ engineers in the design and construction of an automated farming system that can be monitored and controlled remotely with sensors, actuators, ESP32s, and a Raspberry Pi
- Developed an IoT network of microcontrollers with built-in data acquisition and BLE messaging capabilities using Python and C++ to enable the system's remote monitoring and feedback loop controlling process
- Built the power electronics and sensing portion of the hardware platform prototype, which can be accessed remotely through a React site connected to Google Firebase
- Founded the project over the pandemic and won over $5000 of grant funding for construction material

Swarms and Multi-Robot Systems, *Engineer*; Evanston, IL   *September 2022 – December 2022*
- Built decentralized controllers for simulated robotic swarms to facilitate complex behaviors like localizing agents without the use of environmental sensors, separating out groups of robots without direct communication, and creating a robust flock of 20+ differential drive robots with accurate heading alignment
- Implemented the tasks described above with Python using algorithms from existing publications
- Tested the flocking controller on physical robots under the guidance of Prof. Michael Rubenstein

B.U.R.N. Meter, *Engineer*; Burr Ridge, IL   *June 2022 – August 2022*
- Created a portable UV index meter for real-time measurement of UV index and onboard battery

- Published a detailed Instructible on how to build the device so that anyone with access to 3D printing can create their own B.U.R.N. Meter and stay informed on the amount of UV radiation they are exposed to

McCormick Autonomous Robot Design Competition, *Team Lead*; Evanston, IL   *March 2022 – June 2022*
- Devised the hardware, electronics, and software system for a fully autonomous differential drive robot capable of traveling through a maze and dropping small objects in various parts of the environment
- Facilitated precise motions of the robot with a closed-loop PID controller implemented in C++
- Manufactured the chassis and wheels of the robot using 3D printing and laser cutting

U.S. DOE Solar Decathlon Design Challenge, *Water Systems Engineer*; Evanston, IL   *July 2020 – April 2021*
- Engineered a centralized, efficient, and prefabrication-friendly residential water system for an affordable Zero Energy Ready Home based on a site in Chicago, IL
- Reduced the home's overall potable water consumption by 60.5% relative to LEED, ENERGY STAR, and WaterSense baselines by utilizing low-flow fixtures, graywater reuse, and smart landscaping strategies

White Space Product Development Challenge, *Team Leader*; Evanston, IL   *December 2019 – April 2020*
- Invented Arbor, a self-cleaning air purifier that uses live moss, activated carbon, and an UV-C bulb to remove airborne contaminants, increase humidity, and release negative ions
- Led a team of 3 through the conceptualization, prototyping, and presentation phase of the competition
- Filed for a provisional utility patent on the use of live moss for airborne contaminant removal

INVITED TALKS

AutoAquaponics: An Automated, Open-Source, and Sustainable Indoor Farming System   *May 2022*
Annual McCormick Advisory Council   *Evanston, IL*

Soil-Powered IoT System for Smart Green Infrastructure Monitoring   *March 2022*
2022 NTU-NU Engineering Research Poster Session   *Virtual*

NUHome by Northwestern: Chicago's Next Net Zero Home   *September 2021*
2021 EEBA High Performance Home Summit   *Denver, CO*

Arbor Natural Air Purifier   *May 2020*
McCormick Murphy Scholar Spring Seminar   *Virtual*

SKILLS

- **Software:** C, C++, Python, Git, Linux, MATLAB, HTML, CSS
- **Electronics:** PCB Design (KiCAD, EAGLE, EasyEDA), Software-Defined Radio (USRP, HackRF, GNU Radio), Wireless Communication (RF Backscatter, BLE, LoRa, WiFi), Mechatronics, Embedded Programming (ESP32, PIC32, Arduino, Raspberry Pi), Analog Circuit Design, Digital Feedback Systems, Digital Communication Protocols (SPI, I2C, CAN)
- **Mechanical:** 3D Printing (FDM, SLA, SLS), Machining (Mill/Lathe, Laser Cutter, Water Jet), GD&T
- **CAD:** SOLIDWORKS, NX, AutoCAD, Creo, Onshape, Keyshot Studio
- **Language:** Mandarin (Native), Taiwanese (Native), Spanish (Proficient)
- **Other:** Patent/White Space Analysis, Literature Review, Scientific Writing, Design Sketching, Hazardous Material Training, Bioinformatics, Organic Chemistry

GRANTS

- Norman Design Fund   *March 2023*
- Engineers for a Sustainable World Global Project Grant x 2   *January 2021, December 2022*
- Northwestern ASG Sustainability Grant x 3   *February 2021, February 2022, October 2022*
- McCormick Student Advisory Board Grant x 2   *November 2020, March 2022*
- National Science Foundation REU Award   *March 2021*
- Northwestern ASG Wild Ideas Grant   *November 2020*
- Northwestern Summer Undergraduate Research Grant   *April 2020*