

# X Sun

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## Research Interest

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My research interest spans the areas of (additive) manufacturing, tissue engineering, (living) biomaterial, optics, micro electromechanical system (MEMS) and computational & medical imaging. I am especially interested in inventing novel manufacturing tools for (1) producing optical elements (2) biofabrication of human vascular structure for organ transplantation and drug testing.

## Education

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**UC Berkeley College Of Engineering, Berkeley, CA, USA** Aug 2022 - May 2027  
Doctor of Philosophy in Mechanical Engineering under the supervision of Professor Hayden Taylor

**UC Berkeley College Of Engineering, Berkeley, CA, USA** Aug 2019 - May 2022  
Bachelor of Science in Mechanical Engineering

- Jacobs Institute Innovation Catalyst Recipient (\$500), 2020 Fall: led a student team to create a mobile, open-sourced USB bicycle phone charger
- Summer Undergraduate Research Fellowship, 2021: Cost and Construction Analysis of Concrete Gridshells by Finite Element Analysis
- Cal Alumni Leadership Scholarship Recipient, 2021-2022
- Jacobs Institute Innovation Catalyst Recipient (\$2000), 2021 Fall: Extending work of Bear Air (a economically efficient air ventilator) into real life application in face of COVID and wild fire season
- Selected Relevant Coursework (> 100: undergraduate upper division courses; > 200: graduate courses): ME C117 - Structural Aspects of Biomaterial; EE 145B: Medical Imaging Signals and Systems; ME H194 - Honor Undergraduate Research; ME C201 - Modeling and Simulation of Advanced Manufacturing Process; ME 223 - Polymer Engineering; ME C225 - Fracture and Fatigue of Structural Materials ; ME 280A - Introduction to the Finite Element Analysis;
- Accumulative GPA: 3.7 / 4.0

**Mater Dei High School, Santa Ana, CA, USA** Aug 2016 - May 2019

- Principle's Honor List, Class of 2019
- Founder and Team Captain of Math Team & Captain of Speech and Debate Team
- Graduated with 96.28 UC transferable units (including Advanced Placements units and courses taken in community colleges)

## Key Qualifications

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- Skilled in research (literature review, planning and executing experiments, analyzing and organizing data, grant and paper writing) at additive manufacturing, biofabrication, (bio)material, HVAC (Heating, Ventilation, and Air Conditioning), mechanical design and optimization, ocean engineering, and control fields.
- Trained on mammalian cell culture and various molecular imaging techniques
- Experienced in data analysis and simulation with Matlab and Python & CAD with Solidworks and Fusion 360
- Familiar with Finite Element Method theory and its applications in Ansys and Abaqus
- Proficient with mechanical component design and fabrication (3D printers, wood shop, metal shop, and CNC machines)

## Research Experience

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## **Graduate Student Researcher**

Aug 2022 - Present

Design For Emerging and Nanoscale Manufacturing Lab, UC Berkeley

- Applying Computed Axial Lithography (CAL) on manufacturing optical elements
- Designing and testing next generation of computed axial lithography printers

## **Research Assistant**

Feb 2020 - Aug 2022

Design For Emerging and Nanoscale Manufacturing Lab, UC Berkeley

- Regularly reviewed literature, proposed research ideas, and helped with grant writing
- Attended group meetings, workshops and conferences in relevant fields
- Made organic / bio photo-resin with various monomer and photoinitiators for conducting different experiments, including discovering novel materials
- Conducted various bio-related projects for exploring the advantages of volumetric light patterning
- Designed and executing experiments to print, post- process, and evaluate optical components with Computed Axial Lithography (CAL) printer
- Built a theoretical model to optimize post-processing
- Led a team to build an open-sourced CAL printer
- Improved optical performance of the CAL system by further developing projection generation code
- Evaluated mechanical properties of novel hydrogels and fabricate tools for tissue engineering and contact lenses printing
- Led a collaboration with O'Connell Lab on creating cartilage tissue with CAL printer using a mixture of agarose, alginate, and PEGDA gels
- Assisted to upgrade the CAL printer for multi-wavelength printing and applying it to bioprinting in collaboration with a Stanford team
- Built a theoretical simulation for volumetric 3D printing with metal powder in ultrasonic field
- (Bear Air) Co-led a team in a COVID air purification project that gained 130K initial fund from the CITRIS Institution: Literature review, planned and executed experiments, led data analysis and product designing, wrote paper and grants, led communication with research partners
- Led a student team in producing a 3D printable Bacterial Viral Filter model

## **Cartilage Tissue Engineering Research Assistant**

Feb 2021 - 2021 Dec

O'Connell Lab, UC Berkeley

- Constantly reviewed literature and proposed new research ideas
- Prepared bovine meniscus samples
- Made agarose, alginate, PEGDA, GelMA, and collagen gels with different formulas and conducting biocompatibility (using chondrocytes) compressional & stress relaxing test with casted samples
- Printed and evaluated hydrogels with a bio fused deposition printer (Allevi 2)
- Conducted print fidelity tests and improved the print fidelity by alternating print parameters: successfully printed soft 3D structures with overhang parts
- Met with graduate student mentor weekly and presented final research result to the group every semester

## **Researcher**

June 2019 - Dec 2021

Mentored by professor Zhenyu Gan, Mechanical & Aerospace Engineering, Syracuse University

- Investigated the impact of spring linear stiffness in a SLIP (Spring Loaded Inverted Pendulum) model using matlab.

## **Summer Undergraduate Research Fellowship**

May 2021 - Aug 2021

Departments of Architectural and Civil Engineering, UC Berkeley

- Analyzed laminated composite material properties (Young's Modulus, Shear Modulus, Poisson's Ratio, bending strength, and bending modulus) and structural integrity in Ansys and Abqus for their use in gridshell constructions
- Created CAD models for Finite Element Analysis (FEA)
- Reviewed and summarized literature in the field
- Organized, analyzed, and created graphs to visualize data

## **Mechanical Engineer And Researcher**

Mar 2020 - July 2020

COVID19 Project - HelpVentilator (<https://www.ventilatorsos.org>), UC Berkeley

- Repurposed CPAP and BiPAP machines as ventilators for supplementary medical devices
- Created CAD model for 3D printing and press release
- Built and Tested prototype with off-shelf-products and 3D printing parts
- Created the fist website and started a Gofundme campaign for the project
- Gathered and analyzed data including flow rate, pressure drop, and oxygen concentration
- The VentilatorSOS team distributed thousands of machines across the world

### **Ocean Engineering Researcher**

Dec 2019 - Jun 2021

TAF (Theoretical & Applied Fluid Dynamics) Lab

- Operated apparatus around a large scale wave tank in O'Brien Hall at UC Berkeley campus.
- Assisted calibrate wave gauges and force cells
- Team member of UC Berkeley MECC (Marine Energy Collegiate Competition) Team: research, design, and conduct business plan for novel marine energy technologies — Underwater UUV (unmanned underwater vehicle) Charging Station & Wave Energy Microgrid System for Isolated Communities
- Lead author of a paper published at Berkeley Scientific Journal

## **Other Activities**

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### **Volunteer For Youth Education Events**

Sep 2019 - Present

Society of Women Engineer & Berkeley Splash

- An administration member at Splash Berkeley
- Teaching Rocket, Marine Energy, manufacturing, and bioprinting courses to hundreds of high school students at Splash Berkeley
- Regularly volunteer for engineering or scientific workshops to elementary and secondary school students

### **Officer in Project Grant Committee**

Feb 2021 - May 2022

American Society of Mechanical Engineers UC Berkeley Chapter

- Worked on providing funds to student projects in mechanical engineering classes: every semester, we successfully distributed about \$5000 to student teams in ME 102B class (about 100 people) at UC Berkeley for supporting student projects

### **Engineer & Team leader & Mentor & Volunteer**

Feb 2016 - 2020 May

Code Orange FRC 3476, RoboRAVE international

- 3rd Place in Innovation & Entrepreneur Competition Asia Regional 2016: Built a robot automated to deliver toilet paper in bathrooms of commercial stores
- 4th Place in FRC (First Robotics Competition) World Championship 2018
- Volunteered for various educational programs: mentor & judge

### **Researcher, Mechanical Team Lead**

Feb 2020 - May 2021

Space Technologies At California

- Worked on the mechanical control system and design & manufacturing of payload box in HAB (High altitude Balloon) Team
- Led the Mechanical Team in 2021 Spring

### **Mechanical Engineer**

Aug 2019 - May 2020

Cal Space Technologies and Rockery & UC Berkeley Solar Vehicle Team & UC Berkeley Robomaster Team

- Researched on various propulsion systems and simulation techniques of rockery
- Fabricated CCTV camera mount with laser cutting
- Created CAD model for using Ansys to analyze torsional rigidity of the car structure
- Designed and manufactured mechanical parts for additional support on the robot

## **Publications**

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- Sun, X., Deng, B., Zhang, J., Kelly, M., Alam, R., & Makiharju, S. (2021). Reimagining Autonomous Underwater Vehicle Charging Stations with Wave Energy. *Berkeley Scientific Journal*, 25(2). <https://doi.org/10.5070/BS325254504>

## **Conference Talk and Poster Presentation**

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- 2022 MRS Spring Meeting: “Potential Application of Computed Axial Lithography in Manufacturing Optical Elements” (Received Recognition Award)
- 2022 Additive Manufacturing of Soft Materials Conference GRC: “Potential Application of Computed Axial Lithography in Manufacturing Optical Elements”

## **Conference Presentations in Undergraduate**

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- 2020 Fall: CITRIS COVID-19 Grant Projects Discussion — “A low-cost, accessible ventilation system for indoor air purification”
- 2020 Fall: Undergraduate Research Symposium in College of Engineering, UC Berkeley — “A low-cost, accessible ventilation system for indoor air purification”
- 2021 Summer: UC Berkeley Summer Undergraduate Research Fellowship Conference — “Investigation on Bending Behavior of Externally Carbon Fiber Reinforced Concrete Using Finite Element Method and Its Applications in Gridshell Architectures”
- 2021 Fall: Undergraduate Research Symposium in College of Engineering, UC Berkeley — “Volumetric Biomanufacturing via Computed Axial Lithography”
- 2021 Fall: Gulf Coast Undergraduate Research Symposium, Rice University — “Volumetric Biomanufacturing via Computed Axial Lithography”

## **Social Media & Research Platform Links**

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- Research Gate: <https://www.researchgate.net/profile/X-Yaxuan-Sun>
- LinkedIn: <https://www.linkedin.com/in/x-sun/>
- Personal Website: [www.xxxxsun.org](http://www.xxxxsun.org)