

Zeshui Song

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EDUCATION

The Cooper Union for the Advancement of Science and Art	New York, NY
<i>B.E. in Mechanical Engineering; GPA: 3.859</i>	<i>Aug. 2024 – Present</i>
• Relevant Coursework: Statics, Dynamics, Mechanics of Materials, Materials Science, Design and Prototyping, Systems Engineering, Thermodynamics, Physics I-III, Calculus I-III	
Brooklyn Technical High School	Brooklyn, NY

Advanced Regents Diploma; AP Scholar with Distinction *2020 – 2024*

EXPERIENCE & RESEARCH

Tow Tank Research	July 2025 – Present
<i>Mechanical Designer</i>	<i>New York, NY</i>
• Engineered a linear gantry using a NEMA 23 stepper, timing belt, and dual MGN12 rails for precise wing force measurement.	
• Designed high-stiffness modular 80/20 framing to optimize load paths and minimize structural vibration.	
• Integrated Arduino motion control with a TB6600 driver and limit switches for repeatable homing.	
Vertically Actuated Immersion Tank	July 2025 – Present
<i>Mechanical Designer</i>	<i>New York, NY</i>
• Designed a NEMA 17/lead screw vertical actuator to study beetle behavior during air-to-water transitions.	
• Developed motion control using GRBL and G-code to vary immersion rates and depth systematically.	
• Optimized stability via an optical breadboard base and precision linear motion guide shafts.	

PROJECTS

FSAE Suspension Dynamics Model <i>Python (SciPy), ODE, Kinematics</i>	Nov. 2025 – Dec. 2025
• Characterized the front suspension of a Cooper Union FSAE car by developing a four-bar linkage kinematic model and solving for rigid-body static equilibrium.	
• Derived a nonlinear effective spring constant and integrated it into a second-order ODE to simulate free oscillation, validating results against experimental video tracking data.	
• Implemented geometric solvers using circle-circle intersections to ensure numerical robustness across the full range of motion.	
Wales: Water-Based Motion Rectifier <i>Onshape CAD, 3D Printing, Fluid Systems</i>	Jan. 2025 – May. 2025
• Designed an Archimedes screw energy-buffer system in Onshape to decouple variable input for constant output.	
• Developed a bevel gear transmission and crowned pulley system in Onshape to ensure reliable power transfer and self-centering of drive belts.	
• Achieved a nearly constant output speed ($R^2 = 1.00$) by maintaining constant pressure in the upper reservoir via an overflow outlet.	
GigaSniffer: Spoilage Detector <i>Arduino, Sensor Calibration, Prototyping</i>	Sept. 2024 – Dec. 2024
• Built a portable CO2 and ethanol sensor array using Arduino with rolling-average filtering for spoilage detection.	
• Fabricated a laser-cut sensing chamber and integrated real-time graphical feedback for alerts.	
BTHS Solar Car Team <i>CAD, CFD, Electrical Systems, Telemetry, Project Management</i>	Jun. 2020 – Jun. 2023
• Founded and led a 36-member multidisciplinary student team to design a road-legal solar electric vehicle, managing mechanical, electrical, programming, and operations divisions.	
• Secured over \$30,000 in cash and in-kind sponsorships and established a 501(c)(3) partnership to support long-term team funding and operations.	
• Contributed hands-on to CAD design, CFD and thermal simulations, battery pack architecture, and telemetry system development, while coordinating cross-disciplinary integration.	

TECHNICAL SKILLS

CAD/Mechanical: Onshape, Solidworks, AutoCAD, Fusion 360, Inventor, 80/20 Aluminum Framing

Prototyping/Fab: 3D Printing (FDM), Laser Cutting, Sand Casting, Soldering

Programming: Python (SciPy, NumPy), MATLAB, Arduino IDE, C, GRBL

Tools/Hardware: Arduino Microcontrollers, Stepper Motors (NEMA 17/23), TB6600 Motor Drivers, Load Cells (HX711), Gas Sensors (CO2, Ethanol)