

# Benson Lu Huang

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Full Manuscripts Available Upon Request

## EDUCATION

### Half Hollow Hills High School West

- **GPA:** 98.9/100
- **Honor Societies:** Math, Science, National, and Music Honor Society Member
- **Awards:** National Merit Scholarship Semifinalist, University of Pennsylvania Book Award, Rochester Institute of Technology Business and Innovation Scholar
- **AP Courses:** Physics C Electricity & Magnetism, Physics C Mechanics, Calculus BC, Environmental Science, Biology, World History, Seminar, Physics 1, Physics 2, Research, United States History, Macroeconomics, Microeconomics, English Language and Composition, Spanish Language and Culture
- **Test Scores:** 1540 SAT (790 Math, 750 R/W), 1470 PSAT (NMSQT 223 w/ perfect R/W)

### MIT IDSS: Data Science and Machine Learning

- **GPA:** 100/100
- **Completed Courses:** All 50+ courses on Python-based neural networks and predictive analytics

### Google Career AI/ML Essentials

- **GPA:** 100/100
- **Completed Courses:** LLM Self-supervised learning, supervised learning, reinforcement learning, AI Ethics/Prompt Engineering

### Hong Kong Polytechnic University Medicine

- **GPA:** 88/100
- **Completed Courses:** ANA101: Human Anatomy for Stroke

### University of Michigan Medicine

- **GPA:** 100/100
- **Completed Courses:** ANATOMY403.2: Cardiovascular, Urinary, and Respiratory Systems

## HONORS

### Regeneron ISEF 3rd Place Biomedical Engineering Grand Award, Society for Science 2025

One of 300 Grand Award Winners out of millions of competitors worldwide for building the first wave-based robotic surgery force sensor by modeling electricity-tissue interactions under force

### 1st Place Biomedical Engineering, New York State Science and Engineering Fair 2025

One of 15 Best-in-Category winners out of 592 (2.5%) competitors statewide for best overall project

### Live Más Scholar, Taco Bell Foundation 2025

A highly selective group of nationwide awardees for unconventional innovation beyond academics or athletics and the pursuit of accessible, impactful technology

### Yale Most Outstanding Mathematics and Physics Exhibit, Yale Science and Engineering Association 2025

First place out of 592 competitors for excellence in scientific rigor, innovation, and the ability to clearly convey complex ideas to both expert judges and the public

### Caltech Up Close Scholar, California Institute of Technology 2025

One of 120 out of thousands of applicants nationwide for high achieving students from underrepresented backgrounds in science, technology, engineering, and mathematics

### x3 Gold Medalist, National Spanish Exam 2022, 2024, 2025

99<sup>th</sup> Percentile score nationally, awarded for exceptional proficiency in Spanish language comprehension, grammar, vocabulary, and cultural knowledge

<b>Finalist, Junior Scientists and Young Explorers Meta (JYEM)</b>	2025
One of 50 out of 1,372 (3.6%) competitors worldwide for developing a novel force sensing and anomaly detection device and system for robotic surgery	
<b>Semifinalist, Diamond Challenge</b>	2025
Top 10% of competitors worldwide for developing a social media safety monitoring app as a top global student-entrepreneur	
<b>x2 Gold Presidential Volunteer Service Award, AmeriCorps</b>	2023, 2024
For service that strengthens America's civic spirit and inspires others to act in their communities through impactful, youth-driven education and leadership	
<b>Youth Leadership Recognition Award, New York State Senate</b>	2024
One of 24 out of over 500,000 (0.0048%) students statewide for inspiring others through service, dedication, and a passion for creating change	
<b>2<sup>nd</sup> Place, American Chemical Society Mid-Atlantic Regional Meeting</b>	2024
Second Place out of 35 competitors (5.7%) nationwide including PhD students for proposing a non-addictive hydrocode variant, Kalirouna	
<b>National Certificate of Merit, USA Bio Olympiad</b>	2024
For outstanding performance in the USA Biology Olympiad Open Exam	
<b>Youth Ambassador for Science, Stanford Asian American Scholars Forum</b>	2024
For creating viral online science communication content that reached 10K+ users on social media	
<b>5<sup>th</sup> Place Alliance Captain, First Tech Challenge Robotics Regional Championship</b>	2024
One of 4 Alliance Captains out of 47 (8.5%) competitors across Long Island for outstanding competition performance and robot capability	
<b>Control Award, First Tech Challenge Robotics Regional Championship</b>	2024
First Place out of 47 competitors across Long Island for excellence in programming, autonomous operation, and use of sensors in robot performance	
<b>Gold Award with Distinction, NYSSMA All-State Symphonic Orchestra</b>	2024
For excellence in symphonic orchestra performance as evaluated by 3 PhD adjudicators	

## WORK EXPERIENCE

<b>President, Youth Entrepreneurship Finance Association (YEFA)</b>	New York, NY   2022 – Present
<ul style="list-style-type: none"> <li>- Founded a global initiative promoting financial literacy in 15,000+ in 12 countries</li> <li>- Acquired \$60k+ in sponsorships from partners like AFI, Coke, Webflow, and Google</li> <li>- Partnered with the UN to explore Sustainable Development Goals (SDGs) through impact investing</li> <li>- Collaborated with Mastercard, Evercore, and Visa on emerging market seminars</li> </ul>	
<b>Intern, Stony Brook Medicine</b>	Stony Brook, NY   2023 — Present
<ul style="list-style-type: none"> <li>- Kaczocha Lab, aiding Phase 1 FDA Trials for FABP5 as a non-opioid peripheral neuropathy medication, endocannabinoid transport and addiction</li> <li>- Gunn Lab, Pancreatic Triacylglycerol Lipase active site structure</li> <li>- Takemaru Lab, Polycystic Kidney Disease DZIP1/1L mutations and recruiting hierarchies</li> </ul>	
<b>Founder, Hawkeye App Inc.</b>	Berkeley, CA   2023 — 2024
<ul style="list-style-type: none"> <li>- Launched a paid app promoting teen social media safety through digital footprint tracking</li> <li>- Awarded a \$50,000 grant for AI integration as a Microsoft for Startups Accelerator Hub member</li> <li>- Developed with colleagues at the LaunchX @Berkeley entrepreneurial institute</li> </ul>	

## LEADERSHIP EXPERIENCE

<b>President, HHH West FTC Robotics Club</b>	New York, NY   2022 — Present
<ul style="list-style-type: none"> <li>- Led a club of 3 teams and 70+ members</li> <li>- Acquired sponsors from Lockheed Martin, Intuitive Surgical, and Makelabs</li> </ul>	

- Initiated community outreach that reached over 50 businesses and 200+ local educators and business owners

### **Student Body President, HHH HS West**

Dix Hills, NY | 2023 — Present

- Represented the 1000+ person school student body to district and county administrators
- Raised over \$15,000 in revenue through school apparel sales and events to support STEM clubs, athletics, and arts
- Organized homecoming, prom, junior prom, blood drive, etc.

### **Youth Hockey Ambassador, New York Islanders**

Dix Hills, NY | 2024 — Present

- Selected as an ambassador from the director of ice hockey in NYS for excellent sportsmanship, leadership, and service within the New York Hockey Community
- Spoke in front of 2,000,000+ viewers on ESPN and live fans at UBS Arena
- Featured on #1 Long Island radio station, 106.1 BLI as amateur athlete of the month

## **PROJECTS**

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### **BLADE: Bioimpedance-integrated, Laparoscopic, Articulated, Dual-purpose, EndoWrist System for Natural Control, Force Sensing, and Tissue Detection in the DaVinci S Robotic System (submitted to Regeneron Science Talent Search 2025)**

- Designing the next-generation human-robot interface system for surgery in my garage
- Combining bioimpedance sensors for tissue identification/force sensing and haptic glove for ergonomic hand control of EndoWrist into one comprehensive robotic surgery system compatible with the DaVinci S robotic system

### **Using Changes in Bioimpedance Values to Infer Applied Force for Tissue-Specific Force-Sensing During Minimally (ISEF 2025)**

- Designed and built the world's first bioimpedance-based tissue-specific force sensor with haptic feedback for safer robotic surgery on sensitive tissues
- Uncovered previously hidden mathematical relationship correlating impedance values with applied force in biopsy procedures
- Built and validated DIY prototypes at home for under \$50 using disassembled scrap electronics compared to \$3000 commercial equivalents, performed experiments on supermarket meat
- My story was published in Stony Brook University Statesman Magazine
- Recognized at Northeast Bioengineering Conference 2025 @NYU and ISEF 2025; reviewed by Intuitive Surgical Patent Office, New York Presbyterian Hospital Queens, Brown University School of Engineering, and New York Institute of Technology

### **Dippin' Dots: Automated Quantification of Colocalized Puncta in Chromosomal Networks (Stony Brook Medicine)**

- Built an automated U-Net Convolutional Neural Network that integrates into microscopy software (ImageJ and AxioVision) to count colocalized immunofluorescence puncta on chromosomes using computer vision to better count colocalized proteins

### **Langevin Equations Applications in Organoid Computing (Al Kalfus Long Island Mathematics Fair)**

- Proposed application of differential Langevin equations to model stochastic neural dynamics in organoid-based computing systems
- Developed mathematical models for noise-driven learning, synaptic variability, and signal
- Established a theoretical framework bridging computational neuroscience and biohybrid intelligence to enable tunable, noise-enhanced biological computing

### **Kalirouna – The Future of Pain (American Chemical Society Conference)**

- Modeled a novel hydrocodone opioid derivative that theoretically reduced addictive potential while retaining pain treatment efficacy
- Utilized AutoDock and PyCharm to design a molecule optimized to avoid crossing the blood-brain barrier while maintain strong binding affinity to peripheral dorsal root mu-opioid receptors in the spinal cord

### **Investigating the Viability of Fatty Acid Binding Protein 5 (FABP5) in the Nucleus Accumbens as a Pharmaceutical Target to Treat Addiction (ISEF-affiliated Fair)**

- Conducted immunolocalization studies of Fatty Acid Binding Protein 5 (FABP5) in the mouse nucleus accumbens.
- First to discover FABP5 expression in glial cells in this region, mapped its distribution across Nucleus Accumbens and glia to evaluate therapeutic potential to treat addiction

### **Bye Bye Miss American Pie – A Diagnostic Analysis of U.S. Federal Debt compared to the 2008 Greek Debt Crisis as Function of Financial Literacy (Daniel G. Calugar Foundation)**

- Proposed strategies to enhance youth financial literacy to foster informed discussion on national debt to prompt more action
- Conducted comparative analyses of the current U.S. federal debt against historical global fiscal crises to assess severity

### **Staying Cool While the World Heats Up: Address to City of Memphis (MathWorks Math Modeling Challenge)**

- Modeled indoor heat dynamics using Fourier transforms and differential equations to simulate building-specific temperature retention in Memphis
- Forecasted peak AC-driven energy demand under climate change, projecting a 60K+ kWh/day increase by 2045
- Developed a solar deployment plan adding 48M+ kWh/day, guided by a custom vulnerability index to ensure equitable energy access

### **Reducing School Bus-Route Gas Consumption (Northwell Health Medical Marvels)**

- Applied clustering-based heuristics (K-Means, capacity-constrained partitioning) to group student pickups and reduce overlapping bus routes in my own school district
- Optimized intra-cluster paths with 2-opt local search, minimizing total fuel consumption while meeting capacity and time constraints

### **A Novel Gene repressor Method to Treat Atherosclerosis (HHH Research Symposium)**

- Proposed CRISPR interference gene repression of the Pancreatic Triacylglycerol Lipase (PTL) as a potential way to reduce fat content in blood from dietary consumption

## **ATHLETICS**

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### **Awards & Recognition**

- Team ranked 65th in the Nation (Long Island Royals 14U AAA) ([myhockeyrankings.com](http://myhockeyrankings.com))
- MAM Ice Hockey Prospect Development Camp (NHL, USHL, Harvard, and Yale Coaches)
- Half Hollow Hills Varsity Ice Hockey – Most Hat Tricks Award
- Half Hollow Hills Varsity Ice Hockey, x2 Student-Athlete Award
- New York State Varsity AAU Ice Hockey Championships, x1 Semi-Finalist, x1 Quarterfinalist
- International Silver Sticks Tournament – Quarterfinalists
- CCM World Invitational Semi-Finalists