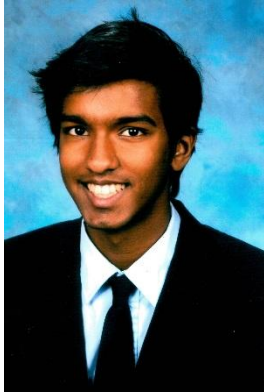


**2017 SIEMENS COMPETITION IN MATH, SCIENCE & TECHNOLOGY
Regional Finalists – University of Notre Dame**



HARAN KUMAR

SCHOOL: Parkway West High School, Ballwin, MO

YEAR: Senior

HOMETOWN: Chesterfield, MO

PROJECT: “Compiling Javascript to WebAssembly”

FIELD: Computer Science

MENTOR: Michael Palmer, CodeRed

“What excites me the most is the intersection between STEM, especially computer science, and the social sciences. I feel that at this point, there is huge potential for thought leaders to bring about change that will impact society on a major level.”

Haran once thought he’d work for the State Department because he was good at geography and loved politics. He quickly learned that computer science was his thing and says, *“I had a phenomenal math teacher in middle school who excited me about STEM. Importantly, he made me a better analytical thinker and made me realize the satisfaction that comes with developing problem-solving skills. Learning about computer science makes you better at reasoning about the world in an analytical fashion.”*

His interest in amateur web development and frustration with slow websites led him to his research. How could he get JavaScript, a programming language used in websites, to speed up? He accomplished what many others have been trying to do for a while: he built a tool that converts a programming language called JavaScript into Rust code, an existing program language, and Rust did all the work to increase speed and improve the performance of websites across all devices.

Haran enjoys long walks a few hours each day, where he can listen to “an unhealthy volume of podcasts and reflect on how life is progressing.” He loves debate, runs, plays tennis and enjoys classical and rap music. In 2016, he placed as an Intel International Science and Engineering Fair (ISEF) finalist. Haran wants to become a computer science professor and a political activist.



NABEEL QURYSHI

SCHOOL: University School of Milwaukee, Milwaukee, WI

YEAR: Senior

HOMETOWN: Mequon, WI

PROJECT: “Role of Telomerase in Vascular Function and Exploration of Mitochondrial Dynamics: A Novel Approach to Treatment of Vascular Dysfunction”

FIELD: Biology

MENTOR: Andreas Beyer, Ph.D., Medical College of Wisconsin

“As a global citizen, I am aware of the power the humanities can have in tandem with STEM. Scientists who care about what they do have to communicate their ideas effectively and clearly.”

Nabeel has always loved a challenge and been eager to explore the unknown. Fascinated with medicine from a young age, he’s dreamed about solving the world’s biggest health problems. For his project, Nabeel set out to treat the damage to the heart caused by coronary artery disease and the chemotherapy treatment cancer patients receive.

His research explored a new application of a protein called telomerase for the treatment of vascular dysfunction and cardiovascular diseases. Telomerase was shown to mitigate and reverse the damaging effects of coronary artery disease and chemotherapeutic treatment on a physiological and cellular level. Additionally, he worked to configure a computer simulation of the human mitochondria to predict changes and activity on the subcellular level.

Nabeel is most passionate about science advocacy. He is a founding member of the Milwaukee Area Science Advocates Outreach Committee, was invited as keynote speaker at the inaugural March for Science in Milwaukee earlier this year, spoke before a crowd of 3,000 people, and was also invited to give a TEDx talk on the need to increase diversity in STEM fields.

His innovative spirit led him to start his own biotech computational biology company where he provides various bioinformatics-related services. He is a mentor for young scientists, researchers and inventors and serves as a global ambassador for the AAT Project and Maater Makers. In 2017, Nabeel earned the First Place Grand Award at the 2017 Intel International Science and Engineering Fair (ISEF) for Biomedical and Health Sciences.

Aside from his passion for all things science, Nabeel is a four-year varsity tennis player, serves as team captain and has won a State Championship. Additionally, he’s passionate about music and bringing music to others. Having played violin since first grade, Nabeel is first chair violin and concertmaster of his school orchestra. He also spearheaded Harmonies for Health, a nonprofit community performance ensemble that provides the gift of live music to residents in nursing homes and assisted living communities.

Nabeel aspires to one day become a biotech entrepreneur with a focus on public and global health issues.



SURAJ SRINIVASAN

SCHOOL: Strongsville High School; Strongsville, OH

YEAR: Senior

HOMETOWN: Strongsville, OH

PROJECT: "Development of a Mosquito-Inspired Insertion Guide to Prevent Flexible Intracortical Microelectrodes from Buckling during Implantation"

FIELD: Biology

MENTOR: Andrew Shoffstall, Ph.D., Case Western Reserve University

"There exists no SparkNotes or Wikipedia for research: when one encounters a research challenge, you simply cannot turn to the back of the book for the answer. The discovery of something new or the development of something novel or innovative is the sole consequence of the researcher's efforts."

Suraj watched his grandfather lose control of his basic motor skills and bodily functions due to a progressive neurodegenerative disease. This sparked his interest in technologies like brain-computer interfaces which allow those who suffer neurodegenerative diseases or loss of limb movement to have a better quality of life and be more active with computer assistance.

For his research, he applied his engineering skills to solve a basic problem in neural engineering: flexible microelectrodes, which are used to interface with the brain, tend to buckle when they are being implanted in the brain. Suraj looked to nature where the mosquito can effectively insert its mouthpiece, a tube merely as small as the human hair, into the skin using a bracing arm. He applied this concept to flexible microelectrodes in the form of an insertion guide and successfully reduced buckling.

Suraj speaks Tamil and Spanish and is active in several academic clubs serving as team captain of his high school's Quiz Bowl/Academic Challenge team; lead programmer on the robotics team; and a participant in Mock Trial, winning several 'Best Attorney' awards. He is a 4-year letterman for his high school's tennis team and serves as the team captain. As part of the Strongsville Youth Commission - a leadership training initiative in his city, Suraj lead his team to financially support and establish three schools in rural India and finance two water pumps for disadvantaged African communities.

Suraj's proudest accomplishments include winning the 1st Prize Grand Award in Biomedical Engineering at the 2017 Intel International Science and Engineering Fair (ISEF) for research conducted at Case Western Reserve and his participation in a spaceflight research team studying vibration enhanced flame spread. Suraj's team won a contest hosted by the American Society for Gravitational and Space Research, and their experiment payload will be flown into suborbital space aboard Blue Origin's New Shepard rocket.

When he grows up, Suraj wants to be a biomedical engineer and start a biotech company focused on human augmentation and enhancement in hopes of improving quality of life for those who suffer from various ailments affecting their ability to move, speak, or control other body functions.



JULIA WANG

SCHOOL: Ladue Horton Watkins High School, Saint Louis, MO

YEAR: Senior

HOMETOWN: Saint Louis, MO

PROJECT: "A Novel Technique for Monitoring Blood Pulse Shape with Packaged Whispering-Gallery-Mode Optical Micro-Toroids"

FIELD: Physics

MENTOR: Lan Yang, Ph.D., Washington University in St. Louis

"I am most passionate about science, writing and music - all areas that let me create and serve humanity in different but equally beautiful ways."

Julia discovered a potential new use for optical microcavities--structures that confine small volumes of light--in devices that could help improve detection of cardiovascular disease.

After a family friend suddenly passed away from cardiovascular disease, Julia became passionate about improving early detection and treatment. In fact, science is one of her favorite subjects in school because it allows her to create new devices that could impact healthcare and save lives.

When she is not working in the lab Julia enjoys playing the ukulele, violin and piano, and songwriting and singing on her YouTube channel. She is co-leader of her school's Tri-M Music Honor Society, a group that performs at local hospitals and assisted living centers.

Julia is also the Co-Founder of a computing camp called Women in Robotics and Engineering Design (WiRED), which is backed by a grant from Apple, Intel, Google, and Northrop Grumman. This camp is designed to help fuel the interest of young women in STEM fields by teaching them how to code and create apps. She is the 2017 National Center for Women & Information Technology Contest Winner and a 2017 National Merit Scholar Semifinalist.



NEIL WARY

SCHOOL: Illinois Mathematics and Science Academy, Aurora, IL

YEAR: Senior

HOMETOWN: Elmhurst, IL

PROJECT: “Connecting the Chromatin Remodeler CHD7 in the Regulation of CHARGE Syndrome and Autism”

FIELD: Biology

MENTOR: Kishore Wary, Ph.D., University of Illinois at Chicago

“STEM has the capacity to change the world. Why can't students be the ones to change the world?”

Neil’s project involved creating a new model using cutting-edge genome editing technology (CRISPR/Cas9) to research potential treatments for CHARGE syndrome (a rare genetic disorder that causes life-threatening birth defects), autism and cardiovascular diseases (CVD). He was particularly interested in exploring the less-understood causes of CVD and understanding the connection between other diseases and CVD.

Neil is passionate about biology and says *“studying biology unquestionably helps us learn more about ourselves and how to live a better life. There are a lot of things we can't control in our lives, but our own health and body shouldn't be one of them.”* One of his proudest accomplishments is having his research on epigenetic/regenerative biology published in the peer-reviewed scientific journal, PLOS ONE. When he grows up, Neil hopes to become a physician and scientist.

Neil is the director of his school’s STEM outreach program. The program has developed a mentoring program and created curriculum for workshops and summer camps. Members of the program volunteer to teach elementary and middle school students during workshops and in summer camps.

Outside of school, Neil plays the violin in the Chicago Youth Symphony Orchestra.

TEAM COMPETITORS

SAI ANANTAPANTULA, Northville High School, Northville, MI

ARAV AGARWAL, International Academy Central, Bloomfield Hills, MI

PROJECT: “Resiliency of the Shuffle-Cube in the Face of Link Deletion”

FIELD: Mathematics

MENTOR: Eddie Cheng, Ph.D., Oakland University

Sai and Arav showed that a certain graph network is extremely viable to be used in the design of large networks compared to other commonly used networks; it holds up to and often exceeds current standards. Their findings could potentially be applied to quantum computing networks to help increase their speed and strength.



SAI ANANTAPANTULA

YEAR: Junior

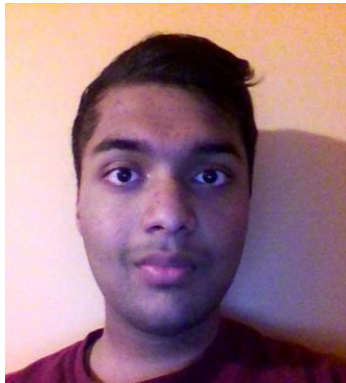
HOMETOWN: Northville, Michigan

“It [STEM] has been a calling for me since I was young. I believe STEM is the future, especially technology in the computer science sector.”

Sai has always been fascinated by STEM-related subjects since he was young and considers this field his calling. The inspiration for his project was seeded from a great interest in networking methods and configurations, specifically its use in parallel and quantum computing.

Sai is extremely passionate about research in the fields of mathematics and computer science, especially in the fields of machine learning and graph theory. In addition to being a researcher, he is also an entrepreneur and an alumnus of the 2017 MIT Launch program where he created a tech startup. Combining these, he aspires to be an entrepreneur who creates machine learning solutions to solve humanity's greatest problems.

When he is not spending his time on mathematics or science, Sai spends his time investing. Sai's favorite book is “The Intelligent Investor” by Benjamin Graham because he found it extremely helpful in navigating the stock market. Sai also enjoys playing tennis.



ARAV AGARWAL

YEAR: Senior

HOMETOWN: Rochester Hills, Michigan

"I'm passionate about learning to learn, or the process about which we can accelerate our learning ability and speed."

Arav is a learning-curious student who aspires to be a material scientist. He is passionate about material science, or the science of the world's polymers, as he believes it will be the key to future robotics and stable quantum computers. He is also interested in the process by which people learn-- in particular, how humans can accelerate their learning ability.

Arav became inspired by the application of mathematics to both real world and hypothetical scenarios after reading "How Round Is Your Circle? Where Engineering and Mathematics Meet," by John Bryant. The book, which detailed the use of geometrical linkages in the creation of shapes and figures, inspired his desire to pursue the applications of pure mathematical theory and its relationship with real-world science.

When he is not spending his time on mathematics and science, Arav spends his time discussing philosophy and the public domain. His favorite book is "Meditations," by Marcus Aurelius. The book, which detailed the basics of stoicism, a philosophical school of thought which focused on how to live a virtuous life, inspired him to look at the works of other stoic writers to better understand how to both keep himself motivated throughout his day and how to increase his productivity.

Arav plays French horn in his symphonic band and full orchestra. An avid reader, Arav has read 127 books in one year. As a Wikipedia editor and LibriVox contributor, he supports new ways to improve access and optimize how information is stored and delivered on the internet.

TEAM COMPETITORS

KANE BREUER, New Albany High School, New Albany, OH

THOMAS BREUER, New Albany High School, New Albany, OH

PROJECT: “Development of a Novel Biological Therapeutic for Preventing the Formation of Pericardial Adhesions after Cardiothoracic Surgery”

FIELD: Biology

MENTOR: Cameron Best, Nationwide Children's Hospital

Brothers Kane and Thomas discovered a potential treatment against the formation of scar tissue after surgery using a protein found in the human body.



KANE BREUER

YEAR: Senior

HOMETOWN: New Albany, OH

“From a young age I knew that I wanted to be a doctor. As I’ve gotten older, I realize how scientific research can be used to advance the field of medicine and help others.”

Kane is most passionate about helping others and one day aspires to be a physician-scientist. His love for science is rooted in the fact that he has always enjoyed finding the answer to a question through hands-on labs and visuals.

When he’s not busy in the lab, Kane runs for the cross-country and track and field teams at his school and is captain of both. Kane has been named “Runner of the Year” and champion at the Ohio Capital Conference in Cross Country. He also participates in his school’s a cappella choir and is a peer minister at his local parish.

Kane’s favorite book is Erich Remarque's “All Quiet on the Western Front” and he is a huge fan of Yankees outfielder Aaron Judge because he has always admired and appreciated Judge’s tireless work ethic to achieve success.



THOMAS BREUER

YEAR: Junior

HOMETOWN: New Albany, OH

"I am most passionate about helping people and making the world a better place. Whether it is a small good deed or a cure for a disease everybody can help the world in some way."

Thomas is most interested in engineering and science because he loves solving problems and learning new concepts and hands-on techniques. When he grows up he'd like to be a biomedical engineer like his father.

With a strong passion for helping others, his proudest accomplishment has been working at a camp for special needs adults. Thomas plays on his school's water polo team and sings in the a cappella choir and has been on the honor roll throughout high school.

Thomas's favorite musician is Logic because he writes and sings about equality and positivity.

TEAM COMPETITORS

HANSON HAO, Illinois Mathematics and Science Academy, Aurora, IL

JİYUN “CLAUDIA” ZHU, Illinois Mathematics and Science Academy, Aurora, IL

PROJECT: “A Computer-Aided Decomposition of the Complete Digraph into Orientations of K_4 -e with a Double Edge”

FIELD: Mathematics

MENTOR: Saad El-Zanati, Ph.D., Illinois State University

As the application of graphs expands to the forefront of computer science and modeling-related mathematics, the size of graphs has become unwieldy. Hanson and Claudia found a way to break down these large graphs into smaller graphs that are significantly easier to manage and solve.



HANSON HAO

YEAR: Junior

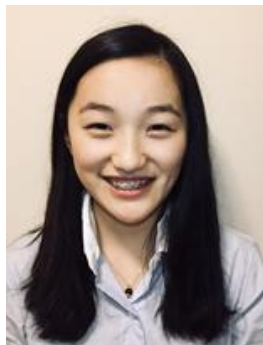
HOMETOWN: Bloomington, IL

“Mathematics is my favorite subject, because I can always look forward to the ‘Aha!’ moment at the end of a long problem.”

Hanson can trace his interest in numbers and mathematics all the way back to the first grade, when his dad bought him the book, “The Number Devil.” Even though he was young, he remembers being captivated by the patterns, diagrams and mathematical tricks he discovered in that book. He hopes to continue his interest in math through a career in academia or an economics-related job.

In his spare time, Hanson plays chess on his state champion high school chess team. He is also a member of the Quiz Bowl team that won the state championship and finished 6th at the PACE national Quiz Bowl competition. He also returned to coach his junior high school math team, helping them to a 5th consecutive victory in their regional tournament and a trip to the state finals.

Hanson speaks Mandarin fluently as well as some French, and his favorite book is “The Little Prince” by St. Exupéry, which he has read in English and the original French. He enjoys listening to Chopin when he is studying or relaxing and is a fan of both BTS and GFriend. Hanson also admires tennis great Roger Federer for his longevity and effortless style.



JIYUN "CLAUDIA" ZHU

YEAR: Senior

HOMETOWN: Schaumburg, IL

"I like math's perfection, beauty and simplicity. I like the fact that there are an infinite number of mysteries and puzzles within the number line and that they are just waiting for someone to discover them!"

Fluent in Chinese and learning Japanese, Claudia has presented research all over the world, including at the annual Japan Super Science Fair last November. She now serves as the committee head for the International Student Science Fair which will be held at her school in 2018.

Claudia was first exposed to advanced mathematics in her sophomore year, elementary Number Theory course. Within the first week, she was challenged to prove that 0 was not equal to 1, something that she had never thought about before. Claudia loved how advanced topics in mathematics encouraged her to think in different ways and reminded her to never take basic facts for granted. Claudia enjoys mathematical research and is currently working on a project in knot theory.

Claudia hopes to use her mathematical research to advance new and rising fields such as machine learning, but she has broad interests. Her favorite subject in school is political theory, where she loves learning about current and historic political systems and being exposed to new perspectives. Claudia also plays soccer and violin. One of her favorite paintings is Monet's 1901 *Charing Cross Bridge*, which can be found at the Art Institute of Chicago.

TEAM COMPETITORS

FREDDIE ZHAO, Troy High School, Troy, MI

SPENCER LIU, Troy High School, Troy, MI

CHITTESH THAVAMANI, Troy High School, Troy, MI

PROJECT: "A Study of the Vulnerability of Connectivity of Graphs: Strong Matching Preclusion of the Folded Petersen Cube"

FIELD: Mathematics

MENTOR: Eddie Cheng, Ph.D., Oakland University

Freddie, Spencer, and Chittesh discovered a potential use for a new class of efficient, fault-resistant graphs, or network configurations that could help improve the reliability of large computer networks.



FREDDIE ZHAO

YEAR: Junior

HOMETOWN: Troy, MI

"I am most passionate about math as I feel that this is ultimately the basis for most calculations and innovations in science, as much of science is derived from mathematical relations."

Freddie's interest in STEM subjects sparked in elementary school when he was encouraged by teachers to pursue a focus in mathematics. In turn, Freddie began taking extracurricular math classes and attended various math competitions to sharpen his skills and pursue his passion. He credits math as his favorite subject because of how abstract it is and its ability to be applied to solve real world problems. A professor who taught a graph theory-related session at a math summer camp he attended inspired him to learn more and pursue it as his research topic for the Siemens Competition.

His two proudest accomplishments include tying for first place in the Michigan Math Prize Competition and qualifying for the Mathematical Olympiad Summer Program.

Outside of his interest in math, Freddie also has an affinity for music, playing both the piano and the violin. He aspires to work in STEM research when he grows up so he can create new, fascinating innovations.



SPENCER LIU
YEAR: Senior
HOMETOWN: Troy, MI

"I am very passionate about learning--just figuring things out and solving problems."

Spencer has been interested in STEM subjects for as long as he can remember through his interests in research and solving problems. After attending a summer college math course, he was inspired by an example problem that introduced him to the world of graph theory.

Besides being involved in mathematics, Spencer is the founder and current president of the Metro Detroit branch of the American Youth Leaders of the United States (AYLUS), a volunteer organization that organizes fundraising and charity events throughout the year. He's also the co-president of his school's math club and has participated in several state and national competitions, placing highly in each. He was chosen to attend the High School Honors Science Program (HSHSP), a selective seven-week research program at Michigan State University. Spencer also enjoys chemistry because he likes to know how things work, and chemistry has allowed him to combine theoretical work with hands-on activities.

Outside of academics, Spencer is a captain of his varsity tennis team which placed second at the state tournament-- the best finish in the school's history. He has also played the violin for 11 years and is fluent in Mandarin.



CHITTESH THAVAMANI

YEAR: Senior

HOMETOWN: Troy, MI

“My interest in STEM subjects began in 2nd grade with a teacher who taught me to question and understand why things work.”

Chittesh developed an interest in STEM subjects in the 2nd grade when one of his teachers urged him to question and understand why things work. Ever since, he’s expressed an affinity for STEM due to its practical applicability.

Chittesh’s love for mathematics inspired his research. He was introduced to the field of graph theory at a summer camp, and he and his teammates began asking their professor for guidance on how to pursue work related to the topic. He notes physics as his favorite subject because of its correlation with math. He is co-president of both his Science Olympiad team as well as the Math Club.

His two proudest accomplishments are becoming a Michigan Math Prize Competition Gold First-Level Award winner and a USA Physics Olympiad Bronze Medalist. Chittesh is also an avid tennis player and runner and is a member of his school’s track and field team.

TEAM COMPETITORS

BRANDON ZHU, Herbert Henry Dow High School, Midland, MI

DANIEL ZHANG, Herbert Henry Dow High School, Midland, MI

PROJECT: "Release of Active Pharmaceuticals Using Capped Hyperbranched Polyesters"

FIELD: Chemistry

MENTOR: Patrick Smith, Ph.D., Michigan State University

Daniel and Brandon developed a method for releasing drugs at a controlled rate into the body, which could increase the effectiveness of many pharmaceuticals.



BRANDON ZHU

YEAR: Senior

HOMETOWN: Midland, MI

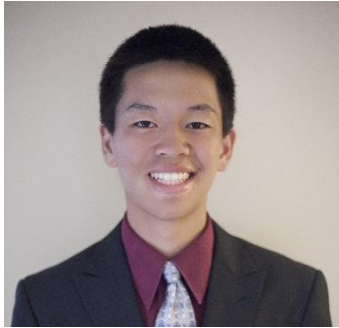
"I'm most passionate about leaving a positive impact on the community around me. One reason I think we were successful in our research was because we knew what a great thing it could be for the people around us."

Brandon grew up surrounded by STEM and becoming a scientist always seemed natural to him. He remembers as a child listening to his father talk about his latest research and thinking that someday he would do the same. Brandon is fascinated by chemistry and thinks there is so much to learn it cannot possibly become boring. As a career, Brandon is drawn to the human aspect of working as a physician but also wants to make new scientific discoveries that will change the world for the better.

Brandon found his research interesting because it was easy to see its clear applicability to the pharmaceutical industry. Many of the active pharmaceuticals used during their research were extremely common including naproxen, salicylic acid, and hydrocortisone.

With a strong passion for helping others, Brandon spends his time volunteering with his student council, Big Brother Big Sister, and Key Club. One of his proudest moments was winning the prestigious A.H. Nickless Innovation Award, bringing \$20,000 to his high school for STEM. He also helped win the District Chairman's Award for his school's robotics team in the international FIRST Robotics Competition.

In his spare time, Brandon also plays competitive soccer and basketball. His favorite sports team is the Detroit Pistons and his personal role model is basketball player Jeremy Lin.



DANIEL ZHANG

YEAR: Senior

HOMETOWN: Midland, MI

“What's important to me is that I'm always doing something to improve the world.”

For as long as he can remember, Daniel has had a passion for STEM subjects, ranging from chemistry to biology to math to computer science. He enjoys the challenge and feels that there's always something new he can learn.

As a high school senior, Daniel is an AP Scholar with Distinction and top honor roll student. He has played varsity tennis for four years and recently won state individual and team titles for his school. He is also a member of his school's robotics team and plays the violin.

Daniel's favorite athlete is tennis player Rafael Nadal because of the energy he puts into every match and his will to win. His role model is his older brother, Steven, who has always been hardworking, kind, and never afraid to try new things like dancing.