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**REGENERON SCIENCE  
TALENT SEARCH  
2024 SCHOLARS**



# 2024 SCHOLARS

The Regeneron Science Talent Search (Regeneron STS), a program of Society for Science, is the nation's most prestigious science and math competition for high school seniors. Alumni of STS have made extraordinary contributions to science and hold more than 100 of the world's most distinguished science and math honors, including the Nobel Prize and the National Medal of Science. Each year, 300 Regeneron STS scholars and their schools are recognized. From that select pool of scholars, 40 student finalists are invited to participate in final judging, display their work to the public, meet with notable scientists and compete for awards, including the top award of \$250,000.

## ALABAMA

### Montgomery

#### Loveless Academic Magnet Program High School

**Rastogi, Rhea, 18**

Understanding How the Maternal Epigenetic Reprogramming Function of LSD1  
Contributes to Inherited Developmental Disease

## ALASKA

### Juneau

#### Thunder Mountain High School

**Djajalie, Elizabeth, 18**

Quantitative Environmental DNA Metabarcoding for the Enumeration of Pacific Salmon  
(*Oncorhynchus* spp.)

## ARIZONA

### Chandler

#### BASIS Chandler

**Avlani, Harshil, 17**

Analyzing the Effect of Mid-Circuit Measurement (MCM) on Spectator Qubits

#### Hamilton High School

**Li, Alexis, 17**

BrainSTEAM: A Practical Pipeline for Connectome-Based fMRI Analysis Toward Brain  
Disorder Classification

### Phoenix

#### BASIS Phoenix

**Mamtani, Bhuv, 18**

Identifying Potential Markers To Combat Afatinib Resistance in Esophageal  
Adenocarcinoma

### Scottsdale

#### BASIS Scottsdale

**Peddi, Sruti, 17**

FloodCast: Real-Time Flood Mapping and Prediction in Southeast Asia Using Remote  
Sensing Data

## ARKANSAS

### Hot Springs

#### Arkansas School for Mathematics, Sciences & the Arts

**Sonputri, Aarohi, 18**

Small Molecule Stabilization of the *CARD11* G-Quadruplex Represses Transcription:  
Developing a Therapeutic Target for Diffuse Large B-Cell Lymphoma

## CALIFORNIA

### Atherton

#### Menlo School

**Babel, Noah Kalyn, 17**

Stable Equilibria Under Random Fitness and Recombination Rates

### Belmont

#### Carlmont High School

**Zhang, Colin, 17**

Complete Molecular Structure Prediction From Infrared Spectroscopy Using  
Deep Learning

### Cupertino

#### Homestead High School

**Chakravarthy, Arnav N., 18**

Leveraging Mitochondrial DNA Mutations for Macrophage Lineage Tracing  
in Primary Human Tissues

<b>Dublin</b>	<b><u>Dublin High School</u></b> <b>Wu, Richard, 17</b> BiblioBERT: Sentence Transformer-Based Semantic Recommendation Engine Using Large Language Model-Enhanced Query Segmentation for Personalized Bibliotherapy Recommendations
<b>Eastvale</b>	<b><u>Eleanor Roosevelt High School</u></b> <b>Saxena, Krrishika, 17</b> Development of a Simple, Affordable Zinc Oxide-Zeolite Chemiresistor VOC Sensor To Detect Colorectal Cancer From the Exhaled Breath: A Solution for the Underserved Communities
<b>Fremont</b>	<b><u>Mission San Jose High School</u></b> <b>Li, Brian Minghan, 18</b> Intertwining Operators Between Subregular Whittaker Modules for $g_N^1$ and Non-Standard Quantizations
	<b><u>Mission San Jose High School</u></b> <b>Lin, Felix, 18</b> Creation of WAL-SEA: The First Shallow-Ocean Multifunctional Remotely Operated Vehicle (ROV) for the Study of Near-Shore Ocean Ecosystems
<b>Hillsborough</b>	<b><u>Crystal Springs Uplands School</u></b> <b>Sun, Katie, 18</b> Designing a Novel Primer Blocker Using Bioconjugation of Single-Stranded Binding Protein and Oligonucleotides for Improved KRAS Mutation Detection
<b>Irvine</b>	<b><u>University High School</u></b> <b>Ji, Howard, 17</b> Development of a Novel Autonomous Column-Climbing Robotic System (AutoBot) for Real-Time Detection and Mapping of Surface Cracks on Bridges
	<b><u>University High School</u></b> <b>Wu, Julianne, 17</b> Sex-Related Signaling of the Angiotensin II Pathway in Primary Aortic Smooth Muscle Cells
	<b><u>Woodbridge High School</u></b> <b>Hua, Katherine, 17</b> An AI-Powered Assistive Device for the Visually Impaired
<b>La Canada</b>	<b><u>La Canada High School</u></b> <b>Backer Peral, David Rodrigo, 17</b> Hot Button: Non-Invasive Approach for Studying Aggressive States
<b>Los Angeles</b>	<b><u>Geffen Academy at UCLA</u></b> <b>Sampath, Rohan, 17</b> Synthesis and Characterization of PEDOT:Algs – Biomacromolecules for Boosting Hydrogel Conductivity
<b>Mountain House</b>	<b><u>Mountain House High School</u></b> <b>Prawira, Jordan, 17</b> Pura Aer 2: Dual-Stage, Energy-Efficient, Modular Air Purifier System Inspired by Porifera To Improve Air Quality
<b>Oakland</b>	<b><u>Bishop O'Dowd High School</u></b> <b>Gonzalez, Ethan Ryan, 18</b> Impact of Electric Fields on Aqueous Phase Contaminants

**Palo Alto****Henry M. Gunn High School****Fan, Roger J., 18**

Multidisperse Random Sequential Adsorption and Generalizations

**Palo Alto High School****Verma, Avi, 17**

Novel Neural Network Models for Predicting Mental Health Outcomes in the U.S. Youth Population

**Pleasanton****Amador Valley High School****Joshi, Ishan Milind, 17**

Development of a Mycorrhizae-Assisted Plant Microbioelectrochemical Fuel Cell for Optimized Bioelectricity Production and Copper Sulfate Mycorrhizoremediation

**Redwood****Sequoia High School****Liou, Collin, 17**

Programmable Multistability and Rigid Flattenability in Origami Cubes by Adding a Minimal Cut

**Sacramento****Mira Loma High School****Srikanth, Hari, 18**

Multimodal Computer Vision and Novel Reinforcement Learning for Robot Navigation in Fires

**San Diego****Canyon Crest Academy****Fan, Michelle, 17**

A High-Throughput Screening Pipeline Targeting Mitochondrial Energetic Dysfunction in Patient-Derived Neurons

**Del Norte High School****Arora, Aarav, 18**

A Mechanistic Basis for the Analysis of SARS-CoV-2 Omicron Variant Severity

**Del Norte High School****Zhang, Jocelyn, 18**

Novel Photoluminescence Recovery Method of Porous Silicon Quantum Dots for Bioimaging Application

**San Jose****BASIS Independent Silicon Valley****Singh, Sanskriti, 17**

CheX-Nomaly: Segmenting Lung Abnormalities From Chest Radiographs Using Machine Learning

**Branham High School****Liang, Eric, 17**

Predicting Pedestrian Crosswalk Behavior Using Convolutional Neural Networks

**Notre Dame High School****Srinivasan, Maya Gabrielle Aler, 18**Optogenetically Examining Channelrhodopsin and CsChrimson-Stimulated Locomotive Behavior To Classify "Moonwalker" Stalling in *Drosophila melanogaster***The Harker School****Lan, Ella Selina, 17**

Creating HD-Performer: A Biomedical Waveform Transformer With Two New Attention Modules, TSA and SPA, for Diabetes Detection

**The Harker School**

**Wei, Michelle, 17**

Solving Second-Order Cone Programs Deterministically in Matrix Multiplication Time

**The Harker School**

**Yee, Ella, 18**

Identification of Circadian Regulator ARNTL2 and Associated Genes as Novel Biomarkers for Cancer Progression

**The Harker School**

**Zhang, Ryan Ruien, 18**

PEDS-AI: A Deep-Learning-Based UAV System for In-Field Insect Species Identification and Pest Early Detection

**The Harker School**

**Zhang, William, 18**

A ChatGPT-Based System With Semi-Closed Domain as an Automatic Online Teaching Assistant in Math Education

**Valley Christian High School**

**Wu, Samantha, 18**

Effect of Storage Conditions on Small Noncoding RNA Concentrations in Human Milk Using the Size Exclusion Chromatography Method for Extracellular Vesicle Isolation

**San Ramon**

**Dougherty Valley High School**

**Kolluru, Vaishnavi, 17**

Human Milk Immune Complexes Isolated Following Pregnancies Complicated by COVID-19 Infection Contain SARS-CoV-2 Nsp13 Helicase and Biologically Active Factors

**Dougherty Valley High School**

**Zou, Charisse, 17**

The Development of a Free-Flying Method To Study the Effect of Neonicotinoids on the Positive Transfer of Learning in the Visual Domain of Honeybees

**Saratoga**

**Saratoga High School**

**Fung, Esabella Sunshine, 17**

A Machine Learning Approach for Assessing Labor Supply to the Online Labor Market

**Saratoga High School**

**Kaya, Zeyneb N., 17**

MADLIBS: A Novel Multilingual Data Augmentation Algorithm for Low-Resource Neural Machine Translation

**Saratoga High School**

**Liao, Kyleen, 17**

Simulating the Air Quality Impact of Prescribed Fires Using a Graph Neural Network-Based PM2.5 Emissions Forecasting System

**Thousand Oaks**

**Thousand Oaks High School**

**Moreno, Jr., Ramon, 17**

The Influence of Isonicotinamide on the Chronological Lifespan of *Saccharomyces cerevisiae* Strains

**Ukiah**

**Developing Virtue Secondary School**

**Wang, Katherine Huaizhen, 18**

Whole-Genome Variant Detection in Long-Read Sequencing Data From Ultra-Low Input Tumor Samples

**Union City****James Logan High School****Kolluru, Anoushka, 18**

Investigating the Proliferation, Invasion and Resistance to Chemotherapy-Induced Apoptosis of A549 Lung Cancer Cells in Relation to Synthetic Nicotine Exposure

**COLORADO****Boulder****Fairview High School****Arthur, Margaret Madeleine, 18**

A Novel Phosphosite Localization Approach Using Tandem Phosphoprotein Mass Spectra and Temporal Dilated Networks

**Fairview High School****Cao, Elton, 17**National Ground-Level NO<sub>2</sub> Predictions via Satellite Imagery-Driven Convolutional Neural Networks**Greenwood Village****Cherry Creek High School****Bhavikatti, Neil, 17**

On Algorithmic Cache Optimization

**Highlands Ranch****Rock Canyon High School****Avinash, Aditi, 17**

Model Validation and Preclinical Testing of Digestive Enzymes for Gluten Breakdown: A Move To Cure Gluten Intolerance and Celiac Disease

**Lafayette****Peak to Peak Charter School****Saini, Amrita, 18**Investigating Hydrogels To Sustain *Pyrocystis fusiformis* for Natural Lighting and Carbon Dioxide Removal**CONNECTICUT****Greenwich****Greenwich High School****Li, Lucy, 17**Footprint Reduction of PET Fiber Waste in Refuse Environments via Non-Toxic *Ideonella sakaiensis* Degradation**Greenwich High School****Lin, Audrey, 17**

Eco-Friendly Remediation of Polycyclic Aromatic Hydrocarbons in Stormwater via Magnesium-Infused Calcite Crystal, Supramolecular Hydrogel Scaffolding

**Greenwich High School****Park, Naomi, 17**

Development and Life Cycle Assessment of a Novel, Multi-Functional Remediation Framework for the Concurrent Removal of Oceanic Carbon Dioxide and Oil-in-Water Contaminants

**New Canaan****New Canaan High School****Huang, Luke, 17**

Binary Cellular Analysis: Understanding the Link Between Aging and Mortality Risk

**Stamford****King School****Kolb, Antonia Maria, 18**

DETICKT IT: A Machine Learning-Based Application for Real-Time Tick Identification and Spatiotemporal Disease Risk Assessment

**Wallingford**

**Choate Rosemary Hall**

**Wu, Isabella, 17**

ST-TopoCAN: A Novel Histopathological System for Clinical Prediction With Topology- and Spatial Genome-Informed Deep Learning

**Woodbridge**

**Amity Regional High School**

**Bhattamishra, Aditi, 18**

The SFSA Ankle: A Novel Smart Fluidic Servo Actuator With Real-Time Environment Sensing for Low-Cost, Low-Power, High-Efficiency Transtibial Bionics

**DELAWARE**

**Hockessin**

**Sanford School**

**Kahlon, Amanrai Singh, 17**

Enhancing Wearable Gait-Monitoring Systems: Identifying Optimal Kinematic Inputs in Typical Adolescents

**FLORIDA**

**Delray Beach**

**American Heritage School Boca-Delray**

**Mohanty, Maya, 18**

Utilizing *Caulobacter crescentus* To Target the NF- $\kappa$ B-Bcl-2 Pathway and BH3-Only Proteins To Induce Apoptosis in Nasal Squamous Cell Carcinoma

**Fort Lauderdale**

**Pine Crest School**

**Ghanta, Priya, 18**

Soluble Plasma Proteins of Tumor Necrosis Factor and Immunoglobulin Superfamilies Reveal New Insights Into Immune Regulation in People With HIV and Opioid Use Disorder

**Pine Crest School**

**Martoma, Joshua, 18**

Predicting Criminal Recidivism With an Ensemble Machine Learning Model Using Logistic Regression, Random Forests and Neural Networks

**Gainesville**

**Buchholz High School**

**Wei, Nathan, 17**

Novel Elastomeric Polystyrene via Photopolymerization and Post-Functionalization of Durable Ultra-High Molecular Weight Perfluorostyrene Copolymers

**Miami**

**Miami Palmetto Senior High School**

**You, Sunny, 17**

Predicting Future Tropical Cyclone Intensity Using a Convolutional Neural Network and 20 Years of IMERG Satellite Rainfall Data

**School for Advanced Studies – Wolfson**

**Akerman, Milo, 18**

Classification of Poisonous *Russula* Species Using CBAM-Integrated Convolutional Neural Networks and Bayesian Optimization

**Ocala**

**Vanguard High School**

**Shaquib, Rishit Arnav, 17**

Bi-Directional Hygiene: Evaluating the Use of Artificial Microbiomes of Commensal Bacteria To Combat Nosocomial Infection



<b>Oviedo</b>	<p><b><u>Oviedo High School</u></b>  <b>Pilacek, Ella, 17</b>  Promoting Attraction of <i>Apis mellifera</i> to the Synthetic Scent of the Endangered Orchid <i>Prosthechea cochleata</i> Using Pavlovian Conditioning and Direct Feeding Paradigms for Conservation</p>
<b>Plantation</b>	<p><b><u>American Heritage School</u></b>  <b>Federici, Jacob Noah, 18</b>  Mitigation of Decreased Protein Synthesis Under Elevated Carbon Dioxide in <i>Arabidopsis thaliana</i> Using Transgenic and Exogenous Approaches</p> <p><b><u>American Heritage School</u></b>  <b>Mehta, Akansha, 17</b>  Quorum Quenching Potential of Novel Phytochemicals on <i>Chromobacterium violaceum</i> Quorum Sensing</p> <p><b><u>American Heritage School</u></b>  <b>Pulmano, Lorenzo, 17</b>  A Microwave-Based Machine Learning Approach To Predict Eyewall Replacement Cycles</p>
<b>Satellite Beach</b>	<p><b><u>Satellite High School</u></b>  <b>Stout, Lana L., 17</b>  Accelerating Carbon Sequestration Through Olivine Using Direct Mineral Carbonation With Carbonic Acid</p>
<b>Stuart</b>	<p><b><u>Martin County High School</u></b>  <b>Goyal, Nira, 17</b>  Quantification of <i>Macrophomina phaseolina</i> Survival After Organic Soil Treatments Under Multiple Temperature Regimes</p>
<b>Tampa</b>	<p><b><u>Berkeley Preparatory School</u></b>  <b>Flitman, Hannah, 18</b>  Exploring Racial Disparities in Auto Insurance Pricing: A Novel Geographical Information Systems Approach to Analyzing Fatality and Rate Discrepancies</p>
<b>Wesley Chapel</b>	<p><b><u>Wiregrass Ranch High School</u></b>  <b>Manjith, Meghna, 18</b>  Preventing Surgical Site Infections: Designing a Novel Post-Surgical Treatment Using Silver Nitrate and Ayurvedic Extracts in Combination With DNA Sequence Analysis</p>

## GEORGIA

<b>Alpharetta</b>	<p><b><u>Innovation Academy</u></b>  <b>Zhou, Cyrus Ma, 16</b>  An Acoustic Noise Reduction Hood for Infant MRI</p>
<b>Johns Creek</b>	<p><b><u>Johns Creek High School</u></b>  <b>Dalal, Rohan Keyur, 17</b>  Neuromesodermal Progenitor Cells Give Rise to Blood Through a Myoblast/Hemangioblast Bipotential Intermediate</p>
<b>Martinez</b>	<p><b><u>Augusta Preparatory Day School</u></b>  <b>Huo, Emily Xingbao, 17</b>  Targeting Macrophage Glycolysis Suppresses Kidney Scarring in a Rodent Model</p>

## HAWAII

### Honolulu

#### Kamehameha Secondary School

##### **Murata, Madison Rieko Hiilani, 17**

Studies on *Gracilaria salicornia*: Zinc Oxide (ZnO) Sunscreen Exposure and Use as Agricultural Fertilizer

## ILLINOIS

### Barrington

#### Barrington Community High School

##### **Zhu, Anthony, 17**

Detection of COVID-19 Through a Heptanal Biomarker Using Transition Metal-Doped Graphene

### Chicago

#### Whitney Young Magnet High School

##### **Agrawal, Nikita, 18**

A Novel Approach for Predicting Large Wildfires Using Machine Learning Toward Environmental Justice via Environmental Remote Sensing and Atmospheric Reanalysis Data Across the United States

### Lincolnshire

#### Adlai E. Stevenson High School

##### **Agrawal, Shaurya, 17**

Combinatorial Optimization and Machine Learning To Predict Optimal Cell-State Conversion Paths

#### Adlai E. Stevenson High School

##### **Kovvuri, Srikar, 18**

Multifaceted Wildfire-Induced Risk Assessment for Electric Power Grid: An Analytical Approach With Implications for Resilient Infrastructure

### Palatine

#### William Fremd High School

##### **Gupta, Aditya, 18**

Agri-GNN: A Novel Genotypic-Topological Graph Neural Network Framework Built on GraphSAGE for Optimized Yield Prediction

## INDIANA

### South Bloomington

#### Bloomington High School

##### **Choi, Grace Seyoung, 18**

Improving Transient Expression of Recombinant Proteins in *Nicotiana benthamiana* Using Color-Optimized Plastic Mulch Covers

### West Lafayette

#### West Lafayette Junior-Senior High School

##### **Kim, Joshua J., 17**

Camouflaged and Biosafe QR Code Bioprinting and Protein Tagging: Combatting Medicine Counterfeiting

## KENTUCKY

### Lexington

#### Paul Laurence Dunbar High School

##### **Vulakh, Joseph Amichai, 17**

Positive Traces on Deformations of Kleinian Singularities of Type D

### Louisville

#### duPont Manual Magnet High School

##### **Kar, Shraman, 17**

Dynamic Layer Pruning and Quantization Using Proximal Policy Optimization: A Synergistic Approach for Efficient Deep Learning Models

## LOUISIANA

## Shreveport

C. E. Byrd High School**Hunter, Leslie Elizabeth, 17**

To What Extent Do Pesticides Alter Antioxidant Properties Found Within Rabbiteye Blueberries?

Caddo Parish Magnet High School**Chen, Sophie, 17**

Intraoperative Histological Analysis of Squamous Cell Carcinoma Tumor Margins Using a Convolutional Neural Network

## MARYLAND

## Clarksville

River Hill High School**Tang, Eric, 17**

Building Redundancy for Resilient Distributed Optimization

## Ellicott City

Centennial High School**Gao, William, 18**

Designing a Federated Learning-Driven Collaborative Diagnostic System for Metastatic Breast Cancer: Reducing Long Diagnosis Delays and Improving Patient Survival Outcomes in Developing Countries

Centennial High School**Ghosh, Ishani, 18**

Saturated Lipid-Mediated Abrogation of Neurogenesis: A New Paradigm for Therapeutic Implication in Traumatic Brain Injury Among Obese and High Lipid-Indexed People

## Poolesville

Poolesville High School**Mathew, Daniel, 17**

MiniMesh: Real-Time 5,000-Node Anatomical Human Body Mesh Reconstruction for Portable Devices

Poolesville High School**Stammers, Milo, 18**

On Elementary Generation of SL2 Over Integer Rings of Imaginary Function Fields

## Potomac

Winston Churchill High School**Mattikalli, Simran, 17**

Deep Learning Segmentation of Hip Radiographs for Guiding Opportunistic Management of Osteoporotic Bone Fractures

## Silver Spring

Montgomery Blair High School**Fan, Jonathan Matthew, 18**

A Genomic Meta-Data Analysis of Alzheimer's and Related Diseases Reveals New Insights for Future Research

Montgomery Blair High School**Wu, Angela Yue, 18**

Calcium-Induced Mitochondrial Sorcin Aggregation: A Model System for Investigating Chaperone Suppression of Protein Aggregation

## MASSACHUSETTS

Acton	<b><u>Acton-Boxborough Regional High School</u></b> <b>Erbas, Timucin, 17</b> Autonomous Precision Rocket Landing Algorithm
	<b><u>Acton-Boxborough Regional High School</u></b> <b>Ohara, Haruki, 17</b> Bio-Physical Sensing of Feeding Patterns on Squid and Applications for Smart Recreational Fishing
Andover	<b><u>Phillips Academy</u></b> <b>Du, Anna Chang, 18</b> Developing an AI-Enhanced Protocol for Simulating Abiogenesis: Novel Nano-Structured Carbon Materials as a Templating Surface for Prebiotic Nucleic Acid Oligomer Formation
	<b><u>Phillips Academy</u></b> <b>Kang, Yifan, 18</b> CNOT-Optimal Circuit Synthesis
	<b><u>Phillips Academy</u></b> <b>Li, Arielsie, 18</b> FlexLizard: A Fast-Running Bipedal Lizard Robot With Optimized Lateral Bending
Belmont	<b><u>Belmont High School</u></b> <b>Meng, Julie, 17</b> Prevalence of Mental Disorders and Factors Associated With Not Receiving Mental Health Services Among Children With a Mental Disorder in Early Childhood in the United States, 2021–2022
Brookline	<b><u>Brookline High School</u></b> <b>Borodin, Matvey, 18</b> The Action of the Cactus Group on Arc Diagrams
Cambridge	<b><u>Cambridge Rindge &amp; Latin School</u></b> <b>Mahajan, Alexandra, 17</b> A Novel Method To Determine Precise Stellar Radii and Temperatures of Low Mass Stars Using <i>JWST</i> Transits and Occultations
Dedham	<b><u>Noble and Greenough School</u></b> <b>Gao, Ruohan, 18</b> Deep Learning-Based Satellite Image Analysis for Predicting the Correlated Density of <i>Ailanthus altissima</i>
Groton	<b><u>Groton School</u></b> <b>Ge, Eric 18</b> An Autonomous Assisted-Feeding Robotic Arm With Computer Vision Capabilities
Hopkinton	<b><u>Hopkinton High School</u></b> <b>Venkatesan, Srilakshmi, 17</b> Utilizing Hypermagnesemia To Understand the Impact of Neuromuscular Blocking Agents on <i>Caenorhabditis elegans</i> : A Safe, Novel Model for Paralytic Drug Testing
Lexington	<b><u>Lexington High School</u></b> <b>Liu, Allison An-Li, 17</b> Next-Generation Synthetic Receptor Circuits for T-Cell Therapy

**Wellesley** **Dana Hall School**  
**Cao, Gaby, 18**  
 Mining Novel Glaucoma Drug Target Using Disease-Associated Multiomics Between Ocular Hypertension-Dependent and Independent Pathways

**Wellesley Hills** **Wellesley High School**  
**Song, Alan, 18**  
 Reinforcement Learning-Based Horizontal Scaling for Serverless Systems

**Worcester** **Bancroft School**  
**Xiang, Steven XiPeng, 17**  
 DDR2 and Substrate Stiffness Regulate Cancer Cell Proliferation Through Metabolic Reprogramming

**Massachusetts Academy of Math & Science**  
**Palit, Isabella, 17**  
 Developing 2D and 3D Models of Human Myometrium To Improve Understanding of Intramural Uterine Leiomyoma Pathology and Study Potential Risk Factors

## MICHIGAN

**Beverly Hills** **Detroit Country Day School**  
**Goddla, Vikram Srinivas, 17**  
 Optimal Policy Sparsification and Low-Rank Decomposition for Reinforcement Learning

## MINNESOTA

**Eden Prairie** **Eden Prairie High School**  
**Dagade, Yash, 17**  
 SkyWindFarm: Harnessing High-Altitude Wind Power in a Scalable Manner

**Rochester** **Mayo High School**  
**Kapoor, Isha, 18**  
 Overcoming Melphalan Resistance in the Treatment of Multiple Myeloma – Year 2

**Woodbury** **Math and Science Academy**  
**Vishnubhatla, Srikara, 18**  
 An Exploratory Analysis of Mosaic Chromosomal Aberrations in the Canine Genome: Toward a Comparative Genomics Model

## MISSOURI

**Chesterfield** **Marquette High School**  
**Zhao, Jason Ziren, 17**  
 A Machine Learning Based Approach to Monitoring Carpal Tunnel Risk Factors in High Schoolers Using Desktop Computers in an Office-Like Environment

**Columbia** **David H. Hickman High School**  
**Kannan, Saathvik R., 18**  
 Revolutionizing Cancer Drug Discovery With DrugGen: Identifying a Novel Drug for DNA Polymerase  $\theta$

## NEVADA

**Reno** **Davidson Academy Online**  
**Tang, Linus, 17**  
 Extremal Bounds on Peripherality Measures

## NEW HAMPSHIRE

### Exeter

#### Phillips Exeter Academy

**Bu, Alan, 17**

On the Maximum Number of Spanning Trees in a Planar Graph With a Fixed Number of Edges: A Linear-Algebraic Connection

#### Phillips Exeter Academy

**Rajaram, Achyuta, 17**

Automatic Discovery of Visual Circuits

#### Phillips Exeter Academy

**Tyagi, Riya, 16**

Using Computer Vision To Disentangle Features Enabling AI To Learn Self-Reported Race and Ethnicity From Medical Images

## NEW JERSEY

### Annadale

#### North Hunterdon High School

**Zhang, Selina, 18**

ArTreeficial: A Novel AI-Integrated Solution to Reducing Invasive Spotted Lanternfly Populations

### Bridgewater

#### Bridgewater-Raritan High School

**Hao, Gracelynn, 17**

Green Synthesis of Black TiO<sub>2</sub> Nanoparticles: A Promising Candidate for Solar-Driven Photocatalytic Water Decontamination

### Cherry Hill

#### Cherry Hill High School East

**Liu, Sophia, 17**

Global and Personalized Models for Detecting Myocardial Infarction With Wearable Devices

### Hackensack

#### Bergen County Academies

**Gupta, Aanya, 17**

Initiating Astrocyte to Neuron Transdifferentiation Through MiR-124a: Implications in Neurodegenerative Disease

#### Bergen County Academies

**Kim, Andrea Choo, 17**

qPCR Assay for the Detection of *Varroa destructor* in the eDNA of *Apis mellifera* Colonies

#### Bergen County Academies

**Lee, Reia, 17**

Analyzing the gKDR-GMM Model's Simulation of *C. elegans* Brain Activity Data and Its Wider Applications in Time-Series Data Analysis

#### Bergen County Academies

**Nuruzzaman, Alfardi, 17**

SMAD4 Signaling Pathway's Role on Production of Exosomes and Associated Extracellular Vesicles

#### Bergen County Academies

**Zhou, Maggie, 18**

The Effect of Calpastatin on an in Vitro Model of Parkinson's Disease

<b>Lincroft</b>	<b><u>High Technology High School</u></b> <b>Fang, Katherine, 18</b> Surveying Water Surface and Wetlands Using Cloud-Removed LandSat Data
<b>Livingston</b>	<b><u>Newark Academy</u></b> <b>Li, Aaron, 18</b> The Dynamics of a Neutrally Buoyant Particle in Laminar Flow
<b>Millburn</b>	<b><u>Millburn High School</u></b> <b>Saha Choudhury, Arjun, 18</b> MELODY: Exploring the Characteristics of Music That Helps Relieve Stress
<b>Monmouth Junction</b>	<b><u>South Brunswick High School</u></b> <b>Sinha, Ishaan, 17</b> Characterizing West Nile Virus Dynamics With Explainable Machine Learning
<b>Pennington</b>	<b><u>Hopewell Valley Central High School</u></b> <b>Michaluk, Charlotte Lenore, 17</b> Innovative Climate Change Emissions Reduction: Cargo Ship Active Vortex Scrubber Sail
<b>Princeton</b>	<b><u>Princeton International School of Math and Science</u></b> <b>Liang, Yiwei, 18</b> Discovery and Validation of Small Molecule TIGIT Inhibitors for Cancer Immunotherapy
<b>Summit</b>	<b><u>Kent Place School</u></b> <b>Wang, Miranda, 17</b> A Machine Learning Study of Of Shoreline Change Prediction for United States Coasts
<b>Tenafly</b>	<b><u>Tenafly High School</u></b> <b>Pyo, Cindy, 18</b> Metabolic Program of Intestinal Stem Cell in Pediatric Development and Inflammatory Bowel Disease

## NEW MEXICO

<b>Albuquerque</b>	<b><u>La Cueva High School</u></b> <b>Koushik, Aditya Kiran, 17</b> ACPLearn: A Deep Neural Network Model To Predict Novel Anticancer Peptides
<b>Los Alamos</b>	<b><u>Los Alamos High School</u></b> <b>Kim, Daniel, 18</b> Engineered Underwater Vehicle for Ocean Litter Mapping

## NEW YORK

<b>Ardsley</b>	<b><u>Ardsley High School</u></b> <b>Khitrov, Kevin, 17</b> Autophagy in Non-Cell Autonomous Regulation of Adipogenesis
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