



58th Annual

Southeastern Michigan Regional

Junior Science and Humanities Symposium

**Program
2022**

**WAYNE STATE
UNIVERSITY**

Virtual- Zoom

<https://us02web.zoom.us/j/82419446330?pwd=aTVWYjBuVjZxZE50WGFBVFovZm4xUT09>

Meeting ID: 824 1944 6330

Passcode: 211439

February 25, 2022

58th Annual

SOUTHEASTERN MICHIGAN REGIONAL

JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM

Friday, February 25th, 2022

SPONSORED BY

WAYNE STATE UNIVERSITY
College of Education

IN COOPERATION WITH

U.S. Army Research Office - Research Triangle, NC

U.S. Naval Research Office

U. S. Air Force Research Office

U.S. Army Development Command (DEVCOM)
Ground Vehicle Systems Center (GVSC)
Warren, MI

National Science Teachers Association, Arlington, VA

National Association of Secondary School Principals

Zoom User guidelines will be shared with all participants when registration is confirmed.



Share on Social Media throughout the day

#JSHSRegionals #JSHSNationals #JSHS

@NtlJSHS @NationalJSHS

Website link: <https://cvent.me/5xA9lg>

Registration shortcut: <https://cvent.me/M8Alwg>

OBJECTIVES OF THE JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM PROGRAM

1. *To promote research and experimentation in the sciences, mathematics and engineering at the high school level.*
2. *To recognize the significance of research in human affairs and the importance of humane and ethical principles in the applications of research results.*
3. *To search out talented youth and talented teachers; recognize their accomplishments at symposia and encourage their continued interest and participation in the sciences, mathematics, and engineering.*
4. *To expand the horizons of research-oriented students by exposing them to opportunities in the academic, industrial, and governmental communities.*
5. *To increase the number of future adults capable of conducting research and development.*

In order to accomplish these objectives, we enlist the active participation of our local communities in improving the education of our children.

PUBLISHING OPPORTUNITIES

Students who submitted a paper for presentation at this year's JSHS are encouraged to submit their paper for publication. Students planning to submit their paper for publication should first consult with their research mentor(s) and anyone else who collaborated in their research.

Before submitting a paper for publication, check the journal's website and closely follow instructions under *Submission*.

- ***JOURNEYS – Journal of Youths in Science***
<http://www.journys.org/>
- ***The Journal of Emerging Investigators*** --
a no-fee, open access journal for middle and high school science students.
The Journal is celebrating its 10th year.
https://www.emerginginvestigators.org/?gclid=CjwKCAjwzt6LBhBeEiwAbPGOgcyj7OHLvcB3ARGXZqR6CBfaYThlm5DZcePM2z60apV45A03BP5PUhoCzmwQAvD_BwE

PUBLICITY REQUEST

**Our host institution, Wayne State University, would like to invite you to be part of the
STEM RESEARCH WARRIORS' INITIATIVE**

Your responses to this survey will enable us to showcase you
and share your research experience within the community.

Please complete the survey using this link:

https://waynestate.az1.qualtrics.com/jfe/form/SV_2rFNfWv0qJ1neMm

ADMINISTRATION OF JSHS

Dr. Sandra Yarema, Regional Director and Coordinator of JSHS
Assistant Professor, Clinical,
College of Education, Wayne State University

JSHS 2022 ADVISORY BOARD

Mr. Gregory Chappelle
Michigan DoD STEM Coordinator &
HBCU/MI Liaison Officer,
U.S. Army DEVCOM-GVSC

Dr. Christine Chow
Professor, Chemistry
College of Liberal Arts and Sciences
Wayne State University

Dr. Russell L. Finley
Professor
Center for Molecular Medicine & Genetics
Wayne State University

Dr. Kellie Finney
Training and Support Coordinator (HS)
Office of Science
Detroit Public Schools Community District

Mr. Mike Fraker
Research Program Manager
Michigan Sea Grant Extension

Dr. Patricia Hanlan
Detroit Country Day Schools

Mr. Scott Hanson
Battle Creek Area Math & Science Center

Dr. Truman Hudson, Jr.,
Outreach Coordinator
Teacher Education, College of Education
Wayne State University

Dr. Megan McCullen
Director, Gordon L. Grosscup Museum of
Anthropology & Planetarium
Wayne State University

Dr. Karur Padmanabhan
Associate Professor, Physics
Wayne State University

Ms. Jasmine Roberson
College of Engineering
Wayne State University

Dr. Kate Roberts
Interim Assistant Dean, Teacher Education
College of Education
Wayne State University

Mr. Brandon Schroeder
Michigan Sea Grant Extension Educator
Michigan State University

Dr. Jennell White
School of Medicine
Wayne State University



Welcome

**from the JSHS Director
Dr. Sandra Yarema**

Dear Students, Teachers, Parents and

Colleagues,

It is my great privilege to welcome you to the 58th annual (2nd Virtual) Junior Science and Humanities Symposium (JSHS) of Southeast Michigan. Once again we have a group of very talented young men and women from schools throughout Michigan's lower peninsula, who will share their research with us. I'd like to thank the teachers and mentors for the guidance they provided students throughout the research process and their parents for the support that such activities entail.

An event such as this one cannot be accomplished by one person alone and I would like to express my gratitude to those who help make this event possible each year: the members of the Advisory Board, judges, speakers and support from the College of Education at Wayne State University. Special thanks to Ms. Marion Tate for her help in the planning and running of the symposium and to Ms. April Hines-Jenkins for assistance with the Zoom platform, and a special mention of the JSHS partnerships with the Biomedical Career Advancement Program, (BCAP), through the WSU School of Medicine, the COE Upward Bound Program, and the Center for Great Lakes Literacy (CGLL), Michigan Sea Grant Extension. We are extremely grateful for the continued support of volunteers from the U.S. Army Development Command (DEVCOM) Ground Vehicle Systems Center (GVSC).

I would like to take this opportunity to give you a short overview of the history of the JSHS, for those who might not be familiar with this wonderful program. The JSHS was established in 1958 by the U. S. Army Research Office. The Office of Naval Research joined the army in funding of the symposium in 1995, followed by the U. S. Air Force in 1997. The Academy of Applied Sciences administered all facets of the program in coordination with the AEOP through 2017, when the National Science Teaching Association assumed administration of all the funds and organizing for the National Symposium.

The primary aim of the JSHS is to promote research among high school students. Every year, more than 10,000 students and their teachers participate in forty-nine regional symposia held on university campuses across the country and in Puerto Rico and the Department of Defense schools in Europe and the Pacific. Students presenting at the regional symposia have the opportunity to receive significant awards in the form of scholarships, payable to the University of their Choice. The first, second and third student finalists at each of the regional symposium receive \$2000, \$1500, and \$1000 respectively, and all five finalists are invited to attend the National JSHS. The finalists at each regional symposium present their research once again at the National JSHS where they have the opportunity to receive additional awards. The three finalists in each of the categories at the National JSHS receive \$12,000.00, \$8,000.00 and \$4,000.00 respectively in scholarships. For additional information about the JSHS please visit: www.go.wayne.edu/jsh-symposium and www.jshs.org

Thank you for participating in this year's symposium. I hope your experience is memorable.

Dr. Sandra Yarema, Regional Director, SE MI JSHS

Welcome from the Dean



Dr. Ingrid Guerra-López
Interim Dean
College of Education
Wayne State University

Dr. Guerra-López currently serves as Interim Dean of the Wayne State University College of Education. She is also a Professor of Learning Design and Technology, Director of the Institute for Learning and Performance Improvement, and Past Interim Dean of the Graduate School at Wayne State University. Dr. Guerra-López is an internationally-recognized expert in human performance systems with a particular focus needs assessment and planning, monitoring and evaluation, and strategic alignment of training and performance innovations such as digital learning and alternative competency-based credentialing. Her work is characterized by a systems approach, multistakeholder engagement, and cross-collaboration.

Her work has been funded by the National Science Foundation, the Skillman Foundation, General Motors, Daimler-Chrysler, UNESCO, the United States Agency for International Development, The World Bank, United Kingdom Department for International Development, Council of Graduate Schools and Educational Testing Services, among others. She has held key leadership positions in prominent professional organizations in the field, including the International Society for Performance Improvement (ISPI) Board of Directors, Editor-In-Chief of its research journal, Performance Improvement Quarterly, Chair of the ISPI Research Committee, and various other key committees and task forces charged with charting future directions for the field. In 2017, Dr. Guerra-López was awarded the ISPI Distinguished Service Award, one of ISPI's most significant honors in recognition for her many contributions to ISPI and the field.

She has written eight books, including the award-winning *Partner for Performance: Strategically Aligning Learning and Development* and the best-seller *Needs Assessment for Organizational Success*, and over 100 other publications in needs assessment, performance measurement and evaluation, strategic alignment, workforce development, human resource management, and evidenced-based decision-making. She has worked with students, leadership, and organizations in over 40 countries disseminating evidenced-based performance improvement practices and has directed nearly 30 doctoral dissertations, some of which have received national recognition and awards, and served on nearly 40 additional doctoral dissertation committees.

Dr. Guerra-López earned her Ph.D. and Masters in Instructional and Performance Systems and her undergraduate in psychology with honors from the Florida State University. She has been recognized by the Florida State University's Instructional Systems and Learning Technologies program, the top-ranked program in the field, for her scholarly contributions and received the distinguished Gagne/Briggs Outstanding Alumnus award in 2014.

Dr. Guerra-López will provide the opening remarks at the symposium.

Where is He Now?



Nikhil Mantena Past JSHS Finalist 2017, 2018, 2019, 2020

Nikhil Mantena is a sophomore at the University of Michigan, earning his Bachelor of Science in Biomedical Engineering along with a Bachelor of Business Administration. He currently works as a research assistant at the University of Michigan Medical School, studying drug treatments for hypothyroidism and tissue engineering using stem cells. Additionally, he works as an Innovation Fellow At Michigan Medicine's Center of Surgical Innovation.

In college, Nikhil is the co-lead of the service and needs assessment team for an organization called M-HEAL, which aims to use education, needs assessment, design innovation, and social entrepreneurship to improve access to health care in underserved communities. Additionally, he is a project manager in Nexecon Consulting Group, a premier consulting group that works with clients from startups to Fortune 500 companies. Lastly, he founded and runs his startup venture called Tech Buddies, aiming to improve the digital communication skills for intellectually and developmentally disabled people.

Nikhil has been able to showcase his research experience and presentation skills in numerous events. In high school, he participated in the Science and Engineering Fair of Metro Detroit for 3 years. Additionally, he participated in JSHS all 4 years of high school and had the opportunity to participate in the National JSHS competition his last two years.

Nikhil is now aspiring to become a doctor and plans to continually push the envelope for medical innovation through his entrepreneurial spirit.

Keynote Addresss



Dr. Amanda Bryant-Friedrich

**Dean, Wayne State University Graduate School
Professor of Pharmaceutical Sciences**

Dr. Amanda Bryant-Friedrich, Ph.D., is currently dean of the Graduate School and a professor in the College of Pharmacy and Health Sciences.

Her research interests center around the study and use of naturally and synthetically modified nucleosides and nucleotides in the determination of disease etiology and drug design and development.

She is a fellow of the American Chemical Society and the American Association for the Advancement of Science. She also is a leadership fellow of the American Association of Colleges of Pharmacy.

She will address the topic *The Treatment of Infectious Disease: The Role of Nucleic Acids*

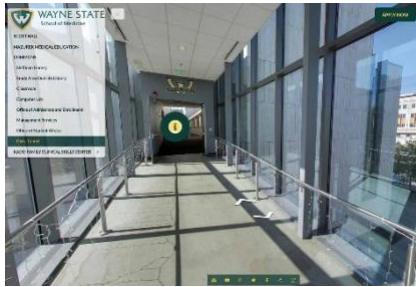
According to the World Health Organization, in 2019, three communicable diseases were among the top ten global leading causes of death: Lower Respiratory Infections, Neonatal Conditions and Diarrheal Diseases. Nucleic acids are vital players in our understanding of many infectious diseases and their treatment. We will discuss the chemistry, modification and utilization of nucleic acids from the prospective of pharmaceutical chemistry.

Campus Tour

Regional JSHS participants have access to virtual tours across Wayne State University:



Main Campus



School of Medicine



Law School

[Main Campus](#)

The virtual tour of the main campus will provide the opportunity to explore Wayne State's 200-acre campus. During your visit, you'll hear from a current WSU Warrior while exploring campus buildings such as our award-winning *Student Center*, *Mort Harris Recreation and Fitness Center*, one of our residence halls, and our new state-of-the-art *STEM Learning Innovation Center*.

[School of Medicine:](#)

The School of Medicine tour will highlight *Scott Hall of Basic Medical Sciences*, *the Commons*, the *Mazurek Medical Education Center* and the *Kado Family Clinical Skills Center*.

[Law School](#)

For more than 90 years, Wayne Law graduates have learned how to apply their knowledge to enhance quality of life. Wayne Law proudly calls Detroit home, and every day, our students and faculty participate in the reinvention of this great American city. At a time of transformative growth, there's never been more momentum on campus and in the city.

Undergraduate Research at Wayne State University



The Office of Undergraduate Research – Undergraduate Research Opportunities Program (UROP) at Wayne State University provides funds to undergraduate students from disciplines across the university – hard sciences, social sciences, performing arts and humanities – to participate in undergraduate research. Undergraduate research puts theory into practice as students work on projects and are mentored by full-time faculty who are leaders in their field. The funds help cover students’ research activities as well as travel expenses to present their research at local, regional and national conferences.

<https://uop.wayne.edu/>

PROGRAM

Friday, February 25, 2022

8:30 a.m. - 9:00 a.m. CHECK-IN, CONFIRMATION & ZOOM LOG-IN

Join Zoom Meeting:

<https://us02web.zoom.us/j/82419446330?pwd=aTVWYjBuVjZxZE50WGFBVFovZm4xUT09>

Meeting ID: 824 1944 6330

Passcode: 211439

9:00 a.m. - 10:00 a.m. OPENING SESSION
Zoom Live General Session

PRESIDING:

Dr. Sandra Yarema Director - JSHS
Director Undergraduate Studies & Teacher Certification Programs
College of Education
Wayne State University

WELCOME/OVERVIEW OF WAYNE STATE UNIVERSITY:

Dr. Ingrid Guerra-López
Interim Dean
College of Education, Wayne State University

ORIENTATION:

Dr. Sandra Yarema
JSHS Director and Coordinator

10:00 a.m. - 11:45 a.m. PRESENTATION OF STUDENT PAPERS
Zoom Breakout Rooms- Assigned by Category

VIRTUAL CAMPUS TOURS

Links to Virtual Tours: [Main Campus](#), [School of Medicine](#), [Law School](#)

STUDENT PRESENTATIONS

BREAKOUT ROOM I: Medicine & Health Behavioral Science

MODERATOR: Dr. Kimberly Derryberry, Ph.D.

Diversity, Equity, Accessibility & Inclusion (DEIA) Manager
The Maryland Zoo in Baltimore
(former U. S. Army DEVCOM GVSC)

STUDENT PRESENTERS:

Sarah Abubaker

Candida Infections Among COVID-19 Patients

Sanjidah Ahmed

The Perceptions of Risks of Alcohol and Cannabis Use in Adolescents

Manish Ileni

A Pathological, Non-invasive Approach to Automated Pancreatic Cancer Assessment from Histopathological Images Utilizing Deep Learning

Mounika Katta

Can The Success Of Metronidazole Treatment Of Bacterial Vaginosis Patients Be Predicted From Initial Microbiomes?

Nadia Niha

Lead Exposure Risk and Anxiety Symptoms in Adolescents

Debarati Roy

The Role of Nicotinamide Loaded Functionalized Solid Lipid Nanoparticles in Improving Cognition in Alzheimer's Disease

Andy Yao

Perception and Reality: the Relationship Between Agreement and Credibility

JUDGES:

Shruti Jha, Environmental Engineer, U. S. Army DEVCOM GVSC

Isabella Cubillejo, Graduate Research Assistant, Biochemistry, Microbiology/Immunology, WSU

Dr. Russell Finley, Professor , Center for Molecular Medicine & Genetics, SOM, WSU

STUDENT PRESENTATIONS

BREAKOUT ROOM II: Biomedical Science

MODERATOR: Dr. Jennell White

Assistant Professor-Research, Pharmacology
School of Medicine
Wayne State University

STUDENT PRESENTERS:

Sohan Madishetty

The Impact of Covid-19 on the Prevalence of Carbapenem Resistant Enterobacteriaceae

Sanjana Pingili

Identification of Dnal1 Binding Partner by Yeast Two-Hybrid Screen

Rania Rafiq

HIV/AIDS Manifestation in Eswatinian Society: A Global Health Exploration

Tahsina Rahman

TB4/VIP Treatment Improves Wound Healing in Corneal Epithelial Cells Exposed to High Glucose

Diya Ramesh

Sputum-Based mRNA-Targeting Probes in Lung Cancer - An Early Diagnostic Tool

Eric Wan

Association of Vaginal Microbiota with Treatment Outcomes for Bacterial Vaginosis

JUDGES:

Lieutenant Colonel (ret.) David Centeno, Biologist, U. S. Army DEVCOM GVSC

Jonathan Panzer, Biochemistry, Microbiology, Immunology, School of Medicine, WSU

Marion Tate, Doctoral Candidate, Wayne State University

STUDENT PRESENTATIONS

BREAKOUT ROOM III: Biochemistry & Environmental Science

MODERATOR: **Dr. Christine Chow**
Professor, Chemistry
College of Liberal Arts and Sciences
Wayne State University

STUDENT PRESENTERS:

Kasey Conklin
Detection of PFAS in Pediatric Marketed Eyeshadows

Keerthana Danasekaran
Identification of Novel Therapeutic Biomarkers & siRNA Probe Design for Glioblastoma Treatment

Veda Mantena
Analyzing Genetic Biomarkers in Patients with Depression

Na'ja Stokes
Physiological function of RNA modification enzyme METTL14 in metabolic diseases

Sonnet Xu
Drought Affects Mangrove Recovery Patterns Following Tropical Cyclones

Jibraan Rahman
Improving Our Drinking H₂O - Effectiveness Of 6 Key Processes and Applications for Developing Nations

JUDGES:

Tracy D'Augustino, Environmental Science, Michigan Sea Grant, MSU Extension
Mike Fraker Research Program Manager, Michigan Sea Grant Extension, Ann Arbor
Catherine Riseng Environmental Educator, School for Environment & Sustainability, U of M
Brandon Schroeder Environmental Educator, Michigan Sea Grant, MSU Extension

STUDENT PRESENTATIONS

BREAKOUT ROOM IV: Engineering, Technology & Physical Science

MODERATOR: **Mr. Gregory Chappelle**
Michigan DoD STEM Coordinator &
HBCU/MI Liaison Officer,
U.S. Army DEVCOM-GVSC

STUDENT PRESENTERS:

Jonathan Bryant

Designing and 3D Printing PLA Based Universal Charging Adapters for Use In Charging Electric Vehicles

Drue Keys

Additive Manufacturing in Autonomous vehicle chassis

Mikul Saravanan

Smart Multipurpose Air Handling Robot with AI-Based Environmental Anomaly Detection

JUDGES:

Thomson David, Electrical Engineer, U.S. Army DEVCOM GVSC

Andrew Kosinski, Robotics, Electrical Engineer, U. S. Army DEVCOM GVSC

Jasmine Roberson, Engineering Educator, College of Engineering, WSU

Christopher Scott, Engineer, U. S. Army DEVCOM GVSC

STUDENT PRESENTATIONS

BREAKOUT ROOM V: Mathematics & Computer Science

MODERATOR: Ms. April Hines-Jenkins
Mathematics Educator,
Doctoral Student, Teacher Education-
College of Education, WSU

STUDENT PRESENTERS:

Noah Black

Design and Analysis of Feed Forward Neural Networks for Non-Small Cell Lung Cancer Prognosis

Vikram Goddla

Artificial Intelligence Solution for Effective Diagnosis, Prognosis and Treatment Planning for Brain Tumor Patients

Michelle Hua

GC-SSN: A Novel Geometric Consistency-based Self-Supervised Neural Network for 3D Human Shape and Motion Reconstruction

Julia Huang

Randomized Audiomentational Layered Convolutional Transformers (RALCT): A Novel Deep Learning Model for Environmental Sound Recognition

JUDGES:

David Brown, Computer Scientist, U.S. Army DEVCOM GVSC

David Daniszewski, AI Machine Learning Signal Processing, U.S. Army DEVCOM GVSC

Mohsen Dianat, Engineer, DEVCOM GVSC

Lonnie Freiburger, AI Robotics Network, U.S. Army DEVCOM GVSC

David Lamb, Mathematics, Computer Science, Dynamics Reliability, Analytical
Modeling & Simulation, U.S. Army DEVCOM GVSC

Danielle Nelson, Computer Scientist, U.S. Army DEVCOM GVSC

STUDENT PRESENTATIONS

POSTER SESSION (1:00 – 2:00 pm)

BREAKOUT ROOM Posters

MODERATOR: **Ms. Marion Tate,**

Doctoral Student, Teacher Education- College of Education, WSU

STUDENT PRESENTERS:

Aanchal Jain

RIPK2 and IRF1 T cell genes as therapeutic targets to remedy Celiac Disease

Yara Mashal

Comparing Tau and Amyloid- β Targeted Nanoparticle Immunotherapy for Alzheimer's Disease: a review

JUDGES:

Bradley Brumm, DoD Scientist, U.S. Army DEVCOM-GVSC

Dr. Truman Hudson, Jr., Outreach Coordinator, Teacher Education- College of Education, WSU

Deirdre Nelson, Doctoral Candidate, Teacher Education, Wayne State University

Charles Sylvester, DoD Scientist, U.S. Army DEVCOM-GVSC

11:45 a.m. – 1:00 p.m. VIRTUAL LUNCHEON
Zoom Live

PRESIDING: Dr. Sandra Yarema
College of Education

SPEAKER: Nikhil Mantena
JSHS ALMNI FINALIST

TOPIC: Where is He Now?

Nikhil Mantena, finalist at the 2017, 2018, 2019, & 2020 Regional JSBS, and will talk about his research experiences during high school and how his participation in the JSBS has impacted his college experience and future research interests.

ANNOUNCEMENT OF FINAL STUDENT PAPERS

The regional finalists will advance to National JSBS,
scheduled for Albuquerque, NM, April 20 – 23, 2022

1:00 - 2:00 p.m. POSTER SESSION

VIRTUAL CAMPUS TOURS

[Main Campus](#)

[School of Medicine:](#)

[Law School](#)

POSTER INTERVIEWS

BREAKOUT ROOM – Zoom Live

2:00 p.m. - 3:00 p.m. KEYNOTE ADDRESS – (Zoom Live)

KEYNOTE SPEAKER: Dr. Amanda Bryant-Friedrich
Dean, Wayne State University Graduate School
Professor of Pharmaceutical Sciences

TOPIC: The Treatment of Infectious Disease: The Role of Nucleic Acids

3:00 p.m. – 5:00 p.m. FINAL JUDGING (Zoom Live)

Determine National JSHS Finalist Ranking

MODERATOR: Dr. Karur Padmanabhan

Physics Department

Wayne State University

STUDENT PRESENTERS:

The 5 finalists from each judging category will present again, to establish rank order for participation in the National JSHS, April 20 – 23, 2022, Albuquerque, NM.

JUDGES: (Deliberation in Breakout Room after presentations)

David Brown, Computer Scientist, U. S. Army DEVCOM GVSC

Dr. Yuan He, Assistant Professor, Microbiology, School of Medicine, WSU

Brandon Schroeder, Environmental Educator, GLLC, MI Sea Grant Extension

Marion Tate, PhD Candidate, Teacher Education, COE, WSU

5:30 – 6:00 p.m.

**AWARDS: Presentation of Student Speaker Finalist Awards
and Regional Poster Prizes**

Dr. Sandra Yarema, Director

CONCLUSION- 57th Annual SE MI Regional JSHS

**Congratulations to the regional finalists who will advance to the
National JSHS, held virtually April 15 – 17, 2021**

**All participants will receive Digital Badges to confirm participation
and any awards earned as part of the Regional JSHS.**

* What are digital badges? Digital badges take the place of medals or medallions. Student winners receive a digital badge issued from JSHS that officially recognizes their achievement. Students can display their digital badge through Facebook, Instagram, LinkedIn, and other social media platforms. What is unique about a digital badge is that they have meta-data to communicate details of the badge to anyone wishing to verify it, or learn more about the context of the achievement it signifies. Some or all of this information will be displayed in a visual format wherever the badge is displayed, but it is also stored within the digital badge's meta-data so it can be verified any time - even if you only have the image.

STUDENT RESEARCH PAPER PRESENTERS

Name	School	City
Sarah Abubaker	Edsel Ford High School	Dearborn
Sanjidah Ahmed	International Academy East	Troy
Noah Black	Herbert Henry Dow High School	Midland
Jonathan Bryant	Renaissance High School	Detroit
Kasey Conklin	BCAMSC	Battle Creek
Keerthana Danasekaran	Northville High School	Northville
Vikram Goddla	Detroit Country Day School	Beverly Hills
Michelle Hua	Cranbrook Schools	Bloomfield Hills
Julia Huang	Northville High School	Northville
Manish Ileni	Novi High School	Novi
Mounika Katta	Northville High School	Northville
Drue Keys	Renaissance High School	Detroit
Sohan Madishetty	Northville High School	Northville
Veda Mantena	Detroit Country Day School	Beverly Hills
Nadia Niha	Cass Technical High School	Detroit
Sanjana Pingili	Northville High School	Northville
Rania Rafiq	International Academy	Bloomfield Twmsp
Jibraan Rahman	Canton High School	Canton
Tahsina Rahman	Dr. Benjamin Carson High School	Detroit
Diya Ramesh	International Academy	Bloomfield Twmsp
Debarati Roy	Cass Technical High School	Detroit
Mikul Saravanan	Cranbrook Schools	Bloomfield Hills
Na'ja Stokes	Cass Technical High School	Detroit
Eric Wan	Northville High School	Northville
Sonnet Xu	Troy High School	Troy
Andy Yao	Herbert Henry Dow High School	Midland

STUDENT POSTER PARTICIPANTS

Name	School	City
Aanchal Jain	Okemos High School	Okemos
Yara Mashal	International Academy East	Troy

STUDENT GUEST PARTICIPANTS

Name	School	City
Jiawei Chen	Cranbrook Schools	Bloomfield Hills
Yun Du	Cranbrook Schools	Bloomfield Hills
Zieje He	Cranbrook Schools	Bloomfield Hills
Bangyan Huang	Cranbrook Schools	Bloomfield Hills
Hoa Tran	University Prep Academy	Detroit

TEACHER/SUPERVISOR/ADMINISTRATIVE PARTICIPANTS

Name	School	City
Christina Abbott	Okemos High School	Okemos
Tekiendria Batts	Biomedical Career Advancement Program	Detroit
Rebecca Brewer	Troy High School	Troy
Faith Briggs	Biomedical Career Advancement Program	Detroit
Dr. Patricia Hanlan	Detroit Country Day Schools	Beverly Hills
Scott Hanson	Battle Creek Area Math & Science Center	Battle Creek
Klaudia Janek	International Academy	Bloomfield Hills
Renee Kizaris	Cranbrook Schools	Bloomfield Hills
Dr. Stephanie Kokoszka	Cranbrook Schools	Bloomfield Hills
Karen Lamb	Detroit Country Day Schools	Beverly Hills
Cynthia Meyer	Herbert Henry Dow High School	Midland
Tim Muhich	Battle Creek Area Math & Science Center	Battle Creek
Nicole Stawasz	Novi High School	Novi
April Surinckap	Northville High School	Northville
Dr. Jennell White	Biomedical Career Advancement Program	Detroit
Keith Young	Ecoteklab	Detroit

Judges

David Brown

Computer Scientist
U.S. Army DEVCOM GVSC
DoD Personnel

Brad Brumm

Scientist/Engineer
U.S. Army DEVCOM GVSC
DoD Personnel

Lt. Colonel David Centeno Jr. (retired),

Biologist/Military Science
U.S. Army DEVCOM GVSC
DoD Personnel

Gregory Chappelle

STEM Coordinator/STEM
Educator/Physicist/Chemist/
Electrical Engineer
U.S. Army DEVCOM GVSC
DoD Personnel

Dr. Christina Chow

Professor, Chemistry
College of Liberal Arts & Sciences
Wayne State University

Isabella Cubillejo

Graduate Research Assistant
Biochemistry
Microbiology/Immunology
Wayne State University

David Daniszewski

Computer Scientist/Adjunct
Professor
U.S. Army DEVCOM GVSC
DoD Personnel

Tracy D'Augustino

Environmental Science Educator
Michigan Sea Grant Extension
Michigan State University

Dr. Kimberly Derryberry

DEIA Manager
The Maryland Zoo
Baltimore, MD

Mohsen Dianat

Cybersecurity/Technology
U.S. Army DEVCOM GVSC
DoD Personnel

Michael Fraker

Research Program Manager
Michigan Sea Grant Extension
Michigan State University

Dr. Russell Finley

School of Medicine
Wayne State University

Lonnie Freiburger

Robotics Network, AI
U.S. Army DEVCOM GVSC
DoD Personnel

Dr. Yuan He

Assistant Professor, Microbiology
School of Medicine
Wayne State University

Dr. Truman Hudson, Jr.

Teacher Education Division
College of Education
Wayne State University

April Hines-Jenkins

Mathematics Educator
Teacher Education Division
COE- WSU

Shruti Jha

Environmental Engineer
U.S. Army DEVCOM GVSC
DoD Personnel

Andrew Kosinski

Mechanical Engineering/Robotics
U.S. Army DEVCOM GVSC
DoD Personnel

David Lamb

Mathematics, Computer Scientist
U.S. Army DEVCOM GVSC
DoD Personnel

Danielle Nelson

Computer Science
U.S. Army DEVCOM GVSC
DoD Personnel

Deirdre Nelson

PhD Candidate
Teacher Education
College of Education, WSU

Dr. Karur Padmanabhan

Physics Department
Wayne State University

Jonathan Panzer

Graduate Research Assistant
Biochemistry/Microbiology/
Immunology, SOM, WSU

Catherine Riseng

Environmental Science Educator
School for Environment &
Sustainability
University of Michigan

Jasmine Roberson

Outreach Director
College of Engineering
Wayne State University

Brandon Schroeder

Environmental Science Educator
Michigan Sea Grant Extension
Michigan State University

Christopher Scott

Electrical Engineer
U.S. Army DEVCOM GVSC
DoD Personnel

Charles Sylvester

Scientist/Engineer
U.S. Army DEVCOM GVSC
DoD Personnel

Marion Tate

PhD Candidate
Teacher Education
COE WSU

Dr. Jennell White

Assistant Professor-Research,
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RESEARCH ABSTRACTS

ORAL PAPER PRESENTATIONS	
Presenter	Abstract
Sarah Abubaker	<i>Candida Infections Among COVID-19 Patients:</i> As the abundance of individuals being exposed to COVID-19 increases and overflows Intensive Care Units (ICUs), many individuals are experiencing symptoms of Candida while being treated for COVID-19. Positive polymerase chain reaction (PCR) tests are conducted and have strongly shown that the presence of COVID-19 puts a patient at risk for Candida. The use of Central Venous Catheters and Corticosteroids are compromising immunocompromised patients and increasing the replication of Candida--since the stability and production of white blood cells is rapidly decreasing. Moreover, since Candida is antibiotic-resistant, injecting steroids to aid in treating COVID-19 is only decreasing white blood cells and is freely encouraging the fungal yeast to replicate. As the presence of Candida in blood cultures continues to arise within COVID-19 patients, a tertiary care hospital in Detroit has been collecting supporting data that illustrate the different modes of treatment that may be the underlying factor to the strong causes of Candida variants among COVID-19 patients.
Sanjidah Ahmed	<i>The Perceptions of Risks of Alcohol and Cannabis Use in Adolescents</i> Alcohol and cannabis are commonly misused substances among adolescents and can have severe health and legal risks. Despite these consequences, a 2019 survey found that 29.2% of U.S. high school students drank alcohol, 14% binge drank, and 21.7% used cannabis within the past 30 days. In this study, 65 Metro Detroit adolescents (10-17 years) completed a survey regarding their perceived risks of alcohol and cannabis use (52.3% female; 41.3% White, 38.1% Black, 14.3% Asian, and 6.3% Biracial). Adolescents rated their perceptions on a scale from 1-4 (1 = no risk, 4 = great risk). Descriptive statistics were used to examine the frequency of responses in each risk level, along with histograms to visualize the data. A chi-square test was used to compare responses between substances. Responses varied across the sample, with most (50.8%) reporting no risk to binge drinking, 7.7% slight risk, 10.8% moderate risk, and 29.2% great risk. Similarly, most adolescents reported no risk (36.9%) to using cannabis (6.9% slight risk; 12.3% moderate risk; 18.5% great risk). There was a significant difference in perceived risk between substances ($p < 0.001$), such that a subset rated cannabis and alcohol differently. Our results revealed that adolescents have divided perceptions of the risks of drinking alcohol and using cannabis; however, most adolescents perceive both substances to have no risks. Therefore, adolescents must be more informed of the risks and consequences of alcohol and cannabis use.
Noah Black	<i>Design and Analysis of Feed Forward Neural Networks for Non- Small Cell Lung Cancer Prognosis:</i> Lung cancer kills over 150,000 Americans every year. Within the broader categorization of lung cancer, non-small cell lung cancer comprises 85% of total cases. Non-small cell lung cancer patients experience a high rate of cancer recurrence: 30-55%. Proactive management and screening of non-small cell lung cancer through computed tomography has been shown to reduce mortality rates dramatically. This study expands on previous proactive management studies by implementing a species of artificial neural networks, called feed forward neural networks, to predict patient prognosis. The study uses microarray data collected through microarray technology that is publicly available on the Gene Expression Omnibus resource. After robust data pre-processing and normalization, this study found high rates of prediction success--100%--even when using simple neural network architectures and realistic training schemes. While highly successful, real world success must be achieved among wild samples to verify the results found within this study.

Jonathan Bryant	<p><i>Designing and 3D Printing PLA Based Universal Charging Adapters for Use In Charging Electric Vehicles</i> Electric vehicles are vehicles that run using batteries and electricity rather than gas. The global Electric Vehicle market was estimated at \$140 Billion USD in 2019 and is expected to increase up to \$700 Billion by 2026. Electric vehicles utilize many accessories such as adapters. Electric vehicle adapters are chargers that allow you to use a brand of charging station that differs from your brand of electric vehicle. Charging stations are stations that are made for indoor or outdoor usage that allows electric vehicles to be charged. This is similar to how gas stations allow your car to be filled with gas so it can continue to work. The adapter I created would work for cars such as the Chevy Volt, Nissan LEAF, Tesla Model S, Toyota Prius, and many others. This adapter uses an SAE J1772 charging connector, which is used by every electric vehicle manufacturer in North America except for Tesla. The J1772 is used for level 1 charging (120 Volts) and level 2 charging (240 Volts). The adapter also uses a Tesla EV connector which is used for the supercharger connector to plug into it. A limitation seen in most adapters is that they work for the Tesla home chargers, but they don't work for the Tesla superchargers that are seen outdoors. This adapter would work for the superchargers and the home chargers.</p>
Kasey Conklin	<p><i>Detection of PFAS in Pediatric Marketed Eyeshadows</i> There are over 4,700 variations of per- and polyfluoroalkyl substances (PFAS) and the number is increasing . PFAS are man-made chemicals that do not break down in the environment and can be found in multiple products. PFAS has been researched to be prevalent within cosmetics creating an opportunity for harm to those who are exposed, especially to those within pediatric populations due to their developing immune systems. Pediatric marketed and adult targeted eyeshadow extracts were run through high performance liquid chromatography (HPLC) in order to determine whether or not there were detectable quantities of PFAS within eyeshadow, and whether or not the marketed age-range changed the presence of PFAS to observe if adult eyeshadows had less negative health potential. This research was inspired by the results of a University of Notre Dame study revolving around fluorinated compounds in North American cosmetics. According to eyeshadow extract chromatogram results, 75% of eyeshadows—both pediatric and adult—tested were found to contain detectable levels of PFAS.</p>
Keerthana Danasekaran	<p><i>Identification of Novel Therapeutic Biomarkers & siRNA Probe Design for Glioblastoma Treatment</i> Glioblastomas (GBM) are one of the most complex, deadly, and treatment-resistant cancers. The five-year survival rate for glioblastoma patients is only 6.8% and the average length of survival for glioblastoma patients is between 12 and 18 months. The survival rates and mortality statistics for GBMs have remained virtually unchanged for decades. Surgical procedures are used to make a diagnosis, relieve pressure on the brain, and safely remove as much tumor as possible, but glioblastomas are diffuse and infiltrate the brain, making them very difficult to remove completely. Radiation and chemotherapy are often used for tumors that cannot be removed with surgery and to slow down the growth of residual tumors after surgeries. However, none of these treatments have succeeded in significantly extending patient lives beyond a few extra months. It is clear that further research is needed to improve overall survival rates for glioblastoma patients. In our study, we have found 5 novel genes that may serve as therapeutic biomarkers for glioblastoma treatment. SGOL1, TSPAN31, ONECUT1, PCDHB5, and CHI3L2 are overexpressed in homo sapiens glioblastoma tumors. A high expression of these genes leads to a poor overall prognosis of glioblastoma patients and all of these genes are involved in cancer progression processes or directly interact with cancer-promoting genes. SiRNA probes were designed to target and inhibit the expression of the SGOL1, TSPAN31, and ONECUT1 genes as well. Ligands can be added to these probes to interact with specific cell receptors. Additional preclinical investigation is needed to confirm our findings.</p>

Vikram Goddla	<p><i>Artificial Intelligence Solution for Effective Diagnosis, Prognosis and Treatment Planning for Brain Tumor Patients</i> Glioblastomas are the most common and aggressive malignant brain tumors in adults^{1,2}. An estimated 200,000 people die each year from Glioblastoma in the world³⁰. Glioblastoma patients have a median survival of 12 months with optimal therapy and less than 4 months without treatment^{1,2,27}. They usually appear as heterogenous, poorly marginated and diffusely infiltrating necrotic masses with irregular peripheral enhancement and are surrounded by vasogenic edema²⁷. The current standard of care includes surgical resection, radiotherapy and chemotherapy, which require accurate segmentation of brain tumor sub regions with consistent labels^{1,2}. In addition, for effective treatment planning, it is vital to identify the methylation status of MGMT promoter, which is a positive prognostic factor of patient's chemotherapy response. Early detection of methylated MGMT promoter may lead to improvements in patient's survival time with effective treatment^{1,2}. However, current manual methods for brain tumor segmentation are tedious, subjective and not scalable¹ and current techniques to determine the methylation status of MGMT promoter involve surgically invasive procedures, which are expensive and time consuming. Hence there is a pressing need to develop automated tools to segment brain tumors and non-invasive methods to predict methylation status of MGMT promoter, to facilitate better treatment planning and improve survival rate^{1,6,8,17}. My research created an integrated diagnostics solution driven by Artificial Intelligence to automatically segment brain tumor sub regions and predict the methylation status of MGMT promoter, using multiparametric brain MRI scans with performance exceeding current standards and ultimately improve survival time for brain tumor patients.</p>
Michelle Hua	<p><i>GC-SSN: A Novel Geometric Consistency-based Self-Supervised Neural Network for 3D Human Shape and Motion Reconstruction</i> 3D human motion reconstruction from a monocular video is one of the most attractive yet challenging research fields. It has the potential to enable 3D broadcasting, advance virtual and augmented reality, conduct sport analysis, deliver telepresence, etc. Existing machine learning methods for 3D reconstruction require a large number of hard-to-obtain training pairs, e.g., human images/videos and their corresponding 3D human models, and often suffer from performance degradation in practice due to appearance variations between the training and testing data. Therefore, I propose a novel geometric consistency-based self-supervised network (GC-SSN) for 3D human shape and motion reconstruction from a monocular video. In GC-SSN, the representation of a moving human is modeled with a geometric representation based on joints and silhouettes extracted from each frame of the video, thus avoiding the instability of appearance-based representations and constraints. During training, the joints and silhouettes of the reconstructed 3D human model are automatically extracted, rendered, and fed back to the reconstruction network to form a complete cycle. By enforcing the reconstructed 3D human model to align consistently with the extracted joints and silhouettes constraints from the input and output geometric representations in both the forward and backward directions, the generator, consisting of a feature encoder and a regressor, in GC-SSN can build the 3D human model with a high accuracy. The GC-SSN is self-supervised with automatically extracted joints and silhouettes without any manual annotations or ground truth 3D human shapes. It significantly improves the domain adaption and outperforms other state-of-the-art algorithms.</p>
Julia Huang	<p><i>Randomized Audiomentational Layered Convolutional Transformers (RALCT): A Novel Deep Learning Model for Environmental Sound Recognition</i> The current solution for the hearing impaired, the conventional hearing aid, is both costly and limited in usage, as it is not intended to detect non-speech audio in one's surroundings. Therefore, my goal is to develop a novel machine learning model to provide a more accurate and affordable mechanism to identify and classify environmental sounds to help improve the safety of the hearing impaired, i.e., if a car is honking behind people as they are walking or a gunshot is fired and they need to move away</p>

	<p>from the source. By performing randomized augmentations on each audio file, concatenating a Mel-Frequency Cepstral Coefficients (MFCCs) diagram and a Log Mel Spectrogram, and including Convolutional Neural Network layers in a Transformers model, the Randomized Audiomentational Layered Convolutional Transformers (RALCT) model efficiently extracts features from diversified representations of audio samples in each epoch of training and establishes long-range dependencies between input features, significantly improves the distinctiveness of learned features from audio. Experiment results on the UrbanSound8K dataset demonstrate the effectiveness of my architecture, resulting in an accuracy of 92.73%, reaching state-of-the-art levels on UrbanSound8K. To leverage the capabilities of this technology in an accessible format, I developed a phone app that can be integrated with my RALCT model to accurately classify outdoor sounds and provide real-time safety control for the hearing impaired. RALCT thus represents a powerful, novel, and versatile deep-learning tool to aid the hearing impaired community, potentially saving lives.</p>
Manish Ileni	<p><i>A Pathological, Non-invasive Approach to Automated Pancreatic Cancer Assessment from Histopathological Images Utilizing Deep Learning</i> Pancreatic Cancer is one of the deadliest and most aggressive types of cancer, with a five-year relative survival rate of 10.8%. This is because current diagnostic methods detect Pancreatic Cancer far too late, due to tumors and symptoms not presenting themselves until the cancer has spread to other parts of the body. It is advantageous to diagnose Pancreatic Cancer before the onset of symptoms, as Pancreatic Cancer treatments are substantially more effective at earlier stages. Current diagnostic methods used in clinical practice are manual approaches which are time-consuming, laborious, and ineffective as diagnostic interpretation is low. The only existing diagnostic method that is somewhat effective is an invasive biopsy, which can be slow and traumatizing for patients. Despite the need for a fast, automated, and accurate approach to classifying and diagnosing Pancreatic Cancer from medical imaging modalities, an effective solution does not exist. This study presents a novel assessment approach that utilizes 3 tuned and optimized convolutional neural networks with different established machine learning approaches and a dataset of over 158 high-resolution pathological WSI images to compile crucial tumor information. The 3 networks exhibited 91.3%, 94.3%, and 96.1% testing accuracy for proper classification and segmentation of the pathological images. Not only were the networks successful for classification and segmentation, but they also produced valuable tumor information that holds potential for other analyses. This assessment approach is one of the first transfer-learning-based affordable diagnostic tools in literature for Pancreatic Cancer with an accuracy above 95%.</p>
Mounika Katta	<p><i>Can the success of metronidazole treatment of bacterial vaginosis patients be predicted from initial microbiomes?</i> Bacterial Vaginosis, or BV, is one of the most common vaginal infections in women. It affects about 30-60% of women worldwide. In most patients, it is caused by a shift from Lactobacillus to polymicrobial flora, but the actual cause of this shift is unknown. Our hypothesis is that the abundance of specific bacteria in BV patients will determine whether treatment with oral metronidazole will be effective. In this project, BV patients treated with metronidazole were divided into three outcome groups: refractory (no recovery), recurrent (transient recovery), and remission (long-term recovery). We collected vaginal samples before and after treatment, and sequenced bacteria to determine whether compositional changes were linked to clinical outcome. We used R, Mega, and Microbiome analysis to analyze and graph our data. The data did not show significant differences in pre-treatment samples that could predict clinical outcome. In contrast, at post-treatment, we found certain bacteria that were significantly associated with recurrent and remission patients versus refractory patients after treatment. Future analysis of this area and data is important because it would eventually lead to clinicians being able to offer specialized treatment for BV patients.</p>

Drue Keys	<p><i>Additive Manufacturing in Autonomous vehicle chassis</i> An autonomous vehicle is a car that uses a combination of sensors to see its environment and navigate a pathway for itself. Essentially it is a self-driving car. Plastic light-weighting can be used in the building of AVs to reduce their weight and increase fuel efficiency and handling. Lightweight materials can make a big impact on the overall efficiency of an autonomous vehicle. Replacing the commonly used steel components in cars and using lightweight materials like magnesium and aluminum alloys or carbon fibers, can greatly decrease weight and greatly increase a vehicle's fuel efficiency. By using lightweight materials you also have more room for control and safety sensors. This is very helpful for AVs since they rely on the accuracy of their sensors to be able to drive successfully. My use of Additive Manufacturing in Autonomous vehicles is replacing the traditionally used and heavier parts of the chassis with lightweight parts to benefit their fuel efficiency and handling. I use Fusion 360 <i>AutoCad</i> to design my chassis parts and perform different Finite Element Analysis simulations to better my designs.</p>
Sohan Madishetty	<p><i>The Impact of Covid-19 on the Prevalence of Carbapenem Resistant Enterobacteriaceae</i> Imagine getting sick from some type of virus and bacteria. However, you have heard that the illness is simple to cure. This would make anyone happy due to the use of antibiotics. Bacteria or disease may become resistant to specific antibiotics through mutations and variants. This could significantly worsen one's conditions, even causing death. New Delhi metallo-beta-lactamase (NDM) is an enzyme that makes bacteria resistant to a broad range of beta-lactam antibiotics. It can cause various diseases by weakening immune response. Additionally, it has the potential to change the characteristics of bacteria, resulting in antibiotic-resistant bacteria that can be nearly impossible to cure. SARS-CoV-2 or Covid-19 is a very deadly and highly transmittable virus that has claimed the lives of 5.5M in the world. This project evaluated the effect of Covid-19 on the rate of NDM. Data was collected from medical records by conducting a retrospective cohort study at the Detroit Medical Center. Finally, I analyzed the data and drew reasonable conclusions between NDM and Covid-19 to fulfill my objectives. When looking at the data, it was evident of the effect Covid-19 had on NDM. The number of cases increased exponentially. Additionally, half of the impacted patients expired while others are improving. My data lets me conclude that the Covid-19 pandemic significantly worsened the NDM epidemic, leading to more cases and fatalities. However, there could have been other factors that affected the epidemic, such as hospital conditions, existing conditions, and treatment.</p>
Ileni Manish	<p><i>A Pathological, Non-invasive Approach to Automated Pancreatic Cancer Assessment from Histopathological Images Utilizing Deep Learning</i> Pancreatic Cancer is one of the deadliest and most aggressive types of cancer, with a five-year relative survival rate of 10.8%. This is because current diagnostic methods detect Pancreatic Cancer far too late, due to tumors and symptoms not presenting themselves until the cancer has spread to other parts of the body. It is advantageous to diagnose Pancreatic Cancer before the onset of symptoms, as Pancreatic Cancer treatments are substantially more effective at earlier stages. Current diagnostic methods used in clinical practice are manual approaches which are time-consuming, laborious, and ineffective as diagnostic interpretation is low. The only existing diagnostic method that is somewhat effective is an invasive biopsy, which can be slow and traumatizing for patients. Despite the need for a fast, automated, and accurate approach to classifying and diagnosing Pancreatic Cancer from medical imaging modalities, an effective solution does not exist. This study presents a novel assessment approach that utilizes 3 tuned and optimized convolutional neural networks with different established machine learning approaches and a dataset of over 158 high-resolution pathological WSI images to compile crucial tumor information. The 3 networks exhibited 91.3%, 94.3%, and 96.1% testing accuracy for proper classification and segmentation of the pathological images. Not only were the networks successful for classification and segmentation, but they also produced valuable tumor information that holds potential for other analyses. This assessment approach is one of the first transfer-learning-based affordable diagnostic tools in literature for Pancreatic Cancer with an accuracy above 95%.</p>

Veda Mantena	<i>Analyzing Genetic Biomarkers in Patients with Depression</i> Major Depressive disorder is a chronic mental disorder caused by various factors which include faulty mood regulation, stress in one's life, genetic factors, medications, or health problems. Some symptoms are the feelings of sadness and hopelessness continuously, angry outbursts, irritability, loss of interest in normal activities, and chronic fatigue. Regarding diagnostics, routine screenings will happen first: the doctor will talk to the patient, and if the patient reveals that they've been having symptoms, doctor may make the diagnosis. Another factor used to decide is the discussion of family history because if one's parents or relatives have had mental disorders, especially depression, you are more likely to get it. Also, a doctor may do a physical examination and/or lab test to determine the exact cause of a patient's symptoms, since there are other mental disorders that could trigger similar symptoms to those of depression. There are two categories of causes for depression: genetics and environmental factors/specific events. This experiment will focus on genetics-related depression. Already, many experiments have been performed, in order to extract samples of different regions of the brain. These samples have been organized into datasets. So, there will not be an experiment that I am conducting. I am choosing an existing dataset out of many that has a good representation of data, as well as a fairly large sample list. Then, I will use GEO2R to create graphs that show the correlation of samples. I will also use R programming to perform statistical analysis and see the differences of biomarkers in people with depression versus healthy sample.
Nadia Niha	<i>Lead Exposure Risk and Anxiety Symptoms in Adolescents</i> Michigan is the fifth worst state in the U.S. for childhood lead poisoning, and Detroit has some of the highest rates of lead poisoning cases. Lead exposure can lead to developmental delays, problems with brain functioning, violent or aggressive behaviors, even into adulthood. The objective of the present study is to examine the correlation between lead exposure risk and anxiety symptoms in adolescents. Sixty-five adolescents from Metro Detroit (29.2% Detroit residents) completed an online survey (52.3% female; $M \pm SD = 13.05 \pm 2.18$ years; 41.3% White, 38.1% Black, 14.3% Asian, 6.3% Biracial). Lead exposure risk was estimated using the zip code of the current residential address and rates of elevated blood levels via Data Driven Detroit. Adolescents self-reported on their anxiety symptoms. Linear regression was run across the entire sample to examine the impact of lead exposure risk on anxiety. Follow-up regression was performed in Detroit vs. non-Detroit groups. Gender was added as a covariate in all analyses. Anxiety levels varied across the sample, and 61.5% of youth have elevated anxiety. Lead exposure risk was significantly associated with anxiety in Detroit youth ($p=0.031$) but not in non-Detroit youth ($p=0.452$). Our results show negative effects of lead exposure risk on mental health in youth. These data point to the importance of awareness surrounding risks of lead, particularly in the city of Detroit. Future studies should examine the impact of lead on mental health in other major cities.
Sanjana Pingili	<i>Identification of Dnali1 Binding Partner by Yeast Two-Hybrid Screen</i> Mammalian dynein axonemal light intermediate chain 1 (DNALI1) is a component of the dynein complex that contains the molecular motors for cilia motility. Our earlier studies demonstrated that mouse DNALI1 is essential for mouse sperm formation. In order to investigate the mechanism of DNALI1 in the regulation of spermatogenesis, we conducted a yeast two hybrid screen using the human DNALI1 as bait. Full length human DNALI1 cDNA was amplified by RT-PCR, and the PCR product was cloned into pCR2.1 TOPO TA clone vector. After sequencing, the correct insert was ligated to the pGBK-T7 vector. The resulting plasmid was transformed into AH109 yeast, and the transformed yeast expressing human DNALI1 was mated with a yeast pre-transformed with human testis cDNA library constructed in the pGAD-T7 vector. 24 hours after mating, the yeast was plated onto α -x-gal-coated SD-agar plates prepared with a selection medium. Five days later, yeast DNA was extracted from blue yeast colonies grown on the SD-agar plates. The yeast DNA was subsequently transformed into competent DH5 α bacteria and plated on the LB-plates supplemented with ampicillin. Plasmid DNA was extracted from the bacteria colonies

	grown on the plates, and the plasmids were sequenced with a T7 primer. The resulting sequences were blasted to the GenBank sequences, and the genes were identified. The translated proteins from these genes are potential DNALI1 binding partners. This study will allow us to further explore mechanisms of DNALI1 in the regulation of mammalian spermatogenesis and other biological functions.
Rania Rafiq	<i>HIV/AIDS Manifestation in Eswatinian Society: A Global Health Exploration</i> Since the emergence of the HIV mutation (human immunodeficiency virus) in 1960 and the first case of AIDS appearing in 1981, today's world population faces an epidemic known as HIV/AIDS. Many nations worldwide have dealt with the epidemic in unique ways; however, sub-Saharan regions suffer the most due to the highest prevalence of HIV/AIDS residing in African countries. The country with the highest rates of HIV/AIDS is known as Eswatini, formerly named "Swaziland". To understand the relationship between Eswatinian government healthcare system limitations and the rise in mortality rates of HIV/AIDS, This investigation follows to explore the question of "How have limitations of the Eswatinian government healthcare system (in Southern Africa) contributed to the prevalence of HIV/AIDS?" This paper will attempt to investigate a global health issue with an interdisciplinary scope; through a biological and global politics lens. The investigation also analyzes Eswatinian policies and why they have been responsible for negatively affecting HIV/AIDS prevalence in Eswatini. The research conducted will focus on the biological implications of HIV/AIDS and how it affects the human population, as well as insight into the governmental structure of Eswatini and the policies they have carried out regarding public health crises. The local case study of HIV/AIDS in Eswatini, as applicable, will provide a sample of data regarding HIV/AIDS incidence and the effect of scaling up on antiretroviral therapies. Data highlighting incidence rates from a number of social and age groups are included to outline the inability to access resources and basic biological research for prevention.
Jibraan Rahman	<i>Improving Our Drinking H2O - Effectiveness Of 6 Key Processes and Applications for Developing Nations</i> Six 2-step treatment + disinfectant techniques were identified to determine their efficacies in removing drinking water contaminants. The goal: find ways to improve drinking water quality in developing nations. While the 6 techniques are known, there is substantial work to be done to determine if some have higher efficacy. Rainwaters (from 3 sources) were collected, treated, and disinfected. The waters were tested before treatment (control group) and after; 150 data points recorded. Next, an analysis was conducted to test the hypothesis that "simple" techniques are as effective as "complex". Data was analyzed by studying changes in absolute levels of parameters. Treated levels were analyzed against regulation. The home lab had limitations as did the fact that the 3-rainwater baselines were quite "clean". Calculations were also done to study % removals. A cost study was conducted to map each technique to a "simple" or "complex:" designation. The experiment hypothesis was tested and was not rejected since the 6 techniques were similarly effective regardless of cost. These findings were further substantiated using statistics. After careful evaluation, it was concluded that the 6 techniques were in fact interchangeable being very close in their effectiveness. Each technique was important for further study especially disinfection using Chlorination since it has residual purification benefits. The conclusion that the 6 techniques are equally effective, allows for adopting any 1 as suitable to each developing nation resulting in preventing fatalities in the short term and establishing a framework to sustain improved drinking water quality in the long term.
Tahsina Rahman	<i>TB4VIP Treatment Improves Wound Healing in Corneal Epithelial Cells Exposed to High Glucose</i> ECIS (Electric Cell-substrate Impedance Sensing) is a real-time, label-free, impedance-based method to study the activities of cells grown in vitro. Corneal epithelial cells are renewed approximately every ten days, allowing corneal injuries to heal quickly. But this process is delayed in diabetic corneas. This project uses the ECIS machine to examine how corneal epithelial cells respond to wounding under high glucose and normal

	<p>glucose conditions and if the response can be improved with a peptide therapy containing thymosin beta 4 (TB4) and vasoactive intestinal peptide (VIP). The cells are tested in normal glucose (NG,5mM), high glucose(HG,25mM), HG+TB4(0.1%), HG+VIP(5nM), and HG+TB4(0.1%)+VIP(5nM) by measuring the wound healing process at different time intervals for each of the conditions. My hypothesis was that the cells might heal quickly with drugs given in high glucose conditions. When we compared the wound healing process after single drug treatments (TB4 or VIP) and the combination (TB4 + VIP) treatment under high glucose conditions, wound healing was quicker after combination treatment. The wound heals quicker even under HG conditions because the velocity of the cells increased in the presence of the drugs and gets closer to the velocity of the NG condition. We can conclude that these drugs may help treat diabetic patients who are experiencing delayed healing of the cornea.</p>
Diya Ramesh	<p><i>Sputum-Based mRNA-Targeting Probes in Lung Cancer - An Early Diagnostic Tool</i> Lung cancer, the leading cause of cancer death, has no simple, non-invasive early detection tests. This project aims to create a multiplex sputum-based RNA probe through the targeting of the mRNAs for tumor marker genes. These genes are significantly overexpressed in the disease and present in sputum. First, the mRNA sequences of EGFR, KRAS, and ALK genes were recorded from UCSC Genome Browser. RNA secondary structures for the sequences were identified. Six fully/mostly open regions (with no base pairing) of 21 nucleotides in length were located per gene, and complementary sequences (to act as probes) were generated. Then, each probe was tested using the RNA-hybrid tool in Linux against the targeted mRNA sequence and reconfirmed with the Duplex Fold Web Server. The three probes for each gene with the most negative minimum free energy (MFE) values, meaning the highest hybridization efficacy with the target gene, were chosen. All probes were then tested in RNA-hybrid against 3 lung-specific genes, AGER, CLDN18, and SFTPC (controls). The chosen probes interact more strongly with their targets than with control genes, with average percent changes in MFE from control genes to the target genes being 92.1%, 77.9%, and 69.5% for KRAS, EGFR, and ALK probes respectively. Probes were additionally tested to rule out dimerization, and 1 ALK probe was removed due to higher probability of self-hybridization. Future experimentation would include clinically testing the probes on sputum samples from patients with and without cancer and eventual creation of an off-the-shelf test.</p>
Debarati Roy	<p><i>The Role of Nicotinamide Loaded Functionalized Solid Lipid Nanoparticles in Improving Cognition in Alzheimer's Disease</i> Alzheimer's Disease is a cognitive impairment that has caused millions to lose memory, connections with loved ones, and vital mental functions. As it is a progressive disease that causes brain cells and connections to degenerate and die, it is known to have several stages with no specific cure. However, there are treatments available to help slow its progression through the brain. Nicotinamide, a coenzyme that plays a role in protein accumulation and mitochondrial dysfunction, has been noted for its efficient delivery and ability to slow this progression. For this reason, Nicotinamide-loaded solid lipid nanoparticles (SLN) were prepared and functionalized to be characterized or evaluated regarding cytotoxicity, biodistribution, and Vivo effectiveness in delivery across the blood-brain barrier (BBB). This was done by performing tests on animals through clinical studies; after which, they could be evaluated to show the coenzyme's potency. Results from each portion of these tests, run on animals, show that in vitro cytotoxicity (in almost all models) was safe, biodistribution proves benefits in functionalization via improving brain delivery, cognition, reducing tau hyperphosphorylation, and preserving neuronal cells. In conclusion, this functionalized SLN could be a potential delivery system—with nicotinamide—it could improve the cognitive impairment of its animal study better than any previously discovered method of administration.</p>

Mikul Saravanan	<p><i>Smart Multipurpose Air Handling Robot with AI-Based Environmental Anomaly Detection</i></p> <p>Maintaining optimal indoor air quality (IAQ), humidity, and household safety is a critical aspect of improving overall health. Poor IAQ and improper humidity have adverse health effects. To a limited extent, stationary air purifiers and humidifiers address the issues of low humidity and IAQ. I experimented with multiple humidity and air quality sensors placed throughout a room, which showed that a standalone air purifier or humidifier could not distribute improved air evenly within the space. I solved the uneven distribution and household safety issue with an innovative robot containing an air purifier, humidifier/ dehumidifier, Ultraviolet C (UVC) lamp (disinfects air by killing most bacteria as well as viruses such as COVID-19), cameras, and microphones. My custom-built robot uses a Jetson Nano, LiDAR, cameras, microphones, and air quality and humidity sensors. The robot and the air handling system were modeled in Computer Aided Design, analyzed with Computational Fluid Dynamics to find the various components' optimal design, and built with 3D printed parts. AI-based anomaly detection uses the microphone to detect unusual events, such as a person falling or a smoke alarm going off. The robot was programmed using the Robot Operating System (ROS) to navigate a mapped room to avoid obstacles or until it detects poor air conditions or household safety anomalies. Navigation and obstacle detection are accomplished by a LiDAR sensor, visual odometry, and an AI-based object detection algorithm. My experiment shows that the robot could humidify a room more evenly than standalone devices and detect anomalies.</p>
Na'ja Stokes	<p><i>Physiological function of RNA modification enzyme METTL14 in metabolic diseases</i></p> <p>My objective was to observe the physiological function of the RNA modification enzyme, METTL14, in metabolic diseases. Metabolic diseases are classified as any disease that disrupts the metabolism on a cellular and molecular level. Methyltransferase (METTL14) is an enzyme that aids in ribonucleic acid (RNA) modification. METTL14 forms the N6-methyltransferase (m6A) complex that aids mRNA with stability and processing. m6A regulates the circadian clock, differentiation of embryonic stem cells, and cortical neurogenesis. It is also a key regulator of mRNA stability by promoting mRNA stabilization and degradation. Research was conducted utilizing various research databases to explore if METTL14 is linked to metabolic diseases. The websites used to investigate the enzyme METTL14 were: Uniport.org, Hgamp.com, and Genecard.com. These websites contained information about the function, common variant gene-level associations, structure, protein interactions, and phenotypes. The research bases provided me with data about METTL14's common and rare variant associations with phenotypes. I viewed graphs and tables to gain an understanding of METTL14's role in different phenotypes related to the metabolism. Determining if METTL14 plays a role in the pathogenesis of metabolic diseases by controlling the m6a Methylation would lead to new insights in cellular processes that affect metabolic syndrome.</p>
Eric Wan	<p><i>Association of Vaginal Microbiota with Treatment Outcomes for Bacterial Vaginosis</i></p> <p>Bacterial Vaginosis (BV) is a condition that occurs when there is too much of a certain bacterium in the vagina and changes the normal balance. Even though it is one of the most common vaginal conditions in women ages 15-44, the main cause is still unknown. BV is concerning because it will increase the risk of contracting other infections like HIV and could cause preterm birth. As of now, there is no cure to BV, with just some treatment like Metronidazole. The treatment isn't too effective on all types of patients because it is hard to predict whether they would become recurrent, refractory, or remission patients. My project, Association of Vaginal Microbiota with Treatment Outcomes for Bacterial Vaginosis, aims to try and distinguish patients in these three groups by looking at the vaginal microbiota in order to better predict patient patterns and offer better treatment options. Our approach to determine what was the main cause of BV was to determine the types of bacteria we could find in patients and then tracing its genetic history and how close it relates to other types of bacteria from patient samples that were from all three groups (recurrent, refractory, remission). After organizing our</p>

	<p>data from patients from two different visits, one before treatment and one after, we compared the results by creating visual representations of our samples using Microbiomeanalyst.ca. We found evidence that could potentially differentiate refractory patients from remission and recurrent patients, and could partially differentiate the other groups. Because of evidence that could differentiate at least refractory patients, we can more effectively administer treatment that could be more specific to their needs. We are continuing to use our methods to try to continue to find stronger evidence that could differentiate all three groups to offer better treatment options for patients. We have taken many steps closer to our goal, but there are many steps still ahead to fully differentiate our three patient outcomes.</p>
Sonnet Xu	<p><i>Drought Affects Mangrove Recovery Patterns Following Tropical Cyclones</i> Mangroves are important coastal ecosystems that buffer cyclone impacts on surrounding ecosystems. Previous studies have shown cyclones to be disruptive but not detrimental to mangroves as resprouting and recovery can rapidly occur. However, resistance to cyclone disturbance can be compromised when compounded with other hydrological stressors, such as drought. Using satellite imagery collected over the Caribbean region since the late 20th century, we found that while drought and storm events both covered extensive areas, they rarely largely overlapped spatially or temporally, except for 2017, where Hurricane Irma significantly impacted several drought regions. Analysis of these dually impacted areas revealed drought adversely affected mangrove recovery following a storm disturbance by increasing recovery times. Analysis of NDVI time series also indicated that previous estimates of Hurricane Irma's impact are likely overstated. Substantial regions of mangrove damage attributed to storm activity actually experienced dieback prior to hurricane impact due to drought. An integrated understanding of the hydrological stressors that may exacerbate loss drivers will enhance future management and conservation efforts. Understanding that droughts negatively impact mangrove recovery to cyclone impacts enable better anticipation of future ecosystem response and inform management strategies to minimize resultant impact.</p>
Andy Yao	<p><i>Perception and Reality: the Relationship Between Agreement and Credibility</i> The ability to internally judge a source's credibility online appropriately has become an important skill in our modern digital age. As political and scientific news is increasingly digitized, being able to see personal bias becomes a matter of extreme importance for our society. The assumption that most can simply see beyond bias has been challenged by the large-scale spread of "fake news" and misinformation online. This study seeks to quantify the relationship between how a user perceives credibility, defined as the objective and subjective believability of an article, and the user's agreement with the information presented in the article. As the demographic where individuals both begin developing cohesive political viewpoints and interacting with internet politics, the study focused on high-school students. A survey was created to determine the user's political standpoints, then the user was given an algorithmically-selected article based on earlier responses. The participants then rated the perceived credibility of the article. The majority of the participants in the study both stated and displayed political beliefs, were generally left-wing, and were more influenced by their associated friend group and community than their family. The results of this study have identified a significant correlation between personal agreement and credibility, which implies an inability for many high school students to distinguish internal biases from objective reality.</p>

RESEARCH ABSTRACTS

POSTER SESSION	
Aanchal Jain	<p><i>RIPK2 and IRF1 T cell genes as therapeutic targets to remedy Celiac Disease:</i> Celiac disease (CD) is a chronic inflammatory disease that affects the small intestine when gluten products are consumed. T cells adversely react to gluten and damage the villi of the small intestine. An estimated 1% of the United States population has CD, although the prevalence may be higher due to misdiagnosed and undiagnosed cases. The primary purpose of this study was to identify differentially expressed genes in CD patients that could be novel therapeutic targets. The Gene Expression Omnibus (GEO) was used to find the publicly available dataset GSE164883 that compares children/adolescents with active CD with children/adolescents that do not have CD but have other stomach afflictions. Using GEO2R, many genes were differentially expressed ($p < 0.05$) in the CD group as compared to the control group. String-DB was used to find related biological processes among the top 250 differentially expressed genes. The biological processes regulation of alpha-beta T cell activation and regulation of T cell proliferation were related to RIPK2 and IRF1, two upregulated genes in the autoimmune disorder. <i>Gene Cards</i> was used to learn more about their functions. RIPK2 plays a role in signaling complexes within the innate and adaptive immune system, and IRF1 stimulates an immune response against foreign cells and pathogens. Their roles in immunity could point to T cell activity, a potential cause of gluten reactivity. Using a precision medicine approach, RIPK2 and IRF1 can be targeted to restore gene expression and regulate T cell activity in CD patients, as a future treatment possibility.</p>
Yara Mashal	<p><i>Comparing Tau and Amyloid-β Targeted Nanoparticle Immunotherapy for Alzheimer's Disease: a review</i> Alzheimer's disease (AD) is a rapidly growing global concern. This chronic neurodegenerative disorder is associated with the accumulation of amyloid-β plaques and intracellular neurofibrillary tangles in the brain as well as high acetylcholinesterase activity. The diagnosis of AD is usually made too late, when patients have an extensive neuronal death, and brain damage is irreversible. However, a number of therapeutic targets have been defined mainly related to two hypotheses of AD: the tau hypothesis and amyloid-β hypothesis. The purpose of this study is to investigate and compare therapeutic approaches against AD, which are based on nanoparticles targeted to the brain and to the pathological hallmarks of the disease. This study analyzes pre-clinical trials that succeeded in improving the bioavailability of the drugs in the brain by using nanocarriers and a targeting strategy towards either tau, amyloid-β, or both. We then compared these trials and sought to find out which protein was more efficient in targeting therapeutically. It was found that the search for a cure, also from the nanotechnological point of view, has been prominently based on the amyloid-β hypothesis. Aβ dyshomeostasis has emerged as the most extensively validated and compelling therapeutic target. Through the use of nanoparticles, an increased drug bioavailability has been achieved in the central nervous system. Targeted nanoparticles have been proved useful to enhance the performance of therapies against AD in animal models. A better understanding of AD mechanisms will help the successful application of targeted nanoparticles for combined therapies.</p>

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*Create and Advance Knowledge, Prepare a Diverse Student Body to Thrive, and Positively
Impact Local and Global Communities*

AWARDS

POSTER PRESENTERS-

- 2nd place Aanchal Jain
- 1st place Yara Mashal



ORAL PRESENTERS- FINALIST RANK FOR NATIONAL JSHS

- 5th Place- Jonathan Bryant
- 4th Place- Mounika Katta
- 3rd Place- Sonnet Xu
- 2nd Place- Diya Ramesh
- 1st Place- Michelle Hua

