



सत्यमेव जयते
Department of Science and Technology
Government of India



INITIATIVE FOR RESEARCH AND INNOVATION IN STEM (IRIS)

REPORT

2021-22







About IRIS National Fair

Initiative for Research and Innovation in STEM (IRIS) National Fair is a public-private partnership program funded by the Department of Science & Technology (DST), and Broadcom, and implemented by EXSTEMPLAR Education Linkers Foundation. IRIS promotes and nurtures Science Technology Engineering and Mathematics (STEM) research amongst young Indian innovators. It recognizes and rewards outstanding projects and provides a platform for young innovators to get recognized at national and international STEM events.

The IRIS National Fair is conducted annually in India for school students, who compete in 21 subject categories. Winners of the IRIS National Fair go on to represent India at the Regeneron International Science and Engineering Fair (ISEF) held in the USA.

OUR SUPPORTERS

Department of Science and Technology (DST) was established in May 1971, with the objective of promoting new areas of Science and Technology and playing the role of a nodal department for organizing, coordinating, and promoting Science and Technology in the country. The Vision of the department is "To enable India to become a global knowledge power by promoting basic research, development of cutting edge technologies and innovation for globally competitive and inclusive growth to power technology-led economic progress of the society." In India's quest for global competitiveness in science, technology, and trade, initiatives like IRIS play a key role in identifying and nurturing high-caliber human resources and as repositories of national intellectual wealth in the Research and Development sector.



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Broadcom Inc. is a global technology leader that designs, develops, and supplies a broad range of semiconductor and infrastructure software solutions. Broadcom's category-leading product portfolio serves critical markets including data centers, networking, enterprise software, broadband, wireless, storage, and industry. Its solutions include data center networking and storage, enterprise and mainframe software focused on automation, monitoring and security, smartphone components, telecoms, and factory automation. Broadcom focuses its corporate social responsibility on advancing the STEM education pipeline.



EXSTEMPLAR's vision is to create dynamic experiences by integrating STEM initiatives with real-life challenges. We attempt to bridge gaps in how STEM knowledge is constructed and help bring innovative ideas to reality. We believe that integrated STEM approaches and programs can help deepen learning and create critical thinkers, problem-solvers, and the next generation of innovators who will solve the problems of the future. EXSTEMPLAR's aim is to promote Innovative and Research Based STEM Learning in India in an inclusive and accessible manner.





Department of Science and Technology
Government of India



Science, Innovation, Research, and Technology are the foundations of a nation's future. Young minds need to be nurtured to channelize their innovative ideas to achieve greater goals for the benefit of society. They should be given access to hands-on learning and provided with the guidance to become inventors of new technology and creators of path-breaking research for India's future.

Young people need to be exposed to such learning environments which stimulate their curiosity and channelize their analytical skills. It is with the help of updated tools, technologies and opportunities that they will be enabled to maximize their potential to become Science Technology Engineering and Mathematics (STEM) implementors and achievers.

Initiative for Research and Innovation in STEM (IRIS) National Fair is a public-private partnership program catalysed and funded by the Department of Science & Technology (DST), Government of India and Broadcom; and implemented by EXSTEMPLAR Education Linkers Foundation. IRIS promotes and nurtures STEM research amongst young Indian innovators. It recognizes and rewards outstanding projects and provides a platform for young innovators to get recognized at national and international STEM events.

The IRIS National Fair is conducted annually in India for school students, who compete in 21 subject categories. Winners of the IRIS National Fair go on to represent India at the Regeneron International Science and Engineering Fair (ISEF) held in the USA. Till 2021, a total of 291 Indian students have participated in ISEF and have won 177 awards and accolades at this unique mega-international event.

The compilation of this booklet is proof of the Scientific and Technological bent of the young minds of our nation, and we are pleased to note that most of the projects have adhered to a very high standard of research and innovation.

We wish all the young innovators success in their future endeavours, and we hope the IRIS platform will enable many more young people from India to shine on the global stage.

Dr Parveen Arora

Head NCSTC,

Department of Science and

Technology, Government of India



Broadcom India and Broadcom Foundation are honored to support the IRIS National Science Fair. We have been inspired as the young people we have honored at the IRIS Fair for nearly a decade grow into contributing members of society as scientists, engineers, and innovators. Because challenges of the post-pandemic economy have intensified global efforts to educate youth to be digitally literate and use coding with scientific knowledge to ensure the sustainability of our planet, it will be our honor to continue the Broadcom Coding with Commitment award at IRIS, which continues to be the flagship of Broadcom India's STEM philanthropies.

We are grateful to Sharon Kumar and all the IRIS sponsors, mentors, judges, and volunteers who make the IRIS Fair the most prestigious science competition in India. Not only does IRIS touch students during competition, but throughout the year, in partnership with other prestigious STEM NGOs supported by Broadcom India.

The Broadcom Foundation is placing new emphasis on the importance of Leadership, Initiative, and Civic Awareness through STEM through an emphasis on the 17 Sustainable Development Goals of the United Nations. Because India seeks to be a leader in sustainability, we look forward to the exciting ideas that young people will present in future IRIS competitions and watching them realize their dreams and aspirations as young scientists, engineers, and innovators.

A handwritten signature in black ink, reading "Paula Golden".

PAULA GOLDEN

President, Broadcom Foundation



This year's performance of Team India at the Regeneron International Science and Engineering Fair (ISEF) 2022 has been the best one ever and we are both humbled and proud.

The Initiative for Research and Innovation in STEM (IRIS) is a platform where young innovators come together to showcase their projects powered by unique innovation and research, to compete for a place on Team India to the Regeneron International Science and Engineering Fair (ISEF).

We are humbled that despite all odds and COVID 19 challenges notwithstanding, the Team from India could make it to ISEF- and extremely proud of the stellar performance of our young innovators who indeed made the other 79 nations present at ISEF sit up and applaud for India. Bringing in a total of 13 Grand Awards and 9 Special Awards is certainly spectacular! This report showcases the sheer grit and determination of all who were involved in ensuring the success of IRIS 2021-22.

A huge shout out and heartfelt thanks to the members of the IRIS Scientific Review Committee for their dedicated involvement with the participants' projects - be it in online outreach webinars across the 21 IRIS subject categories; evaluation; online judging; mentorship or monitoring of progress.

The report is a testimonial of the STEM journey that students from Class 5 to Class 12, from various geographies across India, have set out on through IRIS, and we at EXSTEMPLAR are privileged to have facilitated this.

IRIS is funded and encouraged by Broadcom and Department of Science and Technology, Government of India, and I would like to take the opportunity to sincerely thank both these organizations for their involvement and support of this program.

It is when innovation and creativity work in tandem that path breaking ideas are generated!

Hearty Congratulations to all STEM enthusiasts featured in this report; may you continue to Observe, Question, Research and Design, for a better tomorrow and a better world.

Sharon E Kumar
Fair Director-
Initiative for Research and Innovation in STEM
Chief Operations Officer-
EXSTEMPLAR Education Linkers Foundation

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Virtual **IRIS National** **Fair 2022**

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January 15-21, 2022

Virtual IRIS National Fair 2022



IRIS National Fair 2022 was held virtually from January 15-21. The 7-day event was a synergy of project exhibition, evaluation, workshops, interactive sessions, entertainment capsules and online games which were attended by over 26000+ Students, Teachers, STEM Enthusiasts; Government Officials and Corporate representatives.

110 projects by 135 students competed for a chance to represent India at the Regeneron International Science and Engineering Fair 2022 and for a variety of Special Awards. IRIS Grand Award Winners have been representing the country since 1999 at the International Science and Engineering Fair which is the world's largest international pre-college science competition.

Since 1999, a total of 314 students have participated in ISEF courtesy of their Winning at IRIS National Fair, and have won over 202 awards and accolades.



IRIS National Fair 2022 Virtual Platform - Lobby

Despite the pandemic situation, the IRIS website www.irisnationalfair.org received 1800+ project synopses online for evaluation towards participation in the Virtual IRIS National Fair 2022; of these 110 projects were invited to participate online in the yearly competition.

The Fair was attended by over 26,000+ Students, Teachers and Science enthusiasts between 17 & 21 January when it was opened virtually to the Public. There were Plenary Sessions and informative STEM talks by eminent National and International Scientists, Engineers and Mentors.

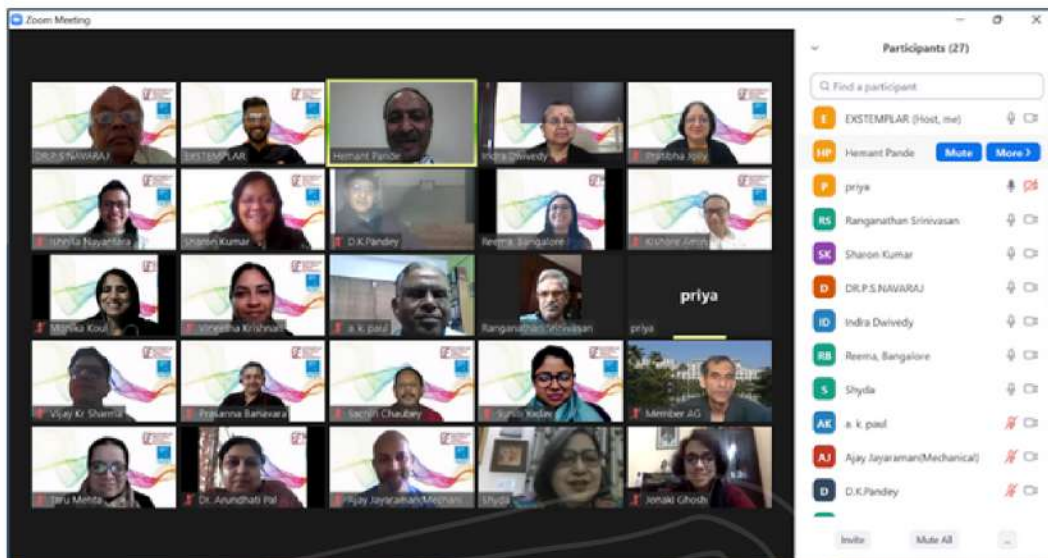
The event was attended by several IRIS/ ISEF Alumni who freely volunteered their time and helped to make the Fair a success.



IRIS 2022 Virtual Judging

In order to ensure a scientific edge to the program, with the help of the Department of Science and Technology, IRIS National Fair engages a Scientific Review Committee which consists of eminent scientists and professionals from reputed colleges, government and private STEM institutions of the country, Corporates and Industry bodies. This committee conducts project evaluations, leads the judging at the IRIS National Fair and provides mentorship to the selected candidates for the international competition.

A seamless Virtual Judging was conducted for each of the 110 projects and 135 participants during a two-day online process. Judges and members of the IRIS Scientific Review Committee spent time in virtual rooms with individual projects to evaluate them in pre-determined time slots on January 15-16, 2022.



IRIS Judges & Scientific review committee during orientation

STEM Sessions

Being Mindful Of The Environment

Speakers:

Ms Taru Mehta - Fellow, Environment Education and Awareness, The Energy & Resources Institute (TERI),

Ms Shweta Thakur - CEO, Wildermart

Dr Kshipra Mishra - President STE & Ex Addl. Dir., DIPAS(DRDO) Delhi



Ms. Taru Mehta, Ms. Shweta Thakur and Dr. Kshipra Mishra during the session - Being mindful of the Environment

Broadcom Masters India Winners Speak

Speakers:

Madhura Kumar & Aarush Suryanarayan



Broadcom MASTERS Alumnus in discussion, Madhura Kumar and Aarush Suryanarayan

Learn How To Protect Intellectual Property

Speakers:

Dr. Indra Dwivedi, Scientist CSIR (Retd.), New Delhi

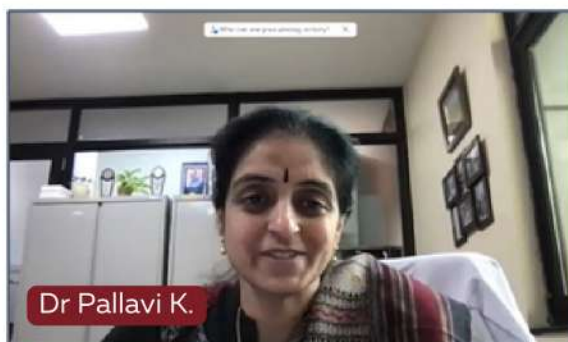


The Motivation Behind Mentoring Innovations For IRIS National Fair

Speakers:

IRIS Scientific Review Committee members

Dr. Pallavi K, Dr. Arundhati Pal, Dr. Sunil

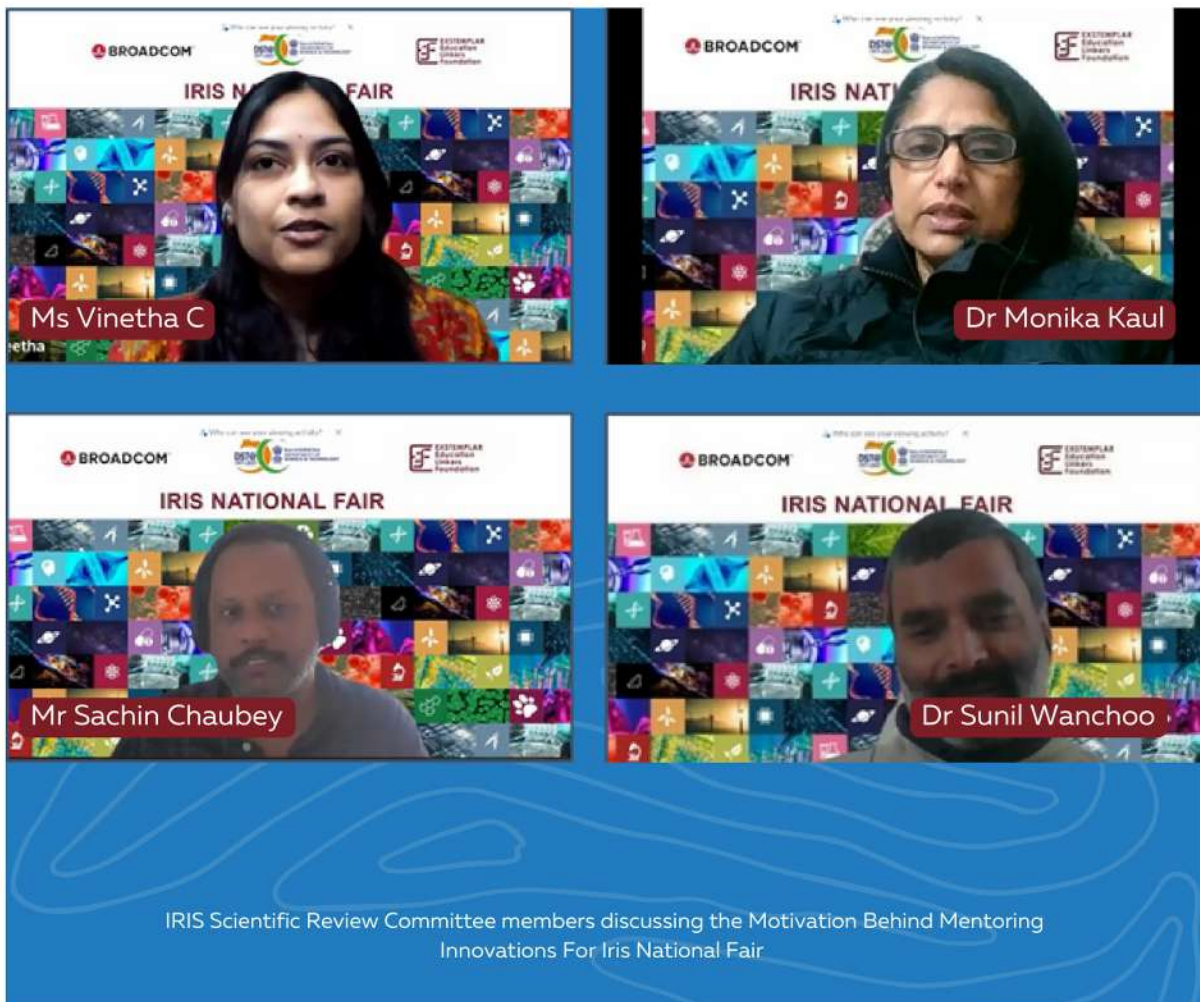


The Motivation Behind Mentoring Innovations For IRIS National Fair

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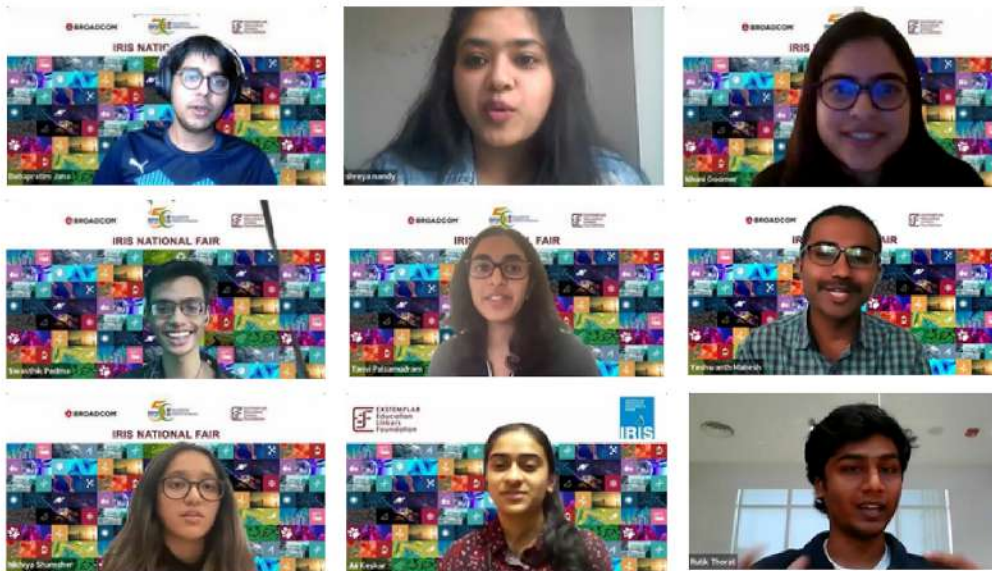
Dr. Pallavi K, Ms Vineetha C, Dr. Monika Kaul, Mr. Sachin Chaubey, Dr. Arundhati Pal, Dr. Sunil Wanchoo



Alumni Over The Years

Speakers:

IRIS Alumnus in discussion



Yoga And STEM

Speakers:

Mr. Sujit Sonkar

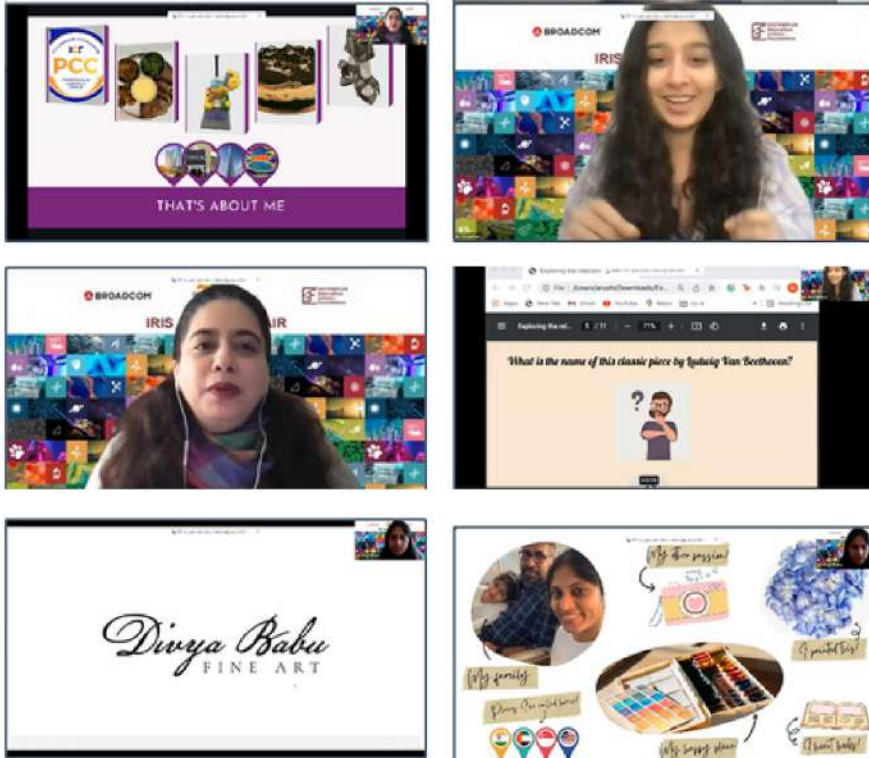
Expert, Sutra Yoga and Healing



Art; Music And STEM

Speakers:

Ms. Anjani Gandhi, Ms. Divya Babu & Ms. Arushi Pant



Alternate Careers

Speakers:

Mr Priyansh Parekh



January 21, 2022



IRIS National Fair 2022 Virtual Exhibition

Opening Ceremony



Opening note

Mr. Sujit Banerjee

Scientist F, Department of Science and Technology (DST), Govt. of India



Innovation in this time of uncertainty, a Special Address

Mr. Jiju George

Country HR Head and Board of Director, Broadcom, India



Appreciating the power of Research and Innovation in STEM', a Special Address

Ms. Paula Golden

President, Broadcom Foundation



Looking beyond Innovation

Mr. Saad Nasser

Broadcom MASTERS winner and Co-Founder ATI Motors



Vote of Thanks

Ms Sharon E Kumar

Fair Director IRIS & COO - Exstemplar



Advocating The Role Of Women In STEM

Dr. Ayesha Chaudhary

Officer on Special Duty (OSD), Office of the Principal Scientific Adviser to the Government of India



STEM In Sports

Mr Cyrus Poncha

Dronacharya Awardee
Vice President of the Asian Squash Federation (ASF)



The Importance Of Innovation In India

Dr. Biswajit Saha

Director-Vocational Skills and Training, CBSE



Scholarship Opportunities

Session - RSI

Mrs. Joann P. DiGennaro

President, Center for Excellence in Education



Scholarship Opportunities

Session; FFE

Mr. Ram Kolavennu

COO - Foundation for Excellence India Trust



Scholarship Opportunities

Session; RISE

RISE 2021 scholarship beneficiary and IRIS alumni-

Aabhas Senapati

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Special Award
Winners-IRIS
2022

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Special Award Winners - 2022

S No.	Special Award	Project Title	Participants Name	School Name
1	The National Geographic Society	Portagait - A Prototype of a Portable Device to Quantify And Compute Gait Analysis Parameters Of Quadrupeds	Hridank Garodia & Amav Anil Kejriwal	Dhirubhai Ambani International School & Singapore International School, Mumbai, Maharashtra
2	U.S. Agency for International Development (USAID)	Averting Frustration in Geriatric Patients Through Identification, 3D Mapping and Navigation Using Machine Learning	Stuti Bhatia & Alekha Malhotra	Cathedral and John Connon School, Mumbai, Maharashtra
3	American Psychological Association	Auracl: An Ai Game-Based Approach To Autism Therapy	Mrinal Jain	National Public-School HSR Layout, Bengaluru, Karnataka
4	Ricoh USA, Inc.	Landslide Susceptibility Prediction Using Integrated Gis and Ml	Rudraksh Mohapatra	Delhi Public School Vasant Kunj, New Delhi, Delhi
5	American Meteorological Society	Algal Capsules for Carbon Sequestration	Shankar Narain Subramaniam	Primus PU College, Bengaluru, Karnataka
6	Association for Women Geoscientists	Environmentally Sustainable Diaper Blocks	Devika Ramkumar & Disha Tendulkar	P. G. Garodia School (ICSE), Mumbai, Maharashtra
7	American Meteorological Society	Sustainable Formation of Bio-Coal and Wood Vinegar from Agricultural Waste I.E. Parali	Mahi Singhal	SMS Dutta Memorial Nosegay Public School, Khatima, Uttarakhand
8	Yale Science and Engineering Association	Improving Lift-To-Drag Ratio of Symmetric Airfoils to Increase Aerodynamic Efficiency	Chaitanya Ongole	Deens Academy, Bengaluru, Karnataka
9	ASM Materials Education Foundation	A Systematic Study of Nickel Oxide Nanoparticle Synthesis for Supercapacitors	Abhiram Cherukupalli	Disha Delphi Public School, Kota, Rajasthan
10	Broadcom Masters	Effect Of Change in The Angle on Heighway Dragon Fractal	Anushka Tonapi	Sri Kumaran Children Home, Bengaluru, Karnataka
11	Mu Alpha Theta	A Realistic, Discrete Sirqv Model to Capture Infection Dynamics: (i) Effect of Quarantining and Vaccination Rollout, (ii) Dynamics In A Single Population Centrum, And (iii) Asymmetric Migration Across Two Or More Population Centra.	Wyndia Ohm	Legacy School, Bengaluru, Karnataka
12	Society for In Vitro Biology	Environmental Influence on Biochemical Parameters of Fermented Cocoa (Theobroma Cacao L.) Beans	Advay Iyer	Sanskriti School, Gurugram, Haryana

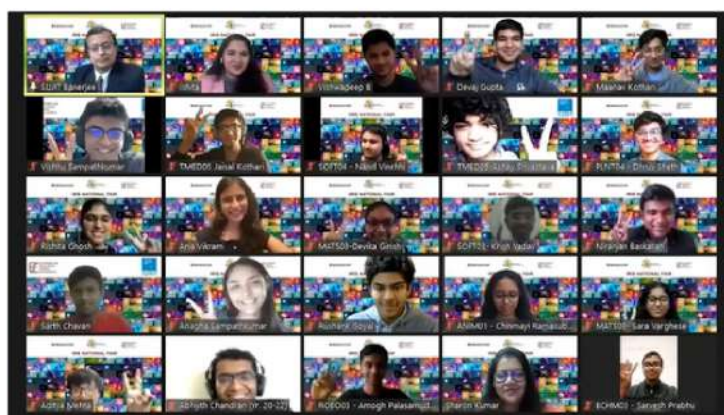
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**Grand Award
Winners-IRIS
2022**

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Grand Award Winners - 2022



S No.	Project Title	Participant Name	School Name
1	Averting Human-Elephant Conflict Using Machine Learning on Elephant Vocalizations	Chinmayi Ramasubramanian	Sri Kumaran Children's Home - CBSE, Bengaluru, Karnataka
2	A Novel Study of The Bio-Insecticidal Properties of Annona Reticulata	Sarvesh Prabhu	FIITJEE Junior College, Hyderabad, Telangana
3	Udān	Anagha Samapthkumar	National Public School, Indiranagar, Bengaluru, Karnataka
4	Multifunctional Activity of Graphene Oxide-Based Nanoformulations with Malathion And Endosulphan Against Aedes Aegypti.	Devaj Gupta	DPS International, Saket, New Delhi, Delhi
5	Designing Of Nitrogen Doped Melamine Foam-Graphene-Cnt-Metal Oxide Heterostructure Photocatalyst for Industrial Waste Management	Rishita Ghosh	Learning Paths School, Mohali, Punjab
6	Xpgan: A Novel Patch-Based Generative Adversarial Network for Super-Resolution Of X-Rays	Aria Vikram	National Public School Indiranagar, Bengaluru, Karnataka
7	Mouthscope - Autonomous Detection of Oral Precancerous Lesions Using Fluorescent-Imaging	Aditya Mehta & Maanav Kothari	Dhirubhai Ambani International School, Mumbai, Maharashtra
8	On Worker-Optimal Matchings in Many-To-Many Markets With Indifferences	Niranjn Baskaran	Gateway International School, Chennai, Tamil Nadu
9	An Elementary Proof of Ramanujan'S Identity For Odd Zeta Values And Its Extensions	Sarth Prashant Chavan	Aditya English Medium School, Nashik, Maharashtra
10	Preparation Of a Superhydrophobic and Oleophilic Membrane Inspired By Taro Leaves For Oil-Water Separation	Sara Varghese & Devika Girish	St.Peter's Senior Secondary School, Kadayiruppu, Perumbavoor, Kerala

Grand Award Winners - 2022

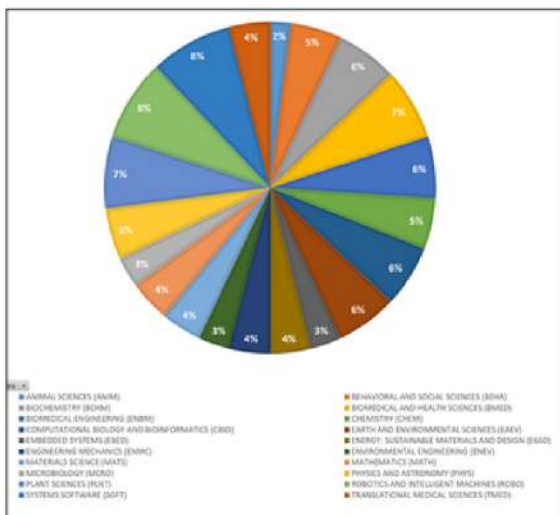
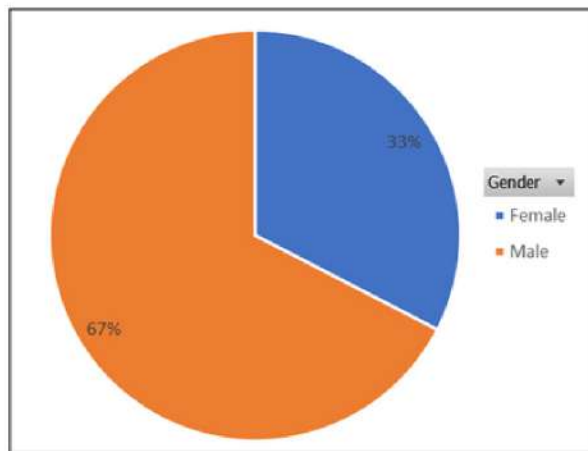
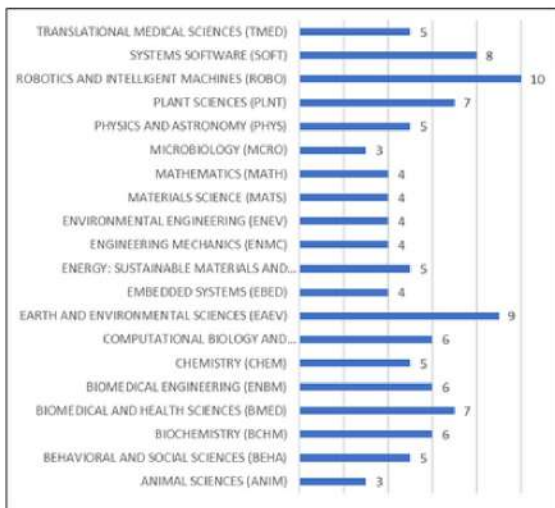
11	P.Stutzeri Vr2004 For Green Synthesis Of Zno Loaded Nanocomposite For Remediation Of Xenobiotics In Aquatic Systems	Vishwadeep	Shiva Niketan School, Tiruppur, Tamil Nadu
12	Hydrodynamical Analogs of Quantum Tunneling	Ahitagni Das	Delhi Public School, Siliguri, West Bengal
13	Spatio-Temporal Generation of Morphological Plant Features for Yield Prediction Before Harvest from Visual Image Input Using Progressively Growing Gans	Dhruv Sheth	Pace Junior Science College, Powai, Mumbai, Maharashtra
14	Penden: A Novel, Deep Learning Based Approach to Make the Internet More Accessible	Abhijith Chandran	Mahindra United World College of India, Pune, Maharashtra
15	Neural Layer Bypassing Network - A Novel Neural Network Architecture to Increase the Speed of Forward Propagation Without Sacrificing Accuracy, Network Structure, or CPU Load	Amogh Palasamudram	The International School, Bengaluru, Karnataka
16	Enhancing The Security of Websites with Unique Virtual Identification Code Steganography	Krish Yadav	MKH Sancheti Public School, Nagpur, Maharashtra
17	Novel Ai Powered Sign Language Translator	Nand Vinchi	National Public School Koramangala, Bengaluru, Karnataka
18	A Quantum Machine Learning-Based Framework for Early Cancer Diagnosis Using Transcriptome Profiles	Rushank Goyal	7i World School, Bhopal, Madhya Pradesh
19	Gliomassist: Automated Glioma Diagnosis and Grading with C11-Met Pet	Vishnu Ram Sampathkumar	National Public School, Indiranagar, Bengaluru, Karnataka
20	Flicker: Resolution of Photosensitive Epileptic Visual Content with Spatio-Temporal Luminance Frequency Analysis	Jaisal Kothari & Ashay Srivastava	Amity International School, Saket & Delhi Public School, R.K Puram, New Delhi, Delhi



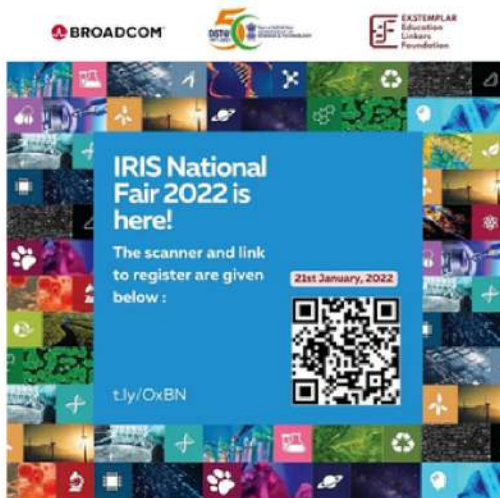
Analytics on IRIS National Fair Finalists 2021-22

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Subect & Gender-wise Distribution



Social Media Posts: Pre IRIS National Fair 2022



Social Media Posts: IRIS National Fair 2022

BROADCOM **50th Anniversary** **EXEMPLAR Education Linkage Foundation**

TUE 18 JAN

learn how to protect Intellectual Property

3 PM - 4 PM IST



Dr Indra Dwivedy
Scientist CSIR (Retd.),
New Delhi

IRIS NATIONAL FAIR 2021-22

BROADCOM **50th Anniversary** **EXEMPLAR Education Linkage Foundation**

TUE 18 JAN

Motivation behind mentoring innovations for IRIS

IRIS Scientific Review Committee





Dr Pallavi Kshetrapal Dr Arundhati Pal Dr Sunil Wanchao




Mr Sachin Chaubey Ms Vinaytha Chidambarkrishnan

IRIS NATIONAL FAIR 2021-22

BROADCOM **50th Anniversary** **EXEMPLAR Education Linkage Foundation**

FRI 21 JAN

Advocating the role of women in STEM

11 AM - 11:30 AM IST



Dr Ayesha Chaudhary
Officer on Special Duty (OSD),
Office of the Principal Scientific
Adviser to the Government of India

IRIS NATIONAL FAIR 2022

BROADCOM **50th Anniversary** **EXEMPLAR Education Linkage Foundation**

FRI 21 JAN

New Perspectives; New Dimensions

10 AM - 11 AM IST



Dr Praveen Arora
Head NCSTC, DST

IRIS NATIONAL FAIR 2022

BROADCOM **50th Anniversary** **EXEMPLAR Education Linkage Foundation**

FRI 21 JAN

Appreciating the power of Research & Innovation in STEM

10 AM - 11 AM IST



Ms Paula Golden
President,
Broadcom Foundation.

IRIS NATIONAL FAIR 2022

BROADCOM **50th Anniversary** **EXEMPLAR Education Linkage Foundation**

FRI 21 JAN

The importance of innovation in India

12 PM - 12:30 PM IST



Dr Biswajit Saha
Director,
Skills and Training, CBSE

IRIS NATIONAL FAIR 2022

Social Media Posts: Post IRIS National Fair 2022



“

India needs more female role models to encourage girls to pursue careers in science, technology, engineering and mathematics.

-Dr Archana Sharma
Principal Scientist,
CERN Geneva, Switzerland

#BreakTheBias



“

It is also essential to identify female mentors who can inspire, support and encourage young women. Through mentorship, young women learn how to process problems, develop solutions and work effectively

-Ms Paula Golden
President,
Broadcom Foundation

#BreakTheBias



Virtual IRIS National Fair 2022
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**Community And
Schools Outreach
Through Workshops
And Subject Specific
Webinars - Report
2021-22**

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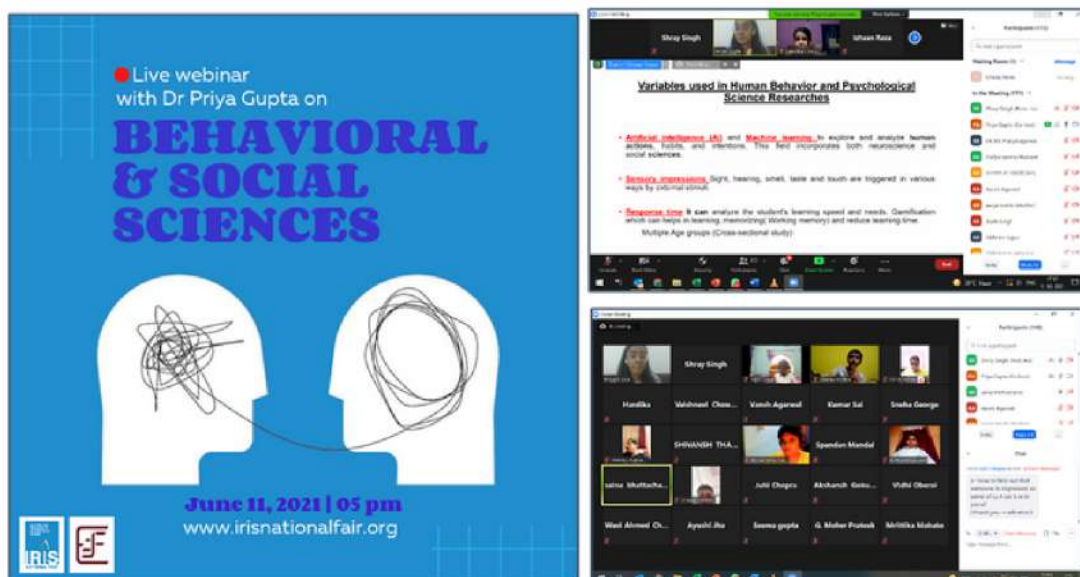
Community And Schools Outreach Through Workshops And Subject Specific Webinars – Report 2021-22

The Initiative for Research and Innovation in STEM (IRIS) is a research-based science initiative for students of Class 5 to 12. It promotes science and research amongst young Indian innovators and recognizes and rewards their outstanding projects based on Science, Technology and Innovation.

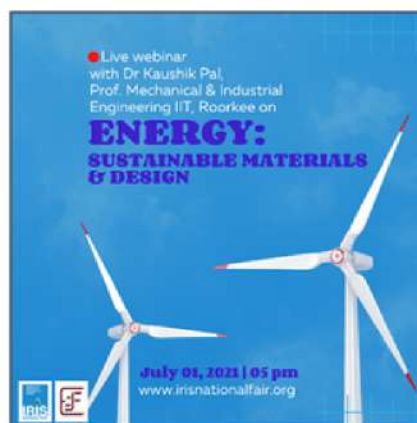
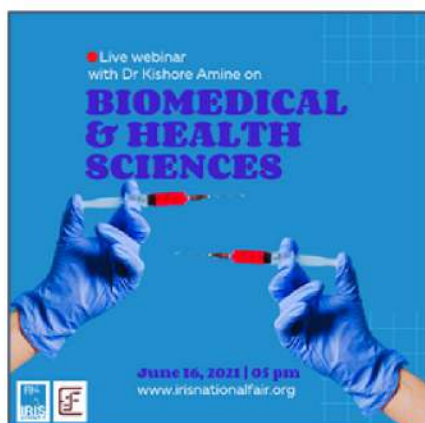
IRIS provides a platform for young geniuses to represent India at the Regeneration International Science and Engineering Fair (ISEF) conducted by Society for Science and the Public in USA every year.

IRIS reaches out to various schools/ institutions in order to communicate the importance of STEM, the motive is to plant a seed of innovation among young students and show them the path of research through these workshops and webinars. IRIS has reached out to over 4.5 million students through its direct and indirect outreach and collaboration with 5 major STEM Fairs of the country.

Despite the COVID 19 pandemic, the IRIS team continued in its outreach efforts switching to an online mode and started a series of Online Subject Category Webinars. With the help of subject matter experts, 37 such webinars were conducted. These informative & interactive sessions taken by Senior scientists gave participants an outlook on various categories of research in a particular subject; focused on the use cases related to the subject topic; shared examples of work that has been done in the past; introduced upcoming research areas in the subject and discussed the kind of projects students can work-on under these topics.



These sessions were interactive and participants were given time to ask questions related to participation in the science fair, preparation of science projects, subject related queries etc. Over a thousand students and teachers attended these online webinars till date.



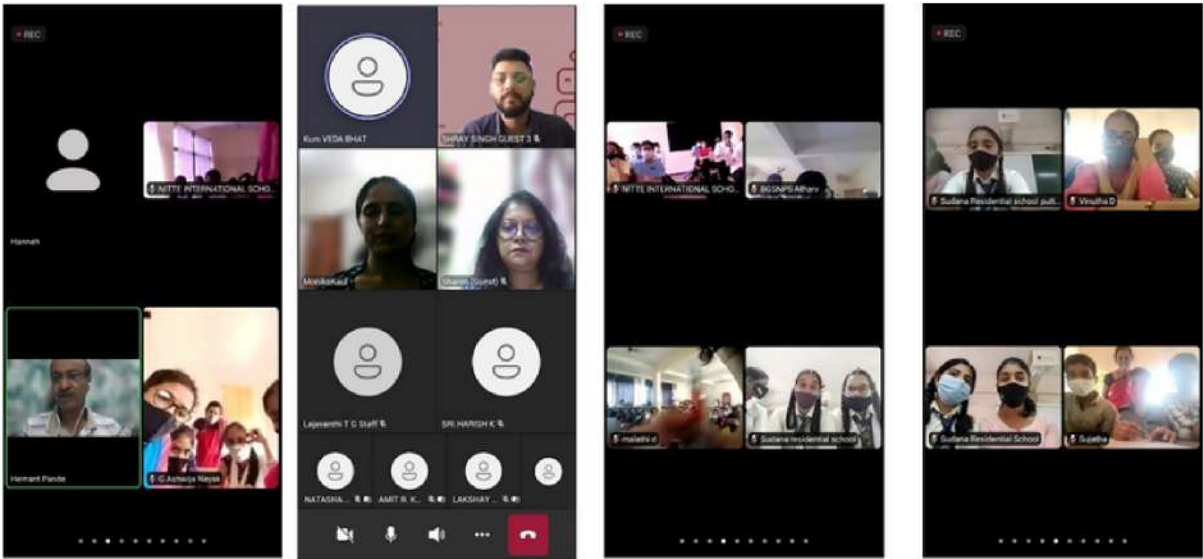
**Webinar Videos
(Scan Here)**



IRIS Webinars and Workshops

IRIS reaches out to students; schools; teachers with the objective to nurture them towards research driven activities, The focus is on students to take interest in STEM learning and come up with innovative research-based ideas. IRIS conducted online workshops targeting over 5000 students; 500+ teachers from 100+ schools. These were again informative & interactive sessions taken by Senior scientists giving participants an outlook on how they can begin their research in a particular field and come up with innovative ideas.





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Project Evaluation Meet 2021

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Project Evaluation Meet 2021

IRIS receives a large number of project entries from student participants on its online submission portal. Students submit their innovative project abstracts on IRIS website as per required questions –

- Student Profile (includes contacts, school details etc)
- Project Details (includes subject category, project synopsis)
- Detailed Introduction and objectives, Innovation, Methodology, Results and conclusions and Acknowledgement and reference links
- Guide Teacher Details

Exemplar conducts a project evaluation meet in order to select top 100 projects from entries received. This process starts with the invitation of select jury members to evaluate these projects. The Jury members include Scientific review committee members along with subject experts across a variety of 21 subject core competencies.

Project Evaluation Criteria:-

Judging Criteria: Science Projects	Judging Criteria: Engineering Projects	Select Marks
I. Research Question (20 Marks)	I. Research Question (20 Marks)	Maximum Marks – 20
Clear and focused purpose	Description of a practical need or problem to be solved	
Identifies contribution to field of study	Definition of criteria for proposed solution	
Testable using scientific methods	Explanation of constraints	
II. Design and Methodology (25 Marks)	II. Design and Methodology (25 Marks)	Maximum Marks - 25
<u>Well designed</u> plan and data collection methods	Exploration of alternatives to answer need or problem	
Variables and controls defined, appropriate and complete	Identification of a solution	
	Development of a prototype/model	
III. Execution: Data Collection, Analysis and Interpretation (25 Marks)	III. Execution: Construction and Testing (25 Marks)	Maximum Marks - 25
Systematic data collection and analysis	Prototype demonstrates intended design	
Reproducibility of results	Prototype has been tested in multiple conditions/trials	
Appropriate application of mathematical and statistical methods	Prototype demonstrates engineering skill and completeness	
Sufficient data collected to support interpretation and conclusions		
IV. Creativity, Innovation & Feasibility (20 Marks)	IV. Creativity, Innovation & Feasibility (20 Marks)	Maximum Marks – 20
Project demonstrates significant creativity in one or more of the above criteria	Project demonstrates significant creativity in one or more of the above criteria	
Feasibility of the Research	Feasibility of the Concept	
V. Project Demonstration & Presentation (10 Marks)	V. Project Demonstration & Presentation (10 Marks)	Maximum Marks - 10
Evaluation on Students' Audio/Visual (AV) given in attachment	Evaluation on Students' Audio/Visual (AV) given in attachment	

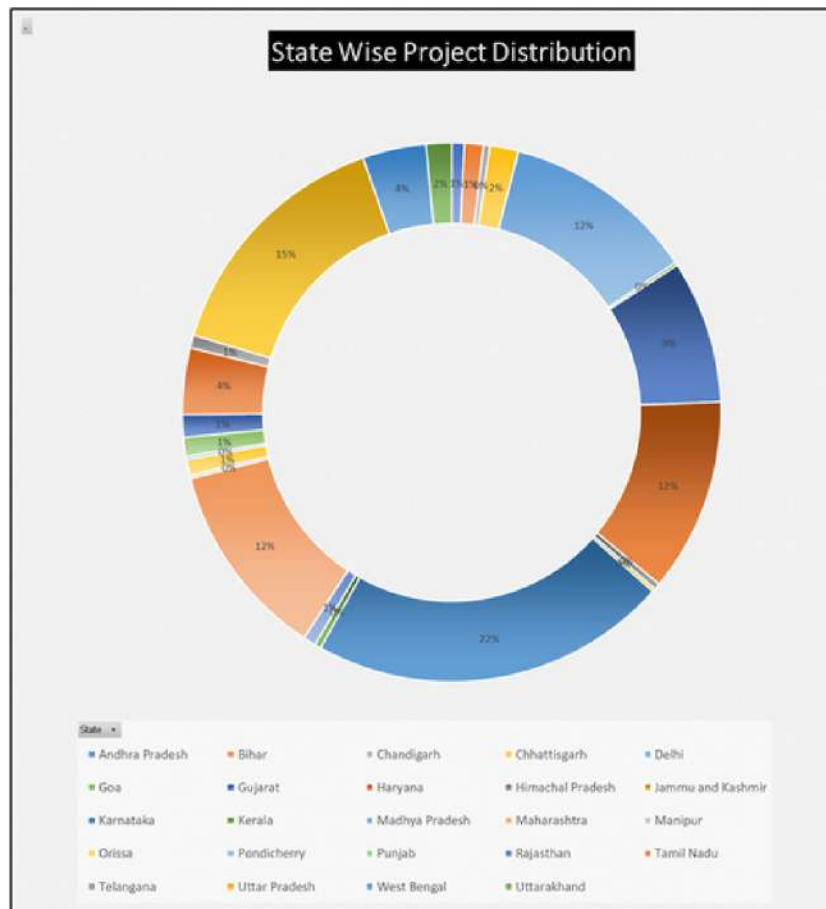
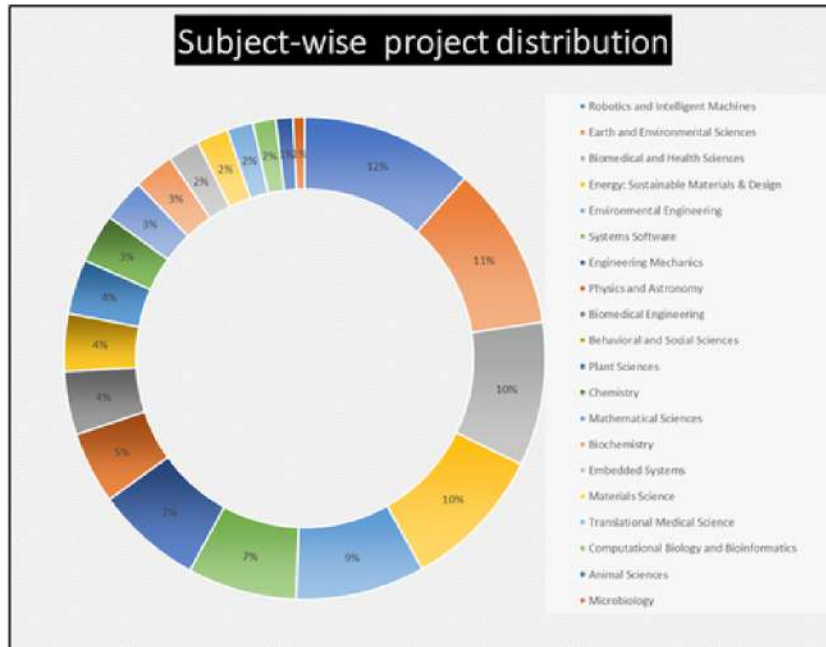
IRIS 2022 Project Evaluation Committee -

S No.	Name	Affiliation	Subject Category
1	Dr. Arundhati Pal	Serampore College, Kolkata	Plant Sciences
2	Dr. A Srinivasan	Professor, IIT, Guwahati	Physics and Astronomy
3	Dr. Hemant Pande	Retd Prof. Hislop College, Nagpur	Chemistry
4	Dr. Kaushik Pal	Professor, IIT, Roorkee	Engineering Mechanics
5	Dr. Neeraja Dashaputre	Asst. Professor, IISER, Pune	Chemistry
6	Dr. Sultan Ahmed Ismail	Retd Prof. New College, Chennai	Earth and Environmental Sciences
7	Dr. Sunil Wanchoo	Professor, Mata Vaishnodevi University, Jammu	Engineering Mechanics
8	Mr. Sachin Chaubey	Engineering Manager, Intel	Robotics and Intelligent Machines
9	Dr. T V Venkateswaran	Scientist 'F', Division Head: Science Communication, Vigyan Prasar	Mathematical Sciences
10	Dr. Monika Koul	Asst. Professor, Delhi University, New Delhi	Plant Sciences
11	Dr. Kishore Amin	Scientist, ACTREC, Tata Memorial Centre, Mumbai	Biomedical and Health Sciences
12	Dr. Shubha Tripathi	BAMS, Private Practice Doctor	Biomedical and Health Sciences
13	Mr. Prasanna R Banavara	Engineering Manager, Intel	Robotics and Intelligent Machines
14	Dr. Pallavi Kshetrapal	Ramalinga swami Fellow, Pediatric Biology Center (PBC), Translational Health Science and Technology Institute, Faridabad	Translational Medical Science
15	Dr. S Ranganathan	HOD, Department of Metallurgical Engineering, Jain University, Bangalore	Materials Science

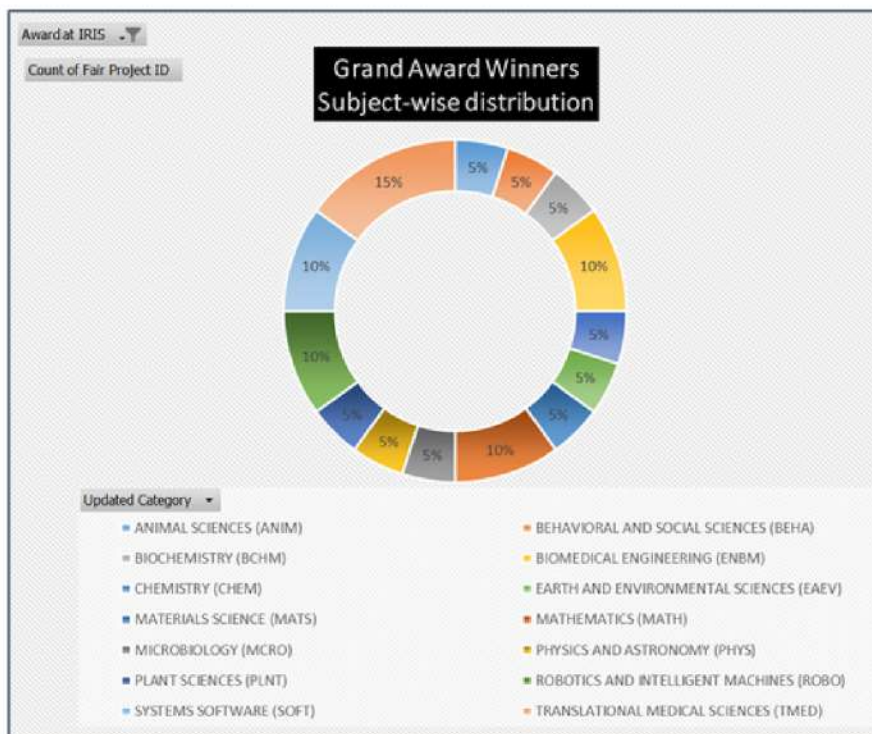
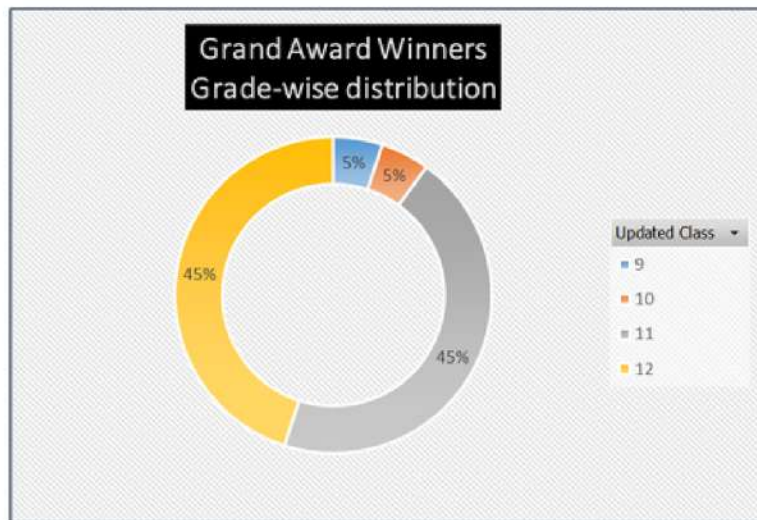
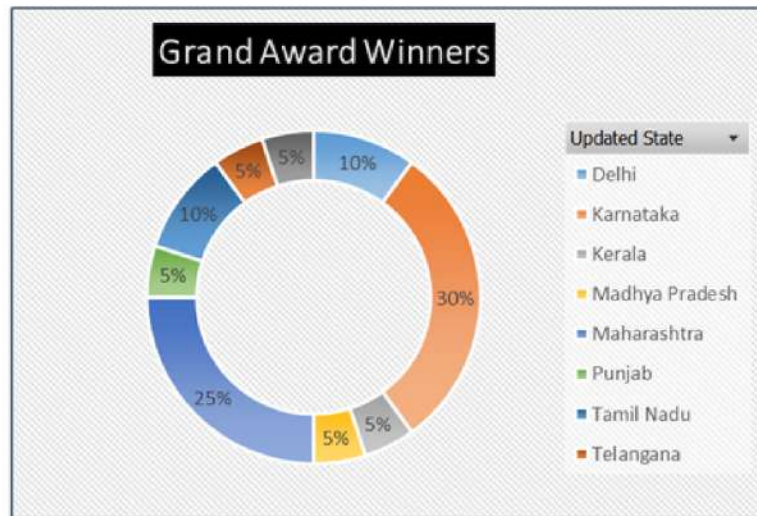
16	Dr. A K Paul	Professor (Retd), Department of Botany, University of Calcutta	Microbiology
17	Dr. Jonaki Ghosh	Asst. Professor, Lady Sriram, New Delhi	Mathematical Sciences
18	Dr. Asim M Auti	Senior Teaching Associate Indian Institute of Science Education and Research (IISER), Pune	Computational Biology and Bioinformatics
19	Dr. Vijay Kumar	Asst. Professor, NIT Srinagar	Physics and Astronomy
20	Ms. Vineetha Chidambarakrishnan	Senior R&D Software Engineer, Broadcom India	Systems Software
21	Dr. D K Pandey	Scientist 'F' (Retd.) Department of Science and Technology, Government of India	Plant Sciences
22	Dr. Priya Gupta	Asst. Professor, Amity University	Behavioral and Social Sciences
23	Dr. Yogananda C S	Professor Mathematics	Mathematical Sciences
24	Mr. Saral Baweja	Doctoral Researcher, Institut für Anorganische Chemie Fakultät für Chemie & Mineralogie, Universität Leipzig, Germany	Chemistry
25	Dr. Paul Douglas	Associate Dean, International Affairs, Andhra University	Environmental Engineering
26	Dr. Suniti Yadav	Asst. Professor, Delhi University, New Delhi	Biomedical and Health Sciences
27	Dr. Jonathan Pillai	Adjunct Professor Center for Biodesign, Translational Health Science and Technology Institute	Biomedical Engineering
28	Dr. Pratibha Jolly	Principal (Retd), Miranda House, University of Delhi, New Delhi	Physics and Astronomy
29	Dr. Anupam K Singh	Dean, Engineering, Indus University, Ahmedabad	Environmental Engineering
30	Ms. Shyda Rana	Faculty, Army Welfare Education Society	Behavioral and Social Sciences

31	Ms. Taru Mehta	Faculty, TERI, New Delhi	Environmental Engineering
32	Dr. Samantha Vaishnavi	Assistant Professor, Central University of Jammu	Computational Biology and Bioinformatics
33	Dr. P.S.Navaraj Yadav	Principal, Annai Fathima College of Arts, Madurai	Earth and Environmental Sciences
34	Mr. Ajay Jayaraman	Engineering Manager, Grey Orange, Bangalore	Robotics and Intelligent Machines
35	Ms. Ganga Shinghal	Research Fellow, Indian Institute of Remote Sensing (IIRS), Indian Space Research Organization (ISRO)	Physics and Astronomy

Evaluation Analysis-



Evaluation Analysis-





**Mentoring Camps
For ISEF Student
Participants & Team
India Flag-Off
Ceremony 2022**

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Mentoring Camps For ISEF Student Participants & Team India Flag-Off Ceremony 2022

Each year, IRIS organizes 3 Mentorship Camps for the winners of IRIS National Fair. These camps are focused on refining students' work through one-to-one mentoring sessions with members of the IRIS Scientific Review Committee. Mentors spend considerable time with each project, validating the quantum of work done till date and giving their suggestions for improvement. They identify the gaps and give further recommendations for improvement to help these projects meet international standards.

These sessions are extremely beneficial and enable students to understand the probable queries that might arise both technically and outside their subject; the nuances of how to present the project highlighting the research and novelty; and an overview towards gaining additional knowledge that is required while competing on the international stage.

IRIS Scientific Review Committee is a group of eminent scientists and professionals from various government and private STEM institutions, corporates and industry bodies.

S No.	Name	Affiliation	Subject Expertise
1	Dr. Arundhati Pal	Associate Professor, Serampore College, Kolkata	Plant Sciences
2	Dr. A Srinivasan	Professor, IIT, Guwahati	Physics
3	Dr. Hemant Pande	Retd Prof. Hislop College, Nagpur	Chemistry
4	Dr. Kaushik Pal	Professor, IIT, Roorkee	Energy
5	Dr. Sultan Ahmed Ismail	Retd Prof. New College, Chennai	Environmental Sciences
6	Dr. Sunil Wanchoo	Professor, Mata Vaishnodevi University, Jammu	Engineering Mechanics
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9	Dr. Monika Koul	Professor, Delhi University, New Delhi	Plant Sciences
10	Dr. Kishore Amin	Scientist, ACTREC, Tata Memorial Centre, Mumbai	Biomedical and Health Sciences

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17	Ms. Vineetha C	Senior R&D Software Engineer, Broadcom	Systems Software
18	Dr. Priya Gupta	Asst. Professor, Amity University, Noida, UP	Behavioral And Social Sciences
19	Mr. Saral Baweja	Doctoral Researcher, University of Leipzig, Germany	Chemistry and Biochemistry
20	Dr. Suniti Yadav	Asst. Professor, Delhi University, New Delhi	Cellular And Molecular Biology
21	Dr. Pratibha Jolly	Principal (Retd), Miranda House, New Delhi	Physics
22	Dr. Ashish Ghosh	Professor, Indian Statistical Institute, Kolkata	Mathematics
23	Mr. Ajay Jayaraman	Engineering Manager, Grey Orange, Bangalore	Robotics
24	Dr. Vijay Kumar	Asst Professor, NIT Srinagar	Physics and Astronomy

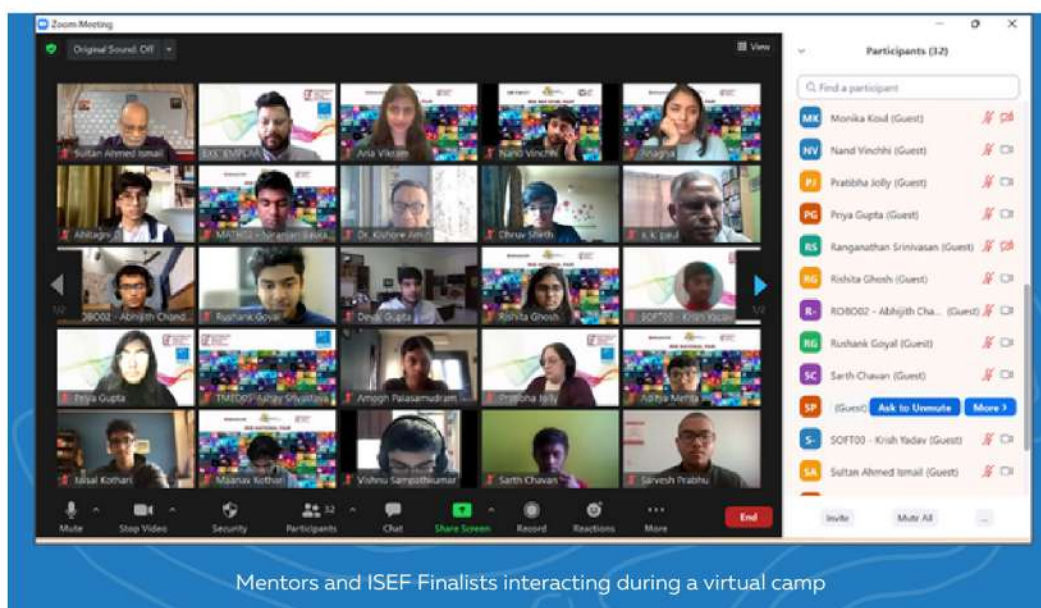


1st ISEF Mentorship Camp

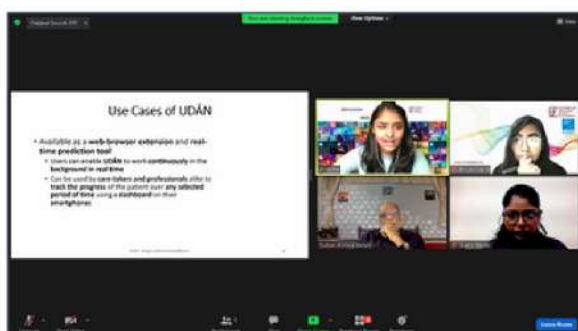
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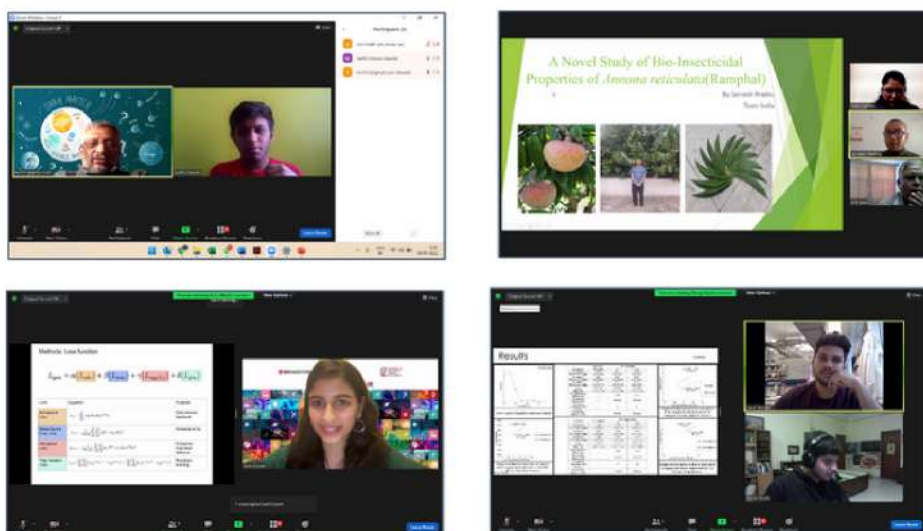
1st ISEF Mentoring Camp

The 1st ISEF Mentoring Camp was held on 29th and 30th January 2022 virtually. 20 selected projects from IRIS National Fair 2022 participated in this 2-day camp.



Members from IRIS Scientific Review Committee and volunteer mentors were present to coach the following students on their respective projects in order to bring improvements and dwell on the innovation being highlighted. Mentors and students were divided into different subject category groups in order to focus on key project areas.





These group wise mentoring sessions were held through Zoom video conferencing and respected zoom video joining links with agenda were shared with SRCs/mentors & participants.

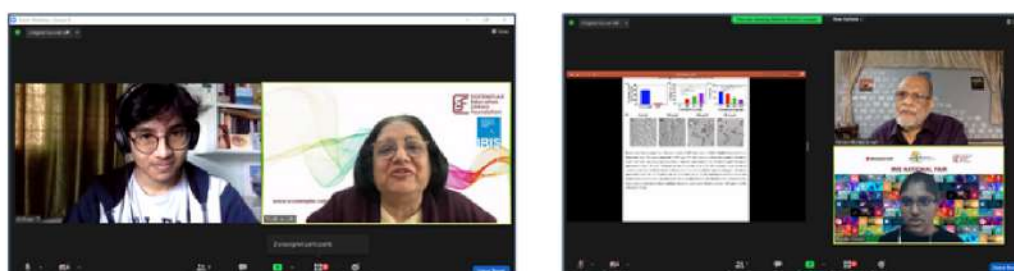
Day 1: 29th January, 2022

Day 1 of the virtual camp began with a round of introduction of the mentors and welcome of participants to the camp by the Fair Director – Ms Sharon E Kumar. This was followed by a discussion on the day's proceedings and an orientation about the program by distinguished IRIS SRC members.

Each project was allocated a group of mentors whom they would be interacting with during the course of the camp. All finalists got the opportunity to present their projects to their respective mentors through video presentation and interacted with their designated mentors during their 45 minutes allocated presentation schedule. Mentors garnered required points from the presentation and questioned participants on various aspects in order to help in project improvement.

Day 2: 30th January, 2022

Day 2 of the virtual camp began with a virtual welcome assembly of all the participants. Participants then were taken through the Day's agenda and instructions for the second day of camp. They were then directed to their respective mentor groups for project mentoring. Each team was asked to present their project in 10 minutes in order to receive feedback from the larger group. The mentors listed their valuable insights and suggestions regards points of improvement, innovation required and addressed their queries.





2nd ISEF Mentorship Camp

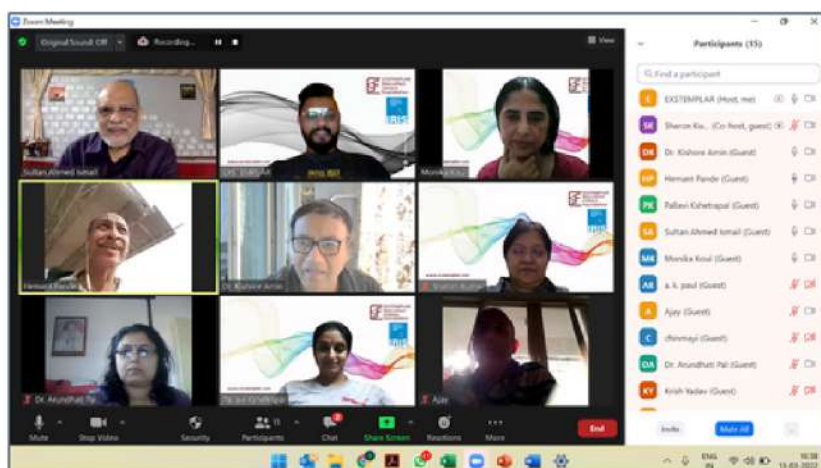
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2nd ISEF Mentoring Camp

The 2nd ISEF Mentoring Camp was held on 12th and 13th March 2022. 20 selected projects from IRIS National Fair 2022 participated in this 2-day camp.

Members from IRIS Scientific Review Committee were present to check on how much work had been done since the last Mentorship camp and to provide their valuable inputs to further improve these projects, in preparation for their participation in Regeneron ISEF 2022.

Mentors were divided into different groups in order to focus on key project areas.



Day 1: 12th March 2022

Day 1 of the virtual camp began with an orientation to the next 2 days sessions agenda by the Fair Director – Ms Sharon E Kumar

Each project was allocated a group with respective group wise mentors. Each participant got the opportunity to present their project to their respective mentors through video presentation and were guided and questioned on their research work during the 45 minutes allocated as per schedule. Mentors evaluated projects on the improvement made in their projects between 1st and 2nd camp and provided further inputs on the same.

Day 2: 13th March 2022

On Day 2 of the virtual camp Participants then were taken through the Day's agenda and given instructions for the camp day. Participants then presented their project in 5-6 minutes to all the mentors with a 5-slide presentation and gathered feedback/comments from all the mentors to further work on their projects.

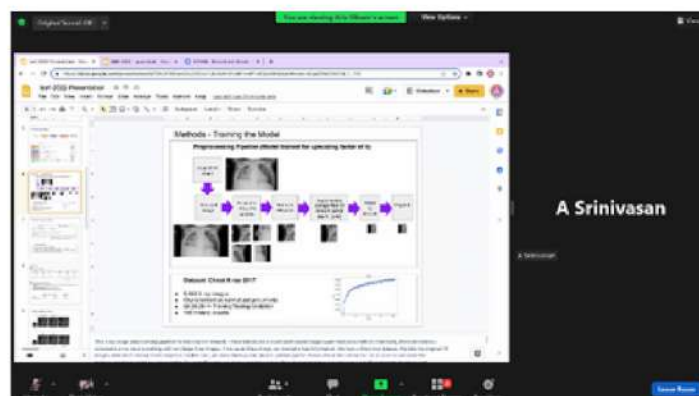
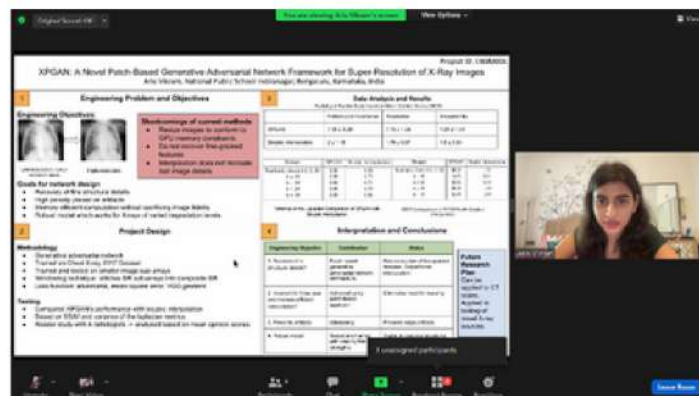
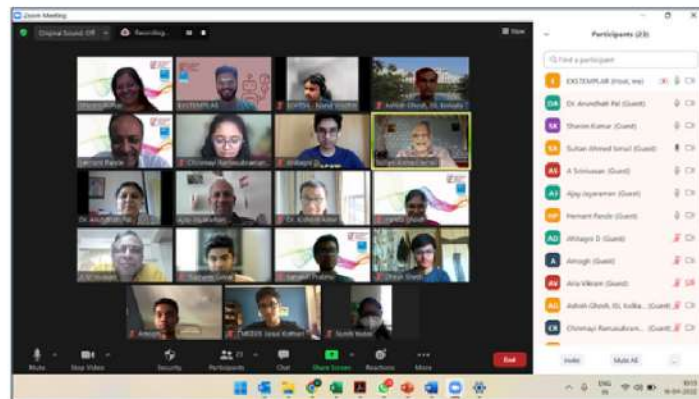


3rd ISEF Mentorship Camp

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3rd ISEF Mentoring Camp

The 3rd ISEF Mentoring Camp was held on 16th and 17th April 2022. 20 selected projects from IRIS National Fair 2022 participated in this 2-day camp. The 3rd camp was conducted to enhance the presentation skills of students and to make them aware of the rules & regulations do's and don'ts at ISEF. This camp also aimed at boosting the students' confidence level, and giving them a talk on overall personality development.





Team India to Regeneron ISEF 2022 Quad Charts

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Team India to Regeneron ISEF 2022 Quad Charts

As per ISEF 2022 participation guidelines, participating teams need to prepare their ISEF 2022 Virtual Stalls which includes a Quad chart, short video of the project and a powerpoint presentation. Team Exstemplar supported students in meeting all the ISEF requirements as per guidelines provided.

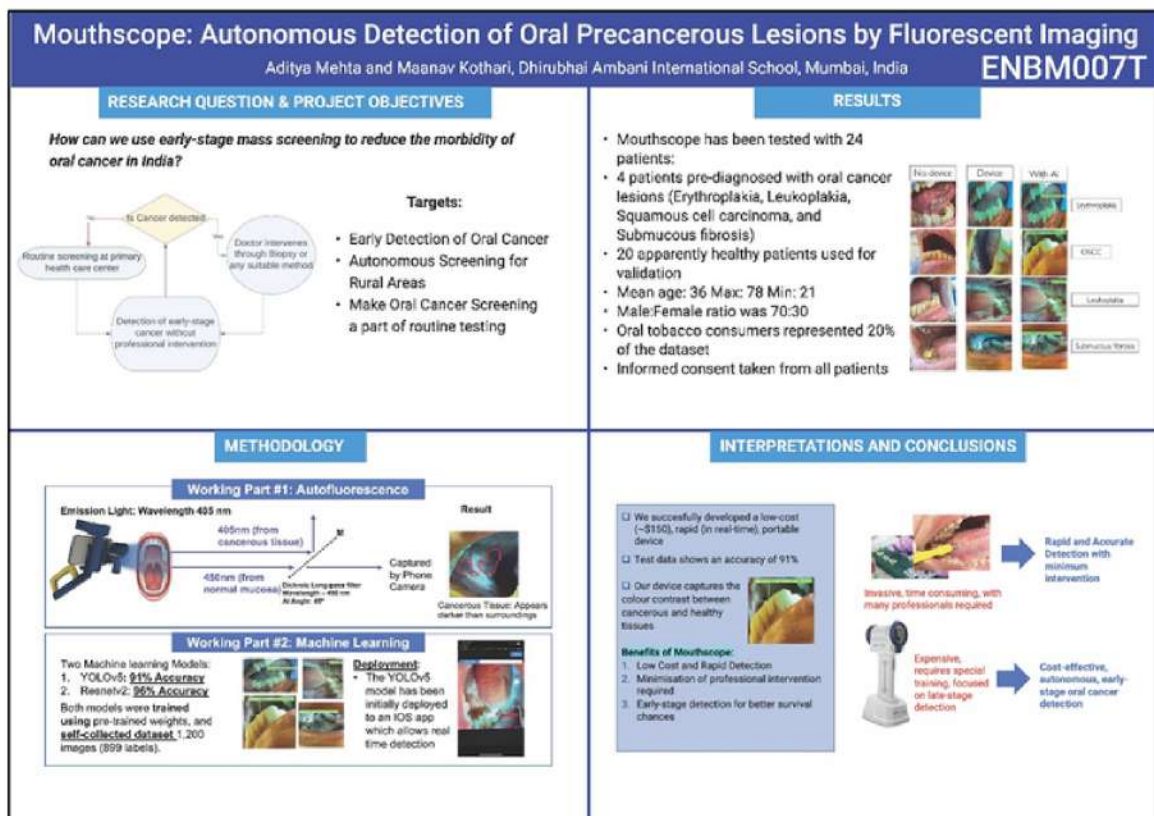
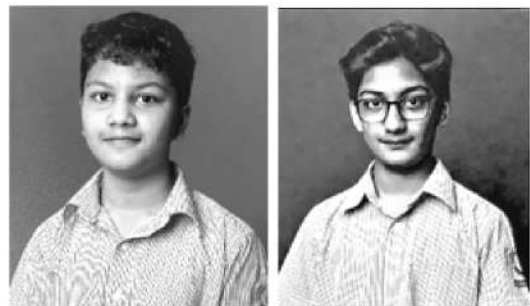
Quad Charts -

Aditya Mehta & Maanav Kothari

School - Dhirubhai Ambani International School, Mumbai

Category - Biomedical Engineering

Title - Mouthscope: Autonomous Detection of Oral Precancerous Lesions Using Fluorescent-Imaging and Computer-Vision



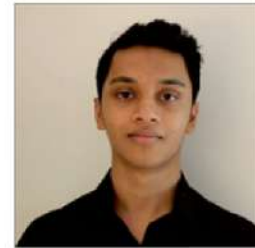
Amogh Palasamudram

School- The International School of Bangalore

(TISB), Bangalore, Karnataka

Category - Biomedical Engineering

Title - Neural Layer Bypassing Network



Neural Layer Bypassing Network (NLBN)

Amogh Palasamudram, The International School Bangalore, Karnataka, India

ROBO006

Engineering Objective:

Create a neural network that selectively performs forward propagation through certain model layers for specific inputs to improve efficiency.

1. Large models are more accurate but slower.
2. Smaller models are faster but less accurate.
3. **Current networks have a trade-off between accuracy and the speed or CPU load, creating inefficiency.**

Data Analysis and Results:

1. Speed increases significantly more than accuracy decreases.

Graph 1

Project Design:

1. After every layer, a Rejection Unit determines if forward propagation should continue.
2. If rejection units have **high confidence in semi-processed inputs returning a meaningful output, forward propagation is stopped** and the next input is taken.

Interpretation and Conclusion:

1. The NLBN increases speed of forward propagation without compromising accuracy or CPU load.
2. The NLBN increase efficiency by minimizing the speed-accuracy trade-off.
 - Benefits important, time-sensitive applications.

Figure 1

Abhijith Chandran

School- UWC Mahindra, Pune, Maharashtra

Category - Robotics and Intelligent Machines

Title - Penden: Making the Internet More Accessible to the Blind



Penden: Making The Internet More Accessible to The Blind

Abhijith Chandran, UWC Mahindra, Pune, Maharashtra, India

ROBO007

1 Engineering Problem and Objectives

Engineering Problem:

- 98.1% websites are not friendly to screen-readers.
- Average time to complete tasks with a screen reader, 9.2x more than without it.

Engineering Objectives:

- Increase the speed of completing tasks with screen readers.
- Empower screen reader users to interact with previously un-interactable elements

PENDEN

Search

Result: Work with on Type - Link

Result: Linking With Accessibility, Type - Link

Result: Linking with Accessibility, Type - Link

Result: Work to progress an element, capture the url through accessibility, Type - Link

Figure 1: Penden search interface

3 Data Analysis and Results

Figure 2: Time taken to complete tasks with and without Penden

94.1 %

Model Accuracy

76.3%

Decrease in time to complete tasks with Penden

2 Project Design

What I did:

- New paradigm for screen reader users to interact with a website - semantic search via a chrome extension.
- Developed a RoBERTa based siamese model for semantic search.
- Created a search engine based on Approximate Nearest Neighbour (ANN) search with Locality Sensitive Hashing (LSH) with ElasticSearch (ES).

Testing:

- Benchmarked the NLP model against 6 state-of-the-art models.
- Piloted system with 56 visually challenged participants.

4 Interpretation and Conclusion

Innovation	Impact
Chrome extension - new paradigm to interact with a website	Previously unusable actions now possible; All tasks completed significantly faster
Semantic Search	Drastically improves ease of for users
ANN based search	Delivers <1s search

Conclusion

Penden drastically decreases time taken to complete tasks and increase ease of use for screen reader users.

Future Plans: Bring Penden to all major browsers

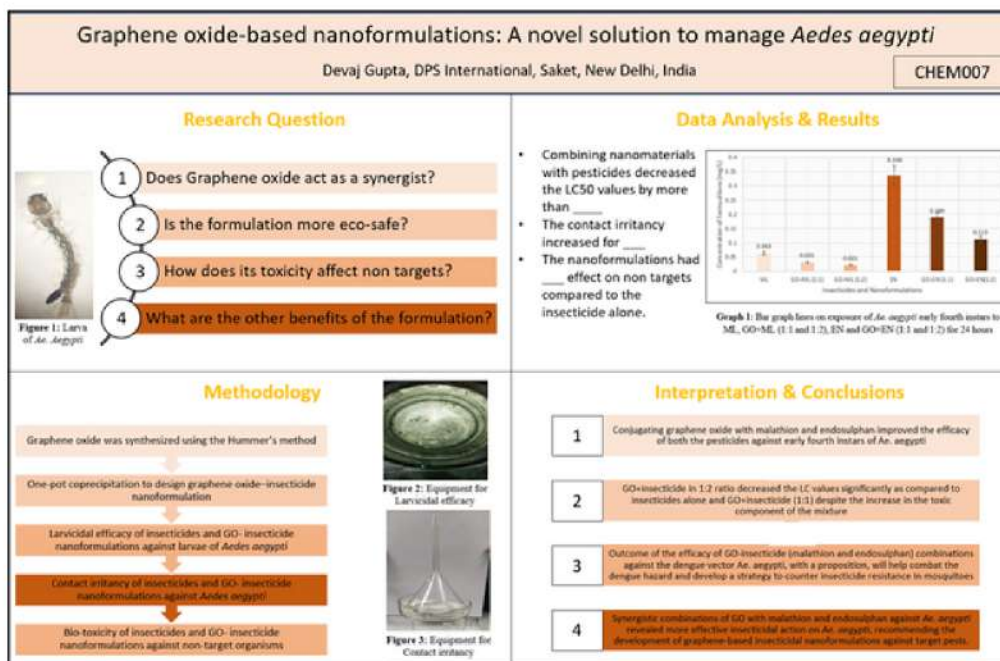
Devaj Gupta

School- DPS International, Saket, New Delhi

Category - Chemistry

Title - Graphene oxide-based nanoformulations:

A novel solution to manage *Aedes aegypti*

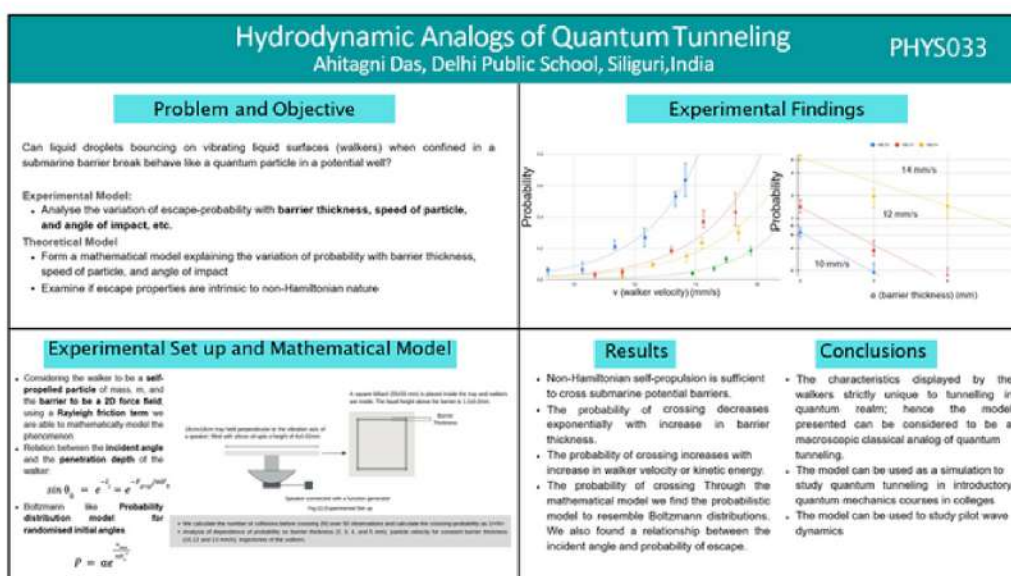


Ahitagni Das

School- Delhi Public School, Siliguri, West Bengal

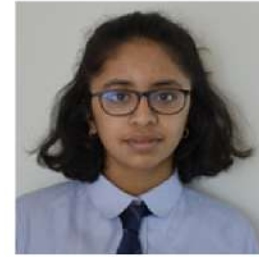
Category – Physics

Title - Hydrodynamic Analogs of Quantum Tunneling



Chinmayi Ramasubramanian

School- Sri Kumaran Children's Home - CBSE, Bangalore, Karnataka
 Category - Animal Sciences
 Title - Averting Human-Elephant conflict using machine learning on Elephant Vocalizations



Averting Human-Elephant Conflict using Machine Learning on Elephant Vocalizations ANIM003
 Chinmayi Ramasubramanian, Sri Kumaran Children's Home, Bangalore, Karnataka, India

Q1: Research Question

Objective:
 - To enable early detection of elephants near human populations and to determine if they are likely to engage in behaviour disruptive to humans and prevent human-elephant conflict

Hypothesis:
 Machine learning and bio-acoustics can be used on elephant vocalizations to detect elephants near human populations and determine their current behaviour

Uniqueness:

1. Uses elephant vocalizations instead of visual aids with more accurate detection in densely forested areas
2. Current behaviour of elephants is also determined to predict whether it is about to raid the village or is only passing by

Parts of the proposed solution -
 Machine learning model - determines if elephants are nearby as well as their current behaviour and mood
 Ele-Voc device - contains the ML model and gives proximity alerts

Fig 1 - Elephant vocalizations identified to determine proximity and behavior of elephants

Q3: Data Analysis & Results

- Model training done with 147 recordings of elephants vocalizing in their natural habitat
- Vocalisations classified as Chirp, Roar, Rumble and Trumpet in their natural habitat
- Various iterations conducted to find the best type of input and ML model
- Modified mel-filterbanks with 2-level CNN model gave best results [Fig 4]
- The final CNN models were deployed as TFlite models on the Ele-Voc Device

Fig 3 - Label distribution of database files

Fig 4 - Final Two-level Hierarchical model architecture

Q2: Methodology

Steps: Data collection and labeling, Data augmentation, Feature Engineering, Training, Validation, Testing & Deployment.

Alarm: To warn people nearby when an aggressive elephant is identified

Raspberry Pi: Runs TFlite CNN model and sends alert messages in Telegram

LED indicators: When an elephant is identified

Fig 2 - Steps conducted to build and test machine learning model and device

Fig 5 - Calculation of mel-filterbanks

Fig 3 - Ele-Voc device parts

Q4: Interpretation & Conclusions

Iteration No.	Input	Method	Model Type	Model Architecture	Accuracy (On validation split)
Iteration 7 - Final iteration	Modified Mel-Filterbanks	Randomly stretch and square sound to balance all classes Custom Data Pipeline to randomly thersome sound before feeding to reduce bias	CNN	2 level	First level model: 98.88% Second level model: 100.00% Total model: 75.00%

Table 1 - Best performing CNN model results

- Two-level CNN model detected and classified elephant vocalizations with best accuracy of 80.12% (1st level), and 100.0% and 70.13% (2nd level)
- The CNN models maintained these accuracies when run in real-time on the Ele-Voc device.

Future Plans

- Install device in Cauvery Wildlife Sanctuary for testing with an NGO.
- Integrate acoustical CNN models with visual machine learning models
- Increase accuracy with more data and finer levels of classification

Fig 6 - Ele-voc device deployed

Anagha Sampathkumar

School- National Public School, Indiranagar, Bangalore, Karnataka
 Category - Behavioral Sciences
 Title - UDAN: Unobtrusive Sentiment Alert Using Natural Language Processing



UDAN - Unobtrusive Sentiment Alert using Natural Language Processing
 Anagha Sampathkumar, National Public School, Indiranagar, Bangalore, Karnataka, India

Research Question

- According to the WHO, 300 million people suffer from depression worldwide
- A survey recorded about 50-70% increase in internet use during the COVID-19 pandemic and of that 50% of the time was spent engaging on social media in 2020
- An individual's depression status can be predicted by social media analysis up to 3 months prior to its first documentation

Key findings:

- Negative adjectives and adverbs and use of mainly first-person singular pronouns (as a result of social isolation)
- Absolutist words (like always and never) are used
- Black and white view of the world and situations
- Text shows self-aversion, guilt and uselessness clearly

Fig 1 - UDAN Logo

Methodology

Data Acquisition & Pre-processing: Acquisition, Preprocessing, Labeling, Normalization, Tokenization.

Data Processing: Feature Extraction, Training, Evaluation.

Fig 1 - UDAN Architecture

Results

Metric	Value
Accuracy of trained model	0.91
F1 Score	0.7
Precision	0.87
Recall	0.58
F1 Score (mean value of P&R)	0.675

Table 1 - UDAN results and metrics

High accuracy of 91% on unlabeled data with ambiguous sentiment

Fig 2 - UDAN Accuracy per Epoch

Fig 3 - UDAN Loss per Epoch

Conclusion

- UDAN is a pioneering, negative-sentiment alerting tool that is quantitative, unbiased, economical, and accurate
- It is available as a web-extension, a real time prediction and as a progress dashboard
- UDAN allows a blended system - the AI counterpart while keeping the mental health professional in the loop (UDAN dashboard)
- UDAN prompts user to access mental health professionals

NEXT STEPS:

- Enhance accuracy to over 95% by increasing the dataset's size
- To synchronize the use of UDAN (screening tool) with standardly used diagnostic tests to strengthen diagnosis
- Work with clinical data to further validate UDAN's accuracy
- Extend UDAN for sentiment analysis of Indian languages

Aria Vikram

School- National Public School, Indiranagar, Bangalore, Karnataka

Category - Biomedical Engineering

Title - XPGAN: A Novel Patch-Based Generative Adversarial Network for Super-Resolution of X-Rays



Project ID: ENBM006

XPGAN: A Novel Patch-Based Generative Adversarial Network Framework for Super-Resolution of Low-Dose X-Rays

Aria Vikram, National Public School Indiranagar, Bengaluru, Karnataka, India

Engineering Problem and Objectives

Engineering Problem:

- Higher resolution = higher radiation dosage.
- Lower-dose X-rays lack pathological detail and texture detail -> not diagnostically valuable.
- Existing interpolation methods cannot reconstruct lost features

Engineering Objectives: To develop a framework for reconstructing lost texture and pathological detail in low dose X-rays

Reference: <https://doi.org/10.1093/rad/ckaa020>

Goals for network design

- Recovery of fine structural details
- High penalty placed on artifacts
- Memory-efficient computation without sacrificing image fidelity
- Robust model which works for X-rays of varied degradation levels.

Data Analysis and Results

Validation

- Compared with interpolation
- Radiologist reader study
- Mean Opinion Score for pathological invariance, resolution, acceptability
- Variance of the laplacian: XPGAN images have sharper edges
- SSIM: XPGAN images retain fine-grained features

Project Design

Methodology

- Generative adversarial network
- Trained on Chest X-ray 2017 Dataset
- Trained and tested on smaller image sub-arrays
- Windowing technique stitches SR sub-arrays into composite SR

Interpretation and Conclusions

Applications

- Reduces radiation dosage by a factor of 16 (current implementation) -> reduces overexposure to radiation
- Reduces X-ray detector costs

Future Research Plan

Applied to CT scans. Applied to testing of novel X-ray sources.

ENGINEERING OBJECTIVE	NOVELTY	CONTRIBUTION
1. Recovers fine structural details?	Patch based generative adversarial network architecture	Reconstruction of features. Outperforms interpolation.
2. Invariant to X-ray size and memory-efficient computation?	Achieved using patch-based approach	Eliminates need for resizing
3. Prevents artifacts	Windowing	Prevents edge-artifacts
4. Robust model	Tested and trained with varying filter strengths.	Viable in practical situations.

Jaisal Kothari

Amity International School - Saket, New Delhi

Ashay Srivastava

Delhi Public School, R. K. Puram, New Delhi

Category - Translational Medical Sciences

Title - FlickerAI: Resolution of Photosensitive Epileptic Visual Content with Spatio-Temporal Luminance Frequency Analysis



FlickerAI: Resolution of Photosensitive Epileptic Visual Content with Spatio-Temporal Luminance Frequency Analysis

Jaisal Kothari, Amity International School, Saket, New Delhi & Ashay Srivastava, DPS RK Puram, New Delhi, India

TMED004T

Engineering Objectives: Can AI/ML be used to detect and resolve harmful photosensitive seizure-inducing flickers from videos?

- Rationale: To help Ashay's sister and Jaisal's friend, patients with Photosensitive Epilepsy (PSE) browse the internet safely.
- Model that would detect both spatial and temporal triggers.
- Computationally efficient and open-source to allow real-time analysis.
- Explore ways to resolve photosensitive videos.
- Create a large dataset of harmful epileptic videos to overcome lack of data.

Data Analysis & Results

3000+ videos processed via Crowdsourcing Testing by 500+ users.

FFT-based resolution reached 100% accuracy.

Previous Best Mean Computation Time: 7.72 ms/frame

FlickerAI Mean Computation Time: 2.64 ms/frame

Methodology

Interpretations & Conclusions

100,000+ video frames can be analysed in minutes.

Detection and resolution work **faster than real-time**.

Largest PSE dataset ever created

First open-source algorithm

Patients of Irlen Syndrome, Dyslexia

1.5B teenagers with access to internet in COVID-19

Patients with Autism, Brain Tumors

flicker

- Simple
- Scalable
- Compatible

GIFs

Video Games

Virtual Reality (VR)

Krish Yadav

School- MKH Sancheti Public School, Nagpur, Maharashtra

Category - Systems Software

Title- Enhancing the Security of Websites with Virtual Identification Code

Steganography



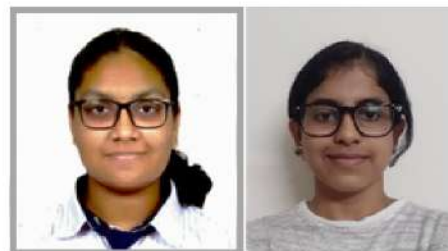
Enhancing the security of websites with virtual identification code steganography		SOFT005	
<p>Engineering problem & Objectives</p> <ul style="list-style-type: none"> Traceback of screenshots of website is not possible. <p>Objectives:</p> <ul style="list-style-type: none"> Allow traceback Should not be easily visible by human eye Should not disturb the existing content on the website 		<p>Data Analysis and Results</p> <ul style="list-style-type: none"> Gave 100% accuracy for lossless images in different extensions such as PNG and BMP Able to successfully test on <ul style="list-style-type: none"> 36 different website templates 4 different screen sizes 5 different browsers. Has a time complexity of $O(N*M)$ for decryption 	
<p>Methodology</p> <ul style="list-style-type: none"> Hash the data Send a copy to client side Plot the data on an imaginary grid at pixel level <p>FLOWCHART FOR ENCRYPTION</p>		<p>Interpretation and conclusion</p> <ul style="list-style-type: none"> The technique was able to traceback screenshots It did not disturb the existing content of website Can be applied to variety of real world scenarios like piracy, cheating, etc 	

Sara Varghese & Devika Girish

School - St. Peter's Senior Secondary School, Kolenchery, Kerala

Category – Material Sciences

Title - Preparation of a Superhydrophobic and Oleophilic Membrane Inspired by Taro Leaves for Oil-Water Separation



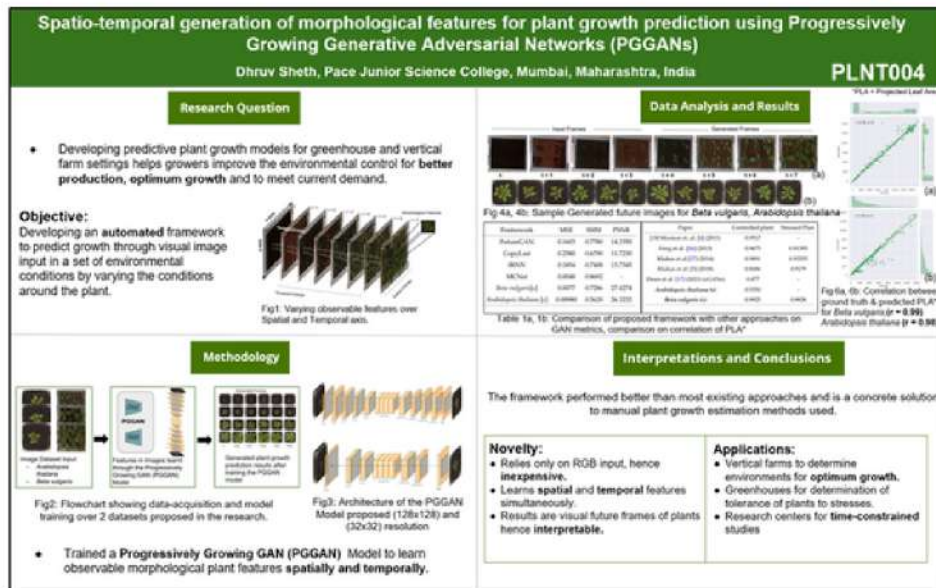
Preparation of a super hydrophobic and oleophilic membrane inspired by Taro leaves for oil-water separation		Sara Varghese, Devika Girish St. Peter's Senior Secondary School, Kadayiruppu, Kerala, India		MATS002T							
<p>Research Question</p> <ul style="list-style-type: none"> Oil-water separation is a huge industrial as well as environmental challenge the world faces. Leaves of taro (Colocasia esculenta), a widespread aroid, are super hydrophobic and super oleophilic and inspired it, hydrophobic and oleophilic membranes are fabricated. <p>Fig 1.1. Photos of all taro and water droplet on taro leaf</p> <p>3) What causes Taro leaves to be super hydrophobic and oleophilic? 2) How can we prepare a membrane with similar properties synthetically using easily accessible materials? 3) What is the efficiency of the prepared membrane and how can we increase it? 4) Does the introduction of calcium oxalate as a filler give any advantage over the ZnO NPs filler?</p>				<p>Data Analysis and Results</p> <p>Characterize from SEM 1. SEM image of the ABS/ZnO membrane 2. Absorption capacity of the SEM results for the membranes in various oils 3. Separation efficiency of the membranes in terms of oil and water 4. Water contact angle of the membranes 5. Cost of the membranes</p>							
<p>Methodology</p> <p>2.1 Preparation</p> <p>2.2 Characterisation</p>		<p>Interpretations and Conclusions</p> <table border="1"> <thead> <tr> <th>Pristine ABS membrane</th> <th>ABS/ZnO membrane</th> <th>ABS/CaOx membrane</th> </tr> </thead> <tbody> <tr> <td> <p>Wett Contact Angle(A) 100° Water Contact 100% Oil Absorption Capacity 100% C.A. Variation with pH 100% Mem. to create and able to be used as oil separator</p> </td> <td> <p>Wett Contact Angle(A) 150° Water Contact 100% Oil Absorption Capacity 100% C.A. Variation with pH 100% Membrane highly performance Oil Flux Intermittent to be used as oil separator</p> </td> <td> <p>Wett Contact Angle(A) 150° Water Contact 100% Oil Absorption Capacity 100% C.A. Variation with pH 100% Mem. to create and able to be used as oil separator</p> </td> </tr> </tbody> </table> <p>* Both ABS and ABS/ZnO membranes membranes are found to be hydrophobic with a water contact angle of 100° The ABS, ABS/ZnO and ABS/CaOx membranes membranes showed super oleophilicity without any membrane pores in the contact angle measurement for both natural and cultured oils. Owing to this superoleophilicity nature, ABS, ABS/ZnO and ABS/CaOx membranes membranes is capable of selectively absorbing and transporting of these oil-water mixture without the use of any external attract.</p>				Pristine ABS membrane	ABS/ZnO membrane	ABS/CaOx membrane	<p>Wett Contact Angle(A) 100° Water Contact 100% Oil Absorption Capacity 100% C.A. Variation with pH 100% Mem. to create and able to be used as oil separator</p>	<p>Wett Contact Angle(A) 150° Water Contact 100% Oil Absorption Capacity 100% C.A. Variation with pH 100% Membrane highly performance Oil Flux Intermittent to be used as oil separator</p>	<p>Wett Contact Angle(A) 150° Water Contact 100% Oil Absorption Capacity 100% C.A. Variation with pH 100% Mem. to create and able to be used as oil separator</p>
Pristine ABS membrane	ABS/ZnO membrane	ABS/CaOx membrane									
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Dhruv Sheth

School - Pace Junior Science College, Mumbai

Category - Plant Sciences

Title - Spatio-Temporal Generation of morphological features for plant growth prediction using progressively growing GANs

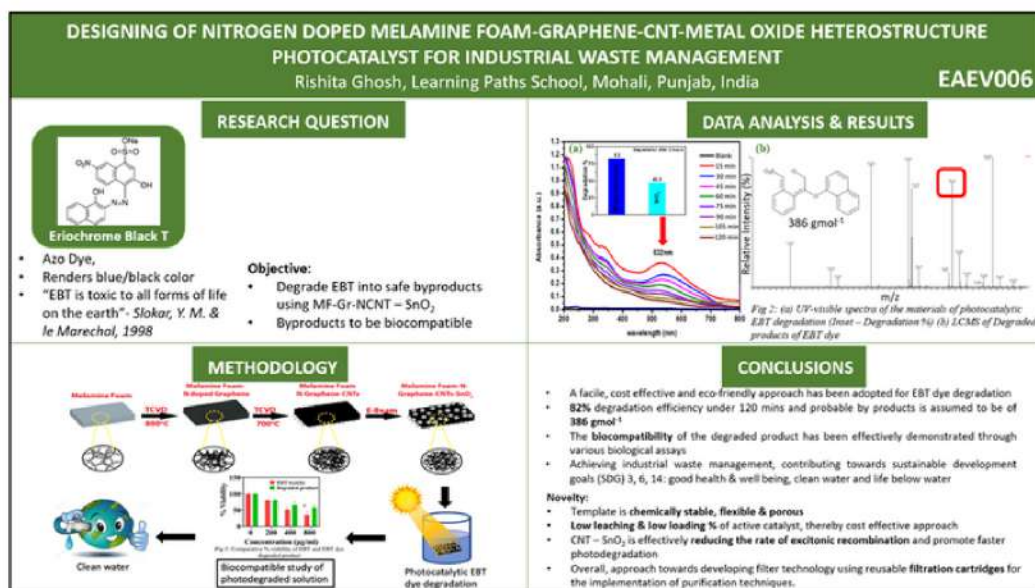


Rishita Ghosh

School - Learning Paths School, Mohali, Punjab

Category - Earth and Environmental Sciences

Title - Designing of nitrogen doped melamine foam-graphene-cnt-metal oxide heterostructure photocatalyst for industrial waste management



Nand Vinchhi

School - National Public School, Koramangala, Bengaluru
Karnataka

Category - Systems Software

Title - Novel Ai Powered Sign Language Translator



Novel AI Powered Sign Language Translator

Nand Vinchhi, National Public School Koramangala, Karnataka, India SOFT004

ENGINEERING PROBLEM & PROJECT OBJECTIVES

- 70M+ speech and hearing impaired people are excluded from technologies such as video conferencing, voice assistants etc.
- Objectives of this project are:
 - To develop a camera vision based application for translation of American Sign Language (both alphanumeric characters and words/phrases).
 - To optimize the software for real-time use.

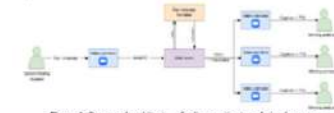


Figure 1: Proposed architecture for live captioning of sign language

DATA ANALYSIS & RESULTS

Table 1: Results of exhaustive search to determine ideal feature scaling strategy

Algorithm for Hands	Algorithm for Body	Distance metric for Fast/FW	Accuracy
Angles	Angles	Euclidean	85.27%
		RMSE	88.98%
Angles	Localized Coordinates	Euclidean	81.29%
		RMSE	85.04%
Localized Coordinates	Angles	Euclidean	95.81%
		RMSE	88.50%
Localized Coordinates	Localized Coordinates	Euclidean	78.72%
		RMSE	82.37%

- After running benchmarks, average delay between extraction of raw pose estimates and detection of word/phrase was found to be 307 ms.

PROJECT DESIGN

- Extraction of raw temporal data from webcam using pose estimation ML models.
- Size independent feature extraction
- Matching live data with reference data using Dynamic Time Warping
- Fixed threshold for detection of word/phrase
- Static classification of hand pose values for alphanumeric characters

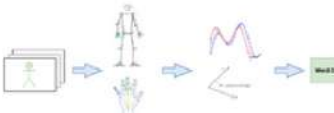


Figure 2: methodology for word/phrase translation

INTERPRETATIONS AND CONCLUSIONS

- The sign language translation technology demonstrated achieves high accuracy detections (approximately 90%).
- Translation delay was measured to approximately 300ms.
- The software is independent of external hardware such as depth sensors.
- It does not require high performance compute resources or large datasets.
- Hence, scales more easily to multiple sign languages.




Figure 3: Real time word/phrase translation demo

Rushank Goyal

School - 7i World School, Gwalior

Category - Translational Medical Sciences

Title - A Quantum Machine Learning-Based Framework for Early Cancer Detection and Biomarker Identification Using Transcriptome Profiles

A Quantum Machine Learning-Based Framework for Early Cancer Detection and Biomarker Identification Using Transcriptome Profiles

TMED005 – Rushank Goyal, 7i World School, Gwalior, India

Introduction and Research Question

Cancer
10 million cancer-related deaths each year. Early diagnosis improves survival rates but remains challenging.

Transcriptome
Expression profile of tens of thousands of genes (ideally all of them) at the cellular or tissue level.

Research Question
Can we use transcriptome data to create explainable mathematical models with an accuracy statistically equivalent to neural networks, and identify new biomarkers, intended for legally-approved clinical use in early cancer detection?

Data Analysis and Results

Black-Boxes vs Explainable AI
In currently used black-box techniques, the AI's decision-making process is unknown, rendering it unsuitable for legal and ethical biological/clinical use.

Fig 1: Creative Illustration of Black-box and explainable AI
(Source: Rishabh DesignLab)

Fig 2: Confusion matrix and ROC curve on test set, for hepatocellular carcinoma (one of the 10 cancers studied)

Fig 3: L. Mathematical expression output by the framework, R. structures of proteins coded by the identified genes, and III. confusion matrix and ROC curve on test set, for hepatocellular carcinoma (one of the 10 cancers studied)

E.g. liver cancer (HCC):

- Acc. = 98.9%
- Sens. = 97.8%
- Spec. = 100%

Gene signature used by model contains FCN2, HBA1, DRAP1, CYP2C18, ITGA6 (left to right; A to E)

Median accuracy across 10 cancer models - 91%
58 total biomarkers across 10 gene signatures: **17 novel**

- 4 lncRNAs
- 15 protein-coding

Methodology

Data Collection
Single-channel microarray datasets of 10 cancers from the Curated Microarray Database (DOI: 10.1089/cmb.2018.0238)
Stratified random train-test splitting

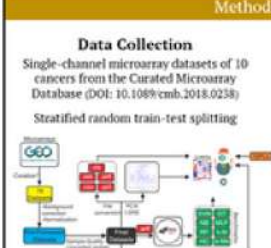


Fig 2: Depiction of the process flow for creation of CoMDEs (source: doi.org/10.1089/cmb.2018.0238)

Framework Design

- XGBoost for feature selection
- Mann-Whitney U Test to find differentially-expressed genes
- Quantum lattice for creation of mathematical expressions (models) with AIC for optimization
- 4 platforms for biomarker discovery + literature review to check novelty

Interpretation and Conclusions

Statistical comparison of the framework's accuracies with a range of prior research using the two-proportion Z-test shows the following results:

- Equivalent performance compared to black-box neural networks, SVMs, etc.
- Superior performance to conventional explainable models like decision trees
- Equivalent performance compared to black-box models utilizing RNA-Seq data

Creative aspects of the project
Robust and accurate model creation even on small and high-dimensional datasets
Less prone to overfitting
Application of functions not used in traditional machine learning
Enables early detection by using molecular rather than morphological changes

Conclusion and Contributions
Transparent mathematical expressions were created – can be used in clinical settings in conjunction with FNAC and RT-qPCR
Identification of gene signatures with complex relationships to cancer diagnosis – can be used for creation of diagnostic tests
Gene signature size reduced by $10^2 - 10^3$

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Niranjan Baskaran

School - Gateway International School, Chennai, Tamil Nadu

Category - Mathematics

Title - On worker optimal matchings in many-to-many markets with indifferences



ON WORKER OPTIMAL MATCHINGS IN MANY-TO-MANY MARKETS WITH INDIFFERENCES		MATH005
<p style="text-align: center;">Niranjan Baskaran, Gateway International School, Chennai, Tamil Nadu, India</p>		
<p>PROBLEM</p> <p>Is there a technique to generate a worker-optimal matching in every many-to-many market with indifferences?</p> <ul style="list-style-type: none"> Matching theory is finding how to match two sets of agents to each other based on their preferences. In a many-to-many market each agent can match with more than one. A worker-optimal matching is one which is the best for one side. With indifferences means, the agents have ties in their preferences. <p>Fig. 1: A many-to-many market: here each firm (f) has several workers and each worker (w) works for several firms.</p>	<p>FINDINGS</p> <p>PROPOSITION 1</p> <p>If a stable matching admits an SWI-cycle or chain, then the matching obtained by carrying out such cycles and chains is also stable.</p> <p>PROPOSITION 2</p> <p>A stable many-to-many matching is Worker-Optimal stable if and only if there are no SWI-cycle or SWI-chains.</p> <p>This leads us to the construction of the Worker-Optimal Stable Matching Algorithm for Many-to-Many matchings (WOSMA-MM)</p>	
<p>MODEL</p> <p>We define Stable Worker Improvement Cycles & Chains, and Reversible Cycles & Chains to investigate the problem.</p> <p>In an SWI cycle, we have worker firm pairs, where each worker desires to work for the firm of the worker next in line. Carrying out an SWI cycle improves the position for workers. An SWI chain is similar, but the movement is non-cyclic. There is an empty position at the end.</p> <p>We show by contradiction that carrying out such cycles and chains preserve stability, and that the absence of these cycles and chains imply Worker-Optimality</p>	<p>STABILITY</p> <p>We say a matching is stable if it does not contain a blocking pair.</p> <p>A blocking pair is a worker-firm pair, who want to have each other in their set of partners as opposed to staying with their current set</p>	<p>CONCLUSION</p> <ul style="list-style-type: none"> We have proved the existence of a technique for identifying worker optimal matchings in many-to-many markets with indifferences. However, the efficiency of our algorithm is still to be investigated in the context of existing models With WOSMA-MM we now have a way to efficiently match many-to-many markets with indifferences to achieve worker optimality. This could affect a myriad of markets like students matching with classes and consultants matching with companies, and buyers with producers in the modern supply chain. Future avenues of research include investigating the efficiency of different tie breakings

Vishnu Ram Sampathkumar

School - National Public School, Bangalore

Category - Translational Medical Science

Title - GliomAssist: Computational Glioma Grading and Prognosis with PET



GliomAssist: Computational Glioma Grading and Prognosis		TMED006
<p style="text-align: center;">Vishnu Sampathkumar, National Public School, Bangalore, India</p>		
<p>Objectives</p> <ul style="list-style-type: none"> Problem Statement: ~0.5ml individuals currently suffering from glioma (most common type of brain cancer) Current Gold-Standard Diagnostic / Grading Method - Histopathological Examination (HPE) <ul style="list-style-type: none"> Highly invasive High inter-observer variation Low test repeatability Aim: To construct an effective, non-invasive and automated pipeline for grading and characterizing gliomas PET Approach - ^{11}C-MET <ul style="list-style-type: none"> Highly sensitive, non-invasive, and quantitative Quantitative modelling of radiotracer accumulation (SARSA, 2021) provides valuable insights into tumoral progression <p>Fig. 1: C11-MET molecule (yellow - C11 atom)</p>	<p>Methods</p> <p>Data Acquisition and Preprocessing</p> <p>Fig. 2: Texture Features - 3 Differentiable Histogram, GCM, RLM (pre-works)</p> <p>Machine Learning Component</p>	
<p>Results</p> <p>Fig. 3: ROC of different classifiers: Deep Gradient Boosting, top-right: Random Forest, bottom: Linear SVC</p> <ul style="list-style-type: none"> RLM (gray line) non-uniformity most indicative of a high-grade tumor ($p = 0.041$) Central Blood Volume ratio (CBV) was found to be least indicative ($p = 0.996$) H3T intensity found to be most indicative of good prognosis ($p = 0.033$) 2D Shape features were uniformly non-indicative ($p = 1.00$) 	<p>Conclusions</p> <p>Summary: It is clear that the method of grading using Random Forest Classifier is highly accurate compared to other ML modalities studied, particularly in distinguishing Grade IV from Grade II and III gliomas.</p> <p>Furthermore, its non-invasive and quantitative nature across cross-specialty subjectivity and qualitative judgements inherent in histopathological examinations.</p> <p>It is the only multi-modal, all-in-one glioma support tool for clinicians</p> <p>INCON</p> <p>Paper accepted and presented in the NCCN 2022 Annual Conference</p>	

Vishwadeep Balakrishnan

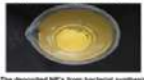

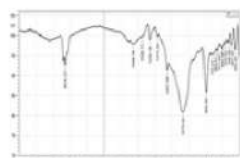
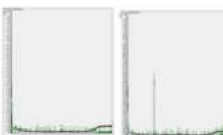
School - Shiva Niketan School, Mangalam, Tamil Nadu, India

Category - Microbiology

Title - Pseudomonas stutzeri VR2004 for Green Synthesis of ZnO Loaded onto a Starch-Gelatine Biopolymer Matrix for Remediation of Xenobiotics in Aquatic Systems



PSEUDOMONAS STUTZERI VR2004 FOR GREEN SYNTHESIS OF ZnO LOADED BIOPOLYMER MATRIX FOR REMEDIATION OF XENOBIOTICS IN AQUATIC SYSTEMS
 Vishwadeep Balakrishnan, Shiva Niketan School, Tiruppur, Tamil Nadu, India PROJECT ID: MCR0018

Research Question	Results
<ul style="list-style-type: none"> The movement of xenobiotics into water bodies occurs through run off, spray drift, leaching, and sub-surface drainage, all of which have negative impacts on aquatic environments and humans. Widely used traditional physico-chemical methods for remediation of xenobiotics in aquatic systems are expensive, requires high energy input and not environmentally sustainable (sludge generation) <p>Objective: To develop a cheap, environmentally sustainable and effective method through microbial nanotechnology for remediation of xenobiotics in aquatic systems and study the synthesis, interactions and products of degradation of the nanomaterial.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Fig 1: The deposited NP's from bacterial synthesis</p> </div> <div style="text-align: center;">  <p>Fig 2: The ZnO loaded gelatine-starch matrix</p> </div> </div>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Fig 3: FT-IR of ZnO loaded gelatine-starch biopolymer matrix</p> </div> <div style="text-align: center;">  <p>Fig 4: GC-MS of Thiazofur (control) and Isosulfazone</p> </div> </div>
Methodology	Conclusion
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Isolation of bacteria from the soil of hospital near and identification through 16S ribosomal RNA gene sequencing</p> <p>Estimate synthesis of ZnO nanoparticles from the supernatant of the bacteria</p> <p>FT-IR spectroscopy of fresh and used supernatant of the bacteria for protein analysis</p> </div> <div style="width: 45%;"> <p>Optimization studies of the biopolymer matrix by changing the biopolymer matrix with respect to ZnO NP's</p> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>Substantive, antimicrobial, and antioxidant tests chosen for degradation and studied with GC-MS to find the products of the degradation</p> </div> <div style="width: 45%;"> <p>The ZnO loaded biopolymer matrix of gelatine-starch, ZnO nanolite, and ZnO-starch were studied with FT-IR to understand their interactions</p> </div> </div>	<ul style="list-style-type: none"> The ZnO loaded biopolymer matrix was synthesized in a sustainable and cost effective way with commercially available material The ZnO loaded biopolymer matrix was able to remove significant amount of xenobiotics from the water While optimizing the biopolymer matrix with varying the amount of gelatine-starch to the ZnO nanoparticles used, there wasn't a significant difference found <p>Future plans:</p> <ul style="list-style-type: none"> To optimize the ZnO loaded biopolymer on the concentration of ZnO to the highest concentration of ZnO NP's that can be used Conduct studies on simultaneous use with phytoremediation for removal of the ZnO loaded biopolymer matrix

Sarth Prashant Chavan

School - Aditya English Medium School Pune, Maharashtra

Category- Mathematics

Title - On Ramanujan's identity for odd zeta values and its generalization



On Ramanujan's Identity For Odd Zeta Values And Its Generalization
 Sarth Chavan, Aditya English Medium School, Pune, Maharashtra, India

Research Question	Data Analysis & Results
<p>Riemann zeta function and Ramanujan's identity for odd zeta values</p> <p>It is quite well known that even zeta values are non-zero rational multiple of powers of π and, therefore, a transcendental number. On the other hand, no such relation is expected to hold for odd zeta values; a folklore conjecture states that the numbers π and odd zeta values $\zeta(2n+1)$ are algebraically independent over the rationals. This conjecture is predicted by Grothendieck's period conjecture for mixed Tate motives. But both conjectures are far out of reach and we do not even know the transcendence of a single odd zeta value.</p> <p>Ramanujan made many beautiful and elegant discoveries in his short life of 32 years. One of the most remarkable formulas suggested by him is the following intriguing identity involving the odd values of the Riemann zeta function.</p> <p>Theorem 1. If $a, b \in \mathbb{N}^+$ such that $a^2 + b^2 = 1$ and if $n \in \mathbb{N} \setminus \{0\}$, then we have</p> $\pi^{2n} \left\{ \frac{1}{2} \zeta(2n+1) + \sum_{k=1}^n \frac{B_{2k}}{(2k)!} \zeta(2n+1-2k) \right\} = (-1)^n \left\{ \frac{1}{2} \zeta(2n+1) + \sum_{k=1}^n \frac{B_{2k}}{(2k)!} \zeta(2n+1-2k) \right\} \quad (1)$ <p>where B_n denotes the n-th Bernoulli number and $\zeta(x)$ denotes the Riemann zeta function.</p>	<p>An elementary proof of Ramanujan's identity</p> <p>While Ramanujan's identity has been already proved a few times in the literature, there has been rising interest in finding an elementary and self-contained proof. In the first part of this project, we present an elementary proof of Ramanujan's identity for odd zeta values. Our proof solely relies on a Mittag-Leffler type expansion of $\cot(x)$, that is</p> $\cot(x) = \frac{1}{x} - \sum_{k=1}^{\infty} \frac{2x}{x^2 + k^2} \quad (2)$ <p>Next, we generalize our method to convolution of arbitrary set of Dirichlet series, that is, we propose a general formula linearizing the convolution of Dirichlet series as the sum of Dirichlet series with modified weights (see Theorem 3); its specialization produces new identities and recovers several identities derived earlier in the literature.</p>
Methodology	Interpretation and conclusions
<p>Main Theorem</p> <p>Our main result is a formula that expresses the n-fold convolution of a set of Dirichlet series as a sum of the same n Dirichlet series with modified weights.</p> <p>Theorem 1. For a set of $n \geq 2$ Dirichlet series $\{C_{k,r}\}_{k=1}^n$, we have</p> $\left(\prod_{k=1}^n C_{k,r} \right) (N+1) = \sum_{k=1}^n C_{k,r} \left(\prod_{j=1, j \neq k}^n C_{j,r} \right) (N+1) \quad (3)$ <p>The special case $n=2$ reads</p> $C_{1,r} * C_{2,r} (N+1) = C_{1,r} (N+1) + C_{2,r} (N+1) \quad (4)$ <p>We use our Main Theorem to obtain some new Ramanujan-type identities for Hurwitz and Bezel zeta function, generalized convolution of Bernoulli and Euler polynomials, one-parameter generalization of Ramanujan's identity for odd zeta values, a Ramanujan-type formula for squares of odd zeta values, and Higher Herglotz function analogue of Ramanujan's identity.</p>	<p>Specializations of Main Theorem</p> <p>Specialization 1. The following identity holds</p> $\sum_{k=1}^n \pi^{2k} (k!)^{2n-1} \zeta^{(n)}(k) = \frac{1}{2} \zeta^{(n)}(1) \zeta(1) + \frac{1}{2} \left(1 + \cot\left(\frac{\pi}{2}\right) \right) \zeta^{(n)}(1) \zeta(1) + \zeta^{(n)}(1) \zeta(1) \quad (5)$ <p>where $\zeta^{(n)}(k) = 2^n \sum_{m=0}^{\infty} \binom{n}{m} \zeta^{(n-m)}(k)$ is a series involving modified Bezel function of the second kind. Substituting a as $-i$ in Specialization 1 produces the following crucial identity</p> $\sum_{k=1}^n \pi^{2k} (k!)^{2n-1} (k-1) = \frac{1}{2} \left(\frac{1}{2} \zeta^{(n)}(1) - \frac{1}{2} \zeta^{(n)}(1) \right) \quad (6)$ <p>Now since we know that $\zeta(1)$ is irrational, we deduce that, at least one of the quantities $\zeta(1)$ and $\sum_{k=1}^n \pi^{2k} (k!)^{2n-1} (k-1)$ is irrational. Hence, it would be indeed a phenomenal breakthrough if the series turns out to be rational, for then it would prove the irrationality of $\zeta(1)$.</p> <p>Apart from these identities, several other analogous generalizations of Ramanujan's identity and specializations have been derived from our Main Theorem quite efficiently.</p> <p>Publication in The Journal of Classical Analysis</p> <p>Some part of this work has been published in The Journal of Classical Analysis, and it appears as Article 11 in Issue 2 in Volume 29. DOI: 10.1155/jca-2022-19-11</p>

Sarvesh Prabhu



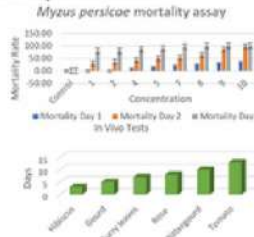

School - FIITJEE Junior College, Hyderabad, Telangana

Category - Biochemistry

Title - A Novel Study of the Bio-insecticidal Properties of *Annona reticulata* L.



A Novel Study of Bio-Insecticidal Properties of *Annona reticulata*
Sarvesh Prabhu, FIITJEE Junior College, Hyderabad, Telangana, India BCHM005

<p style="text-align: center;">Scientific Question</p> <ul style="list-style-type: none"> ➤ Can a non-toxic, easy to make, cost effective bio-insecticide be made available to farmer? ➤ What explains the properties of <i>Annona reticulata</i> as an insecticide? ➤ What is the effect of <i>A.reticulata</i> on crop pests? 	<p style="text-align: center;">Data Analysis and Results</p> <p style="text-align: center;"><i>Myzus persicae</i> mortality assay</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Repellent Effect Data</caption> <thead> <tr> <th>Concentration</th> <th>Repelled (9/10)</th> <th>Mean Time (min)</th> </tr> </thead> <tbody> <tr> <td>10% w/v</td> <td>9/10</td> <td>6.67</td> </tr> <tr> <td>5% w/v</td> <td>9/10</td> <td>4.26</td> </tr> </tbody> </table> 	Concentration	Repelled (9/10)	Mean Time (min)	10% w/v	9/10	6.67	5% w/v	9/10	4.26
Concentration	Repelled (9/10)	Mean Time (min)								
10% w/v	9/10	6.67								
5% w/v	9/10	4.26								
<p style="text-align: center;">Methodology</p> <ul style="list-style-type: none"> ➤ Plant authentication ➤ Extract preparation ➤ Collection of larvae and rearing ➤ In vitro mortality assay ➤ In vivo tests on plants ➤ Phytochemical screening and GCMS analysis ➤ Olfactometer test <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center; margin: 0;">Extract Preparation</p> <ul style="list-style-type: none"> ➤ Collection of leaf material ➤ Homogenization into fine paste ➤ Filtration ➤ Dilution (1:20) ➤ Application and use </div>	<p style="text-align: center;">Interpretation & Conclusion</p> <ul style="list-style-type: none"> ➤ In vitro tests and In vivo test showcase the efficacy of plant extract against common crop pests. It was noted that the extract is extremely effective and causes significant mortality in all three cases exceeding 85% at 10% w/v concentration. ➤ GCMS results indicated three active compounds <ul style="list-style-type: none"> • Phytol • Germacrene D • Caryophyllene  <p>➤ It was also concluded that the extract is a cost effective, bio insecticide which can be used on a wide variety of pests.</p>									



Team India To ISEF 2022 Blazer and Lapel Pin

Anushka Vivek Tonapi

Broadcom MASTERS International Winner from India



Anushka Vivek Tonapi

Broadcom MASTERS International winner from India 2022

School - Sri Kumaran Children home, Bengaluru, Karnataka

Category - Mathematics

Title - Effect of change in the angle on Heighway Dragon Fractal

Abstract -

I will be inspecting the Heighway Dragon Fractal, which was discovered by John Heighway, a NASA physicist and was trying to explore space-filling curves, hoping to find an efficient method to coat materials on spacecraft and discovered the Heighway Dragon through paper folding.

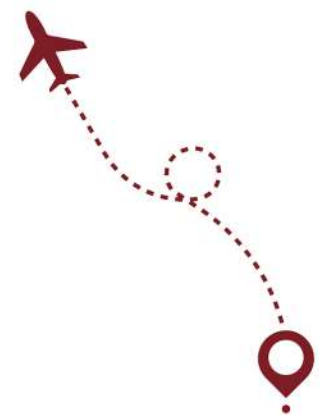
This project aims to explore how changing the angle between the generator (a straight line that is the 0th stage of the fractal) and the first iteration in the Heighway Dragon Curve affects its appearance. By the 'angle' I am referring to the angle produced when the generator is superimposed upon the first iteration of the fractal.

I used the LaTeX program to generate the images and the Lindenmayer System to alter the starting axiom and the rules associated to obtain a fractal image.

I first change the angle and observe the change in the appearance of the Heighway Dragon. Then I looked at angles that are odd multiples of which produce reflections of the original Heighway Dragon.

I also observed that there is a cyclic pattern among these angles, where the original Heighway Dragon is obtained every four angles into the sequence of odd multiples of 45° and angles that correspond to each other in this sequence produce identical images. I also found that supplementary angels produce fractal images which contain reflections of corresponding iterations in the fractal image produced by the other angle. Details of various angels used and their corresponding results will be discussed.





Team India to ISEF 2022 Flag Off Ceremony

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Team India to ISEF 2022 Flag Off Ceremony

Aryabhata Hall, Department of Science and Technology
Technology Bhawan, New Delhi



Team India to ISEF 2022 with DST Secretary - Dr. S Chandrasekhar (center), Head NCSTC - Dr. Praveen Arora (extreme left), COO-Exstemplar Foundation - Ms. Sharon E Kumar (extreme right)



Team India ready to present their projects to
Dr. S Chandrasekhar
Secretary, Department of Science
Government of India



Welcome address

Dr Parveen Arora

Head- National Council for Science & Technology Communication (NCSTC)
Department of Science and Technology,
Government of India



Ms Paula Golden

President, Broadcom Foundation
addressing Team India to ISEF 2022



Sharon E Kumar

Fair Director-
Initiative for Research and Innovation in
STEM
Chief Operations Officer-
EXSTEMPLAR Education Linkers
Foundation orienting about the program



Virtual and physically present Team India
participants interacting with

Dr. S Chandrasekhar,

Secretary, Department of Science and
Technology, Government of India



Keynote Address by

Dr. Srivari Chandrasekhar

Secretary, Department of Science and
Technology, Government of India



Participation in ISEF 2022

Participation in ISEF 2022



Team India At Regeneron International Science And Engineering Fair 2022 Atlanta, Georgia, USA

The Regeneron International Science and Engineering Fair or ISEF is the world's largest pre-collegiate STEM competition. Students from over 75 countries participate at what has come to be known as the Olympics of Science Fairs. The winners of the Initiative for Research and Innovation in STEM (IRIS) National Fair represent our country as Team INDIA and have been shining brightly at ISEF since the year 1999.

The IRIS National fair, a program of EXSTEMPLAR Education Linkers Foundation, is funded by the Department of Science and Technology, Government of India (DST) and Broadcom. It is an annual event where students of grades 5-12 compete to form Team India to represent the country at the Regeneron International Science and Engineering Fair held each year in the United States of America.

314 Indian students have participated in ISEF since 1999 courtesy their Winning at IRIS National Fair, and have won over 202 awards and accolades at ISEF. This year the 20 projects that made up team India brought home a collective of 22 awards making the Tri-colour soar higher than ever.



Special Awards won at Regeneron ISEF 2022

Chinmayi Ramasubramanian

Category- Animal Sciences

Title - Averting Human-Elephant conflict using machine learning on Elephant Vocalizations

Award -

1. Acoustical Society of America - 2nd Award of \$1000
2. US AID - 2nd Award of \$3000
3. University of Arizona - Scholarship



Rishita Ghosh

Category - Earth and Environmental Sciences

Title - Designing of nitrogen doped melamine foam-graphene-metal oxide heterostructure photocatalyst for industrial waste management

Award - Arizona State University - Scholarship



Sarth Prashant Chavan

Category- Mathematics

Title - On Ramanujan's identity for odd zeta values and its generalization

Award - American Mathematical Society - 1st Award of \$2000



Niranjan Baskaran

Category - Mathematics

Title - On worker optimal matchings in many-to-many markets with indifferences

Award - Mu Alpha Theta - Mathematics Honor Society - 1st Award of \$1500



Special Awards won at Regeneron ISEF 2022

Rushank Goyal

Category- Translational Medical Sciences

Title - A Quantum Machine Learning-Based Framework for Early Cancer Detection and Biomarker Identification Using Transcriptome Profiles

Award -

American Statistical Association - 3rd Award of \$500



Jaisal Kothari & Ashay Srivastava

Category - Translational Medical Sciences

Title - FlikcerAI: Resolution of Photosensitive Epileptic Visual Content with Spatio-Temporal Luminance Frequency Analysis

Award - Shanghai Youth Science Education Society



Devaj Gupta

Category- Chemistry

Title - Graphene oxide-based nanoformulations: A novel solution to manage Aedes aegypti

Award - American Mathematical Society - 1st Award of \$2000



Grand Awards won at Regeneron ISEF 2022

Rishita Ghosh

Category - Earth and Environmental Sciences

Title - Designing of nitrogen doped melamine foam-graphene-cnt-metal oxide heterostructure photocatalyst for industrial waste management

Award - 2nd Grand Award of \$2000



Chinmayi Ramasubramanian

Category- Animal Sciences

Title - Averting Human-Elephant conflict using machine learning on Elephant Vocalizations

Award - 2nd Grand Award of \$2000



Jaisal Kothari & Ashay Srivastava

Category - Translational Medical Sciences

Title - FlikerAI: Resolution of Photosensitive Epileptic Visual Content with Spatio-Temporal Luminance Frequency Analysis

Award - 2nd Grand Award of \$2000

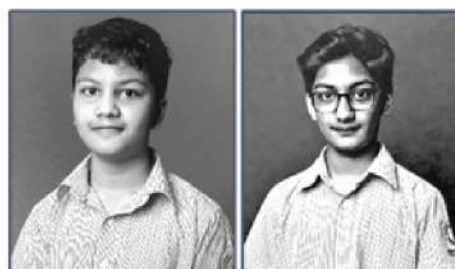


Aditya Mehta & Maanav Kothari

Category - Biomedical Engineering

Title - Mouthscope: Autonomous Detection of Oral Precancerous Lesions Using Fluorescent-Imaging and Computer-Vision

Award - 2nd Grand Award of \$2000



Grand Awards won at Regeneron ISEF 2022

Sara Varghese & Devika Girish

Category – Material Sciences

Title - Preparation of a Superhydrophobic and Oleophilic Membrane Inspired by Taro Leaves for Oil-Water Separation

Award - 2nd Grand Award of \$2000



Devaj Gupta

Category - Chemistry

Title - Graphene oxide-based nanoformulations: A novel solution to manage Aedes aegypti

Award - 3rd Grand Award of \$1000



Sarvesh Prabhu

Category - Biochemistry

Title - A Novel Study of the Bio-insecticidal Properties of Annona reticulata L.

Award - 3rd Grand Award of \$1000



Dhruv Sheth

Category – Plant Sciences

Title - Spatio-Temporal Generation of morphological features for plant growth prediction using progressively growing GANs

Award - 3rd Grand Award of \$1000



Abhijith Chandran

Category - Robotics and Intelligent Machines

Title - Penden: Making the Internet More Accessible to the Blind

Award - 3rd Grand Award of \$1000



Grand Awards won at Regeneron ISEF 2022

Vishnu Ram Sampathkumar

Category - Translational Medical Science

Title - Assist: Computational Glioma Grading and Prognosis With PET

Award - 3rd Grand Award of \$1000



Anagha Sampathkumar

Category - Behavioral Sciences

Title - UDAN: Unobtrusive Sentiment Alert Using Natural Language Processing

Award - 4th Grand Award of \$500



Sarth Prashant Chavan

Category - Mathematics

Title - An Elementary proof of Ramanujan's identity for odd zeta values and its generalization

Award - 4th Grand Award of \$500



Rushank Goyal

Category - Translational Medical Sciences

Title - A Quantum Machine Learning-Based Framework for Early Cancer Detection and Biomarker Identification Using Transcriptome Profiles

Award - Award - 4th Grand Award of \$500



Glimpses Of Team India At ISEF 2022





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IRIS in the NEWS

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Kochi students to represent India at international science fair

TNN / Updated: Feb 23, 2022, 10:20 IST

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Sarah Varghese (L) & Devika Grish

KOCHI: Two school students from Kochi, who carried out a project at the department of polymer science and rubber

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INTERNATIONAL CONFERENCE ON CLIMATE CHANGE HELD IN DELHI

FOR MORE DETAILS CONTACT

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Team India shines at world's largest pre-collegiate STEM completion in USA

The IRIS National fair is a programme of Extempor Education Linkers Foundation, funded by the Department of Science and Technology, Government of India and Broadcom.

ETGovernment • Updated: June 10, 2022, 11:11 IST

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Team India shine at Regeneron International Science and Engineering Fair held in USA

DC | Express Computer | Last updated: Jun 8, 2022



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Students From Kerala Got Selected To Represent India In Regeneron International Science And Engineering Fair In Us

Susmita Modak
Hans News Service | 23 Feb 2022 11:14 AM IST



HIGHLIGHTS

- One of the Top 20 Projects in the Research and Innovation (IRIS) National Science Fair, 2022, was a project created by 17-year-old students
- The students created a highly porous polymer membrane with remarkable oil absorption capabilities

Students From Kerala Got Selected To Represent India In Regeneron International Science And Engineering Fair In Us

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Team India bags 22 awards at Regeneron International Science and Engineering Fair 2022

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Student duo wins grand award at Iris National Fair 2021-22

FPJ Web Desk | Updated: Tuesday, March 08, 2022, 06:20 PM IST



CONGRATULATIONS

IRIS NATIONAL FAIR

SCIENCE CHAMPION AWARD WINNER

OMOTEC saw its mentoring receive a vote of confidence when three of its 12 national finalist-student teams won big at one of the country's much-coveted science tests, OMOTEC.

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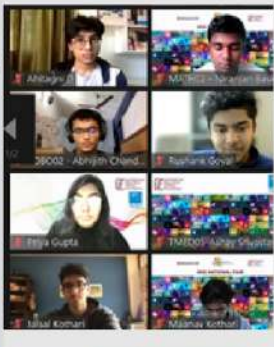
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