NEWSLETTER

JIS INSTITUTE OF ADVANCED STUDIES AND RESEARCH (JISIASR) KOLKATA, JIS UNIVERSITY

JIS School of Medical Science and Research Campus
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A NOTE from the Managing Director, JIS Group
Sardar Taranjit Singh

Welcome to our latest newsletter! We are excited to share updates on our institute's progress, including recent projects, innovations, and the remarkable achievements of our faculty and students. Since its inception in August 2019, the institute has made significant strides, and we take pride in our growing impact. This edition highlights notable publications, successful research initiatives, and key accomplishments that showcase our commitment to excellence. Looking ahead, we remain dedicated to innovation and growth, continuously striving for new milestones. From groundbreaking research to the launch of new programs, our collective efforts are shaping a promising future. With optimism and enthusiasm, we look forward to achieving even greater success together.

MESSAGE from the Director, JISIASR
Prof. Ajoy Kumar Ray

JIS Institute of Advanced Studies and Research, Kolkata, under JIS University, commenced its journey in 2019 with the goal of providing translational research-based postgraduate education. Its mission is to nurture young minds equipped to tackle the scientific and technological challenges of the 21st century. Addressing the need for high-quality, industry-oriented education, the institute offers specialized programs in some of the most relevant fields of science and technology. Currently, the institute houses four centers: Centre for Data Science, Centre for Renewable & Sustainable Energy Studies, Centre for Health Science and Technology, and Centre for Interdisciplinary Sciences. These centers collaborate closely, fostering interdisciplinary research while engaging with industries and R&D laboratories at both national and global levels. Experts from academia and industry actively contribute to teaching and research, ensuring a dynamic and practical learning environment.

THRUST AREAS for Research

Centre for Data Science (CDS):
Intelligent Intrusion Detection Systems
- AI-enabled Access Control Models
- ML in Signal & Image Analysis
- Generative AI & applications
- Large Language Models
- Natural Language Processing
- Intelligent Business Analytics
- Remote Sensing & GIS
- Neuro Signal Processing

Centre for Health Science and Technology (CHeST):
Evolution of Virulence & Antibiotic Resistance
- Human Microbiome in Health & Disease
- Machine Learning in Healthcare
- Medical Microbiology
- Molecular Modelling & Drug Design
- NGS Data Mining & Methodology Development
- Neuro Signal Processing

Centre for Interdisciplinary Sciences (CIS):
Materials & 3D Printing
- Sensor Technology
- Advanced Functional Materials
- Nano- materials & Protein Aggregation
- Bioorganic & Biomedical Sciences
- Polymer Science
- Paint & Coating
- Super Hydrophobic Material
- Corrosion & Surface Science
- Neuro Signal Processing

Centre for Renewable and Sustainable Energy Studies (CReSES):
Renewable Energy
- Solar PV & Applications
- PV Module Reliability & System Modelling
- Environmental Impact on Solar Power Generation
- Electric Vehicles & Battery Technology • Dust Sensor
- Biosensors & Biomedical Instrumentation

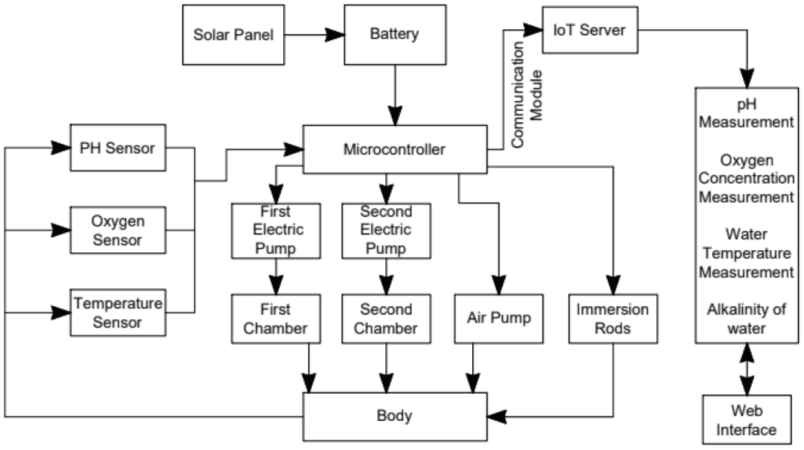
NEWSLETTER

JIS Institute Of Advanced Studies and Research (JISIASR) Kolkata, JIS University

RESEARCH Highlights

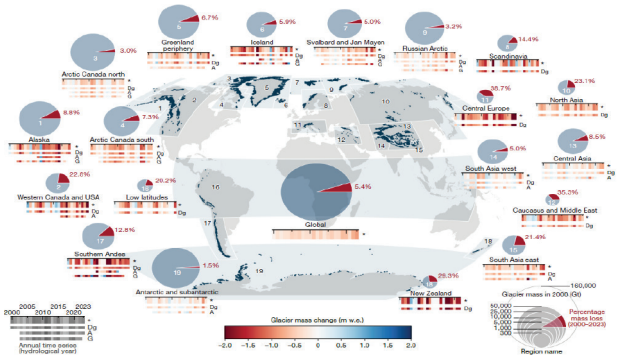
Water quality monitoring and management system for aquaculture

The present invention relates to a water quality monitoring and management system for aquaculture that is developed to foster a stable and 5 prosperous aquatic environment for fish farming by controlling crucial surrounding factors, including pH, oxygen levels, and temperature, to ensure ideal conditions for fish well-being and growth. In addition, the proposed system establishes a wireless communication network for real-time data transmission and remote system monitoring, facilitating efficient management practices.



Exploring corporate governance on post-ipo performance of R&D intensive new public firms

Building on corporate governance life cycle theory, this study aims to enrich the understanding of the influence of corporate governance on post-IPO performance of R&D intensive newly public firms. The findings of this study reveal that corporate governance is an essential factor for determining the long run post-IPO performance. Promoters who retained controlling ownership in the post-IPO period and board independence are positively associated with the firm's performance. Yet, a promoter's involvement in management can have adverse influence on the firm's performance. The outcome of the hypotheses draws support at the interplay of agency, stewardship, and resource dependence theory. The novelty of this study prevails in understanding the impact of corporate governance at the nexus of industrial and institutional contexts together.

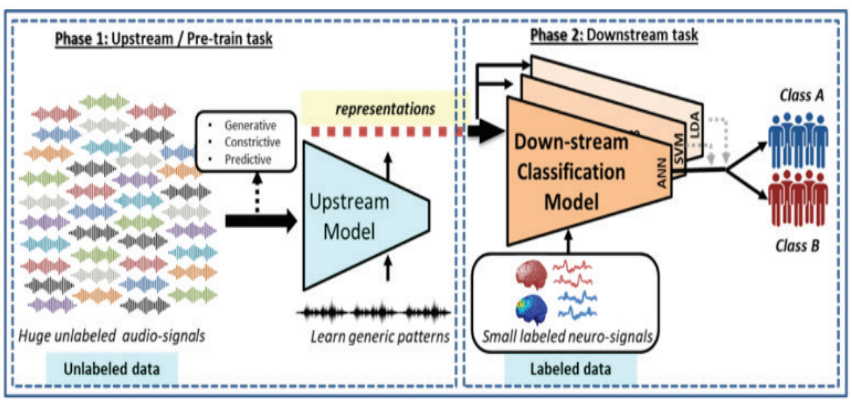


Community estimate of global glacier mass changes from 2000 to 2023

Glaciers are crucial indicators of climate change, driving sea-level rise and impacting ecosystems, freshwater resources, and global cycles. This study finds glaciers lost 273 ± 16 gigatonnes annually from 2000 to 2023, with a 36% increase in loss in the latter half. Since 2000, glaciers have lost 2%–39% of their ice regionally and 5% globally, exceeding Greenland's loss by 18% and doubling Antarctica's. The findings, based on standardized global data, refine previous estimates, highlight regional variations, and improve climate model calibration for more accurate sea-level projections.

Self-supervised machine learning approach for autism detection in young children using MEG signals

This research work develops a non-invasive method for early autism detection using MEG signals from young childrenThis work utilizes cross-domain pre-trained self supervised machine learning (SSL) framework, enhancing classification accuracy. Here, pretrain SSL model, Wav2Vec 2.0's final layer significantly outperform traditional handcrafted features. SSL approach is effective with limited labeled data in neurodevelopmental research.



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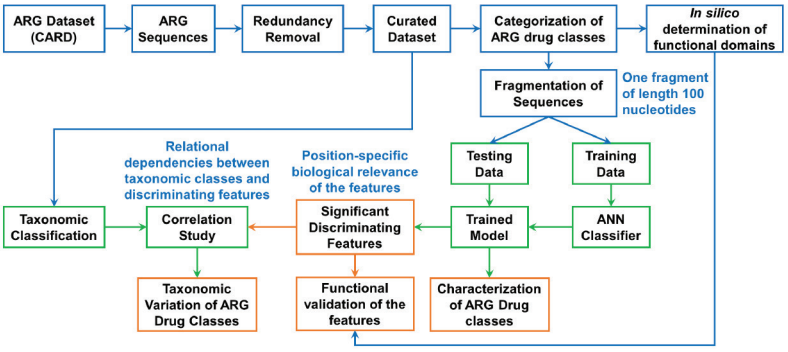
RESEARCH Highlights

MACI: a machine learning-based approach to identify drug classes of ARGs (antibiotic resistance genes) from metagenomic data

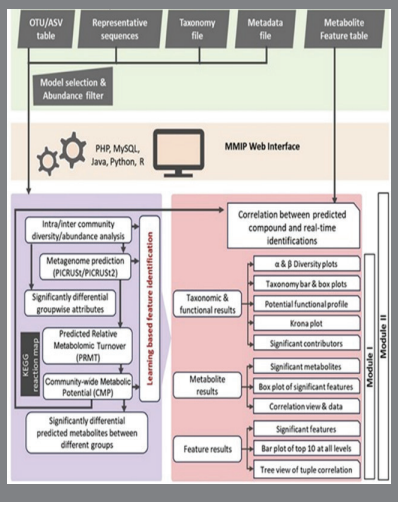


New methods are crucial for identifying antibiotic-resistant pathogens. We present MACI (Machine learning-based Antibiotic resistance gene-specific drug Class Identification), which predicts the drug class of antibiotic-resistant genes from metagenomic fragments. Trained on the CARD, with 5138 sequences across 134 drug classes, the model focused on 23 dominant classes. It achieved an average precision of 0.8389 ± 0.0747 and recall of 0.8197 ± 0.0782. real-time data transmission and remote system monitoring, facilitating efficient management practices. For multidrug-resistant classes, precision and recall were higher (0.8817 ± 0.0540 and 0.8620 ± 0.0493) compared to single drug-resistant categories (0.7923 ± 0.0669 and 0.7737 ± 0.0794). Five key drug classes, including "carbapenem;cephalosporin;penam" and "fluoroquinolone," were identified, showing class-specific patterns aligned with functional domains of resistance genes, crucial for rapid identification.

A web-based analytical and predictive tool MMIP (Microbiome Metabolome Integration Platform)

This is a unique free web-resource with key features:

- MMIP can compare the taxonomic content, diversity variation and the metabolic potential between two sets of microbial communities from targeted amplicon sequencing data.
- MMIP is capable of highlighting statistically significant taxonomic, enzymatic and metabolic attributes as well as learning-based features associated with one group in comparison with another.
- MMIP is capable of predicting linkages among species or groups of microbes in the community, a specific enzyme profile related to those organisms, or a specific compound or metabolite.



Exploring the resistome and virulome in major sequence types of Acinetobacter baumannii genomes: Correlations with genome divergence and sequence types

This research investigates the association between antimicrobial resistance genes, virulence factor genes, and Sequence Types (STs) in Acinetobacter baumannii from genomic information of 223 strains. The five major STs were identified from core phylogeny analysis as associated with geographic origin, with substantial differences in resistance genes and virulence factors. The results offer insights into the evolution of the pathogen and contribute to effective infection control measures.

Dopamine Toxicity Induces ROS-Dependent Death of Murine Neuroblastoma Cells: Impact on the Interactions of Cofilin With UCHL1 and MMP9

This research examines the effects of increased dopamine on protein interactions and stability of neuronal cytoskeleton in Parkinson's disease. Exposure to increased levels of dopamine resulted in ROS-dependent apoptosis, changed gene expression, enhanced MMP9 activity, and actin cytoskeleton degradation. All these findings indicate dopamine-induced protein interaction changes, providing potential targets for PD therapy.

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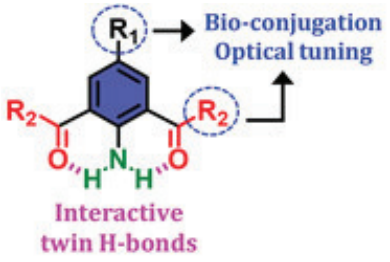
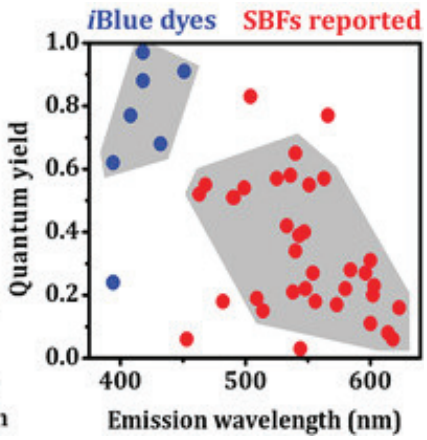
RESEARCH Highlights

Interactive twin intramolecular hydrogen bonds enable bright, s-blue emissive, environment-insensitive single -benzene fluorophores



- ✓ Deep-blue emissive (<450 nm)
- ✓ Super-bright (Φ_F: 0.6–1.0)
- ✓ Solid-state emission
- ✓ High chemo- and photostability
- ✓ Environment-resistant emission



Blue-fluorescent small-molecule dyes, especially in the S-blue region, are scarce. Functionalizing benzene with electron-donating and -accepting groups creates single-benzene fluorophores (SBFs) with adjustable emissions. Exploring interactive twin intramolecular H-bonds led to novel SBFs with promising bioimaging features. Aniline derivatives with two ortho carbonyl/carboxyl groups form these H-bonds, causing conformational restriction, reduced solvation, and larger HOMO-LUMO energy gaps compared to conventional SBFs.

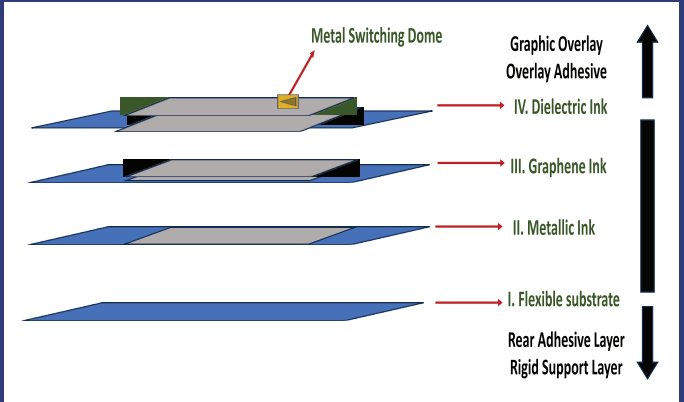
These new SBFs are S-blue emissive, bright, photo- and chemo-stable, solid-state emissive, and environment-insensitive. This versatile dye demonstrates potential in bioimaging through fluorescent probes, organelle-staining dyes, and a fluorescence-resonance-energy-transfer probe for hydrogen sulfide.

3D bioprinting for artificial organ design

3D Bioprinting for artificial organ design We are currently working on developing cellulose-based injectable and printable ink for successful bioprinting of artificial organs and organoids. Cellulose is an abundant and biocompatible material, known for its resistance to many chemicals, making it an ideal choice for tissue engineering applications. However, its low reactivity has traditionally limited its use in this field. To overcome this challenge, we are employing chemical modifications to adapt cellulose for various organ design. Our research includes utilizing different cellulose derivatives such as bacterial cellulose, carboxymethyl cellulose and cellulose acetate to bioprint. By exploring these different forms of cellulose, we aim to address the unique requirements of various tissue types. The primary objective of our research is to expand the potential uses of cellulose in tissue engineering, harnessing its natural properties and enhancing its functionality through future organ transplantation. We at Bioprinting lab, also use electrospinning of nanofibers for scaffold design and applications in skin grafting, bone-tissue engineering.

Graphene enhanced and engineered materials for membrane touch switch and other flexible electronic structures

This invention discloses formulations of mutually compatible sets of graphene, graphene-carbon, metal and dielectric inks for the fabrication of high-performance membrane touch switches (MTS). The compositions of these inks are optimized to achieve higher degree of compatibility with highly engineered polymeric substrates, thereby offering a holistic solution for fabricating high-performance MTS. These sets of materials can also be used for fabrication of sensors, biosensors and RFIDs on flexible substrates, such as polymers and papers.



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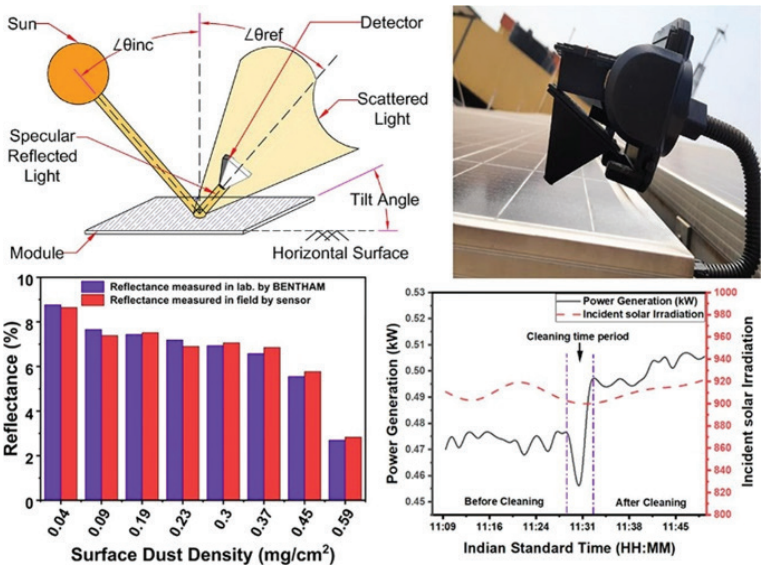
RESEARCH Highlights

Development of smart dust detector for optimal generation of SPV power plant by cleaning initiation



Enhancing solar cell and module efficiency is crucial, with millions invested in this goal. However, field-installed modules generate less power due to dust deposition. The lack of an effective on-demand cleaning system worsens this issue, impacting solar power plant performance. This paper presents a novel specular reflectance-based technique for detecting dust and triggering cleaning cycles as needed. Experiments analyzed reflectance parameters on dusty surfaces, leading to the design and fabrication of a dust sensor prototype. The sensor's working principle and theoretical model are explained, along with a microcontroller-based control unit for monitoring and activating the cleaning system.

Field tests showed the sensor achieved 95% accuracy, resulting in a 9% increase in daily power generation. A scheme for a MW-level plant cleaning system is proposed. These new SBFs are S-blue emissive, bright, photo- and chemo-stable, solid-state emissive, and environment-insensitive. This versatile dye demonstrates potential in bioimaging through fluorescent probes, organelle-staining dyes, and a fluorescence-resonance-energy- transfer probe for hydrogen sulfide.

Mobile Green Power Pack (MGPP): A sustainable solution for green house gas reduction during festive seasons

Energy has played a vital role in the evolution of human society. However, the carbon emission rate has risen significantly since the Industrial Revolution, posing a severe threat to our planet through global warming. To tackle this issue, a prototype of a Durga Puja Pandal that runs on renewable solar energy, based on Mobile Green Power Pack (MGPP) is developed. It is a portable system that includes solar modules and a battery in a vehicle that can be transported from one place to another. During the day, when sunlight is available the batteries get charged up and parallelly a direct connection is there to provide the required electricity. The portable battery system in parallel with the grid ensures uninterrupted power supply during nighttime. The proposed model can be used not only during events but also during natural calamities such as cyclones in affected areas. The use of this MGPP model for at least 50% of days of the year we can easily reduce 1.98mt of CO2 each year from a single pack.

Advanced attachment system for real-time intra-oral visualization and enhanced precision during dental procedures

Intra-oral operative procedures often face challenges due to limited visibility, negatively impacting outcomes. To address this, we propose incorporating a camera into a dental hand-piece for dynamic navigation, as no such equipment currently exists in the global market. Our project aims to develop a unique detachable accessory for dental hand-pieces, featuring a movable camera and an adjustable light source. This accessory will enhance visualization during dental operations, particularly in hard-to-reach areas. The system will display real-time video images on a monitor, providing comprehensive lighting of the operative field. Given the high humidity inside the mouth due to saliva and splatter, the camera will be coated with a hydrophobic layer to ensure image clarity. Additionally, the camera will be flexible to adjust its position, ensuring full visualization of the area being treated. Compatible with any commercially available dental hand-piece, this accessory will undergo field trials by dental experts to validate its effectiveness.

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Achievement Highlights

- **1st International Conference on Advanced Materials and Manufacturing (ICAMM-2024) was organized by** Centre for Interdisciplinary Sciences (CIS), supported by ANRF, DSIR and American Chemical Society (ACS) during 18th - 19th December, 2024 at JISMSR-JISIASR Campus, Santragachi, West Bengal, India.
- **International Seminar on "Pesticides and Bladder Cancer" was organized by** Centre for Health Science and Technology (CHeST) at JISMSR-JISIASR Campus. Speaker: Dr. Paramita M. Ghosh, Professor of Department of Biochemistry and Molecular Medicine from University of California Davis, USA.
- **SERB SSR-funded symposium on "Biotechnology, Bioinformatics, and AI: Essential for Research & Career Prospects in Health and Medicine" was organized by** Centre for Health Science and Technology (CHeST) on February 04, 2025 at JISMSR-JISIASR Campus.
- **Three Memoranda of Understanding (MoUs) were signed** (Two with national industrial partners: **Espin Nanotech Pvt. Ltd.** Kanpur, and **Guardian**, Kolkata, and **one with Gdansk University of Technology, Poland)** emphasizing the importance of collaboration between academia and industry.

Student Achievements of 2024-25

CII-ITC Centre of Excellence for Sustainable Development
IISWBM
CII Confederation of Indian Industry

Certificate of Participation

This is to certify that Mr./Ms. **Madhusree Bhattarjee**
of **JIS Institute of Advanced Studies & Research**
Secured 2nd Place in Poster Competition of One-Day Seminar on **Roadmap for Achieving Sustainable Development Goals** organised by MBA-Public Systems in association with CII-ITC CESD on April 2, 2024 at IISWBM, Kolkata.

SUEMA ARORA, DEPUTY DIRECTOR GENERAL, CONFEDERATION OF INDIAN INDUSTRY
PROF. (DR.) K. M. AGRAWAL, DIRECTOR (ACTING), IISWBM
PROF. (DR.) PRADIP K SIKDAR, HOD, MBA-PS, IISWBM

- Ms. Madhusree Bhattacharjee, M.Tech. student of CReSES, JISIASR secured 2nd place in poster competition of one-day seminar on 'Roadmap for Achieving Sustainable Development Goals' organised by MBA-Public Systems in association with CII-ITC CESD on 2nd April, 2024 at IISWBM, Kolkata.
- Ms. Madhusree Bhattacharjee, M.Tech. student of CReSES, JISIASR secured 2nd place in poster competition of one-day seminar on 'Roadmap for Achieving Sustainable Development Goals' organised by MBA-Public Systems in association with CII-ITC CESD on 2nd April, 2024 at IISWBM, Kolkata.
- Dr. Shayeri Biswas recived PhD-Gold Medal (Best Research credentials) from Centre for Interdisciplinary Sciences (CIS), JISIASR.
- Dr. Chandan Pan from Centre for Data Science (CDS) was awarded a doctorate degree this year.
- Dr. Stephy Mol Robinson from Centre for Health Science and Technology (CHeST), convocated with doctorate degree this year.
- Gouripriya DA, student of Centre for Interdisciplinary Sciences (CIS) department, received the best poster award in ICAMM- 2024 with one year ACS membership.

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Sponsored Research Project Activities only for 2024-25

SL. No.	Name of the Project	Investigator(s)	Funding Agency
1.	Synthesis and evaluation of mitochondria-targeted multi-gated therapeutics (theranostics) for tumor suppression in vivo: An approach to prospective preclinical benefit	Sankarprasad Bhuniya	SERB-CRG
2.	Development of a computational pipeline to detect cross-species convergence of bacterial gene inactivation via truncation mutations: considering the adaptive evolution of two most predominant pathogens causing urinary tract infections, Escherichia coli and Klebsiella pneumoniae, as a model system	Sujay Chattopadhyay	SERB-MATRICS
3.	Clonotyping of Shigella spp. – a novel machine learning based approach to combat shigellosis	Sujay Chattopadhyay Kausik Basak Swalpa Kumar Roy	WBDSTBT
4.	Attachment facility for intraoral visualization of real-time image during dental procedures	Sugato Ghosh	WBDSTBT
5.	Developments in Indian Disease Database: Updation, Analysis, and inclusion of Complex Diseases	Sandip Paul	DBT
6.	Flavonoid-Conjugated Silver Nanoparticles: A Significant Platform for Amending the Treatment of Systemic Amyloidosis	Pooja Ghosh	WBDSTBT
7.	Studies of homoeopathic medicines as nano-formulation in application to colon cancer therapy and insights into cancer cell death	Sankarprasad Bhuniya	CCRH
8.	GadgetsGhatao: Developing Neurosignal Biomarkers to Combat Screen Addiction Disorder	Kasturi Barik	ANRF
9.	Investigation of chromatin modifications induced by homoeopathic medicines in patients with type 2 diabetes mellitus - an exploratory study	Farhat Afrin	CCRH
10.	Physico-chemical investigation of natural resource derived homeopathic medicines and its theraputic effects	Prosenjit Saha	CCRH
11.	Monitoring shelf-life of homoeopathic mother tinctures through analysis of active principles and bioactivity: exploring the influences of aging, temperature, storage duration, and container material	Subhankar Singha	CCRH
12.	Fluorescence-based optical analysis of homoeopathic medicines in dilutions: Investigating (nano) particle nature and bioactivity	Barun Das	CCRH
13.	Exploring the efficacies of homoepathic drugs in ameliorating the treatment of diabetes: In-vitro and in-vivo investigation	Pooja Ghosh	CCRH
14.	AI-enabled deep neural predictive model for assisted decision-making in homoeopathic medication	Chirantana Mallick	CCRH
15.	Using unsupervised learning to detect the patterns of symptoms of common homoeopathic remedies	Saptarshi Das	CCRH
16.	Exploring bowel nosodes from preparation to therapeutic applications.	Kamakshi Sureka	CCRH

RESEARCH Supports (Extra-mural)

Since its inception in August 2019, JISIASR Kolkata has bagged 32 research projects worth of approximately INR 9.56 Crores from various funding agencies.

SERB DIA

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Ministry of Science & Technology
Government of India

CSIR INDIA

Ministry of Earth Sciences
Govt. of India

DSTBT

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ANRF

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LIST OF COURSES for AY 2025-26

Centre for Data Science (CDS):

1. 2-Year MTech in Computer Science and Engineering (with specialization in Data Science) – For Regular Candidates and Working Professionals
2. 2-Year MSc in Computer Science
3. PhD (Areas: AI and machine learning / Medical image processing / Business analytics / Cybersecurity / Natural language processing / Blockchain / IoT / Satellite image processing / Cryospheric science)

Centre for Health Science and Technology (CHeST):

1. 2-year MSc in Medical Biotechnology and Bioinformatics
2. 2-year MSc in Medical Microbiology
3. PhD (Areas: Evolution of virulence and antibiotic resistance / Host-pathogen interactions / Human microbiome in health and disease / Machine learning in healthcare / Medical microbiology / Medical image analysis / Molecular modelling and drug design / NGS data mining and methodology development)

Centre for Interdisciplinary Sciences (CIS):

1. 2-year MSc in Paint and Coating Technology
2. MS (by Research) in Paint and Coating Technology
3. 2-year MSc in Nanobiotechnology
4. 2-year MSc in Polymer Science and Technology
5. PhD (Areas: Materials and 3D printing / Paint and coating technology / Sensor technology / Advanced material research / Immuno-Epigenetics / Nanomedicine / Nanomaterials and protein aggregation and allied domains)

Centre for Renewable & Sustainable Energy Studies (CReSES):

1. 2-year MTech in Renewable Energy and Electric Vehicle Technology – For Regular Candidates and Working Professionals
2. 2-year MSc in Renewable Energy
3. PhD (Areas: Renewable energy and applications / Smart and self-cleaning technology / Radiative cooling technology / Electric vehicle and battery / Smart sensor system and instrumentation / Biomedical instrumentation / Electronics design and instrumentation / PV system reliability / Prosthetics & orthotics)

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