



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

CSR Project Catalogue

2023 - 2024



CSR PROJECT CATALOGUE

2023-2024

About

Ranked first in India and 149th globally in Engineering and Technology by the Quacquarelli Symonds (QS) rankings, IIT Bombay is committed to developing innovative technology solutions that will drive nation-building and catalyse societal transformation. The Institute's R&D span diverse areas including Education; Sustainable Development and Climate Action; Social and Policy Development; Women Empowerment; Skills and Entrepreneurship, Rural Development, and Agriculture and Healthcare.

IIT Bombay is determined to partner with corporates that are committed to making a difference through their CSR efforts in the research domains mentioned above. As we continue to make breakthroughs in these emerging areas, we invite corporates to join our journey of excellence and offer them the opportunity to amplify their CSR endeavours. These partnerships will play a key role in contributing to IIT Bombay's mission of enabling deep-tech innovations and impactful solutions that have the power to build an equitable and stable society.

By partnering with IIT Bombay, corporates can unlock the true potential of technology, foster sustainable growth, and create a brighter future for generations to come.

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EDUCATION



Project Title

CHILDREN'S BOOKS IN DIFFERENT VERNACULAR LANGUAGES

Objective

To make beautifully illustrated books for children between the ages of 1-5 years in various fields like science, engineering, history, etc. in languages like Hindi, Sanskrit, and other vernacular languages.

Project Description

India is a land of stories and storytellers. Moreover, there are a lot of stories to be told related to science and engineering. Most of the current children's books with decent-quality illustrations are published in English.

Finding good storybooks with beautiful illustrations is extremely rare for Hindi and Sanskrit books for kids aged between 1-5 years old. This augments children's curiosity and reading abilities in other languages.

Expected Impact

It would provide story books in languages like Hindi, Sanskrit, and other vernacular languages for children between the ages of 1-5. This will help children learn different languages from an early age.

PROJECT DETAILS

Principal Investigator:

Prof. Aparna Singh

Theme:

Education

Budget:

INR 8 Lakhs

Technology Readiness Level:

8

Project Duration:

2 years

UN SDG No:

SDG 4

Project Title

SENSITIZATION WORKSHOPS FOR THE IIT BOMBAY COMMUNITY ON THE INCLUSION OF PERSONS WITH DISABILITIES

Project Description

To create and execute sensitization workshops leading to awareness among students and faculty at IIT Bombay on the inclusion of Persons with Disabilities (PwD).

Objective

To make beautifully illustrated books for children between the ages of 1-5 years in various fields like science, engineering, history, etc. in languages like Hindi, Sanskrit, and other vernacular languages.

Expected Impact

There will be 5 workshops held every semester and each of them will target a different group. On average, the workshops are expected to include about 100 participants. The direct impact may be on around 1000 campus residents. But the secondary impact will be on a much larger number due to the ripple effect caused by the presence of several sensitized individuals in the population over a period of time.

PROJECT DETAILS

Principal Investigator:

Prof. Swati Pal and
Prof. Sridhar Iyer

Theme:

Education

Budget:

INR 15 Lakhs

Technology Readiness Level:

NA

Project Duration:

1 year

UN SDG No:

SDG 4

Project Title

SUSTAINABILITY BEGINS AT HOME

Objective

- To evaluate learning outcomes from the target groups about sustainable living concepts
- To disseminate potential and impactful sustainable living concepts emerging from the study in the K12 education system

Project Description

Sustainable living, where individuals adopt lifestyles that reduce the use of the earth's limited natural resources, is an urgent need of the day to combat climate change. Making an early impression and emphasizing the need to judiciously use services such as electricity, water, and transportation among school kids may have a significant impact on them in the long run.

In this project, the team would engage with school kids of two different age groups - (i) grades 3-4 (ages 8-10) and (ii) grades 7-8 (ages 12-14) - to explain concepts such as star ratings on appliances, water shortage and fixes, renewable energy sources, and the recycle-reduce-reuse paradigm. The concepts will be taught through in-class demonstrations, suitably designed apps, and other forms of engagement. Over the course of the project, we expect a set of learnings to emerge which can then be used to actively work out a more detailed plan of disseminating such information in the K-12 education system.

Expected Impact

Key concepts of sustainable living such as recycle-reduce-reuse, renewable energy sources, composting, the impact of public versus private transport, etc. will be introduced to the two identified age groups by building on concepts they already learn via regular education. Modules based on small experiments/demonstrations will be developed to explain these concepts to students. Modules may involve the use of kits/apps etc.

We expect an immediate impact of this endeavour to manifest in the younger generation who will be the future pillars of our society. The project will give us insights on how to reach out to kids and create modules that are effective for teaching elements of sustainable living at a level they can understand and imbibe. We will use the learnings generated from this project to devise a more elaborate plan to impact K12 education at a future stage. Roughly, 2000 children will be part of the initial trial and there is a possibility of including 10000 children with online interactive modules.

PROJECT DETAILS

Principal Investigator:

Prof. Anupama Kowli

Theme:

Education

Budget:

INR 20 Lakhs

Technology Readiness Level:

3

Project Duration:

2 years

UN SDG No:

SDG 11

Project Title

SHABDAMITRA - A DIGITAL AID FOR TEACHING AND LEARNING INDIAN

Project Description

Hindi Shabdmitra promotes the following aspects with the help of audio-visual learning aids:

- **Experiential Learning:** Where digital learning redefines the boundaries of a classroom and students learn the application of a concept through dynamic concepts
- **Flipped Classroom Approach:** This is the reversal of traditional teaching which provides active learning

Objective

Shabdmitra is a tool (online as well as offline) that helps a teacher as well as a student teach/learn a natural language in an active classroom effectively. It uses Hindi Wordnet, which is further augmented with audio-visual features, and grammatical properties, and is presented in a learner-friendly layered format.

Mastering vocabulary is a major part of language learning. Understanding a word involves committing to memory its form, capturing its relationship with other words, and finally knowing how and where to use it. Word relationships and meaning relationships are very helpful in firmly establishing word meanings and word usage in the mind of learners. For example, the fact that 'horse' is a kind of 'animal' (hypernymy relation), 'uniform' is the opposite of 'diverse' (antonymy relation), 'cultivate' has as its object 'land' (argument entailment relation), greatly assist in understanding these words. Wordnet, an online lexical database, based on psycholinguistic principles, is built around lexical and semantic relations which are cognitive universals, i.e., these relations are found in all languages. Such a resource can be a valuable aid in teaching a language.

Expected Impact

The tool was piloted in 26 schools and each one of them found it useful. The end users of this elearning tool are students, teachers, parents, and self-learners. It is developed for formal teaching learning environments as well as informal learning environments.

PROJECT DETAILS

Principal Investigator:

Prof. Pushpak Bhattacharyya

Theme:

Education

Budget:

INR 30 Lakhs

Technology Readiness Level:

NA

Project Duration:

1 year

UN SDG No:

SDG 4

Project Title

LOW-COST MICROSCOPES FOR EDUCATION

Objective

To disseminate low-cost hand-held microscopes, smartphone-based microscopes, and convertible webcam-based microscopes.

Project Description

Conventional optical microscopes are expensive and, hence, largely inaccessible to students. Many schools and colleges cannot afford to buy multiple units for laboratories due to high costs. Consequently, students in schools and colleges often do not get a chance to handle commercial microscopes due to fear of damage and mishandling. In addition, conventional microscopes are not portable in case one has to carry these while travelling for conducting outreach activities in remote places.

The project focuses on alternative low-cost microscopy solutions to be used for teaching in large classrooms, conducting training courses for school teachers, and Quality Improvement Programs (QIP)/Continuing Education Program (CEP) courses for faculty members of engineering colleges. Over the last three years, our team has developed three different types of microscopes, the design and development of which were motivated by limitations of already existing microscopy solutions.

A short video of these different types of microscopes is available on the following link: [Low Cost Microscopes for Education - YouTube](#)

Expected Impact

The outcomes are training workshops for microscope building for teachers working in underprivileged schools and colleges. The target is to cover 360 teachers and 3600 students at underprivileged schools and colleges assuming that each teacher trains 100 students in his/her school.

PROJECT DETAILS

Principal Investigator:

Prof. Ambarish Kunwar

Theme:

Education

Budget:

INR 30 Lakhs

Technology Readiness Level:

NA

Project Duration:

2 years

UN SDG No:

SDG 4

Project Title

POPULARIZING HIGHER MATHEMATICS IN SCHOOLS

Objective

- To introduce mathematical content and some basic aspects of mathematical reasoning via short story books
- To attract students toward mathematics via the narrative, and at the same time teach them the formalism of the subject
- To provide exposure to mathematically inclined students towards aspects of mathematics typically not seen in school

Project Description

Over the past two decades, mathematics has appeared in mainstream media via many mediums like books, puzzle books, movies about famous mathematicians, articles explaining an important result in mathematics, or a new topic of research, etc. Some of these clarify key concepts or are useful to already familiar audiences. These aid large-scale mathematical thinking and often popularize an aspect of the subject.

Research in elementary education suggests that narratives help children learn a subject better. Research in mathematics education also suggests that a narrative without reiterating the methodology and some amount of formalism can cause students to misunderstand the concept. So, through this project, we want to introduce mathematical content via short story books and some basic aspects of mathematical reasoning and formality.

Expected Impact

With a two-fold goal, this project will first introduce concepts of mathematical thinking and reasoning at the school level and develop ease in learning mathematics among the students. Second, it will let mathematically inclined students get qualitative exposure to the subject and further their interest. We expect that mathematical formality, when learnt at a younger age, will become second nature to the students.

The proposed structure will encourage undergraduate students in mathematics to learn to write the narrative form, keeping in mind the formalism of mathematics teaching and learning. Further guidance will be provided to inclined students to develop this unique master skill that will combine these different skills often developed in isolation from each

PROJECT DETAILS

Principal Investigator:

Prof. Rekha Santhanam

Theme:

Education

Budget:

INR 33 Lakhs

Technology Readiness Level:

NA

Project Duration:

3 years

UN SDG No:

SDG 4

other. These storybooks will aim to cover several school levels (6-8 and 9-12 standards) and will assume only what is commonly taught in schools as background information e.g., NCERT books. Each book will introduce a different concept. Currently, undergraduate students majoring in mathematics at IIT Bombay have been working on key topics and plots for these books. We expect that through these books, young audiences will become familiar with mathematical reasoning and conceptualization models.

Project Title

TCHERLY: A DASHBOARD FOR TEACHERS' SELF-REFLECTION AND STUDENT ENGAGEMENT

Objective

- To improve the logistical framework to extend Tcherly for classroom use
- To enhance the technology backend of the Tcherly prototype for mass adoption

Project Description

In large classrooms, students often cannot voice their opinions due to fear, shyness, lack of opportunity, etc. Similarly, the teacher sometimes does not understand students' blind spots.

To meet this challenge, the team has designed a system to facilitate the collection of student feedback about the teaching method. Students will provide anonymous feedback on a phone or tablet on four aspects - whether the lecture is engaging, boring, difficult, or easy. They can also indicate reasons for their choice. The aggregate data of the students (not individual) is then provided to a teacher on a teacher-facing dashboard so that teachers can take remedial action, either in the next class or learn from it for future sessions. The solution is currently geared toward online video lectures but would apply equally well to face-to-face classrooms with minor modifications.

Expected Impact

With a two-pronged solution approach, anonymous feedback can be taken from students to inform the teacher about their teaching at an unprecedented granularity (one-minute resolution) where they can change slides/figures/explanations. This can be useful for:

1. Self-reflection by teachers to improve their instruction (changing slides, figures, etc.)
2. For administrators to see how teachers are using this feedback to improve their instruction by comparing class feedback between years
3. Engage students by making them more participatory in their learning process and giving them some agency

The prototype is in place, and more details are available at [Tcherly](#)

PROJECT DETAILS

Principal Investigator:

Prof. Ritayan Mitra

Theme:

Education

Budget:

INR 60 Lakhs

Technology Readiness Level:

7

Project Duration:

3 years

UN SDG No:

SDG 4

Project Title

MATHPAL: PERSONALIZED LEARNING ENVIRONMENT

Objective

- To provide personalized and adaptive feedback to learners based on their performance and behaviour while they interact with an intelligent tutoring system (ITS). The learners will work on complex decision-making tasks
- To model learners' behaviour using data collected via multiple sensors (eye trackers, webcam, log files, screen captures, audio)
- To develop machine learning models to predict learners' affective states such as boredom, confusion, surprise, frustration, delight, engaged using facial expressions and log data
- To conduct studies in classrooms using mobile eye trackers and other software to model learners' interaction behaviour in the natural settings
- To study the impact of personalized feedback provided based on interaction behaviour on learning

Project Description

The existing online learning environments provide learning content and assessment to test the learning skillset of the learners. However, the learning processes are not traced and used to provide personalised learning content. To address this challenge, the team has developed a webbased learning environment that collects learners' interaction data such as eye trackers, and facial expressions, and analyses their learning behaviour to provide adaptive content.

Expected Impact

The team has been able to demonstrate the impact of an online learning environment using Math content for Class 6 students. The students who interacted with the system and followed all the remedial content provided were able to perform better in the system compared to the students who didn't follow the advice. The project is expected to develop a complete system for Class 6 Math and Science and make it available to all learners. The project aims to reach 100,000 students through this learning environment.

PROJECT DETAILS

Principal Investigator:

Prof. Ramkumar Rajendran

Theme:

Education

Budget:

INR 1 Crores

Technology Readiness Level:

8

Project Duration:

3 years

UN SDG No:

SDG 4

Project Title

VIRTUAL PATIENT SYSTEM FOR ENHANCING CLINICAL REASONING SKILLS OF MEDICAL STUDENTS

Objective

To help medical students train their clinical reasoning skills and improve their decision-making skills through feedback

Project Description

The project aims to create a Virtual Patient system to help medical students train their clinical reasoning and improve their decision-making skills through feedback.

The Virtual Patient system includes a digital representation of the patient which will present symptoms to the user. Users will be able to ask this patient a question in text or speech and the reply will appear as speech and text/subtitle on the VR screen. They can also virtually examine it using various onscreen tools. The user will be able to request for additional tests to be conducted on the virtual patient. The user will then make a diagnosis based on the examination results. This will be matched with the examination results that have been pre-fed into the system. The user will be scored on the accuracy of their diagnosis and based on the final results, they will be provided medical information/lectures/publications to study and analyse the case further.

Expected Impact

The project is a way to reflect the user's skills in diagnosing a patient. By studying actual clinical cases, it is possible to develop symptoms corresponding to a particular disease.

By obtaining this data, we can create a virtual patient entity to mimic an actual patient's conditions. The symptoms, along with the correct diagnosis, are fed into the tool. A predefined set of answers are provided for each patient created. Through AI, users can have conversations with the virtual patient, and the virtual patient can interact with the user by understanding the questions through speech recognition and NLP. The user can then request a few tests and provide a diagnosis for the illness. This is matched with the results that are already available.

PROJECT DETAILS

Principal Investigator:

Prof. Rohit Srivastava

Theme:

Education

Budget:

INR 1.2 Crores

Technology Readiness Level:

2

Project Duration:

1 year

UN SDG No:

SDG 3

Project Title

PULSE: PRACTICAL AND UPBEAT LABS FOR SECURITY EDUCATION

Objective

To develop security labs that can be established at scale across different student operating systems with minimal setup costs and with support for automated assessment

Project Description

Security education is critical in today's digital age for protecting sensitive information, mitigating cyber threats, and maintaining a secure work environment. Hands-on labs are a necessity along with theory courses to create a generation of students with the skills that industry and government need at scale. The project aims at developing security labs that can be conducted at scale, across different student operating systems with minimal setup costs and with support for automated assessment. The goal is to develop at least 5 comprehensive and engaging labs in each of the core security subjects, totaling around 20 labs.

Expected Impact

It would benefit tens of thousands of students over the next few years. It would also benefit hundreds of industries and government organizations that seek this talent.

PROJECT DETAILS

Principal Investigator:

Prof. Kameswari Chebrolu

Theme:

Education

Budget:

INR 1.2 Crores

Technology Readiness Level:

NA

Project Duration:

2 years

UN SDG No:

SDG 9, 17

Project Title

MAITREYI: CONVERSATIONAL AGENT WITH SUMMARIZATION AND EMOTION UNDERSTANDING CAPABILITY

Objective

To create a conversational agent with the capability of answering queries, engaging in dialogue, query-directed summarization, and being aware of sentiment and emotion

Project Description

Smart Assistants on our phones/laptops are very adept at answering short factual answers. However, they lack the ability to perform well with open-ended questions. Assume questions like “What helps cats see in the dark?”, “Why do Indian trains find it hard to operate in the fog?”- answering these requires not only task-specific knowledge (biology of the eyes of a cat; friction coefficient of hot-rolled steel in the presence of water) but also a way of concisely and succinctly presenting the information that may not be restricted to a single phrase. Present-day QA systems would perform poorly on such open-ended questions as they are mostly trained with the objective of finding short phrases. A conversational agent called “Maitreyi” has been proposed to fulfil this need.

Expected Impact

Conversational AI agents are the need of the hour and are in huge demand now. Once implemented, the project has the potential of being incorporated into tens of thousands of installations.

PROJECT DETAILS

Principal Investigator:

Prof. Pushpak Bhattacharyya

Theme:

Education

Budget:

INR 1.32 Crores

Technology Readiness Level:

7

Project Duration:

3 years

UN SDG No:

SDG 4

Project Title

NATIONAL CENTRE FOR MATHEMATICS EDUCATION

Objective

To raise the quality of research carried out by Ph.D. students and faculty members and for active collaboration of academia and industry for solving industrial problems which require crucial input from mathematics. The aim is to offer about 50 schools and workshops at IIT Bombay

Project Description

IIT Bombay and the Tata Institute of Fundamental Research Mumbai (TIFR Mumbai), both funded by the Central government, established the National Centre for Mathematics (NCM) as a virtual Centre in 2011. The Centre has conducted about 300 workshops for Ph. D. Students, post-doctoral fellows, young faculty, and college teachers during the last 10 years. Over the next five years, TIFR Mumbai and the National Board for Higher Mathematics (DAE) will provide partial funding for holding 400 schools and workshops for the benefit of students, teachers, and industry professionals. IIT Bombay has earmarked space for the Centre and prepared plans for an academic block and a guest house block. Plans for the construction of a building have been prepared. This five-year project aims to raise Rs. 32.02 crores for the construction of the building.

Expected Impact

The Centre is expected to be a significant agent of change in the mathematical landscape of India primarily by creating a large pool of brilliant mathematicians for universities, colleges, institutes, and industry. This will be achieved by providing opportunities for advanced training and collaboration to research scholars, college teachers, senior researchers, and industry professionals.

The project would accelerate the use of mathematics and statistics in technological development. This requires many years of training and enhancement of awareness among industry professionals. About 2000 students, teachers, and industry professionals will be trained each year.

PROJECT DETAILS

Principal Investigator:

Prof. Jugal Verma

Theme:

Education

Budget:

INR 32 Crores

Technology Readiness Level:

NA

Project Duration:

> 3 years

UN SDG No:

SDG 4



SUSTAINABLE DEVELOPMENT AND CLIMATE ACTION



Project Title

REVIVAL OF INDIAN TRADITIONAL LIME CONSTRUCTION TECHNOLOGY

Objective

- Lab-scale manufacturing of traditional lime mortar with required fresh and hardened properties
- Natural and accelerated carbonation studies on lime mortar samples made with red mud and bio-admixtures to establish the benefits and properties of each
- Development of design mixes of lime mortar

Project Description

Lime (calcium oxide) which was used as the main building material in ancient times has now been replaced with cement, for its fast setting and hardening properties. In India, most of the centuries old heritage structures are made of lime binder, which is of proven durability. The indigenous Indian traditional lime mortar uses raw materials such as jaggery, different cocktails of plant extracts, seeds, eggs, etc., which are not documented and practiced anymore.

In this current scenario, there is a dire need to find an alternative to cement (which is the biggest cause of CO₂ emission from the construction industry). Reviving sustainable lime-based mortar/binder systems that are less CO₂-intensive and CO₂-absorbing is the need of the hour. Almost 53% of Indian construction still incorporates masonry-style methods. So, if revived, lime mortar can have large-scale applications in India. Rural constructions and small and medium-scale buildings can opt for lime mortar using locally available material instead of cement. The building of lime manufacturing also enhances employment and skill development in rural communities, which, currently, is a forgotten art.

The current proposal attempts to unwind the raw materials used in various regions of India and mix the composition and manufacturing methodology of Indian traditional lime technology. This will eventually be used to standardize the practice of lime application. The study also will address reducing the curing period of lime by enhancing carbonation, thus increasing its sustainability potential as well.

PROJECT DETAILS

Principal Investigator:

Prof. Swathy Manohar

Theme:

Sustainability (Environment, Climate, Solar Energy)

Budget:

INR 9 Lakhs

Technology Readiness Level:

3

Project Duration:

2 years

UN SDG No:

SDG 7, 11, 12 & 13

Expected Impact

- Skill development and rural employment - approximately 500
- Artisans who can work for ASI (Archaeological Survey of India) and repair the heritage constructions with compatible lime mortar - 50
- Inhabitants of Indian cities like Mumbai where the construction industry and industrial wastes take a toll on the environment with proliferating CO₂ emissions. This sustainable innovative solution of lime-based binders will thus benefit everyone

Project Title

DEVELOPMENT OF HIGH-STRENGTH STEELS FOR RAILS AND DEFENCE APPLICATIONS

Objective

- Development of new grades of steel
- Mechanical testing of the new grades of steel

Project Description

Most materials in structural applications require a combination of high strength, toughness, and ductility, which ensures their long lives. In the academic domain, there are many possibilities for designing new steel grades. Many of these grades have the potential to emit extraordinary mechanical properties. The same grades can be potentially used in defence applications and the railways.

Expected Impact

Crash safety with advanced high-strength steels continues to increase even as it fuels the economy and increases engine performance, and top speeds, which are a result of the reduced weight.

PROJECT DETAILS

Principal Investigator:

Prof. Aparna Singh

Theme:

Sustainability (Environment, Climate, Solar Energy)

Budget:

INR 10 Lakhs

Technology Readiness Level:

6

Project Duration:

2 years

UN SDG No:

SDG 7, 11 & 13

Project Title

RECYCLED POLYMER COMPOSITE PANELS FROM PLASTIC AND ALUMINA FOIL WASTE

Objective

- Design and fabricate the laboratory scale extruder and injection moulding machine to prepare composite panel samples
- Laboratory demonstration of proposed technology on plastic waste and aluminium foils for preparation of composite panels
- Establishing an influence of variation in the plastic waste and aluminium fillers on the durability and mechanical properties of the recycled polymer composites

Project Description

The major challenge of this project is effectively utilising the plastic and alumina foils obtained from packaging waste. These materials often contain a mixture of different types of plastics and are combined with multi-layered aluminium foils, making their recycling and processing more complex. Overcoming this challenge involves developing innovative methods to separate and process these materials to create recycled polymer composite panels.

Expected Impact

This project focuses on the manufacturing of recycled polymer composite panels using unsegregated plastics and multi-layered aluminium foils. The aim is to reduce the cost associated with plastic waste separation and develop composite panels for non-infrastructure applications.

PROJECT DETAILS

Principal Investigator:

Prof. D. N. Singh

Theme:

Sustainability

Budget:

INR 16.5 Lakhs

Technology Readiness Level:

4

Project Duration:

1 year

UN SDG No:

SDG 7, 12 & 13

Project Title

MONITORING LAKE REGIME SHIFTS USING REMOTE SENSING

Objective

- Health monitoring of lakes using remote sensing
- A graphical user interface showing the inventory of lakes and supporting parameters using satellite data and field data
- Check the potential of upcoming satellite missions for a near real-time database of the health of lakes

Project Description

This proposal aims to analyse lake regime shifts by leveraging the complex interaction between atmosphere, surface, and underground water in response to climatic conditions. Changes in the volume of surface water have been identified as proxy indicators of local and regional climates. By utilising data from existing and future missions, such as TRISHNA, we will explore the synergistic potential to understand lake dynamics while considering our evolving understanding of natural laws and materials to create recycled polymer composite panels.

Expected Impact

Designing methodologies for examining the ecosystem of lakes based on existing observation data of the earth and altimetry data from the SWOT mission.

PROJECT DETAILS

Principal Investigator:

Prof. J. Indu

Theme:

Sustainability

Budget:

INR 30 Lakhs

Technology Readiness Level:

5

Project Duration:

3 years

UN SDG No:

SDG 7

Project Title

DEVELOPMENT OF A HIGH EFFICIENT INDUCTION MOTOR BASED CEILING FAN

Objective

- Identification of design targets for ceiling fans and operational specifications
- Modelling and analysis of existing induction motor-based designs for possible efficiency improvements
- Induction motor design modifications for improving efficiency, prototyping, testing, and validation

Project Description

Ceiling fans are among the most essential appliances for standard living norms in developing countries. In Indian homes, they represent about 20% share of the domestic load. Conventional ceiling fans use induction motor technology, which is very mature, and known for its high reliability and low cost. However, they suffer from efficiencies as low as 40%, for the power ratings in the range of 35 – 50 watts.

Several other technologies based on permanent magnet motors and switched reluctance motors exist in the market. However, they often come with a premium price tag and lower reliability, owing to necessary motor-drive electronics. Further, their repair would either require complete electronic replacement or skilled engineers, both of which may not be available throughout the country. Consequently, induction machine technology remains the best-suited option for the ceiling fan market in the near future.

In this project, we aim to design and develop an induction machine-based ceiling fan with improved efficiency. The design will be restricted to the existing outer dimensions and materials, which, in turn, will reduce the modifications in the existing assembly lines of ceiling fan motors, and hence, the reflected cost. Furthermore, in tribal regions where conventional electrical grids are unavailable, battery-operated solutions for ceiling fans would be required. These batteries can be charged using solar or wind power.

Expected Impact

- Last-mile villagers with electricity connectivity -- 1000s – 1000s
- Middle-class population with electricity connectivity – 1,00,000s
- Nation-wide energy saving, owing to efficient ceiling fans – 1,00,00,000s

PROJECT DETAILS

Principal Investigator:

Prof. B.G. Fernandes

Theme:

Sustainability (Environment, Climate, Solar Energy)

Budget:

INR 30 Lakhs

Technology Readiness Level:

7

Project Duration:

2 year

UN SDG No:

SDG 7, 13

Project Title

HEAT WAVE HAZARD, VULNERABILITY, AND RISK ASSESSMENT FOR INDIA

Objective

- Year 1: Data collection and processing
- Year 2: Vulnerability and risk maps at coarse and fine resolutions
- Year 3: Projections of risk under climate change

Project Description

Heat waves are one of the most significant disasters in India, hurting health, the environment, agriculture, and the supply chain. Our study focuses on assessing the hazard, vulnerability, and risk of heat waves at both country and district levels. Specifically, we will concentrate on regions in North India prone to pre-monsoon heat waves. Additionally, we will explore the potential evolution of this risk under future climate change.

Expected Impact

Our study aims to develop comprehensive heat wave risk maps for North India by integrating district-level hazard and vulnerability data. The findings of this study will be crucial in informing climate action plans and assisting in the assessment of future risks associated with heat waves.

Additionally, the insights gained from this research will contribute to the planning and adaptation efforts toward achieving a net-zero emissions target in India.

PROJECT DETAILS

Principal Investigator:

Prof. Arpita Mondal

Theme:

Sustainability (Environment, Climate, Solar Energy)

Budget:

INR 32 Lakhs

Technology Readiness Level:

2

Project Duration:

3 years

UN SDG No:

SDG 7, 11 & 13

Project Title

HIGH-RATE ELECTROCHEMICAL CO₂ CONVERSION TO METHANOL

Objective

- Study metal atom dispersion on carbon supports for CO₂ to methanol conversion
- Explore non-metallic dopants in carbon matrices for CO₂ to methanol conversion
- Analyse synthesis conditions' impact on the structure and composition of metal atom catalysts
- Establish a correlation between catalyst structure/composition and CO₂ to methanol performance
- Investigate operating conditions' effect on methanol production efficiency in CO₂ conversion

Project Description

To limit global warming, we must replace fossil fuels with renewables and accelerate CO₂ capture and utilization. This research focuses on electrochemical CO₂ conversion to methanol using renewable electricity. We aim to develop a selective and stable catalyst layer for high-rate methanol production. Through advanced nanofabrication techniques, we will optimize catalyst structures and combine them with a gas diffusion layer. This technology has transformative potential for CO₂ capture, utilization, and renewable energy sectors.

Expected Impact

This project aims to advance electrochemical CO₂ conversion to methanol technology. Our goal is to achieve cost parity with fossil-based methanol production. Over the next three years, we will focus on developing a selective and stable catalyst for high-rate methanol production from CO₂.

PROJECT DETAILS

Principal Investigator:

Prof. Ankit Jain

Theme:

Sustainability

Budget:

INR 39.5 Lakhs

Technology Readiness Level:

3

Project Duration:

3 years

UN SDG No:

SDG 7, 13

Project Title

AIR QUALITY AND EXPOSURE IN TRIBAL AREAS- IMPACTS AND SOLUTIONS

Objective

Providing households with improved cookstoves, clean energy, and teaching them the best ventilation practices.

Project Description

Air quality in tribal areas and health effects due to exposure to air pollutants.

Expected Impact

Possible migration to cleaner energy sources, proper ventilation, and reduction in exposure.

PROJECT DETAILS

Principal Investigator:

Prof. Abhishek Chakraborty

Theme:

Sustainability

Budget:

INR 42 Lakhs

Technology Readiness Level:

2

Project Duration:

3 years

UN SDG No:

SDG 7, 11

Project Title

DESIGNING AND DEVELOPMENT OF DECENTRALIZED FIXED BED OXY-ENRICHED COMBUSTOR FOR SUSTAINABLE DISPOSAL OF MUNICIPAL & BIOMEDICAL WASTE WITH GAS CLEANING & HEAT RECOVERY

Objective

- Construction of primary and secondary combustion chambers
- Performing experiments and data collection
- Incorporation of flue gas modules
- Incorporation of a heat recovery system
- CFD modelling of combustor
- Manufacturing of prototypes and testing

Project Description

Municipal solid waste (MSW) is a colossal problem vitiating environmental safety in developing countries like India, where civic authorities mostly rely on landfills due to a lack of technological and economic resources. According to the Union Ministry of Environment, Forests, and Climate Change, the country generates approximately 62 million tonnes of waste annually. The landfills release a large amount of CH₄ (a greenhouse gas about 25 times more harmful than CO₂) into the atmosphere. Large quantities of pollutants are generated due to the incomplete combustion of waste. They also cause groundwater contamination in nearby localities by the leachates formed in landfills.

Among the solid waste disposal options, MSW incineration, which can reduce solid volume by up to 90%, effectively recover energy, avoid CH₄ release, and mitigate soil and water contamination, has gained significant attention worldwide, particularly in various developed countries, such as the USA, Germany, Japan, and developing countries like China and India. The present waste management scenario in India points toward more focused research on sustainable incineration. Incineration of Indian MSW is challenging due to its high organic fraction, moisture content, and inert content (all

PROJECT DETAILS

Principal Investigator:

Prof. Neeraj Kumbhakarna

Theme:

Sustainability (Environment, Climate, Solar Energy)

Budget:

INR 45 Lakhs

Technology Readiness Level:

5

Project Duration:

3 years

UN SDG No:

SDG 7, 11 & 13

ranging from 30-60%) and low heating value (800-1100 kcal/kg). Due to its unfavourable physical properties, incineration of Indian wastes is feasible only with an additional fuel supply. Biomedical Incineration is currently done centrally without much attention to the guidelines and rules. It is ineffective as it requires additional fuel and heat recovery is not implemented. Control of the gas emitted is also a matter of concern in remote areas where these incinerators are operated, not to mention the danger of transporting such contaminated waste over long distances. Waste from agriculture is burnt in the open-air causing pollution, especially after the harvesting season. This creates various problems along with a waste of unutilised heat energy produced and the fossil fuel used to burn the waste.

Expected Impact

- Residential societies
- Waste management system

Project Title

FERTILIZERS FROM THE AIR FOR INDIAN FARMERS: ELECTROCHEMICAL AMMONIA SYNTHESIS

Objective

- Design and fabricate large-area electrochemical-flow cell for electrochemical NRR (geometric area > 5 cm²)
- Establish optimal operating conditions to achieve electrochemical NRR

Project Description

The widely-used Haber-Bosch process for producing ammonia, primarily used in fertilizer production, is responsible for consuming over 1% of global energy production and producing more than 1.5% of worldwide CO₂ emissions. An alternative to the Haber-Bosch process is the direct nitrogen reduction reaction by an electrocatalytic route at ambient conditions (eNRR) in which ammonia is produced by using air as the nitrogen source, water as the hydrogen source, and solar energy as the electricity/energy source.

Expected Impact

Our work revolutionizes fertilizer production with a solar-powered tabletop electrochemical setup. It enables sustainable on-site production using electrons, solar energy, nitrogen from the air, and hydrogen from water. This reduces reliance on commercial suppliers, decreases dependence on overseas companies, and eliminates emissions from transportation and hydrogen. Our method makes fertilizer production more sustainable and environmentally friendly.

PROJECT DETAILS

Principal Investigator:

Prof. Ankit Jain

Theme:

Sustainability

Budget:

INR 60 Lakhs

Technology Readiness Level:

5

Project Duration:

3 years

UN SDG No:

SDG 7

Project Title

EXPERIMENTAL INVESTIGATION OF THE FLOW IN PRACTICAL LIQUID METAL BATTERIES

Objective

- Extrapolate lab-scale results to field-scale and study the impact of ambient magnetic field on flow in LMB electrodes
- Investigate the effect of ambient magnetic field on flow-through experiments, simulations, and comparisons
- Examine electro vortex flow in a Na-Zn battery model and analyse its parameters
- Provide design suggestions for LMB manufacturers based on experiments, simulations, and CFD validation

Project Description

To enable India's renewable energy transition, affordable and reliable grid-scale energy storage is crucial. MIT's proposed liquid metal batteries (LMBs) show promise as a viable alternative to Li-Ion batteries. Ambri Inc. has successfully deployed small LMB battery packs with Ca-Sb chemistry in the US, backed by funding from top companies. However, for Indian customers, cost reduction and local material sourcing (Na, Zn) are essential. Our IITB group collaborates with Cambridge and HZDR to investigate fluid flow phenomena in practical LMB designs, aiming for safe, affordable, and durable solutions. Experimental validation requires equipment like Helmholtz coils and gallium, a liquid metal consumable.

Expected Impact

Our goal is to provide design suggestions for existing LMBs and develop strategies for new Na-Zn liquid metal batteries. Collaboration with electrochemists will be crucial for battery fabrication. If successful, LMBs could significantly contribute to India's renewable energy goals. However, addressing practical challenges and achieving safe, reliable, and affordable LMBs with long cycle life will require substantial investment. Notably, continuous research and development efforts have played a vital role in the cost reduction of Li-Ion batteries.

PROJECT DETAILS

Principal Investigator:

Dr. Avishek Ranjan

Theme:

Sustainability (Environment, Climate, Solar Energy)

Budget:

INR 65 Lakhs

Technology Readiness Level:

3

Project Duration:

3 years

UN SDG No:

SDG 7

Project Title

VALUE-ADDED CHEMICALS FROM FEEDSTOCK MATERIAL

Objective

- Develop new chemistry using renewable feedstock chemicals
- Train and equip manpower for research and innovation addressing the shortage of qualified and skilled human resources in the field
- Position India as a global leader in this domain to enhance socioeconomic development and industrial growth through specialised skillsets
- Solve challenges and create value in the broad domain of renewable feedstock chemicals

Project Description

The shift towards sustainable development and addressing environmental concerns has prompted the exploration of eco-friendly resources in the chemical industry. Currently, crude oil and fossil feedstocks are the primary sources for producing chemicals and fuels. However, advancements in carbon capture, renewable energy generation, and catalytic synthesis have paved the way for using renewable feedstocks to produce value-added chemicals. It is crucial to generate these chemicals from renewable sources to ensure sustainable development and reduce reliance on non-renewable fossil resources.

Expected Impact

In recent decades, the substitution of non-renewable fossil resources with renewable biomass as a sustainable feedstock has gained significant attention. This shift aims to produce high-value-added products such as biofuels, commodity chemicals, and bioplastics. Eugenol and furfural have emerged as potential feedstocks for manufacturing commodity chemicals. Converting plant biomass to essential commodity chemicals is crucial for meeting long-term needs with minimal environmental impact. The project focuses on developing new chemistry with these feedstock chemicals and training manpower for research in this domain, aiming to explore newer avenues in perfumery chemicals and biologically important molecules.

PROJECT DETAILS

Principal Investigator:

Prof. Santosh J. Gharpure

Theme:

Sustainability

Budget:

INR 75 Lakhs

Technology Readiness Level:

1

Project Duration:

3 years

UN SDG No:

SDG 7

Project Title

QUALITY ASSESSMENT OF DAIRY PRODUCTS/PROCESSED FOOD USING NON-INVASIVE METHODS

Objective

This project involves collecting time domain data using low-field NMR to measure fat, moisture, and oil in different products for 1-4 months. It also includes developing a protocol for differentiating products, conducting chemometric analysis to identify similarities, developing a machine learning protocol for identifying adulteration, and creating a QR code system for accessing product components.

Project Description

The current state of the quality of food products in our country is subpar and lacks authentication and alignment with global standards. Widespread adulteration, particularly in dairy products, raises concerns about the reliability and characteristics of processed and packaged food. Traditional testing methods are time-consuming, unreliable, and fail to provide a quantitative assessment. However, employing advanced techniques like NMR and modern analytics tools can address these issues, enabling accurate and non-invasive estimation of all of the components in food products. This would facilitate certification for domestic consumption and exportation and will ensure that high-quality food reaches consumers. Additionally, there is a disparity between the government's quality testing protocols for selling food products in India versus those required for international markets.

Expected Impact

The proposed methodology utilizes NMR-based analysis of various food products with minimal sample preparation using an affordable low-field NMR spectrometer. Time-domain and diffusion-based experiments will be conducted, and the data will be analyzed using customized software. This approach offers a time-saving and chemical-free alternative to conventional methods, ensuring reliable quality checks and assurance for the entire food industry. It will have a direct impact on ensuring hygienic, unadulterated, and nutritious food for consumers.

PROJECT DETAILS

Principal Investigator:

Prof. Ashutosh Kumar

Theme:

Sustainability

Budget:

INR 85 Lakhs

Technology Readiness Level:

2

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

GREEN HYDROGEN PRODUCTION FROM SEAWATER

Objective

- Developing robust and bifunctional electrocatalyst
- Generating H₂ gas from wastewater
- Developing the electrolyze stack
- Life cycle analysis

Project Description

The global rise in energy consumption, driven by population growth and economic development, has led to a significant increase in carbon-based fossil fuel usage, accounting for approximately 90% of the energy resource. Consequently, anthropogenic CO₂ emissions have risen substantially. This trend is particularly notable in developing countries like India and China, where deteriorating air quality is a growing concern.

Expected Impact

This proposal aims to develop a carbon footprint-free energy resource by utilizing solar energy. We present a technology blueprint for converting renewable energy-generated electricity into hydrogen gas, enabling the establishment of a parallel hydrogen economy.

PROJECT DETAILS

Principal Investigator:

Prof. Arnab Dutta

Theme:

Sustainability

Budget:

INR 1.62 Crores

Technology Readiness Level:

4

Project Duration:

2 years

UN SDG No:

SDG 7

Project Title

LABORATORY AND FIELD PERFORMANCE EVALUATION OF COLD-IN-PLACE RECYCLED BITUMINOUS MIXES

Objective

- Performance evaluation of cold mixes in the lab at varying conditions
- Field performance and identification of stretches

Project Description

The present proposal will evaluate laboratory and field performance of environmentally friendly cold recycled mixes keeping the following motivation and research gaps which can help refine the IRC guidelines and implementation of the technology on a larger scale.

- Range of resilient modulus for pavement design
- Revision on mix design protocol
- Long-term field performance

The outcomes of the project are expected to provide multiple benefits:

- Adoption of realistic resilient modulus for pavement design, which can further result in a reduction in thickness and cost, and this will be validated from field evaluation
- Revision in mixed design approach to suit different traffic, climatic, rainfall, and terrain conditions, which will be a significant addition to the IRC guidelines
- Evaluate field performance in terms of structural and functional performance which will motivate contractors and agencies to implement this technology with more confidence on a larger scale
- The adoption of technology will not only reduce carbon emissions but also will provide cost-effective and faster construction of pavements in remote areas

Expected Impact

- Conservation of natural resources (aggregates, nonrenewal resources), good quality roads, overall sustainability
- Construction industry

PROJECT DETAILS

Principal Investigator:

Prof. Dharamveer Singh

Theme:

Sustainability (Environment, Climate, Solar Energy)

Budget:

INR 1.7 Crores

Technology Readiness Level:

3

Project Duration:

3 years

UN SDG No:

SDG 7, 13

Project Title

TEAM SHUNYA

Objective

- Participate in competitions to build a Net Zero Energy Building in the upcoming year
- Collaborate with local bodies to create an exhibition space outside IIT showcasing sustainable solutions in built environments
- Target at least 100 home users in the next year to adopt this technology

Project Description

TeamShunya, an interdisciplinary initiative at IIT Bombay, focuses on creating sustainable habitat solutions, including Net Positive Energy, Net Zero Carbon, and Net Zero Water Buildings. Their goal is to develop translational technologies for the building sector, reducing energy requirements throughout the building life cycle.

The team works on sustainable materials, alternative energy solutions, optimization, building automation, and sensing for energy reduction while ensuring inhabitant comfort. As participants in the International Solar Decathlon competition, they are the country's sole representatives in the 2023 Solar Decathlon in the USA. Team Shunya seeks collaborations with government and private infrastructure developers to implement clean energy systems and adopt sustainable construction practices.

Expected Impact

Buildings consume a significant amount of global energy, water, and resources while emitting a large portion of greenhouse gas emissions. Our goal is to develop a replicable housing prototype that reduces energy consumption and improves liveability for middle-class families in Navi Mumbai and similar regions. By incorporating net positive energy aspects and quality spaces, our design aims to create a sustainable ecosystem within the urban environment. For more information, visit <https://teamshunya.com/>

PROJECT DETAILS

Principal Investigator:

Prof. Venkata Santosh Kumar

Theme:

Sustainability

Budget:

INR 2.1 Crores

Technology Readiness Level:

6

Project Duration:

> 3 years

UN SDG No:

SDG 7, 11 & 13

Project Title

DESIGNING A SUSTAINABLE, LOW-ENERGY CONSUMING, AND MODULAR CO₂ CAPTURE AND UTILIZATION TECHNOLOGY

Objective

- Optimizing homogenous/surface immobilized catalysts for CO₂/HCO₃-conversion
- Optimizing surface-immobilized catalysts under industrially relevant conditions for CO₂/HCO₃-conversion
- Investigation of the large-scale conversion of stored CO₂ to carbonate minerals
- Development of a modular CO₂ capture and conversion prototype

Project Description

Conventional coal-driven energy, steel-iron, and cement sectors contribute to 80% of CO₂ emissions in India. Existing CO₂ capture methods, including pre-combustion and post-combustion techniques, have been employed to reduce direct emissions. However, high costs and a lack of sustainable utilization plans for stored CO₂ hinder the growth of these CO₂-producing industries.

Expected Impact

This concept note presents a new approach to CO₂ capture and utilization. Our proposed modular unit captures CO₂ from flue gas, generating a mixture of carbonate and bicarbonate in an aqueous solution. The project highlights an eco-friendly and cost-effective water-based CO₂ capture unit, rapid conversion of captured CO₂ into commercially viable chemicals, scalable and mobile units for easy installation and transportation, and a sustainable carbon-negative solution.

PROJECT DETAILS

Principal Investigator:

Prof. Arnab Dutta

Theme:

Sustainability

Budget:

INR 3 Crores

Technology Readiness Level:

4

Project Duration:

3 years

UN SDG No:

SDG 7

Project Title

LONG DURATION ENERGY STORAGE SYSTEMS FOR OFF -GRID APPLICATIONS

Objective

- Scalable synthesis of electrode materials and coin cell-level testing and optimization: Particle size, electrode thickness, porosity, and conductivity
- Aim for optimal performance in lithium-ion batteries with titania-based anodes and iron phosphate-based cathodes
- Translate year one's efforts to larger pouch cells and conduct degradation and failure analyses
- Perform accelerated testing under high-temperature conditions and predict battery lifetime

Project Description

Many rural Indian households, especially in remote areas, lack access to electricity. Even in formally "electrified" villages, thousands of homes remain without electricity. This persistent issue undermines the ambitious goals and achievements of the Indian government's rural electrification program, leaving a significant portion of the population at the bottom of human development indicators.

Expected Impact

We aim to develop long-lasting standalone battery storage systems, lasting 20,000+ cycles (around 15 years), to address electrification challenges in remote areas. By combining them with solar farms, we can provide continuous power to improve the quality of life. Our project focuses on high performance batteries using iron and titania-based materials, scaling up from pouch cells to larger (>2 Ah) packs for easy integration into 48 V modules.

PROJECT DETAILS

Principal Investigator:

Prof. Srinivasan Ramakrishnan

Theme:

Sustainability

Budget:

INR 5 Crores

Technology Readiness Level:

7

Project Duration:

3 years

UN SDG No:

SDG 7

Project Title

INDOOR VENTILATION TO TACKLE AIR QUALITY AND AIRBORNE INFECTION IN OFFICE SPACES: RESEARCH, DEVELOPMENT, AND IMPLEMENTATION

Objective

To study air quality and airborne infections in office spaces and meeting rooms at IIT Bombay

Project Description

Indoor air quality and the ventilation of enclosed spaces have taken centre stage in recent times because of concerns about airborne infection spread. Tiny droplets and aerosol in the air exhaled by an infected person can carry the pathogen to large distances, floating in the air for a long duration of time. This poses a threat of infection to a large number of healthy people sharing common spaces, like meeting rooms, corporate or business offices, and so on.

Specifically, office spaces have long-duration occupancy - up to an entire work day. Respiratory activities also differ from other setups like classrooms and lecture halls. In addition, most offices and meeting rooms are air-conditioned, with barely any ventilation. This poses a new set of challenges for controlling air quality and airborne infection. Research underway at IIT Bombay mostly focuses on classrooms. But these methods can be re-oriented towards tackling the air quality in office spaces and meeting rooms.

Most of the earlier guidelines of indoor ventilation fall short in dealing with an airborne infection, necessitating new research and newer ways to study indoor air quality. Specifically, the source of infection is usually in one of the occupants of the room, instead of pollutants in the air outside. The extremely small size of the pathogen (in the range of nanometres, instead of micron-level particulate matter) and how to detect it in the air is another challenge posed by airborne infection. In addition, conventional approaches of replacing the air in the room with fresh air result in high energy costs.

With the diverse expertise available at IIT Bombay, the ventilation committee is uniquely placed to tackle indoor ventilation for public health, energy efficiency, and sustainability. The team includes experts from environmental and chemical engineering to mechanical and aerospace engineering. This is complemented by additional expertise from electrical engineering and bioengineering. The goal is to combine state-of-the-art technology with cutting-edge research to improve indoor air quality and minimize the impact of infection in enclosed spaces such as meeting rooms, corporate or business offices, etc.

PROJECT DETAILS

Principal Investigator:

Prof. Krishnendu Sinha (convener of the ventilation committee) and

Prof. Soumyo Mukherji (coconvener of the ventilation committee)

Theme:

Sustainability (Environment, Climate, Solar Energy)

Budget:

INR 7 Crores

Technology Readiness Level:

5

Project Duration:

5 years

UN SDG No:

SDG **3, 7, 11 & 13**

The project will combine extensive computational and experimental efforts to study air quality and airborne infections in office spaces and meeting rooms at IIT Bombay. Various studies concerning air residence time and tracking the particle from the source in full-scale as well as scaled-down laboratory scale setup will be carried out. This will be complemented with live data to study and optimize different ventilation parameters, including energy consumption. The project aims to improve indoor air quality and reduce the risk of airborne infection in office spaces such as corporate meeting rooms, conference rooms, etc. It will thus have a direct impact on occupant health, energy cost, and sustainability.

Expected Impact

The institute has 800 faculty and 600 staff members. These will be direct beneficiaries of improved air quality in the offices and meeting rooms. In addition, a large student community (13,000) uses office spaces intermittently when they convene for discussions with faculty and group meetings. The results of the study are to be extended to a large number of office spaces in corporate and business facilities, thus impacting occupant health and productivity. Optimized energy consumption will save on the operational cost of buildings and improve their sustainability.



SOCIAL AND POLICY DEVELOPMENT



Project Title

DATA FOR SOCIAL GOOD - COLLECTION & ANALYSIS

Objective

The objective of this project is to design and implement a framework for data collection and analysis that can be used to support initiatives for social good.

Project Description

In today's world, data is being generated at an unprecedented rate, with vast amounts of information being produced from various sources such as social media, government, databases, and wearable devices. However, the potential of this data to impact society positively is often untapped. The challenge lies in collecting and analysing large and diverse data sets to gain insights that can be used to inform policies and decision-making in fields such as healthcare, education, and environmental sustainability.

This project aims to harness the power of data to address pressing social issues and drive positive change. It involves collecting data from various sources such as government agencies, non-profit organizations, and other stakeholders. The collected data will then be analysed using advanced analytical tools and techniques. This will allow us to gain insights and identify patterns that can be used to inform decision-making and drive social impact. The insights generated from the data analysis can be used to inform policies, allocate resources more effectively, and target interventions in a more focused and impactful way.

Expected Impact

The "Data for Social Good" project has the potential to be a game-changer in addressing social challenges and promoting positive impact by collecting and analysing data. It can help policymakers and organizations make informed decisions that can lead to better outcomes and leave a positive impact on communities. It can also help build data literacy and data-driven decision-making in communities.

PROJECT DETAILS

Principal Investigator:

Prof. Shishir Jha and
Prof. Santosh Noronha

Theme:

Social and Policy Development

Budget:

INR 25 Lakhs

Technology Readiness Level:

0

Project Duration:

2 years

UN SDG No:

SDG 17

Project Title

COGNITIVE MARKERS FOR ADHD SUBTYPES

Objective

To examine which parameters or combinations of parameters can differentiate different types of ADHD accurately.

Project Description

Worldwide, the prevalence rate of ADHD children is 7.1%, and in India, it is around 12%. Diagnosis of ADHD in children aged <7 years presents significant challenges to clinicians because many behavioural manifestations of ADHD may be normative at such a young age (7-10). Therefore, accurate diagnosis of ADHD children is crucial.

ADHD children often have symptoms that overlap highly with other neurodevelopmental disorders. This may lead to an increase in their misdiagnosis which, in turn, can lead to life-impacting issues. A combination of some cognitive-motivational functions and a computer-based classification system can classify ADHD-combined type with healthy controls as well as children with other neurodevelopmental disorders (e.g., ODD) with an accuracy of ~98%. The present proposal aims to test this.

Expected Impact

This project will eliminate the problem of misdiagnosis of children suffering from ADHD significantly by implementing an affordable and scalable technology solution that can help clinicians diagnose these children accurately.

PROJECT DETAILS

Principal Investigator:

Prof. Rashmi Gupta

Theme:

Empowering communities-
Supporting differently-abled

Budget:

INR 30 Lakhs

Technology Readiness Level:

6

Project Duration:

2 years

UN SDG No:

SDG 3, 10

Project Title

JELLOW BASIC AAC COMMUNICATOR: A SPEAKING AID FOR NON-VERBAL CHILDREN

Objective

Jellow aims to develop a complete communication system, conceived to cater to the communication and educational needs of users with a varying range of abilities and with both low- and high-tech options such as Flash Cards, E-book, Mobile/Tablet/Desktop versions, Switch Accessible, and Customizable. This will, in turn, also support the education and social development of special children.

Project Description

Worldwide there are more than 140 million children who have some form of Speech and Language impairment. Over 30 million children in India suffer from the same including those with Autism, Cerebral Palsy, and Down's syndrome. Hence, there is a need for an Augmentative and Alternative Communication (AAC) system. Jellow Basic Communicator is a freely downloadable AAC system that uses icons/images to enable communication in children learning to speak or for children with difficulty in speech and language.

Expected Impact

Jellow Basic helps non-verbal children to communicate and gradually learn to speak - especially those with Autism, Cerebral Palsy, and Down's syndrome. Jellow Basic has already been established as a reliable platform in India with over 10,000 users. We would like this to expand to at least 100,000 children in India. The beneficiary/target audience for this collaboration includes non-verbal children and those who have difficulty in communicating with speech and language – especially children suffering from Autism, Cerebral Palsy, and Down's Syndrome.

PROJECT DETAILS

Principal Investigator:

Prof. Ravi Poovaiah

Theme:

Empowering Communities

Budget:

INR 37.2 Lakhs

Technology Readiness Level:

9

Project Duration:

1 year

UN SDG No:

SDG 4,10

Project Title

TRICYCLES FOR PARAPLEGICS - ENABLING EMPLOYABILITY FOR THE DISABLED POPULATION

Objective

Manufacture and distribute 100 Confy Trikes - Tricycles for Paraplegics integrating a variety of features/accessories to facilitate their employability (selling goods & services).

Project Description

Around 10 million people in India are mobility disabled and a large proportion of them live in villages and semiurban places. They are generally marginalised and remain unemployed. There is a dire need to empower them (both men and women) by making them employable. The team has designed and developed 'Confy Trike,' a hand-tricycle that is also an assistive mobility device for the paraplegic population of the country. The tricycle is ready for production. The ergonomic tricycle offers dual handles for pedalling action to gain higher initial torque and can climb slopes and move in undulated terrains. The team has consciously worked on the image of the product and made it attractive so that the vehicle is not seen as a symbol of sympathy but as a symbol of confidence. The tricycle prototypes have been tested by many users.

Expected Impact

The tricycle will make the marginalised disabled population employable. The team will track and measure the impact of the tricycles in terms of their earnings after six months of use.

PROJECT DETAILS

Principal Investigator:

Prof. Nishant Sharma

Theme:

Empowering communities

Budget:

INR 50 Lakhs

Technology Readiness Level:

8

Project Duration:

1 year

UN SDG No:

SDG **10,11.2**



WOMEN EMPOWERMENT



Project Title

WOMEN AT IIT BOMBAY: ENROLL, ENCOURAGE, AND EMPOWER

Objective

- Enhance opportunities for female students who want to study at IIT Bombay
- Change the on-campus culture for women and underrepresented groups in STEM and non-STEM fields
- Provide support to female faculty members and students to excel in the domain of STEM and critical non-STEM disciplines

Project Description

We, at IIT Bombay, are committed to radically transforming the stories of women at our Institute. To that end (and under the overall rubric of this project), we have developed a cluster of initiatives embracing the three phases of the lives and careers of our women students – Enroll-Encourage-Empower.

1. Enroll covers initiatives to increase the number of women who come to IIT Bombay for their undergraduate and postgraduate studies and to retain them at all levels.

2. Once they are enrolled, make sure they are able to realize their abilities to the maximum, encourage, stimulate, and reward them, sustain their interest, and ensure that their stay in the Institute is safe, fulfilling, and not constrained by bias or the inadequacy of resources. All of these initiatives are detailed under Encourage.

3. Finally, work towards Empowering and changing the futures of our women students and ensure that once they leave the Institute, their prospects are brighter and more satisfying.

Our intention is to expand the scope of opportunities available to them and direct their creativity and expertise to the fields where they will be best utilized and where they can prosper and thrive.

Expected Impact

Heland cited a recent research report by McKinsey and said that narrowing the gender gap in STEM can lead to an increase of \$12-28 trillion in the global economy. “Gender equality is important from a business perspective, and it should be made a business priority by companies.”

PROJECT DETAILS

Department:

Gender Cell

Theme:

Women empowerment

Budget:

INR 12.83 Crores

Project Duration:

5 years

UN SDG No:

SDG 5



SKILLS & ENTREPRENEURSHIP



Project Title

MECHATRONICS

Objective

- Interdisciplinary Skills
- Hands-on Experience

Project Description

Mechatronics is a multidisciplinary field that combines the principles of mechanical engineering, electrical engineering, and computer science. The versatility of the skills and knowledge acquired through a Mechatronics programme makes it an attractive option for students who are looking to gain a broad and diverse set of skills that can be applied in several ways in their future careers.

Expected Impact

This project will impact the lives of students who have dropped out of school, ITI students, undergrad students, and girl students. While, traditionally, the technology industry has been male-dominated, pursuing a course in Mechatronics can help increase the number of women in STEM. Early-age learning and vocational training also give curious students the skills to tackle problems confidently, facilitate positivity towards the learning process, inspire greater self-confidence in students, and contribute to the growth of individuals who are curious, confident, and willing to take the initiative when faced with challenges.

PROJECT DETAILS

Principal Investigator:

Prof. Santosh Noronha

Theme:

Skill Development and Livelihoods

Budget:

INR 25 Lakhs

Technology Readiness Level:

1

Project Duration:

2 years

UN SDG No:

SDG 4.4



RURAL DEVELOPMENT AND AGRICULTURE



Project Title

SOIL MOISTURE SENSOR USING IN-HOUSE DESIGNED APPLICATION SPECIFIC INTEGRATED CIRCUIT

Objective

- Design, fabrication, and testing of the application circuit with the packaged ASIC Testing with different soils
- Integration and test of custom IC-based soil moisture sensor
- Testing in the greenhouse or open field and planning the way forward for mass production in the SCL fab in India

Project Description

The importance of affordable soil moisture sensor systems is a well-known fact not only for the agriculture sector in India but also worldwide. However, in India, most of the components of such sensor systems including electronic ICs are imported, particularly when it reaches the electronic ICs (integrated circuits). For a sustainable and cost-reduced soil moisture sensor-system for large scale agriculture fields and greenhouses, the design of an ASIC IP-based (application specific integrated circuit with intellectual property) is necessary.

Expected Impact

The team has been working on developing indigenous soil moisture sensors. Earlier, a discrete design of soil moisture sensor was made that was successfully used in the field. To make sensors even more compact and reliable (with less drift with the addition of fertilizer), the team has come up with an ASIC-based soil moisture sensor. The team has also successfully designed and developed an indigenous ASIC for capacitive sensing. It will help reduce the effect of parasites arising due to sensor aging and ionic conductivity of soil, providing a long-lasting sensor with minimum serviceability. The power consumption of the sensor is reduced in comparison to the commercial off-the-shelf IC-based sensors, and this, in turn, increases the lifetime of the battery-operated systems.

PROJECT DETAILS

Principal Investigator:

Prof. Maryam Shojaei Baghini

Theme:

Agriculture and Rural Development

Budget:

INR 10 Lakhs

Technology Readiness Level:

4

Project Duration:

1 year

UN SDG No:

SDG 9

Project Title

DEVELOPMENT OF RICE GRAIN IMAGING SYSTEM FOR QUANTIFICATION OF GRAIN FISSURE QUALITY CHARACTERISTICS

Objective

- An optical test rig for the detection, imaging, and quantification/classification of fissures/cracks of different types of de-husked rice paddies
- A quality metric for rice grains based on fissure/crack data to serve as a basis for abrasive milling process optimisation for a better yield

Project Description

A rice grain (seed) typically consists of brown rice and an enclosure called a husk. Brown rice has several thin layers of tissues, collectively termed bran. The retail market is primarily dominated by white rice, which is obtained by abrasive milling and polishing to remove the bran layer from brown rice. The yield of the milling/polishing, characterised by uniformity in size, shape, and colour, is largely decided by the quality of the input brown rice grains. The de-husking process before abrasive milling/polishing introduces fissures or cracks in the rice grains. The rice grains with fissures result in the breakage of rice kernels adversely affecting the yield of the milling.

The rice millers often resort to a trial-and-error approach for the milling process setting to minimise grain breakage. A scientific approach is needed to detect, classify, and quantify the input grain quality with the aid of an easy-to-use, non-invasive, and cost-effective inspection device.

Expected Impact

De-husked rice grains of different types will be analysed using different imaging approaches to investigate the nature of fissures inside the grains. An objective quality index will be established based on the fissure characteristics of the grains. This will enable the mill owner to decide on the parameter setting of the milling process. An optical imaging device will be developed that can be used at milling sites for the user to assess the quality of the input de-husked paddy by detecting the grain fissures/cracks.

PROJECT DETAILS

Principal Investigator:

Prof. Rakesh G. Mote

Theme:

Agriculture and Rural Development

Budget:

INR 15 Lakhs

Technology Readiness Level:

1

Project Duration:

1 year

UN SDG No:

SDG 2

Project Title

MULTIFUNCTIONAL, ROBOTIC PLASMA JET TECHNOLOGY FOR TEXTILE, FOOD PACKAGING, AND MEDICAL APPLICATIONS

Objective

The ultimate goal of the proposal is to develop the next-generation DBD plasma jet-based surface functionalization process via an enhanced understanding of plasma physics and plasma material interaction. The knowledge base created in this project via various transformative and translational research tasks will be utilized to demonstrate the applications of the novel process for applications such as self-cleaning surfaces, surface disinfection, wetting, and adhesion.

Project Description

Atmospheric low-temperature plasma jets (ALTPJs) have been used for various surface functionalization applications, such as cleaning, wetting, adhesion, and disinfection. More specifically, such plasma jets have potential applications in improving water absorption and adhesion of ink/coatings on textiles (nylon [1], PET [1], cotton [2], etc.), cleaning and disinfection of food packing material [3, 4] (bottles, cans, trays), and sterilizing medical devices [3-6] (endoscopes, surgical instruments, implants). However, most of the current research on ALTPJs has been conducted on a small scale, and more work is needed to scale up the technology. Consequently, there is a need to further develop the ALTPJ technology by addressing the challenges of scaling up, optimizing its performance, and ensuring its safety and environmental friendliness. This will ensure that it is ready for industrial and commercial use, specifically in the textile, food, and biomedical industries.

Expected Impact

The development and implementation of atmospheric plasma jet technology in India can revolutionize the materials and manufacturing industry by improving the properties of various materials like alloys, ceramics, polymers, and glasses. The use of a robotic system to control surface properties without damaging the underlying material has the potential to enhance efficiency, sustainability, and performance in industries such as textiles, food packaging, and agriculture. Furthermore, the knowledge gained from this research will have broader applications in areas like water/air purification, seed germination, sterilization, and plasma medicine.

PROJECT DETAILS

Principal Investigator:

Prof. Soham Mujumdar

Theme:

Agriculture and Rural Development

Budget:

INR 26 Lakhs

Technology Readiness Level:

-

Project Duration:

-

UN SDG No:

SDG 9

Project Title

DEVELOPMENT OF PLANT PROBIOTICS FROM THE LAB TO THE FIELD IN AGRICULTURE THROUGH MICROBIAL MINERALIZATION

Objective

- Identify deposits containing substantial potassium silicates. This includes mostly potassic clay minerals
- Identify the best possible combination of potassic clay minerals, microbes, and plants in Lab scale
- Extrapolate the lab scale results to the field scale

Project Description

The project envisages formulating economically viable, eco-friendly, slow-release fertilizers (SRF) out of clay minerals and developing novel products with the help of bioinoculant to improve soil fertility and overall health of the soil. The study begins with mineralogical and chemical characterization of easily available clay mineral deposits, particularly waste mica, glauconite, celadonite, and other minerals such as K-feldspar having high mineral reserves in India. Selected samples, which are easily available all over India, will be used for preparing potash-enriched compost. Further, the study will test the effectiveness of the newly formulated potash-enriched compost, by estimating the phenotypic growth of Solanaceae plants along with biofortification of potassium-enriched compost and thereby increasing dietary micro-nutrients. The study will help farmers use alternative sources of potassic fertilizers. The use of bio-formulation is useful for maintaining soil health as the excessive application of chemical fertilizers destroys microorganisms in the soil. Soil amendments, such as K-bearing rock with bacteria, and bioformulations from them are sustainable and environment-friendly for agronomic biofortification.

Expected Impact

The project is likely to reduce the import bill of fertilizers in India. Although the country has a huge reserve of potassic deposits, it imports potash salts from Canada and Russia to meet its agronomic needs. This study envisages releasing potash from silicates through microbial processes.

PROJECT DETAILS

Principal Investigator:

Prof. Santanu Banerjee

Theme:

Agriculture and Rural Development

Budget:

INR 35 Lakhs

Technology Readiness Level:

3

Project Duration:

3 years

UN SDG No:

SDG **3, 6, 7,**
9, 12, 13, & 17



HEALTHCARE



Project Title

MAKING LAPAROSCOPIC SURGICAL GAS EXHAUST SAFER WITH LOW DELTA-P BIOAEROSOL FILTERS TO REMOVE SMOKE, TISSUE FRAGMENTS, AND COVID-19 VIRUS

Objective

To develop a compact air filter utilizing hollow fibre membranes (HFMs) for decontaminating the exhaust air of laparoscopic devices

Project Description

There is a need for safer and easier ways of treating the smoke created during laparoscopic procedures before discharging into the environment. Typically, a filter is used to remove aerosol particles containing viruses, to protect the HCPs during the pandemic. HEPA filters will not be feasible to use in this case as it has a relatively high-pressure drop. High-pressure drops are particularly problematic for laparoscopic surgery as high-pressure drops mean high pressure in the abdomen which can cause barotrauma. Under pressure drops would not be effective either, as they would not keep the lungs/abdomen adequately inflated. So, there is a need for a low-pressure drop bioaerosol filter that can remove smoke, tissue fragments, and the Covid-19 virus. The proposed solution is a hollow fibre-based design. The main advantage is that hollow fibres have 1200 m²/m³ whereas current pleated technology has about an order of magnitude less, about 100-200 m²/m³. The proposed device is hollow fibre membranes (HFMs) based compact air filters that have lower pressure drops. They are effective for decontaminating exhaust air of laparoscopic trocars, insufflators, and other gas-exhausting devices.

Expected Impact

- The compact air filter design can decontaminate the exhaust air of laparoscopic trocars, insufflators, and other gas-exhausting devices with very high efficiency
- Over 1 lakh people will be directly impacted daily and a few crores on an annual basis. This includes patients requiring surgical procedures, health care personnel, doctors, etc.

PROJECT DETAILS

Principal Investigator:

Prof. Jayesh Bellare

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 15 Lakhs

Technology Readiness Level:

6

Project Duration:

1 year

UN SDG No:

SDG 3, 9

Project Title

GEOSPATIAL MAPPING OF CHILD MALNUTRITION – TOWARDS A HEALTHY INDIA

Objective

To develop a technology-based platform for viewing, analysing, and monitoring malnutrition data at the subnational and regional level

Project Description

India is a vast country and it doesn't have real-time data (digitized) for child malnutrition. In addition, workers at aanganwadis, PHCs, CHCs, and district hospitals/medical colleges have a high workload and several responsibilities and it is not easy for them to maintain all the data relevant to malnutrition in hard copy. Therefore, there is a strong need for a real-time technology-based solution to monitor malnutrition in local areas/mohallas of each district and the states throughout India. After collecting real-time data, suitable interventions can be done to reduce the rate of child malnutrition.

Expected Impact

The main object of the proposed project includes the team deploying a Child Health Monitoring - CHM kit, which will be an easy-to-use monitoring tool for rural healthcare workers and will be primarily used in the Geospatial mapping of child malnutrition in various districts of the state. The CHM kit will consist of a smart scale (the Electronic Physio-Growth Monitoring System - EPGM) for malnutrition screening: the smart scale will be used for online monitoring of child malnutrition at aanganwadi centres/primary schools, primary healthcare centres, and medical colleges. This is a fully automated version of malnutrition screening along with malnutrition assessment and analysis that is integrated with GPRS/GSM and RFID technology. The smart scale machine collects the weight and height data of a child and stores it appropriately by recognizing the child using an RFID tag. It assesses the malnutrition status of children between the age group of 0 to 59 months based on three W.H.O. growth charts - underweight, stunting & wasting, and BMI (Body Mass Index). The data is updated on the Malnutrition Assessment & Analysis (M.A.A.) website server in real time (GPRS/GSM).

The CHM kit will also contain a device for measuring MUAC: Mid-Upper Arm Circumference. The MUAC screening will be used to assess malnutrition for 6/12 months in children who are 59 months old.

Management of malnourished children: Management of malnourished children will be done in coordination with ICDS, the State Nutrition Mission, and the State Health Department. For this, supplementary feeding, micronutrients, and medicines will be suggested under the expert supervision of paediatricians.

PROJECT DETAILS

Principal Investigator:

Prof. Rohit Srivastava

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 20 Lakhs

Technology Readiness Level:

8

Project Duration:

3 years

UN SDG No:

SDG 3

Project Title

A UNIQUE DIGITAL PLATFORM TO STUDY TINNITUS PATTERNS AND TINNITUS CLINICAL DECISION SUPPORT SYSTEM (CDSS) AS AN ASSISTING SYSTEM

Objective

- Formation of an expert medical panel and one research fellow (to be employed) in continuation of the existing project
- A field-deployable time-based tinnitus data and subject-capturing platform/ dashboard based on the current version of our App in consultation with the software company
- Database and information base structure design, time-based data and information collection (no personal information), encrypted anonymous database formation, analysis, and model generation/evolution in close interaction with the expert medical panel
- Bug fixing (if any), enhancement of the data/information base based on inputs from the medical panel, more data collection, and joint paper publication with the medical panel, which will continue after the 1st year for another year

Project Description

Tinnitus is ringing in the ear of the head without the presence of an external sound source. Tinnitus is a medical condition with a worldwide prevalence ranging from 11.9-30 %. Around 16.18% of the adult population in India suffers from tinnitus. The diversified symptoms, non-uniformity in patient history, lack of electronic health records, insufficient diagnostic resources, lack of a database, and uncertainty of medicine/techniques lead to unknown cause(s) and prolonged treatment thereby adding on the socio-economic burden on the tinnitus patients and even doctors, particularly in cases where the tinnitus is prolonged.

Expected Impact

The proposed digital therapeutic assisting platform will directly impact the affected tinnitus patients (estimated 3.08 Cr population from India). Medical professionals and audiologists will be indirectly affected by the proposed assisting system. The estimated number of ENT doctors and audiologists is 13,500 in India. The proposed system will directly affect the socioeconomic status of sufferers by providing a digital platform to the medical fraternity. Moreover, psychiatric symptoms like anxiety, depression, and frustration can be handled effectively. The intelligent machine learning algorithms will

PROJECT DETAILS

Principal Investigator:

Prof. Maryam Shojaei Baghini

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 21 Lakhs

Technology Readiness Level:

3

Project Duration:

2 years

UN SDG No:

SDG 3

be helpful to the medical fraternity to make quicker decisions about tinnitus disease, and patient-specific treatment. The usability of the CDSS platform in assisting decision-making is expected to offer more efficient and optimal patient care based on individualised symptoms and causes. The use of the treatment shaping tool will allow us to provide an optimized treatment protocol, thereby resulting in faster recovery of tinnitus patients.

Project Title

SHAPEDX: A HIGH-ACCURACY POINT-OF-CARE SICKLE CELL DIAGNOSTIC KIT

Objective

- Development of a commercial prototype of a point-of-care diagnostic device to detect sickle cell anaemia that will provide results within one hour and at 1/10th the cost
- Performing rigorous benchmarking against the gold standard with a large number (~ 400) of clinical samples

Project Description

Sickle cell anaemia is a hereditary blood disorder with no cure where red blood cells (RBC) become stiff and sickle-shaped. The afflicted individuals suffer from lifelong anaemia, recurring extreme pain, and, eventually, organ damage. Every year, nearly 45,000 children are born in India with the sickle gene. Disadvantaged communities living in remote parts of India have disproportionately high incidences and mortality rates due to limited access to diagnosis and counselling. The gold standard test (HPLC) for distinguishing between sickle cell disease and sickle cell trait requires blood samples to be transported to centralized pathology laboratories, leading to an increase in diagnosis cost (~INR 2500) and delaying treatment (by at least 48 hours). There is an unmet need for a point-of-care test that can distinguish between these two conditions with very high accuracy and within an hour (20 times faster). The proposed device is a point-of-care diagnostic device, ShapeDx to address this problem that provides results within one hour and at 1/10th the cost (INR 250).

Expected Impact

The technology can provide a quick and affordable diagnostic test for even low-income communities, impacting their lives. This work also resonates with the 'mission mode eradication of sickle cell anaemia' by 2047 recently announced by the Govt. of India in the Union Budget 2023-24.

PROJECT DETAILS

Principal Investigator:

Prof. Debjani Paul

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 25 Lakhs

Technology Readiness Level:

6

Project Duration:

2 years

UN SDG No:

SDG 3, 9

Project Title

BILISCOPE - AN AFFORDABLE, NON-INVASIVE BILIRUBIN METER FOR THE ACCURATE DIAGNOSIS AND EFFECTIVE TREATMENT OF NEONATAL JAUNDICE

Objective

- Development and engineering validation of the handheld device
- Large-scale clinical studies conducted with the handheld device

Project Description

60% of all newborns nationwide suffer from neonatal jaundice. 10% of those require treatment for jaundice to prevent death or lifelong disability. 6-10% of newborn mortality can be attributed to complications caused by jaundice.

Conventional clinical practice for screening and diagnostics is through periodic blood sampling by heel stick procedures which are invasive and, potentially, cause trauma or infection. Commercially available noninvasive transcutaneous bilirubin meters cost upwards of Rs. 2 Lakh per unit, limiting their adoption in resource-constrained settings.

Our product, Biliscope, addresses the above shortcomings and is a state-of-the-art instrument that presents a viable, sensitive, non-invasive, and affordable alternative for neonatal jaundice screening.

The blood sample (heel-prick) method of bilirubin estimation is both painful and potentially infectious. The device reduces the number of heel pricks while UV therapy is administered to neonates. It will be of use to any hospital that has a neonatal ward and UV chamber. It will also be useful for hospitals with maternity wards.

Expected Impact

Municipal bodies, hospitals with neo-natal units and maternity wards, NGOs

PROJECT DETAILS

Principal Investigator:

Prof. Santosh Noronha

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 25 Lakhs

Technology Readiness Level:

1

Project Duration:

2 years

UN SDG No:

SDG 3, 9

Project Title

MACHINE LEARNING DRIVEN EARLY IDENTIFICATION OF THOSE AT RISK OF DEVELOPMENT OF LONG COVID COMPLICATIONS IN THE INDIAN POPULATION

Objective

- To investigate the changes in the structure, and functional connectome (DMN, DAN, CEN, SN, Sensory Motor, Visual, Primary Visual, Auditory, Language) and white matter integrity (CST, AF, OR, ILF, SLF, IFOF) using sMRI, rs-fMRI and DTI and its correlation with Montreal Cognitive Assessment (MoCA) in three age groups (45-55, 55-65, & 65-75 years) through cross-sectional investigation
- To develop an ML-based multimodal approach to combine imaging (both structural and functional) data with demographic and lab investigations to identify risk factors associated with accelerated cognitive aging

Project Description

As the world enters the fourth year of the pandemic, despite the relaxation of travel and mobility restrictions, COVID continues to be a constant threat, especially, the long-term complications and post-COVID sequelae. While the present mortality and infection rates of COVID exist at a significantly lower level compared to the peaks of the pandemic much to the excitement of the administration as well as the general population, the disease burden of long COVID complications, especially in the Indian context is still under-appreciated. A longitudinal study in North India has demonstrated that approximately 10% of patients diagnosed with COVID continue to express symptoms beyond 12 weeks of the acute infection. Further, the most common symptoms identified in Post COVID were myalgia, fatigue, insomnia, breathlessness, mood disorder, and anxiety. Notably, the effects of long COVID can dramatically affect the quality of life and the ability to perform daily activities. Also, early identification, diagnosis as well as treatment of patients with long COVID continues to be a challenge due to the heterogeneity in symptomatology which generally evolve over long trajectories.

Expected Impact

The study will benefit patients, clinicians, researchers, and policymakers directly and will indirectly benefit caregivers, employers, and the wider community.

PROJECT DETAILS

Principal Investigator:

Prof. Kshitij Jadhav

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 25 Lakhs

Technology Readiness Level:

2

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

SPECULUM FOR CERVICAL CANCER SCREENING CAMPS

Objective

- To design and manufacture the redesigned speculum prototype
- To test the prototypes with doctors and Asha workers within hospitals and in screening camps

Project Description

Cervical cancer is a major public health issue and a leading cause of cancer-related deaths among women worldwide. Cervical cancer is the second leading cause of cancer deaths among women in India. About one in every five (21%) cases of cervical cancer are reported from India, according to a study published in The Lancet Global Health journal.

Despite the availability of effective screening tools in India, many women still do not receive timely screening, leading to a high number of cases and deaths that could have been prevented. Several challenges contribute to low rates of cervical cancer screening, including lack of awareness, limited access to healthcare, and cultural or social barriers.

At present, we have developed a screening tool named GyneaCam. This screening tool is in the testing stage at hospitals. With GyneaCam we can screen 30 women in a day during an 8-hour period. Currently, the use of the speculum is limited to one speculum for one woman at a time and requires sterilization before using it on another woman. The product is available in 3 standard sizes but is designed such that it can be used only by doctors. All of these issues lead to a lower number of women screened per day.

The use of a speculum is a critical part of gynaecological exams. So is the effort to redesign the speculum to make it more comfortable and less intimidating for women.

Expected Impact

With this tool, cervical cancer screening can be done faster and make it more accessible/usable for Asha workers. The device's ease of use would also break the taboo and make it more comfortable for women to undergo screening in tribal communities. The more screenings are done, the more we can prevent cervical cancer.

PROJECT DETAILS

Principal Investigator:

Prof. Santosh Noronha

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 25 Lakhs

Technology Readiness Level:

0

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

EARLY DETECTION OF POLYCYSTIC OVARIAN DISEASE/SYNDROME

Objective

- To conduct primary research and develop a questionnaires-based survey model for the early detection of PCOD/PCOS
- To conduct research & development in biochemical testing methods and hormone level impact study
- To test the early detection models on the field and conduct clinical trials by partnering with NGOs

Project Description

A questionnaire would be created as an important tool in detecting Polycystic Ovary Syndrome (PCOS) because it provides important information about a woman's symptoms and medical history.

This tool is important since there is a tremendous increase in the number of patients ranging from 10-year-olds to 30-year-olds who have Polycystic Ovarian Diseases (PCOD) issues. It's astonishing to see this trend even in village camps and amongst the same age group. Initially, PCOD was seen in obese girls and older girls. Now, unfortunately, cases are observed in young girls (10 years) who are lean.

The tool would help healthcare providers identify the presence of common symptoms of PCOS, such as irregular menstrual cycles, excessive hair growth, acne, and weight gain. Additionally, it can also provide information about other factors that may contribute to the development of PCOS, such as family history, insulin resistance, and obesity. This information is crucial in making an accurate diagnosis and determining the best course of treatment for each individual patient.

Overall, a questionnaire is a simple and effective way to gather important information that can help healthcare providers diagnose and treat PCOS, improving the lives of millions of women around the world.

Expected Impact

One among 5 women in India suffers from PCOD. It affects approximately 10-20% of women of reproductive age in India. Early detection through the tool would lead to implementing lifestyle changes and undergoing medical treatments. It would help manage symptoms of PCOS, such as irregular periods and excess hair growth, and improve overall health and fertility. Treating PCOS can also reduce the risk of longterm health problems, such as type 2 diabetes, heart disease, and endometrial cancer.

PROJECT DETAILS

Principal Investigator:

Prof. Santosh Noronha

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 28 Lakhs

Technology Readiness Level:

1

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

TARGETED DELIVERY OF THERAPEUTICS IN TRIPLE NEGATIVE BREAST CANCER THROUGH CRISPR/CAS9-BASED GLYCOCALYX EDITING

Objective

Develop a nano-formulation that increases drug uptake in cancer cells by inhibiting the expression of Mucin-1, thereby leading to increased cell death.

Project Description

Triple Negative Breast Cancer (TNBC) is an aggressive form of breast cancer with a high chance of spreading to secondary tissues in the body. It is difficult to treat and patients often relapse due to ineffective doses of the treatment or the development of resistance to chemotherapy. It has been established that cancer cells have an extended cell membrane (Glycocalyx) which can prevent the entry of certain molecules inside the cell. The protein, Mucin-1, is over-expressed in breast cancers and forms a part of the glycocalyx. We aim to modulate this cancer cell barrier by targeting the Mucin-1 protein in order to increase the efficacy of therapeutic uptake by cancer cells. This, in turn, will ensure a higher rate of survival for patients.

Expected Impact

The study will help us to simultaneously evade the cell barrier along with the treatment of cancer cells. The benefits of this formulation are increasing the efficacy of current chemotherapeutics and reducing the chance of a relapse.

PROJECT DETAILS

Principal Investigator:

Prof. Shamik Sen

Theme:

Healthcare

Budget:

INR 30 Lakhs

Technology Readiness Level:

1

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

TOPOGRAPHICALLY PATTERNED HYDROGELS FOR FASTER WOUND HEALING AND REDUCED SCARRING

Objective

- Designing and selecting topographic patterns using wound healing simulations
- Fabrication of patterned hydrogels and performing in-vitro studies
- Scaling patterns for performing animal studies

Project Description

Wound healing normally results in scarring. Scars are formed from the quick response of the body to close the wound but scars last for a lifetime and affect the physiological functions of the tissue. Patients with scars will sometimes have poor mental health due to the visible damage to their skin. The scar tissue is composed of highly aligned collagen fibres that are formed due to the contraction of the wound. Scarring from wound healing leads to the poor physiological function of the tissue and impacts the mental health of patients.

Solution:

Scar tissue is made of highly aligned collagen fibres. Breaking the alignment of collagen fibres during wound contraction will reduce scarring.

Impact:

We developed a topographic pattern that will direct cells and also disrupt the alignment of collagen fibre, which will result in better tissue regeneration.

Expected Impact

- 2-3 lakh people get injured in India annually
- Nearly 3 lakh people are injured and are recovering from wounds

PROJECT DETAILS

Principal Investigator:

Prof. Shamik Sen

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 30 Lakhs

Technology Readiness Level:

1

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

A MICROFLUIDIC PLATFORM FOR LABEL-FREE ISOLATION OF EXOSOMES FROM URINE

Objective

To develop a compact and user-friendly microfluidic platform that can directly isolate exosomes from urine without the need for centrifugation, expensive antibodies, or manual intervention

Project Description

There is growing interest in developing urine-based biomarkers for diagnostic tests, particularly for bladder, prostate, and renal cancer. However, current methods for isolating urinary exosomes, which serve as excellent biomarkers, are time-consuming and require expensive equipment.

This project proposes a compact and user-friendly microfluidic platform that can directly isolate exosomes from urine without the need for centrifugation, expensive antibodies, or manual intervention. The platform utilizes the balance between Dean (FD) and lifts forces (FL) in a curved microfluidic channel. Exosomes migrate from the outer wall to the inner wall of the channel due to the Dean force, while a wall-induced lift force pushes them away from the walls. This allows for the separation of exosomes from larger particles, such as suspended cells, through two outlets. Once the design is optimized and tested, the device will be fabricated using acrylic (PMMA) through micromilling or laser cutting, followed by injection moulding.

Expected Impact

The exosome market had a revenue of \$174 million in 2020 and is expected to reach \$2.3 billion by 2030. The growth is largely driven by the growing incidence of cancer patients (>19 million new cases in 2020) and, more recently, the COVID-19 pandemic. The available technologies are superexpensive and complex. But the method proposed here has a simple design (a single curved channel instead of a spiral), high throughput (2 ml/min), and no requirement for sample pre-processing or additional equipment. These qualities will enable scale-up and a faster operation time.

PROJECT DETAILS

Principal Investigator:

Prof. Debjani Paul

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 35 Lakhs

Technology Readiness Level:

3

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

THERMOMUDRA - A LOW-COST CONTACTLESS FAST BODY TEMPERATURE IMAGING DEVICE FOR HIGH TRAFFIC AREA DEPLOYMENT

Objective

To develop a device to quickly identify a person with higher-than-normal temperature in a high-traffic area (for example - security entrance or classroom entrance) and tag them with their thermal and optical image.

Project Description

Every object emits heat/infrared radiation that is not visible to the eyes. The radiation emitted is proportional to temperature. A thermal/infrared camera is capable of detecting the radiation. The radiation is then matched to a specific colour producing images with heat/temperature profiles. The standalone thermographic cameras are quite costly, (\$250 ~ \$1500). The cost of a thermal imager goes up as you increase the resolution (number of pixels).

The goal of this project is to come up with a solution specific to measuring body temperature at a price point of around Rs. 10,000 using locally sourced components. The innovation in the proposed technology is in using the optical image to selectively measure temperature at select locations corresponding to body temperature locations. This will substantially reduce the cost of the sensor required for ThermoMudra.

Expected Impact

The technology will help identify and quickly isolate a person with a higher-than-normal temperature in a high-traffic area which will help in preventing transmission of viruses like Covid-19 which are highly contagious.

PROJECT DETAILS

Principal Investigator:

Prof. Rajesh Zele

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 35 Lakhs

Technology Readiness Level:

6

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

DESIGNING DEFORMABLE AND ELASTIC 3D SCAFFOLDS FOR CELL GROWTH UNDER HIGH COMPRESSIVE LOADS

Objective

- Fabrication and mechanical evaluation of scaffolds with high compressive strains and stresses
- Biochemical and physiological response evaluation in cell-seeded and compressed scaffolds
- Enhanced cell growth, proliferation, and osteogenesis in scaffold cells under variable stress and strain loading

Project Description

Cell-seeded 3D scaffolds with superior mechanical strength, deformability, and elasticity underlying low regeneration times are highly desirable for effective Bone Tissue Engineering.

Expected Impact

- 3D elastic scaffolds with high mechanical strength can be helpful for orthopaedic surgeons for the restoration, replacement, or regeneration of defective tissues, especially where the injury occurs under high mechanical load deforming conditions
- Physiotherapists can also use them to investigate the impact of specific physiotherapy activities imparting enormous mechanical strain on the rate of bone/tissue repair and hence their success landscape. e.g., in articular cartilages
- Also, orthopaedic tissue engineering companies could use the scaffolds for culturing stem cells for personalized therapy

PROJECT DETAILS

Principal Investigator:

Prof. Shobhna Kapoor and
Prof. Kamendra P. Sharma

Theme:

Healthcare

Budget:

INR 40 Lakhs

Technology Readiness Level:

3

Project Duration:

3 years

UN SDG No:

SDG 3

Project Title

HIERARCHICAL FEDERATED LEARNING FOR THE INDIAN HEALTHCARE SYSTEM

Objective

To develop Hierarchical Federated Learning (H-FL) which will be an intermediate architecture between the classical centralized federated learning and the fully decentralized architecture which could be a solution to the problems mentioned above.

Project Description

The decentralized nature of healthcare data and the hierarchical structure of the Indian healthcare system pose challenges to the successful application of ML and classical FL. The team proposes a partially decentralized FL design to address these issues. However, even the application of FL in the Indian healthcare system presents unique challenges. Firstly, the data-sharing rules vary within and outside organisations, leading to a complex hierarchy of trust. Secondly, different healthcare facilities use varied data acquisition devices and protocols, leading to disparities in data distribution. The team proposes a partially decentralized FL design. The research will focus on resolving the following key questions:

1. How to design a hierarchical communication topology and aggregation algorithms across different data distributions?
2. How to reason about different levels of privacy and convergence across different levels of hierarchy?
3. How to rigorously evaluate the effectiveness of our proposed FL algorithm and other federated learning algorithms on healthcare datasets within a hierarchical topology?

Expected Impact

The project consists of three deliverables: Hierarchical Federated Learning Framework, Privacy- Preserving Mechanisms, and Benchmarking and Evaluation. The framework will facilitate the aggregation of knowledge across data silos, while the mechanisms will protect privacy at different levels. The evaluation will use realistic datasets and simulations relevant to the healthcare sector in India.

PROJECT DETAILS

Principal Investigator:

Prof. Kshitij Jadhav

Theme:

Healthcare

Budget:

INR 40 Lakhs

Technology Readiness Level:

2

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

POLYMERIC IMPLANT FOR PANCREATIC CANCER TREATMENT

Objective

To develop polymeric implants containing GEM for PC treatment

Project Description

According to Globocan 2020, pancreatic cancer (PC) accounts for nearly 500,000 new cases worldwide, with a high death rate of 93%. The five-year survival rate for PC patients remains less than 5%, which has not improved in the past four decades. Most cases are diagnosed at an advanced stage, limiting the possibility of surgery and making chemotherapy the primary treatment. The FDA-approved drugs Gemcitabine (GEM) and solferino are commonly used but are limited in their efficacy and have many side effects. To optimise GEM delivery, the proposal suggests using polymeric implants containing GEM for PC treatment. The pancreatic tumour microenvironment poses challenges for drug delivery, and GEM has toxic effects on healthy cells. By placing a GEM-loaded polymeric implant near the tumour, the drug can be released locally. A polymeric film implant using chitosan and polyvinyl alcohol as a base has been developed, showing localized and prolonged drug release, enhanced cell-killing capability, and reduced tumour growth in mice models. Promising results in mice have led to plans for investigating the effect of the GEM film on PC patients and filing a patent for this novel delivery system. Additionally, an injectable gel combining GEM and curcumin is being developed and characterized for its gelation time and cell-killing ability.

Expected Impact

Current implants used in the treatment of PC fail to attain a sustained release of GEM for a prolonged time since GEM is highly hydrophilic. Additionally, drug release from implants at different pH has not been investigated. This is important because the tumour region is acidic, while the surrounding region has neutral pH. Thus, implants must release drugs at both pHs, as they can be inserted at the tumour region or in the tumour-adjacent region. Thus, there is an unmet need to explore other forms of polymeric implants (like gel, film, and wafers). Also, current findings in the area of implantable drug delivery systems do not address the problem of chemoresistance. The proposed technology addresses both these serious concerns.

PROJECT DETAILS

Principal Investigator:

Prof. Rajdip Bandyopadhyaya

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 40 Lakhs

Technology Readiness Level:

5

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

DEVELOPMENT OF PORTABLE RAMAN TWEEZERS FOR ON-SITE IDENTIFICATION AND CHARACTERIZATION OF MICROPLASTICS AND NANO-PLASTICS

Objective

To develop a cost-effective portable version of Raman Tweezers for the identification and characterization of micro and nano plastic particles dispersed in liquid samples

Project Description

Plastic is widely used but mostly as single-use materials, leading to environmental and health threats. The breakdown of plastic into smaller micro and nano forms has been observed in the ocean, where they are ingested by aquatic organisms and potentially accumulate in the food chain. Recent studies even found microplastics in the human placenta. Micro and nano plastics can have adverse effects on cells, causing cytotoxicity, oxidative stress, changes in gene expression, and loss of protein function. Current analytical tools for detecting and characterizing micro and nano plastic particles are expensive and unsuitable for liquid dispersions. Therefore, there is a need for advanced, cost-effective techniques to address this issue. This project aims to develop a cost-effective portable version of Raman Tweezer for the identification and characterization of micro and nano plastic particles dispersed in liquid samples.

Expected Impact

The portable RT would be very helpful for the on-site chemical analysis of nano-sized plastic contaminants that are dissolved in local water bodies. By studying the chemical fingerprint of the nano plastic particles, predominant chemical contaminants can be identified and the toxic effects associated with these chemicals on human and aquatic health can be predicted.

PROJECT DETAILS

Principal Investigator:

Prof. Ambarish Kunwar

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 45 Lakhs

Technology Readiness Level:

0

Project Duration:

3 years

UN SDG No:

SDG 3, 6, 14

Project Title

PROTOTYPE DEVELOPMENT FOR LOW-COST SOLAR-THERMAL MEMBRANE WATER PURIFICATION UNIT FOR BRACKISH WATER TREATMENT

Objective

Development and deployment of a portable solar-thermal-membrane water purification equipment to produce useable water from brackish groundwater

Project Description

Access to safe water is crucial for improved health and preventing the spread of diseases. However, many regions, particularly coastal areas, face water scarcity and inadequate infrastructure. To address this, a portable solar-thermal-membrane water purification equipment is proposed. This solution utilizes locally available components, is easy to maintain and repair, and operates using solar energy. It can produce usable water from brackish groundwater, providing relief to rural populations, especially in coastal regions. Additionally, the equipment can produce high-value pure distilled water, supplementing the drinking water supply.

Expected Impact

- Local solutions for brackish water purification in coastal areas will create a huge impact not only in terms of generating sustainable sources of usable water but also with the economic and financial development of these areas
- This will provide significant respite to rural populations, especially in the coastal belt, where brackish groundwater is abundant

PROJECT DETAILS

Principal Investigator:

Prof. Sumit Saxena

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 45 Lakhs

Technology Readiness Level:

4

Project Duration:

2 years

UN SDG No:

SDG 3, 6

Project Title

AUTOMATIC GENERATION OF RADIOLOGY REPORTS FROM MEDICAL IMAGES

Objective

To design a system that generates a structured, and patient-specific report from a radiology image, image tags, and domain knowledge.

Project Description

Radiologists typically prepare diagnosis notes by dictating them onto a voice recording device or writing them on paper. The transcriptionists then convert the notes into a preliminary, formatted report, which is then passed back to the radiologist. The radiologist reviews the report, corrects the errors, and signs off. Subsequently, transcriptionists are trained using a radiologist's feedback. India has a severely imbalanced ratio of one radiologist per 100,000 population, leading to high patient inflows, making radiologists incredibly busy and stressed out. To increase efficiency and productivity, many hospitals and diagnostic centres have installed picture archival and communications systems (PACS) and radiology information systems (RIS). However, currently adopted workflows cause significant delays in report turnaround time, errors in the reports, and burnout. To solve this problem, three approaches are proposed:

- Approach 1: Generate the tags for the input chest radiograph
- Approach 2: Generate the pathological description from the generated tags and image features
- Approach 3: Replace appropriate normal sentences from the normal report template with the generated pathological descriptions

Expected Impact

Our initial interactions with Indian radiologists, diagnostic centres, and hospitals highlight that many of the radiologists wanted to get rid of the tedious report typing process and focus mainly on the diagnosis. It led them to hire transcriptionists who can assist them in preparing the final diagnostic reports.

PROJECT DETAILS

Principal Investigator:

Prof. Pushpak Bhattacharyya

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 50 Lakhs

Technology Readiness Level:

9

Project Duration:

2 years

UN SDG No:

SDG 3, 9

Project Title

BIOCATALYSIS TOWARD THE INDUSTRY-SCALE SYNTHESIS OF ISOINDOLINE DRUG DERIVATIVES

Objective

Scale-up developed protocols to synthesise bioactive, as well as commercial drug molecules.

Project Description

Although asymmetric catalysis has long been a challenge for chemists, nature has been able to perform such reactions on highly complex molecules rather robustly using a variety of enzymes. However, these enzymes do have limitations in terms of the types of reaction that can be performed, the flexibility of the enzyme, and the specificity of the substrates.

After studying the above, we combined the two strategies and realised that we would be able to perform non-biological reactions in an enantioselective manner while having minimal impact on the environment as our method does not require any external oxidants. In addition, as the protein can be easily extracted using cell colonies, it is both economical for production and easily scalable and does not require additional compounds like chiral ligands. The enzyme system also provides better turnover numbers and lower catalyst loading making it highly efficient compared to its synthetic counterparts.

In this project, we have employed biocatalysis, especially artificial metalloenzyme catalysis, towards asymmetric synthesis of bioactive small molecules. In this context, we want to scale up our already developed protocols to synthesise bioactive as well as commercial drug molecules. Large-scale protein expression and whole-cell reaction conditions have already been achieved and we will apply them for the robust synthesis of small drug molecules. The main issue we will address here is the achievement of high turnover numbers (TON). Additionally, the use of organic solvents will be significantly minimized.

Expected Impact

Isoindolone and its derivatives are common fractions that are present in various natural products, some of which are being utilized for therapeutic treatment. As such, its synthesis has attracted the interest of various groups and several protocols for its synthesis can be readily found. Isoindolone is one such derivative that is present in various pharmaceuticals. As many of the drug molecules and natural products that contain isoindolone scaffold have an aromatic substituent, we propose that our methodology would be a good fit for the synthesis of such molecules and provide value to industries that perform their large-scale synthesis.

PROJECT DETAILS

Principal Investigator:

Prof. Debabrata Maiti

Theme:

Healthcare

Budget:

INR 50 Lakhs

Technology Readiness Level:

5

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

DEVELOPMENT OF AN ACTIVE ARTIFICIAL KNEE JOINT

Objective

To develop an artificial knee joint that can replicate the anatomy and functionality of the natural knee using smart biomimetic materials

Project Description

Artificial or cadaveric experimental testing offers advantages over human and computational testing for validating medical implants and surgical reconstructions. Cadaveric specimens provide natural tissue with similar material and mechanical properties, making them ideal for mimicking real conditions. The development of artificial joints that replicate natural joint features, including anatomy, material properties, and functionality, presents significant challenges in scientific, execution, and application aspects.

Currently, no existing models can fully replicate the complexity of natural joints, hindering clinical research and training. However, ethical and logistical issues surrounding cadaveric specimens limit their use. To overcome these challenges, the focus is on developing an artificial knee joint that closely replicates the anatomy and functionality of the natural knee using smart biomimetic materials.

The ultimate goal is to advance the development into an active artificial joint incorporating technology to mimic muscles and sensors for real-time feedback control. This innovation aims to combine the replication of anatomical, material, and functional aspects of human joints, which is not well-documented in the literature. The active component of the device intends to improve functional replication by capturing and replicating the biomechanics of the knee joint comprehensively.

Expected Impact

The impact of this innovation lies in its potential applications in musculoskeletal biomechanical research, orthopaedic training, and education. It will provide a valuable tool for academics, scientists, clinicians, and the industry to study and simulate the knee joint. Additionally, orthopaedic surgeons and the industry can use it as a testing bed for current and future implants and surgical procedures. By reducing the reliance on cadaveric specimens, this development aims to transform orthopaedic training and medical education in a meaningful way.

PROJECT DETAILS

Principal Investigator:

Prof. Darshan Shah

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 50 Lakhs

Technology Readiness Level:

2

Project Duration:

3 years

UN SDG No:

SDG 3

Project Title

DEVELOPMENT OF AN IOT-BASED PLATFORM FOR THE ASSESSMENT AND MONITORING OF MUSCLE FATIGUE FOR PREVENTION OF WORK-RELATED MUSCULOSKELETAL DISORDERS (WMSDS)

Objective

To design an IoT-based platform for the assessment and monitoring of muscle fatigue in the workplace integrating data from sEMG sensors of workers as well as the generation of customized alerts

Project Description

WMSDs are injuries and disorders that develop slowly over time due to repetitive activities or awkward postures, resulting in chronic pain. They primarily affect the musculoskeletal system including muscles, tendons, ligaments, cartilage, and nerves. WMSDs related to arm and hand movements are common in jobs that require their use. Early assessment and workplace interventions can significantly reduce and prevent these disorders. However, there is a lack of awareness about WMSDs in India, leading affected workers to seek medical attention only when the problem becomes chronic. This proposed project aims to develop an IoT-based platform with wireless sEMG sensors for assessing, monitoring, and preventing WMSDs. The platform will collect real-time muscle fatigue data, allowing customized interventions. The project also intends to test the platform in a workplace with prevalent WMSDs due to repetitive motions.

Expected Impact

The IoT-based platform proposed in this project will help in the early assessment of WMSDs which, in turn, will help significantly reduce and, potentially, prevent the disorder altogether through early interventions at the workplace.

PROJECT DETAILS

Principal Investigator:

Prof. Ambarish Kunwar

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 50 Lakhs

Technology Readiness Level:

1

Project Duration:

3 years

UN SDG No:

SDG 3

Project Title

CONTACTLESS ANTHROPOMETRIC CLINICAL MEASUREMENTS USING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Objective

To develop an AI-enabled IP camera with a cross-platform App and database

Project Description

Anthropometric dimensions are highly significant and play an important role in determining shape, size, extent, consistency, contour, regularity, deformity, and many such implications in patient care. Apart from clinical medicine, it is also useful in forensic science, anatomy, archaeology, textile, fashion, aerospace research, underwater science, security, sports, and many other fields. In clinical setups, the physical examination is mostly done by measuring with a tape and manually dominating the same. The measurements of various distances or points are extremely important in rheumatological examination. This is a very tedious job and takes almost one hour to properly examine a patient. In this design and development, an automated and accurate method for the measurements of anthropometric dimensions of the human body using real-time object detection, computer vision, and machine learning algorithms will be used. A parallel development method to measure the same parameters using 2-D images will also be carried out.

Expected Impact

- It has huge commercial potential
- Area of use includes healthcare (like general medicine, anatomy surgery, paediatrics, orthopaedics, maxillofacial surgery, plastic surgery, etc.) fashion, defence, forensic science, security, aerospace, gesture control, anthropometry, biomechanics, archaeology, textile, underwater science, sports, and many other fields

PROJECT DETAILS

Principal Investigator:

Prof. Rohit Shrivastava

Theme:

Healthcare

Budget:

INR 57 Lakhs

Technology Readiness Level:

1

Project Duration:

1 year

UN SDG No:

SDG 3

Project Title

PREVENTING GOSSYPIBOMA USING AI ML

Objective

Develop an AI camera-based object tracker for the prevention of Gossypiboma.

Project Description

Gossypiboma is a dreadful complication caused by any retained foreign body such as cotton or surgical sponge left inside the body cavity during a surgical procedure. Gossypiboma is an entirely preventable surgical complication and is associated with significant morbidity in patients and medico-legal issues for the surgeon. The literature review shows that the incidence of gossypiboma is significant and that the most cited reason for it is the error of the surgeon in the retrieval of the gauze pieces after the surgery. Gossypiboma usually has varied and vague presentations and is also difficult to detect in radiological investigations. We propose an AI-based unique solution with the use of a tag and tag-tracker mechanism. The camera can count and remember each gauze piece using a particular tag and recount at the end of surgery and thus alert doctors about any lost gauze pieces and prevent complications from arising thereof.

Expected Impact

Clinically any retained foreign object inside the body cavity can be diagnosed using various radiological techniques such as X-rays and CT scans. Sponges having radiopaque materials are not visible clearly in MRIs as the radiopaque materials do not have magnetic or paramagnetic properties. Intraoperative radiography is also suggested by many surgeons to check for any retained foreign substance left inside the body cavity. Gossypiboma usually has varied and vague presentations and is also difficult to detect in radiological investigations. The proposed tool has a huge commercial potential as the scope of such an app includes almost all systems in surgical procedures of internal organs.

PROJECT DETAILS

Principal Investigator:

Prof. Rohit Srivastava

Theme:

Healthcare

Budget:

INR 57 Lakhs

Technology Readiness Level:

1

Project Duration:

1 year

UN SDG No:

SDG 3

Project Title

ESTABLISHING A STATE-OF-THE-ART ORGANOID CULTURE FACILITY TO GROW PATIENT TUMOURS IN VITRO

Objective

- To set up a lab for organoid culture and set collaborations with clinicians
- To grow tumours as organoids and improve the survival rate and efficacy

Project Description

Organoid culture involves growing a primary patient tumour in a lab. Interestingly, it is easier to cultivate non-cancerous cells in a laboratory setting than it is to grow patient tumours because it requires special training and media conditions. In a clinical setting, clinicians face the challenge of finding an effective and less toxic treatment for their patients. The traditional method of drug-test-trial is detrimental to a patient's health, finances and takes months to find the right drug. A solution to this problem is to grow a short-term organoid culture and perform drug testing on patient tumours. Utilizing my previous expertise, I intend to establish an in vitro culture system for primary tumours obtained from hospitals. The organoids could be used for drug testing, and results of drug sensitivity could be available within a month.

Expected Impact

- Breast cancer patients across India
- Families of breast cancer patients across India

PROJECT DETAILS

Principal Investigator:

Prof. Sushil Kumar

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 60 Lakhs

Technology Readiness Level:

3

Project Duration:

3 years

UN SDG No:

SDG 3

Project Title

EXOSOME-BASED DIAGNOSTICS FOR SUSTAINABLE CANCER CARE

Objective

- Development of a microfluidic platform for the enrichment of exosomes from plasma and urine samples
- Physical and biological characterization of exosomes isolated by microfluidics

Project Description

By developing and validating a microchip-based point-of-care (PoC) technology for liquid biopsy-based (using exosomes as biomarkers) cancer diagnosis, the project aims to reduce the dependence on traditional energy-intensive and expensive clinical imaging techniques. Besides accelerating a transition towards economically and environmentally sustainable cancer care, the proposed benchtop platform will bring a higher quality of cancer care within the reach of a larger patient population without having to travel long distances to specialized healthcare facilities. We propose a microfluidics-based platform for the sensitive and specific isolation of exosomes from body fluids like plasma and urine of cancer patients. We also propose to benchmark this technique against the gold standard for disease monitoring. Accurate and early diagnosis of cancer from a small amount of body fluid is the “holy grail” of cancer care. Such an approach can drastically improve clinical outcomes by capturing tumour heterogeneity and providing the scope for frequent testing. It can also significantly improve economic and environmental sustainability by partially removing the dependence on expensive, energy-intensive, and environmentally detrimental imaging methods like CT and MRI. The proposed exosome-based profiling can, in the long run, lead to the decentralization of cancer care facilities and reduce inequalities in the distribution of cancer care.

Expected Impact

- According to the National Cancer Registry of India, during 2012-2015, the number of individuals diagnosed with cancer in Mumbai was 53714. This number is likely to be much higher today. These patients who have been diagnosed with cancer will be the direct beneficiaries of our technology
- According to the National Cancer Registry of India, 1 in 9 males and 1 in 8 females between 0-74 years of age are likely to develop cancer in any part of the body in their lifetime. Our proposed liquid biopsy innovation will benefit this population who are at a cumulative risk of developing cancer

PROJECT DETAILS

Principal Investigator:

Prof. Debjani Paul and
Prof. Shamik Sen

Theme:

Health, Nutrition, Safe Drinking
Water and Sanitation

Budget:

INR 60 Lakhs

Technology Readiness Level:

1

Project Duration:

3 years

UN SDG No:

SDG 3

Project Title

MAKING LAPAROSCOPIC SURGICAL GAS EXHAUST SAFER WITH LOW DELTA-P BIOAEROSOL FILTERS TO REMOVE SMOKE, TISSUE FRAGMENTS, AND COVID-19 VIRUS

Objective

To develop a compact air filter utilizing hollow fibre membranes (HFMs) for decontaminating the exhaust air of laparoscopic devices

Project Description

There is a need for safer and easier ways of treating the smoke created during laparoscopic procedures before discharging into the environment. Typically, a filter is used to remove aerosol particles containing viruses, to protect the HCPs during the pandemic. HEPA filters will not be feasible to use in this case as it has a relatively high-pressure drop. High-pressure drops are particularly problematic for laparoscopic surgery as high-pressure drops mean high pressure in the abdomen which can cause barotrauma. Under pressure drops would not be effective either, as they would not keep the lungs/abdomen adequately inflated. So, there is a need for a low-pressure drop bioaerosol filter that can remove smoke, tissue fragments, and the Covid-19 virus. The proposed solution is a hollow fibre-based design. The main advantage is that hollow fibres have 1200 m²/m³ whereas current pleated technology has about an order of magnitude less, about 100-200 m²/m³. The proposed device is hollow fibre membranes (HFMs) based compact air filters that have lower pressure drops. They are effective for decontaminating exhaust air of laparoscopic trocars, insufflators, and other gas-exhausting devices.

Expected Impact

- The compact air filter design can decontaminate the exhaust air of laparoscopic trocars, insufflators, and other gas-exhausting devices with very high efficiency
- Over 1 lakh people will be directly impacted daily and a few crores on an annual basis. This includes patients requiring surgical procedures, health care personnel, doctors, etc.

PROJECT DETAILS

Principal Investigator:

Prof. Jayesh Bellare

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 65 Lakhs

Technology Readiness Level:

6

Project Duration:

1 year

UN SDG No:

SDG 3

Project Title

CAREHER: HEALTH ENTREPRENEURS ENABLING HEALTHCARE PROVIDERS TO OFFER QUALITY CARE TO WOMEN AT THE LAST MILE

Objective

- Identification of geographies for 30 HE and 300 healthcare providers
- Selection of HEs and training them on clinical and business aspects
- Selection of doctors/healthcare providers
- Monitoring and Evaluation - per HE's earnings, doctor's interest, sustainability, device, and software performance

Project Description

Lack of access to healthcare devices at the bottom of the pyramid leads to the exclusion of the end user from basic as well as state-of-the-art services. Start-ups and academia have developed many solutions but these solutions have not made any tangible impact on the ground.

The future of India lies in its villages. However, 70% of Indians living in rural areas have access to only one-third of hospital beds. The majority of rural residents have to travel an average of 5km to access a health centre. There is also limited access to quality pregnancy and women's healthcare in rural and semi-urban areas. Lack of expertise limits critical screening and consultation which can be lifesaving. One such example is fetal monitoring for fetal distress identification. Lack of access to fetal monitoring may lead to stillbirths and preterm birth. ~50% of neonatal deaths are associated with asphyxia and preterm birth. The cost of fetal monitors and the ability to use and interpret them limits access to non-stress tests (NST). In order to get an NST, women travel 20 km and pay Rs 1200. This amount goes up to Rs. 2000 considering the daily wages they sacrifice and the money they spend on food.

If the closest healthcare facility/doctor is able to offer these tests, it can save time, effort, and money. Similar to NSTs there are other tests for neonatal care and colposcopy which are offered only at mega hospitals and/or cities due to a lack of infrastructure, capital, or technical expertise of the doctor available at the local level. These problems exist even in economically middle and backward areas of many urban cities as well. Unfortunately, the lack of services and devices at the last mile continues to persist even after interventions by GOs and NGOs.

This problem can be solved by a sustainable and Village Level Health Entrepreneur (VLHE) model. The setup of a robust entrepreneurial ecosystem or VLHE can offer basic health care services and diagnostics, and provide a safe, convenient, and accessible source of care for vulnerable populations living in peripheral areas. Supported by the recent advances in digital health,

PROJECT DETAILS

Principal Investigator:

Prof. Rohit Srivastava

Theme:

Social Policy and Development

Budget:

INR 77 Lakhs

Technology Readiness Level:

8

Project Duration:

2 years

UN SDG No:

SDG 3

the villages stand to gain from improved access to basic and specialist care, with healthpreneurs in their vicinity, that provide information and diagnostics, and connect them with experienced medical practitioners.

Expected Impact

- 54,000 rural women will benefit directly. 30 rural women will be employed whilst 300 doctors will receive the necessary devices
- 2,70,000 rural and peri-urban villagers

Project Title

AN AI-BASED INTELLIGENT DIGITAL DIARY FOR THE PREDICTION AND PREVENTION OF HYPERSENSITIVITY SPELLS AND IDENTIFICATION OF ETIOLOGICAL RISK FACTORS FOR VARIOUS CHRONIC SINGLE OR MULTISYSTEM DISORDERS

Objective

- To devise an AI-based intelligent digital diary for the prediction and prevention of hypersensitivity spells for patients with allergies
- To enable easy identification of etiological risk factors for various chronic single or multisystem disorders

Project Description

The project aims to improve the prognosis of allergic disorders by developing an AI-based digital diary. The diary will allow patients to map their daily activities, document triggers, and record vital information related to their health. By analysing the data collected, the AI algorithm will identify patterns and correlations between triggers and hypersensitivity episodes. The system will have various applications, including predicting and preventing allergic episodes, as well as identifying risk factors for other chronic disorders.

Features of the AI-based digital diary:

Daily Documentation: Patients can easily document their daily activities, including food intake, clothing, comorbidities, vital parameters, exposure to allergens, and other relevant factors.

Event Day Flagging: On the day of an allergic episode, the diary will flag the parameters and activities associated with the event. The AI algorithm will analyse common factors and identify potential triggers.

Various Other Applications: The system can also be applied to predict and prevent other conditions such as migraine, asthma attacks, mood swings, anxiety spells, and more. Additionally, it has potential applications in cognitive and mental development, mental health determination, memory function, and early detection of chronic disorders.

Expected Impact

The research is expected to have significant commercial potential and can be applied in various medical fields. The AI-based digital diary can aid in the diagnosis, prevention, and management of hypersensitivity disorders across multiple systems, including skin, nervous system, rheumatological, respiratory, gastro-enteral, renal, hepatology, and psychiatric disorders.

PROJECT DETAILS

Principal Investigator:

Prof. Rohit Srivastava

Theme:

Social Policy and Development

Budget:

INR 78 Lakhs

Technology Readiness Level:

1

Project Duration:

2 years

UN SDG No:

SDG 3

Project Title

INDIGENIZATION AND GENERATING CURE FOR INFANTS FOR SPINAL MUSCULAR ATROPHY

Objective

- Establishing a transgenic zebrafish model for monitoring motor neuron development and Spinal Muscular Atrophy (SMA)
- Standardising exosome isolation from human Mesenchymal Stem Cells (MSCs)
- Standardising CRISPR-driven Homologous Repair of SMN1 mutations in MSCs
- Standardising motor neuron development and swimming and escape response behaviour motor assays in zebrafish
- Testing proof of concept xenograft experiments of CRISPR corrected MSCs and derived exosomes in a zebrafish SMA model

Project Description

Spinal Muscular Atrophy (SMA) is a degenerative neuromuscular disease caused by the loss of motor neuron function. Severe forms of SMA can be fatal before the age of 2. Current therapies only slow the progression of mild to moderate SMA, and there is no cure for severe SMA. This proposal suggests a gene-editing strategy using CRISPR technology to correct the mutated SMN1 gene in Mesenchymal Stem Cells (MSCs) derived from affected infants.

The plan involves identifying the specific SMN1 mutation and using CRISPR-based homologydirected repair to restore the gene to its normal sequence in MSCs. These edited MSCs can be delivered to patients through intrathecal injections or injections into the cerebrospinal fluid. The MSCs have the potential to hone into the spinal cord and differentiate into motor neurons expressing the full-length SMN1 protein. Another strategy is to utilize exosomes secreted by the CRISPR-edited MSCs, which can cross the blood-brain barrier and act as bio nanotherapeutics in damaged motor neurons.

To assess the efficacy of CRISPR-edited MSCs and exosomes, zebrafish will be used as a vertebrate animal model. A transgenic zebrafish model for SMA will be established to monitor motor neuron development. Motor neuron function can be evaluated through swimming and escape response motor behaviour assays, which are high throughput and suitable for personalized medicine and other muscular atrophies.

PROJECT DETAILS

Principal Investigator:

Prof. Sreelaja Nair

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 80 Lakhs

Technology Readiness Level:

5

Project Duration:

4.5 years

UN SDG No:

SDG 3

Expected Impact

Mutations in the survivor motor neuron 1 (SMN1) gene occur in 1 in ~10000 live births. SMA is the second most common fatal autosomal recessive disease after cystic fibrosis due to a high carrier frequency of 1 in ~50 in the population. The proposed strategy will provide an Indian-origin cure for SMA patients in India, reducing the cost and making the cure financially viable for affected patients and families. The current strategies to mitigate the disease burden of Spinal Muscular Atrophy involve genetic testing to detect lesions in the SMN1 gene and therapies to slow down the progression of the disease for moderate to less severe forms. The technology developed through this proposal can benefit infants affected with severe forms of SMA, for which, currently, there is no cure.

More details can be found here -

<https://drive.google.com/open?id=1bu-ZFSdbkowEMaJ6eHGiK9Yqpi1GfcM>

Project Title

HIGH-DENSITY CEREBRAL BLOOD FLOW IMAGING SYSTEM FOR STROKE PATIENTS /INDIGENIZATION OF BEDSIDE MONITORING FOR CHRONIC STROKE PATIENTS

Objective

- To develop a two-channel Near Infrared Spectroscopy (NIRS) system and associated
- algorithms for measuring tissue oxygen saturation in the prefrontal cortex of an adult human head
- To develop a two-channel Diffuse Correlation Spectroscopy (DCS) system and associated
- algorithm to measure the cerebral blood flow (CBF) in the prefrontal cortex of an adult human head
- To employ a multi-speckle DCS system for the high-density CBF measurement

Project Description

The current imaging technologies that look at cerebral perfusion in adults like MRI or CT cannot be used for point-of-care diagnostics. The light-based technologies like NIR spectroscopy have a high potential for bedside monitoring of chronic stroke patients. A hybrid optical imaging system comprising Near Infrared Spectroscopy (NIRS) and Diffuse Correlation Spectroscopy (DCS) is used to measure cerebral metabolism and cerebral blood flow in adult humans. The systems can be deployed as a point-of-care cerebral metabolism monitoring device for chronic stroke patients to monitor cerebral reperfusion. The system can also be deployed for functional imaging in the domain like clinical neuroscience, cognitive and behavioural studies, etc.

The proposal consists of indigenization (in NIRS) as well as a novelty (in DCS) towards a commercial NIRS-DCS system for long-duration bedside monitoring of chronic stroke patients. We have introduced a novel approach to DCS to scale it up for high-density imaging using a camera termed M-DCS (multi-speckle DCS).

A total of 5 publications and a pending patent have been achieved from this project in the last 4 years. The proof of concept was demonstrated in healthy adult human subjects to image cerebral blood flow associated with voluntary apnoea and number processing tasks. A novel method to achieve optical

PROJECT DETAILS

Principal Investigator:

Prof. Hari M. Varma

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 96 Lakhs

Technology Readiness Level:

4

Project Duration:

3 years

UN SDG No:

SDG 3,9

tomography is also developed for almost real-time imaging of the cerebral hemodynamic along with methods to filter out the artifacts from the scalp. The deployment of the DCS system is often associated with the NIRS and hence by employing more than one wavelength, DCS data can be equally used for the DCS or M-DCS.

Expected Impact

Several stroke cases are happening in the country even at a very young age. A need to monitor CBF for chronic stroke rehabilitation is necessary. The device can be employed in infants to look at the brain's development in a completely noninvasive and safe way (please see the Tiny Brain or Babylux projects in Europe). All the NIRS machines for functional and cognitive clinical research are currently imported. This proposal is an indigenization effort for the NIRS machine.

Project Title

SUSTAINABLE AND RESILIENT URBAN WATER DISTRIBUTION SYSTEMS

Objective

- Identification of case city for demonstration of the innovative water distribution technology
- Baseline survey of the situation and identification of zone for demonstration
- Design, fabrication, civil works, and commissioning of an innovative water distribution system

Project Description

In India, intermittent water supply (IWS) is existent throughout the country. Conventional water supply techniques and pressure management technologies are designed for continuous water supply. Hence, they are not suitable in the Indian context. Since consumers in the IWS zones are unsure of the next supply hours, they try to bring home as much water as possible. This situation creates the problem of unequal water distribution and pressure management throughout the network. At times, the water tanks are bypassed. The main aim of the operators is to deliver water to the consumers irrespective of the pressure. Moreover, problems such as unequal water distribution to the consumers, differential pressures in the upstream and tail end of the service area, and inadequate pressure in households are commonly observed. Hence, it is essential to develop innovative sustainable solutions which are field relevant and address the challenges faced by consumers.

The Ministry of Jal Shakti, Government of India, has recommended that all the authorities responsible for water supply across the country test the performance of the shaft in water distribution networks. The application of shaft-based technology will help achieve equitable supply in the serving area. The improved equitable supply will enhance consumer satisfaction, which, in turn, will increase the revenue generation of the WSS. Improved revenue generation will ultimately improve the performance of the system. Moreover, the application of the shaft will help reduce the number of valve operations, and reduce the wear and tear of the network. The improved infrastructure condition will help reduce the Non-Revenue Water (NRW).

Expected Impact

Low-income people living in cities – 2000; Urban residents - 5000

PROJECT DETAILS

Principal Investigator:

Prof. Pradip Kalbar

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 1 Crores

Technology Readiness Level:

7

Project Duration:

2 years

UN SDG No:

SDG 6, 11

Project Title

URINARY INCONTINENCE MESH FOR WOMEN

Objective

- To design a urinary incontinence mesh for women
- To undertake trials on the designed solution

Project Description

After menopause, women experience weakening in their pelvic floor. Therefore, they experience stress urinary incontinence (SUI) and pelvic organ prolapse (POP), where pelvic floor organs like the uterus, bladder, and/or rectum descend from their anatomical position towards or through the vaginal opening due to loss of muscle strength that supports pelvic floor organs. Over 30% of Indian women have various degrees of POP. Currently, there is no synthetic product available in the market to treat this condition. Earlier, polypropylene-based hernia meshes were used to treat SUI and POP. Due to mechanical property mismatch, polypropylene meshes caused inflammation, organ perforation, mesh infection, mesh migration, dyspareunia, etc. and they were banned by the USFDA.

Expected Impact

Our innovation overcomes this and caters to the majority of the 65 lakh Indian women (as of 2020) who are suffering from this condition. By 2030, the number will increase to 95 lakhs. With the increasing geriatric population, there will be an increasing number of end users of this product.

PROJECT DETAILS

Principal Investigator:

Prof. Jayesh Bellare

Theme:

Healthcare

Budget:

INR 1.5 Crore

Technology Readiness Level:

4

Project Duration:

> 3 years

UN SDG No:

SDG 3, 9

Project Title

INEXPENSIVE AND SCALABLE TECHNOLOGY FOR HIGH THROUGHPUT DRUG SCREENING AND PRECISION MEDICINE FOR BREAST CANCER PATIENTS

Objective

- Development and characterization of breast cancer organoids from patient-derived samples
- Molecular and functional characterization of the developed breast cancer organoids
- Characterisation of drug sensitivity and drug-resistant organoids

Project Description

Over the past few years, research in the field of 3D cultures has grown exponentially and offers significant potential with broad applications in drug development and toxicity testing for a wide variety of diseases ranging from cancer to neurological disorders. The major challenge in this area is to create 3D cultures which are biologically relevant and recapitulate tumour microenvironmental factors that resemble in vivo tissue and disease pathology. However, with an increasing list of available 3D cell culture methods, the team aims to take advantage of technologies that are most appropriate for a particular purpose such as mimicking a tumour environment with appropriate stiffness and tunability and can be applied to other specialized technical applications.

Hydrogel designed from functional amyloid produces unique synthetic extracellular matrices (ECMs) that provide the necessary structural and biochemical support to promote physiologically relevant behaviour of any cell type, including breast tumour cells isolated from a rat. The team has established an easy-to-use, inexpensive, and scalable technology for the generation of complexshaped, 3-D microtissues or 3D macromolecular structures. Amyloid hydrogel as a scaffold for the 3D organoid model provided a realistic platform to precisely simulate the native tumour microenvironment in a controlled manner observed through gene expression analysis.

Products designed can support applications ranging from small-scale exploratory studies to fully automated drug screening campaigns and clinical use.

PROJECT DETAILS

Principal Investigator:

Prof. Samir K. Maji

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 2.9 Crores

Technology Readiness Level:

5

Project Duration:

3 years

UN SDG No:

SDG 3, 9 & 17

Expected Impact

Breast cancer is the most often diagnosed cancer and is the leading cause of female mortality worldwide, accounting for 25% of the total number of cancer cases and 15% of all cancer-associated female mortality. This platform will benefit this cohort. Immediate testing of drugs in the 3D organoids created may ultimately aid in choosing the best therapy for breast cancer patients. These organoids accurately represent the primary tumour and show potential for quick development and low-cost, comprehensive testing of novel therapies moving 3D drug discovery into the age of precision medicine. The application of organoids will potentially revolutionize the pre-clinical testing of novel anti-cancer therapeutic compounds. More details can be found here - <https://drive.google.com/open?id=1B6T43RPiOMRtmGOIq6VJaf8UDOrUEIS>

Project Title

A MULTIMODAL MACHINE LEARNING-DRIVEN APPROACH TO IDENTIFY RISK FACTORS ASSOCIATED WITH CHANGES IN RESTING STATE FUNCTIONAL CONNECTIVITY AND VOLUMETRIC CHANGES IN HEALTHY AGING LINKED WITH ACCELERATED COGNITIVE DECLINE IN THE INDIAN POPULATION

Objective

- Ethics committee approval: 6 months
- Patient recruitment: 4 years
- ML analysis: 6 months

Project Description

Healthy, as well as pathological aging, are associated with cognitive decline which is preceded by subtle brain changes thereby demonstrating the utility of brain imaging to predict present cognitive functioning. However, predicting future cognitive decline from present data is a greater challenge and has a higher prognostic value with significant clinical relevance. Several factors such as demographics, mood disorders, socioeconomic status, early life stress, metabolic impairments, metabolomics, and enhanced inflammation have been previously associated with the risk of accelerated cognitive impairment. While previous studies have used structural imaging alone for predictive cognitive decline, combining it with functional imaging as well as the aforementioned risk factors could be substantially better at predicting cognitive decline. Further, a machine learning (ML)-driven approach to identify early risk factors that predict cognitive decline based on longitudinal studies in the Indian context is currently lacking.

Importantly, several previous investigations have focused on whether patients with MCI progress to Alzheimer's disease or have assigned a patient to a data-driven trajectory subgroup. However, predicting the cognitive decline in the future based on a continuum instead of specific categories, especially in healthy individuals, could provide a fine-grain analysis of individual changes in cognitive abilities thereby also extending the abilities of such an approach to the wider aging population. We will perform big data analysis and machine learning predictive modelling to determine the risk of Long COVID in the Indian population.

The identification of individuals who develop Alzheimer's appears at a very late stage of the disease when several interventions do not affect the disease's progress. There is a need to identify the biomarkers for early diagnosis of Alzheimer's disease. A multimodal machine learning-driven predictive analysis for early identification of Alzheimer's might pave the way to intervene at an early stage of the disease condition.

PROJECT DETAILS

Principal Investigator:

Prof. Kshitij Jadhav

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 3 Crores

Technology Readiness Level:

1

Project Duration:

> 3 years

UN SDG No:

SDG 3

Expected Impact

The aging Indian population suffering from the risk of developing Alzheimer's disease

Project Title

LOW-COST, MADE-IN-INDIA, HOLLOW FIBRE MEMBRANES (HFMS) FOR HAEMODIALYSIS APPLICATION

Objective

To develop biocompatible hollow fibre membranes (HFMs) on a large scale for haemodialysis applications

Project Description

In India, over 2 lakh patients suffer from chronic kidney disease (CKD). Unfortunately, a large majority of these patients, around 90%, die within months due to a shortage of dialysis centres and nephrologists, high treatment costs, and delays in receiving treatment. Most cases are diagnosed in the final stages of CKD or end-stage renal disease (ESRD), where patients require constant dialysis or a kidney transplant. Currently, India relies heavily on the import of haemodialysis instruments, accessories, and consumables, including the HFM dialyzer. To address this issue and provide dialysis facilities to a large population suffering from kidney failure, a project has been undertaken to develop biocompatible hollow fibre membranes (HFMs) on a large scale for haemodialysis applications. The key technology in this project revolves around the development of HFMs. These HFMs possess several beneficial features such as a novel composition, low cost, excellent hemocompatibility, high efficiency in removing uremic toxins, high permeation flux, and minimal side reactions. The aim is to manufacture dialyzers locally, thereby reducing costs and increasing accessibility to dialysis treatment. The project involves close collaboration with the industry to scale up the manufacturing process and address aspects like potting, housing, and fabrication of dialyzers. By achieving this goal, the project aims to benefit not only the 90% of the end-stage CKD patients who currently cannot afford or access constant dialysis but also approximately 10,000 individuals who rely on dialysis for their survival.

Expected Impact

The development of biocompatible HFMs and localized manufacturing of dialyzers holds the potential to alleviate the challenges faced by CKD patients in India, including unaffordable treatment costs, shortages of dialysis facilities, and the limited availability of constant dialysis procedures.

PROJECT DETAILS

Principal Investigator:

Prof. Jayesh Bellare

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 1 Crores

Technology Readiness Level:

7

Project Duration:

2 years

UN SDG No:

SDG 3, 9 & 17

Project Title

DETECTION OF PARKINSON'S DISEASE IN BLOOD USING CIRCULATING A-SYN AMYLOID AMPLIFICATION

Objective

- The proposed project will provide a proof-of-concept demonstrating the use of PMCA technology for the highly sensitive detection of A-Syn seeds in blood for early diagnosis of PD
- A mathematical model to quantify the initial concentration of seeds in blood and the correlation between the seed concentration and the progression of the disease will indicate the timeline of the disease and can be used along with PD therapy
- The blood profiling of PD patients may provide readouts about the stage-wise disease progression and overall physiological status of the patient

Project Description

1) Can we detect α -Syn seeds at ultralow concentrations from blood using the α -Syn-PMCA method?

2) Can we correlate the presence of α -Syn seeds with both pre-clinical as well as the post-clinical timeline of PD and monitor the efficacy of drugs against Parkinson's disease patients?

The major goal of our study is to use PMCA for the specific detection of brain-derived, pathological α -Syn (oligomer/fibril form of α -Syn) in peripheral blood (as it is minimally invasive and easily accessible) for the early detection of PD. The amount of α -Syn seeds in a PD patient's blood is difficult to measure using conventional techniques due to their extremely ultra-low concentration. However, this could be amplified using PMCA up to a detectable range. This technique requires a concentrated monomeric pool of the protein of interest in which the sample (body fluids) containing a small number of seeds is to be added. However, natively unstructured proteins like α -Syn will self-aggregate without the requirement of seed and show false positive results. Therefore, PMCA will become a futile exercise due to less specificity and there is a high chance for inconclusive false positive errors.

Expected Impact

6.1 million are currently affected by PD globally.

PROJECT DETAILS

Principal Investigator:

Prof. Samir K. Maji

Theme:

Technology Incubation and Entrepreneurship

Budget:

INR 3.5 Crores

Technology Readiness Level:

7

Project Duration:

3 years

UN SDG No:

SDG 3,9

Project Title

DEVELOPMENT OF A FALL-RISK METRIC FOR GERIATRIC HEALTH SCREENING AND FALL PREVENTION IN THE AGING POPULATION OF INDIA: A DRAMATICALLY RISING DEMOGRAPHIC

Objective

The overall objective of this research study is to determine, comprehensively, the fall risk factors and to develop a fall-risk metric for predicting falls in the aging population of India.

Project Description

The study aims to address the pressing public health concern of falls among the aging population in India. It focuses on three main objectives. First, to identify the risk factors associated with predicting falls in older adults in India, considering factors such as cognitive deficits, balance and gait control issues, sensory impairments, and underlying health conditions. Second, to investigate how age-related cognitive deficits, balance, and gait control interact with behavioural and socioeconomic factors to increase the risk of falls. This includes examining the influence of physical fitness levels, income, access to healthcare, and environmental factors. Lastly, the study aims to develop fall risk assessment models and metrics that can be used for geriatric health screening in the Indian elderly population. The ultimate goal is to enhance understanding of fall risk factors, develop effective fall prevention strategies, and provide valuable insights to improve the overall health and well-being of older adults in India.

Expected Impact

The project aims to develop fall-risk assessment models and metrics for the Indian elderly population to identify individuals at risk of falling. This will enable targeted interventions and rehabilitation to prevent falls. The study's long-term goals include understanding the connections between cognitive impairments, balance control, and falls. The ultimate objective is to create a multi-lingual cognitive-motor-based fall prevention and rehabilitation approach delivered through mobile applications. This will improve accessibility and allow for cost-effective community-based fall prevention centres, promoting healthy aging among older adults in India.

PROJECT DETAILS

Principal Investigator:

Prof. Neeta Kanekar

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 4.04 Crores

Technology Readiness Level:

Not Applicable

Project Duration:

4 years

UN SDG No:

SDG 3

Project Title

NOVEL STRATEGIES FOR WOUND HEALING USING BILAYERED BIOACTIVE SKIN SUBSTITUTE AND DERMAL PATCH

Objective

To develop innovative wound healing strategies using bilayered bioactive skin substitutes and dermal patches

Project Description

Burns and chronic wounds pose significant public health challenges, particularly in low and middleincome countries. The majority of burn victims (over 95%) die due to bacterial sepsis, while chronic wounds like diabetic foot ulcers often lead to amputation. Traditional wound dressings do not create the necessary moist environment for effective wound healing. To address these issues, we have developed two innovative wound-healing strategies.

Dermal Patch: Our multifunctional bilayered polymeric patches provide moisture retention and essential signals for wound healing. The top layer is composed of PCL and chitosan polymers, while the bottom layer consists of PVA polymer and woundhealing chemicals. Curcumin nanoparticles and soluble eggshell membrane proteins are incorporated as wound-healing agents.

Skin Substitute: Our indigenous, three-dimensional, bilayered skin substitute is made from natural, biocompatible, FDA-approved biopolymers. The epidermal layer is a non-porous film that acts as a barrier, while the dermal layer is a macroporous cryogel with antibacterial properties that facilitates cell attachment and migration. Both layers are degradable, eliminating the need for secondary surgery and autografts. These products offer affordable treatment solutions using natural biomaterials for patients with extensive burn wounds and recurring chronic wounds in India.

Expected Impact

The proposed solution will significantly impact the lives of burn patients and those with chronic wounds. The product offers rapid and efficient wound healing, and since it is indigenous, it will be readily available and economically affordable for targeted patients in India.

PROJECT DETAILS

Principal Investigator:

Prof. Prakriti Tayalia

Theme:

Health, Nutrition, Safe Drinking Water and Sanitation

Budget:

INR 10 Crores

Technology Readiness Level:

4

Project Duration:

5 years

UN SDG No:

SDG 3

Project Title

EARLY DETECTION OF TYPE 2 DIABETES

Objective

Prediction of Type 2 Diabetes Mellitus (T2DM) years before its onset would be valuable to the patient, their family, and the overall healthcare system of the country.

Project Description

India is home to around ~77 million diabetics and ~25 million prediabetics. Prediabetes is a heterogenous group with different subsets of individuals - those with elevated glycated haemoglobin (HbA1c- between 5.7% to 6.4%), those with impaired fasting glucose alone, or those with impaired post-prandial glucose alone. Several studies have demonstrated that these different subgroups have different progression rates toward full-blown diabetes. Although fasting blood glucose (FBS), post-prandial blood glucose which is 2 hours post meal (PP2BS), oral glucose tolerance test (OGTT), and glycated haemoglobin (HbA1c) are the standard tests used for diabetes, they lack predictive value.

Studies have shown that full-blown diabetes can be prevented, or its onset can be significantly delayed if the pre-diabetic stage is identified early. Different interventions have been identified including lifestyle modifications and medications like metformin, acarbose, and SGLT21 which can prevent this progression. Presently, no diagnostic tests are available in India for prediabetes. The present proposal is the first step in the path to developing new diagnostic tests for this purpose.

Expected Impact

Prediction of Type 2 Diabetes Mellitus (T2DM) years before its onset would be valuable to the patient, their family, and the overall healthcare system of the country. New biomarkers need to be identified from the hundreds of metabolites in human fluids. Hence, we propose performing metabolomic profiling via high-resolution (HR) liquid chromatography coupled with mass spectrometry (LCMS) and gas chromatography coupled with MS (GCMS). These techniques are well-known for their ability to simultaneously perform untargeted and comprehensive analyses of many metabolites.

PROJECT DETAILS

Principal Investigator:

Prof. Pramod P. Wangikar

Theme:

Healthcare

Budget:

INR 20.4 Crores

Technology Readiness Level:

6

Project Duration:

3 years

UN SDG No:

SDG 3



OTHERS



Project Title

A NOVEL METHOD FOR DISCONTINUITY DETECTION IN PIPELINES CARRYING FLAMMABLE LIQUIDS

Objective

- To create a cost-effective reliable Pipeline Leak Detection System (PLDS) to curb the losses from fluids transmission and distribution systems
- To create a continuous pipeline health monitoring system that could be integrated into the distribution and support network of water
- To safely transport fuels such as liquid natural gas and hydrogen and prevent losses by 30-40% Scale-up developed protocols to synthesize bioactive as well as commercial drug molecules

Project Description

Transportation of fluids such as water, oil, and natural gases through pipelines is crucial, with utmost precaution needed to be taken to avoid leakage or the bursting of these pipelines. Various hardware and software-based solutions are currently present but existing Pipeline Leak Detection Systems (PLDS) in the market are expensive and, sometimes, unreliable. Most detection systems have a lower range. Also, an average of 30-40% of water is lost while they are transported. Currently, no such continuous pipeline health monitoring system has been integrated into the distribution and transport network of water. Therefore, the distribution or transport network needs a cost-effective, and reliable solution that can continuously monitor the pipelines so the service area and quality may be increased. Moreover, no power supply arrangements can be made for the addition of commercially available sensors for the detection of leakage.

We have developed an ingenious monitoring technique to detect cracks in pipelines carrying flammable fluids. The technology works on the self-capacitance principle. Details can be found at [Novel Method for Discontinuity Detection in Pipelines Carrying Oils and Gases | Journal of Pipeline Systems Engineering and Practice | Vol 12, No 1 \(ascelibrary.org\)](#). The novel composite strip requires no external supply for operation. The proposed novel technology can be implemented in both existing and new pipelines carrying water. The cost of the novel sensor strip is only 10% of that of the existing solution with an accuracy of ± 0.04 m. The average establishment cost is 20% of that of the present detection system. For a length of 1 km, the cost of the composite strip attached to the surface of the pipeline will be \$65. The detection module will be \$25. Single repair is less than \$10. At present, the technology requires funding to make it market ready. We have already

PROJECT DETAILS

Principal Investigator:

Prof. Samir K. Maji

Theme:

Technology Incubation and Entrepreneurship

Budget:

INR 3.5 Crores

Technology Readiness Level:

7

Project Duration:

3 years

UN SDG No:

SDG 3,9

filed a patent and published a paper on this innovative technology.

This novel pipe-health diagnostic technology received the third prize in a conclave organized by North East Centre for Technology Application and Outreach (NECTAR), Unnat Bharat Abhiyan (UBA), and Vijnana Bharati (VIBHA) at Shillong, Meghalaya.

Expected Impact

The product can provide reliable, precise, and cost-effective long-range real-time health monitoring for pipelines carrying flammable fluids. It will help enhance the operational safety measures for the transportation of flammable fluids. The servicing and repair cost of leaked pipelines can be done promptly as it will identify the location of leakage accurately. Thus, this innovation reduces the breakdown time. It is reported that the wastage of water during transmission in Delhi is 40%. In Mumbai, the amount of water wastage is 7.74%, and, if saved, it could have served 23,92,593 persons' water requirements. Hence, this developed technology can reduce water leakage substantially, and many people will benefit from this. Implementing this technology will allow the gas pipeline operator to cover a good range of pipelines in the city/town distribution. Illegal distribution may also be detected. Overall, it will increase the safety of the common people. Finally, since the technology is novel and made in India, it will generate employment for Indians.

PROJECT DETAILS

Principal Investigator:

Prof. Sandip Kumar Saha

Theme:

Others

Budget:

INR 47 Lakhs

Technology Readiness Level:

6

Project Duration:

2 years

UN SDG No:

SDG 9

Project Title

RESEARCH & DEVELOPMENT IN DIGITAL TRUST & CYBERSECURITY (EQUIPMENT)

Objective

"Digital Trust" involves not only scientific and technological advances, but also sensitizing society as well as training the next generation of engineers and scientists. A core thrust of the lab would be to foster an ecosystem that enables the same. Towards this, the Lab will pursue a multi-pronged approach, one of which would be to engage with and educate the public on matters of digital trust. The other would be to expose researchers to the latest advances by providing support for students and faculty to attend conferences.

Project Description

We all live in a digital world, with a threat to privacy and security. While a digitally interconnected world is convenient, the digital footprint creates many complex security issues which are further complicated by the vastness and borderless nature of cyberspace. For instance, the adoption of mobile payment platforms at scale, the use of e-commerce for everything from groceries to cars, ubiquitous social networking, and information technology underlying the control of manufacturing, transportation, health care, and energy sectors have all created a broad spectrum of threats and vulnerabilities. These include cybercrimes, cyber warfare, unregulated commercial entities, or bugs and misconfigurations. The risks range from minor inconveniences to a Cybergeddon. This is why building a safer digital world is no less a social imperative than securing national borders or tackling environmental issues.

Expected Impact

Digital Trust – encompassing security, privacy, accountability, and users' trust in all aspects of a system – is no longer an "afterthought" to be retrofitted to existing operations and systems but must be an integral part of all new technology development. There is a clear need for ambassadors of digital trust who are committed to enforcing standards of security, transparency, and ethics in the digital space.

PROJECT DETAILS

Principal Investigator:

Prof. Manoj Prabhakaran

Theme:

Others

Budget:

INR 55 Lakhs

Technology Readiness Level:

NA

Project Duration:

1 Year

UN SDG No:

SDG 9

Project Title

VAJRA: SECURING ENDPOINTS FROM CYBERATTACKS

Objective

- Rich datasets of malware behaviour can be prepared by logging into granular information on process, network, and file activities. This dataset itself could be of independent interest to other researchers.
- Apart from the above, developing AI&ML algorithms can aid in detecting malicious activity like lateral movements and privilege escalations. The same can aid the EDR tool to protect against cyberattacks.

Project Description

Cyberattacks have become more sophisticated - they exploit new vulnerabilities to launch zero-day attacks and could be spread over multiple endpoints through lateral movement and privilege escalation. Hence, traditional algorithms designed for single endpoints may not detect advanced and unforeseen cyberattacks. To detect such unforeseen attacks, one needs to monitor each endpoint of the network, and Endpoint Detection and Response (EDR) has emerged as a popular solution technique. We aim to equip EDR with AI/ML algorithms to detect advanced cyberattacks. To train the AI/ML algorithm for EDR solutions, one needs rich datasets that capture the networkwide behaviour of malware. To the best of our knowledge, there are no publicly available datasets that provide granular information about the various process, sockets, and file activities of malware in a network. Our first goal is to systematically collect malware from various resources and run them in a network sandbox to collect logs of their activities. The logs are collected using open-source tools like Osquery and custom scripts taping the operating systems at the kernel level. The data generated from the Cuckoo sandbox environment do not provide such granular information and hence do not provide rich datasets for training AI/ML algorithms.

Expected Impact

The requested funds would be used to cover expenditures related to support for travel (domestic and international) for student/researcher mobility and other outreach activities.

PROJECT DETAILS

Principal Investigator:

Prof. Manjesh Kumar Hanawal

Theme:

Others

Budget:

INR 90 Lakhs

Technology Readiness Level:

4

Project Duration:

3 Years (and more)

UN SDG No:

SDG 9 & 17

Project Title

RESEARCH & DEVELOPMENT IN DIGITAL TRUST & CYBERSECURITY (EQUIPMENT)

Objective

"Digital Trust" involves not only scientific and technological advances, but also sensitizing society as well as training the next generation of engineers and scientists. A core thrust of the lab would be to foster an ecosystem that enables the same. Towards this, the Lab will pursue a multi-pronged approach, one of which would be to engage with and educate the public on matters of digital trust. The other would be to expose researchers to the latest advances by providing support for students and faculty to attend conferences.

Project Description

We all live in a digital world, with a threat to privacy and security. While a digitally interconnected world is convenient, the digital footprint creates many complex security issues which are further complicated by the vastness and borderless nature of cyberspace. For instance, the adoption of mobile payment platforms at scale, the use of e-commerce for everything from groceries to cars, ubiquitous social networking, and information technology underlying the control of manufacturing, transportation, health care, and energy sectors have all created a broad spectrum of threats and vulnerabilities. These include cybercrimes, cyber warfare, unregulated commercial entities, or bugs and misconfigurations. The risks range from minor inconveniences to a Cybergeddon. This is why building a safer digital world is no less a social imperative than securing national borders or tackling environmental issues.

Expected Impact

Digital Trust – encompassing security, privacy, accountability, and users' trust in all aspects of a system – is no longer an "afterthought" to be retrofitted to existing operations and systems but must be an integral part of all new technology development. There is a clear need for ambassadors of digital trust who are committed to enforcing standards of security, transparency, and ethics in the digital space.

PROJECT DETAILS

Principal Investigator:

Prof. Manoj Prabhakaran

Theme:

Others

Budget:

INR 55 Lakhs

Technology Readiness Level:

NA

Project Duration:

1 Year

UN SDG No:

SDG 9

Project Title

RESEARCH & DEVELOPMENT IN DIGITAL TRUST & CYBERSECURITY (TRAVEL)

Objective

"Digital Trust" involves not only scientific and technological advances, but also sensitizing society as well as training the next generation of engineers and scientists. A core thrust of the lab would be to foster an ecosystem that enables the same. Towards this, the Lab will pursue a multi-pronged approach, one of which would be to engage with and educate the public on matters of digital trust. The other would be to expose researchers to the latest advances by providing support for students and faculty to attend conferences.

Project Description

IITB Trust Lab was founded with the basic idea of creating a secure digital space for all end users. It embodies IIT Bombay's expertise and vision for leading the country in the area of digital trust. One of the primary goals of the Trust Lab is attracting and nurturing world-class researchers, and providing them with resources for building top-notch research programmes, including research cutting across traditional disciplinary boundaries. This requires the Lab to provide several resources to all the projects and activities that it supports including access to computing resources, high-end servers, and contingency technical support for faculty, students, and staff members. Without these resources or equipment, the Lab would not be able to initiate its research activities in full swing. Any additional funding in the form of CSR support would facilitate the purchase of equipment that will not only support the current projects in the Lab but also pave the way for future expansion.

Expected Impact

The requested funds would be used to cover expenditures related to support for travel (domestic and international) for student/researcher mobility and other outreach activities.

PROJECT DETAILS

Principal Investigator:

Prof. Manoj Prabhakaran

Theme:

Others

Budget:

INR 1.1 Crores

Technology Readiness Level:

NA

Project Duration:

1 Year

UN SDG No:

NA



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