EVENT REPORT

IEEE REGION 10 SPONSORED HACKATHON ON
Affordable Medical Device Development

Date: 03.10.2024 to 04.10.2024
Venue: VIT, Vellore

October 2024

ABOUT VIT

VIT was founded in 1984 as Vellore Engineering College by the Chancellor, Dr. G. Viswanathan. From its humble beginnings, the institution has grown exponentially to that of more than 35,000 students. It was conferred the University status in 2001 in recognition of its excellence in academics, research, and extracurricular initiatives. Currently, VIT has 5 campuses – in Vellore, Chennai, Amaravati (AP), Bangalore and Bhopal (MP). VIT has been consistently ranked among the best institutions of the country and is aspiring to emerge as a global leader. The National Institutional Ranking Framework (NIRF) of the MHRD, Government of India, has identified VIT as the best Private Engineering Institution in India. With students from all the states of India and from more than 50 countries, the cosmopolitan VIT provides an appropriate ambience for holistic learning and comfortable living. Sports, games and cultural activities are an integral part of student life on campus. VIT holds an exemplary placement record by consistently placing more than ninety percentage of the students in good companies. The VIT's international linkages provide ample opportunities for students and faculty to gain global exposure. VIT alumni, spread across the world, are serving the most-advanced as well as the most deprived.

ABOUT SELECT

School of Electrical Engineering (SELECT) has 98 faculty members who have done their UG and PG degrees from the top-notch universities. The school offers B.Tech. (Electrical and Electronics Engineering), B.Tech. (Electrical and Computer Engineering), B.Tech. (Electronics and Instrumentation Engineering), M.Tech. (Power Electronics and Drives) and M.Tech. (Control and Automation), M.S. by Research and Ph.D. in Engineering. B. Tech (Electrical and Electronics Engineering) and B.Tech. (Electronics and Instrumentation Engineering) are accredited by the Engineering Accreditation Commission of ABET. All UG & PG programmes of the school are accredited by the Institution of Engineering and Technology (IET), UK. The placement record of the school has always been impressive. Almost 100% of the students get job from the campus placement and many of them are getting it in core companies every year. The school has state-of-the-art laboratories in almost all the areas of Electrical, Electronics and Instrumentation Engineering. Every year, students get scholarships to do their final year projects abroad under the Semester Abroad Program (SAP). Danfoss Industries Pvt. Ltd. India, Schneider Electric, India and NxP Semiconductors, India, have established Centre of Excellence. The school has signed MoUs with many foreign universities, research organizations and Industries from where students get benefits for their R&D work / projects from the MoU's.

QS WORLD UNIVERSITY RANKINGS BY SUBJECT

Electrical and Electronics Engineering

7 - 8 IN INDIA   151 - 200 IN THE WORLD

Approval from IEEE Region 10

IEEE Region-10(Asia Pacific)
2024 R10 AdHoc Committee on Outreach and Retention (ACOR)
Proposal Acceptance

9th August, 2024

To,

Dr. Albert Alexander S (Chairman, IEEE PELS, IEEE MAS SECTION)
Dr. Chitra A
School of Electrical Engineering (SELECT),
Vellore Institute of Technology
IEEE Madras Section

Subject: Regarding approval of 1000$ for the proposal submitted under to host 36-hour medical device Hackathon

Dear Coordinator,

This is to convey the sanction of the fund of $<<1000>> for the conduct 2024 Region-10 36 hours Affordable Medical Device Development Hackathon under Adhoc Committee on Outreach and Retention **This fund will be released as per guidelines mentioned in the Call for proposal. The coordinator for the proposed event/activity(ies) shall comply with the deadlines & other documentation post conduct of proposed event/activity(ies). This is only sanction communication and should not be treated as assurance to get the grant-which shall be transferred to the respective OU as per IEEE R-10 norms only after complying with the conditions and submission of documents required for the reimbursement within timelines. The proposed event/activity(ies) should be conducted before 15 Oct positively and date of conduct to be communicated in advance.**

Purpose

- 2024 Region-10 36 hours Affordable Medical Device Development Hackathon has been established aligning to IEEE tagline Advancing technology for Humanity' to encourage all IEEE R10 Council, Section, Subsection, Student Branch, Student branch Society chapter and other Affinity Groups to join hands and come together to design develop and prepare BTL3/4 prototypes.
- It's a is Medical device hackathon bringing together Members of various grades of various sections IEEE Region 10 and inter-disciplinary teams to explore medical device innovation.
- The outcome shall be BTL level ¾ prototype of low cost solution for the medical problems.
- The hackathon leverages networking, team building, solutions to the complex problems and bringing mechanical engineers, design engineers and medical practitioners at same platform

Selection of Host Responsbility

• Any IEEE R10 Councils, Sections, Subsections, Student Branch, Society Chapters, Women in Engineering (WIE), Young Professional and Life Members Affinity Groups having access to makers space accommodating 50-70 students

• Consent for Matching grant as per rule of Region 10

Event Brochure

School of Electrical Engineering
Presents

AFFORDABLE MEDICAL DEVICE DEVELOPMENT HACKATHON
3rd and 4th October 2024

Sponsored by
IEEE Region-10 (Asia Pacific) 2024 R10 AdHoc Committee on Outreach and Retention (ACOR)

PRIZES
Winner: Rs.20,000/-
First Runner up : Rs.15,000/-
Second Runner up : Rs.10,000/-

Purpose
- A **36 hours** hackathon focuses on affordable medical device development
- The outcome shall be TRL 3/4 prototype of low cost solution for the medical problems
- The hackathon leverages networking, team building, solutions to the complex problems and bringing mechanical engineers, design engineers and medical practitioners at same platform
- A beacon for fostering innovation, collaboration, and achieving technical excellence

Hackathon Rules
- Open to all students (UG/PG) of any stream (engineering/ medical)
- Teams (**5** members) will be formed by the organizers based on matching algorithm
- Each team comprises of one industry expert (young professional), one mentor, one female student (WIE), one student member in a way that each team shall have one mechanical/ design Engineer, one Computer/ Electronics Engineering, one Biomedical/ dental/ medical/ pharmacy/ Physiotherapy student
- 4 stages of the event: team building, problem definition, concept and prototyping, pitch to jury
- Scan the QR code given below for details, rules and registration

Registration deadline: 20.09.2024

Event Venue: Sarojini Naidu Gallery, VIT, Vellore

Powered by

VIT-Technology Business Incubator

MeitY Startup Hub

IEEE MADRAS SECTION

Coordinators: Dr Albert Alexander S & Dr Chitra A
Department of Energy and Power Electronics
School of Electrical Engineering, Vellore 632 014, Tamil Nadu.
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Problem Statements

DR PUGAZHENTHAN T.,
MBBS, MD (PGI), DNB, MNAMS, MAMS, PGD (Diabetalogy),
MBA(HM),FRCP (LONDON), FIMSA, PhD
Associate Professor, Department Of Pharmacology,
All India Institute of Medical Sciences (AIIMS),
(An Institute of national importance under Ministry Of Health And
Family welfare) Government of India, Raipur, Chhattisgarh, India.
Ex- Central Health Services/Junior Administrative Grade/Group A
Gazetted; Central Leprosy Teaching and Research Institute, Ministry
Of Health and Family Welfare, Government of India

Problem statement 1:

In patients undergoing polypharmacy, identifying the specific drug responsible for severe adverse reactions such as Stevens - Johnson syndrome (SJS) or Toxic Epidermal Necrolysis (TEN) presents a significant clinical challenge. The complexity arises from the concurrent use of multiple medications, each potentially contributing to or causing the severe drug reaction.

The inability to pinpoint the offending drug(s) delays appropriate management decisions and may lead to prolonged patient suffering, increased healthcare costs, and potentially severe outcomes. This problem necessitates a systematic approach to analyze and identify the causative medication from the polypharmacy regimen to inform clinical decisions about discontinuation and mitigate further risk.

Objective:

Develop a reliable and efficient method for identifying the specific drug responsible for SJS/TEN in patients on polypharmacy, to facilitate timely and informed clinical decisions regarding the cessation of the offending drug(s) and improve patient outcomes.

Problem statement 2:

Current smart watches with electrocardiogram (ECG) capabilities typically offer a single-lead ECG, which provides limited diagnostic information compared to a 12-lead ECG. The inability to capture a comprehensive 12-lead ECG constrains the smartwatch's utility in detecting and diagnosing complex cardiac conditions.

To enhance diagnostic capabilities and provide more detailed cardiac monitoring, there is a need to develop an extension for existing smart watches that enables the recording of a full 12-lead ECG. This extension should integrate seamlessly with the smart watch using Bluetooth or other sensor technologies, allowing users to obtain a more complete and actionable ECG reading without requiring additional bulky equipment.

Objective:

Design and implement an extension for existing smart watches that facilitates the recording of a 12-lead ECG through Bluetooth or integrated sensors. This modification will enhance the smartwatch's diagnostic capabilities, providing users with more comprehensive cardiac monitoring and improving the overall utility and effectiveness of wearable ECG technology.

Problem statement 3:

Current drug packaging often includes printed expiry dates on strips, but these details can fade over time, making it difficult for patients and consumers to accurately determine the remaining shelf life of their medications. This issue poses a risk of consuming expired or nearly expired drugs, which can lead to reduced efficacy and potential health risks.

To address this challenge, there is a need for a mobile application that can identify and signal patients or consumers about the near expiry of their medications. The application should utilize a method to capture and store drug expiry information, potentially using the packaging's visual details or integration with smart technology, and provide timely notifications to users as the expiry date approaches.

Objective:

Develop a mobile application that accurately identifies and tracks the expiry dates of medications through innovative methods, such as image recognition of drug strips or integration with smart packaging technology. The application should notify patients and consumers in advance of the expiry, ensuring they can manage their medication effectively and avoid potential health risks associated with expired drugs.

Problem statement 4:

In rural settings, many individuals are unaware of the risks associated with expired drugs and lack proper methods for their safe disposal. This lack of awareness and infrastructure can lead to improper disposal practices, potentially contaminating the environment and posing health risks to the community.

To address this issue, there is a need to develop an Internet of Things (IoT) based solution that facilitates the safe and effective disposal of expired drugs in rural areas. Such a system should provide education on the risks of expired medications, offer guidance on proper disposal methods, and create a mechanism for collecting and safely disposing of these drugs.

Objective:

Design and implement an IoT-based strategy for the disposal of expired drugs in rural settings. The solution should include educational tools to raise awareness about the dangers of expired medications, a system for tracking and managing drug disposal, and a collection mechanism that ensures safe and environmentally friendly disposal practices. This approach will help mitigate health risks and environmental contamination associated with improper drug disposal

PROBLEM STATEMENT:

Title: Utilizing AI-Driven Strategies for Self-Reported Medical Advice and Rehabilitation in Drug Dependency Recovery

Background: Drug dependency is a complex issue that affects individuals physically, emotionally, and psychologically. Effective treatment and rehabilitation require personalized and adaptive approaches to support recovery. The integration of artificial intelligence (AI) into this process can offer innovative solutions for monitoring, advising, and facilitating rehabilitation.

Problem Description: Individuals struggling with drug abuse often face challenges in accessing personalized medical advice and structured rehabilitation programs. Self-reporting alone may not provide sufficient data for tailoring effective treatment. There is a need to leverage AI strategies to enhance self-reported data accuracy, provide adaptive medical recommendations, and support a structured weaning process to facilitate drug dependency recovery.

Objectives:

1. To develop AI-powered systems that can accurately analyze self-reported data and provide personalized medical advice tailored to the individual's needs.
2. To create AI-driven rehabilitation programs that offer dynamic and adaptive support, including behavioural therapies and coping strategies.
3. To implement AI tools that guide and monitor the weaning process, ensuring a safe and effective reduction in drug dependency.
4. To enable ongoing self-assessment and adjustment of the recovery plan through AI analytics and feedback mechanisms.

VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Request for problem statements -- "Affordable Medical Device Development" hackathon -- Regarding

Dr Yogendra Narayanrao Keche <drynkeche@aiimsraipur.edu.in>   Mon, Aug 19, 2024 at 12:55 PM
To: Albert Alexander S <albert.alexander@vit.ac.in>
Cc: Chitra A <chitra.a@vit.ac.in>

Dear Sir,
Sorry for the late reply.
Thanks for contacting us for the problem statement.
One thing I am observing repeatedly and problems faced by Small children (15 days to 5 years) regarding drug dose formulation and administration. The drugs formulations available are for the adults or they are prepared for the adults. We are getting request to convert one adult tablet into multiple small fractions of 10 -20 which is very difficult task. What we are doing now, we making powder form of the tablet by breaking that tablet and adding some glucose powder and weighing again as per proportion. This is very crude method. If you can bring out some machine that will accurately carry out this work that will be helpful for these population.
I had a talk long back with some pharmacy Professors, I had tried to work with tablet breaking and reformulation techniques, but unfortunately I could not make it.

As you have good brains with you, this topic can be worked out which will be beneficial to all.

Thanks and regards.

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    [Quoted text hidden]

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Dr Yogendra Narayanrao Keche
MD (Pharmacology)
Additional Professor
Ex- Member Secretary, IEC- AIIMS Raipur
Room No. 2215, 2nd Floor, College Building, Gate 5
All India Institute of Medical Sciences, Raipur
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CMC Vellore – Problem Statements

1. An end-to-end encrypted messaging system is needed for hospitals to be able to share patient details regarding clinical care (lab, pharmacy etc).

2. Cardiotocography (CTG) is a method used to track the fetal heart rate along with uterine contractions throughout pregnancy and childbirth. It is commonly employed to evaluate the fetus's condition, particularly in pregnancies with an increased likelihood of complications.

AI to interpret Cardiotocography (CTG) findings. Decide if a CTG trace suggests a reassuring or non-reassuring fetal status after assessing background risk factors as well. This will help in making decisions in peripheral set ups without an experienced obstetrician.

3. Tubectomy, also referred to as tubal ligation, is a surgical intervention designed to permanently block, clamp, or remove a woman's fallopian tubes, thereby preventing pregnancy. This procedure inhibits fertilization, making pregnancy highly unlikely. Tubectomy is regarded as a permanent form of sterilization and birth control.

The surgery typically lasts between 30 minutes to an hour, during which the surgeon makes a 2- to 5-inch incision in the abdomen and secures the fallopian tubes. Various methods are used to close the tubes, including cutting, tying, clamping, banding, or sealing them with an electric current. Once the procedure is complete, the surgeon will close the incisions with one or two stitches.

The development of a cost-effective camera for tubectomies (Female sterilization surgery) could significantly impact healthcare. This tool, which assists in visualizing the fallopian tube, would provide an affordable solution for healthcare settings, potentially improving access to this important procedure.

4. Cervical dilation assessment is critical in monitoring labour progress and ensuring timely medical interventions during childbirth. Accurate measurement of cervical dilation is essential for determining the stage of labour and making informed decisions about delivery.

However, the current method of assessing cervical dilation is highly subjective and dependent on the experience of the healthcare provider. This subjectivity can lead to measurement variability and potentially impact maternal and fetal outcomes. In many primary health centres, deliveries are often managed by junior doctors or nurses who may lack the extensive experience required for precise cervical dilation assessment. As a result, the potential for inaccurate measurements increases, which can lead to inappropriate management decisions, delays in interventions, and an increased risk of complications for both the mother and the baby.

To address this critical issue, there is a pressing need for a reliable and objective device to assess cervical dilation. Such a device would provide consistent and accurate measurements, thereby reducing the dependency on the skill level of the healthcare provider and improving the overall quality of care in primary health centres. This advancement could lead to better labour management, improved outcomes for mothers and infants, and enhanced efficiency in clinical practice.

Biomedical engineers are therefore called upon to develop a device that can accurately and objectively measure cervical dilation, to standardize labour assessment and enhance the safety and effectiveness of childbirth management

5. To decrease substance use among adolescents, biomedical engineers could develop a targeted public health intervention combining wearable technology with behavioral incentives. For example, creating a wristband that tracks physical activity, sleep patterns, and stress levels—factors influencing substance use—could help. The device would sync with a mobile app that offers personalized insights and rewards for healthy behaviors, such as achieving daily physical activity goals or avoiding triggers. This solution can be integrated into schools and communities, providing continuous monitoring, positive reinforcement, and early intervention to reduce substance abuse. If the device can assess free radicals and environmental pollutants related to substance use, that can provide valuable feedback to the individual as well as the healthcare provide. This scalable approach supports both prevention and education in public health settings

Problem statements from CMC Vellore is from:
1. Dr.Jackwin Sam Paul
   Department of Community Health
   Christian Medical College,
   Vellore 632002
2. Dr Venkata Raghava Mohan MD, MPH
   Professor & Head
   Department of Community Health
   Christian Medical College,
   Vellore 632002
   Tamil Nadu, India

Registration Responses

Event Summary

On 3rd and 4th of October 2024, Vellore Institute of Technology (VIT) hosted a 36-hour hackathon focused on the development of affordable medical devices under the aegis of IEEE Region 10 and technically supported by AIIMS Raipur and CMC Vellore. The event has brought together participants from diverse disciplines to solve pressing healthcare challenges. The major objective of the hackathon was to foster innovation in healthcare technologies that are cost-effective and accessible to all.

The hackathon kicked off with an inauguration ceremony on the morning of October 3rd, featuring speeches from Dr.Partha Sharathi Mallick, Pro Vice Chancellor, VIT Vellore, Dr.Preethi Bajaj, Chair, 2024 IEEE R10 (Asia Pacific) Adhoc on Outreach and Retention Committee, Dr.K.Porkumaran, Chairman, IEEE Madras Section and healthcare expert from AIIMS Raipur, Dr. T. Pugazhenthan. They highlighted the importance of affordable healthcare and the critical role of young innovators in shaping the future of medical technology.

Dr. T. Pugazhenthan, Associate Professor, AIIMS, Raipur explained all the problem statements and cleared the doubts raised by the participants. Afterward, participants formed interdisciplinary teams and were provided with carefully crafted problem statements that emphasized the need for scalable, practical solutions to improve healthcare accessibility.

YouTube link of Inaugural event: https://www.youtube.com/live/utVGamW3r8U

Event Venue: https://tinyurl.com/hackathon-location

During the 36-hour event, teams worked tirelessly on their projects, developing hardware prototypes and software solutions that addressed real-world medical issues. Mentors from AIIMS, CMC, and VIT played a crucial role in guiding participants through the development process, offering expert feedback and insight to help refine their projects. The collaborative atmosphere encouraged creative problem-solving and knowledge-sharing among participants.

During the entire event, food and snacks were served to all the participants.

By noon on October 4th, teams pitched their final products in front of the jury panel, which were then evaluated by a distinguished panel of judges, composed of experts from both the healthcare and engineering fields. The judges considered criteria such as innovation, feasibility, scalability, and impact on healthcare.

At the valedictory ceremony, after an intense deliberation process, the judges announced the winners, runners-up, and second runners-up in both the hardware and software categories.

The hackathon concluded with reflections on the importance of interdisciplinary collaboration in healthcare innovation. The event came to a close with the National Anthem, marking the official end of the hackathon and leaving participants inspired to continue their journey toward transforming healthcare.

Prize Winners

Prize Winners (Panel 1)

Winner details	Team Leader Name	Project Title	Prize Amount
Winner	Shashank P	Innovative Dual-Approach System for Cervical Dilation Measurement Using Mechanical Probes and AI-Enhanced Endoscopic Imaging	20,000 INR
1st Runner Up	Ketan Chouhan	MediSort: AI-Powered Medical Waste Management and Expired Medication Tracking System	15,000 INR
2nd Runner Up	Rohith S	MediQR: Secure Tablet Information and Consumer Safety via QR Code Integration	10,000 INR

Prize Winners (Panel 2)

Winner details	Team Leader Name	Project Title	Prize Amount
Winner	Sugan Raghav M	CTG-Assist: AI-Powered Fetal Monitoring and Analysis Tool for Healthcare Professionals	20,000 INR
1st Runner Up	S Harini Hemavarshini	MITRA: AI-Powered Personalized Healthcare Assistant for Comprehensive Medical Support	15,000 INR
2nd Runner Up	Sharmila L	SafeTrack: AI-Powered Wristband for Substance Use Prevention and Adolescent Well-Being	10,000 INR

Event Glimpses

Vellore, Tamil Nadu, India
SJT, VIT University, Vellore, Tamil Nadu 632014, India
Lat 12.970858°
Long 79.164006°
04/10/24 02:54 PM GMT +05:30

GPS Map Camera

Vellore, Tamil Nadu, India
SJT, VIT University, Vellore, Tamil Nadu 632014, India
Lat 12.970858°
Long 79.16401°
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