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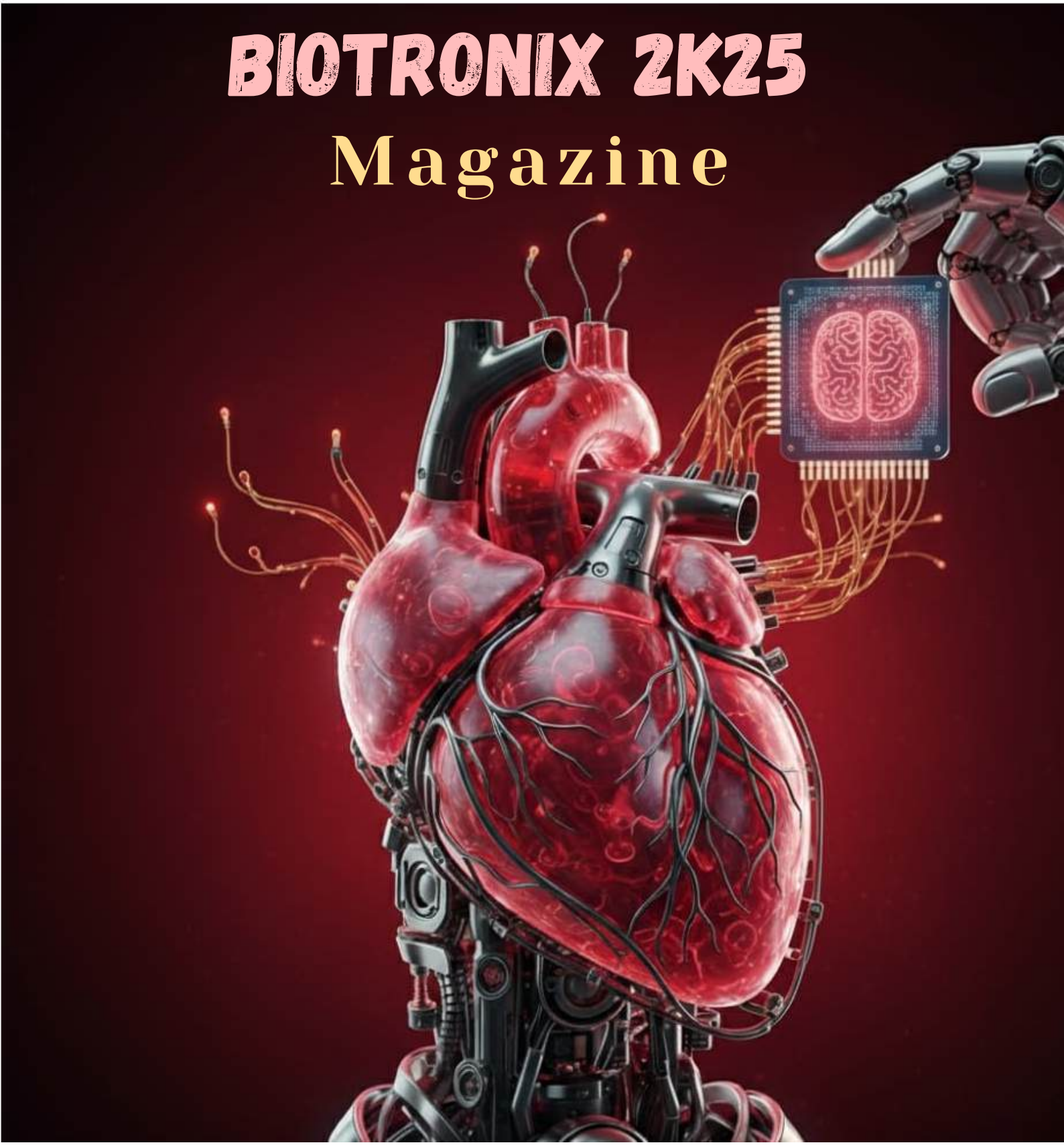
BIOTRONIX 2K25
Magazine



DEPARTMENT OF BIOMEDICAL ENGINEERING

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BIOTRONIX
2025

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MESSAGES

FROM THE DESK OF THE CHAIRMAN,RCET

"Learning gives creativity, creativity leads to thinking, thinking provides knowledge, knowledge makes you great" - Dr.A.P.J.Abdul Kalam.

These words by - Dr.A.P.J.Abdul Kalam perfectly describe our aim at Rohini College of Engineering and Technology. Our aim is to teach students to LEARN, not just STUDY. Hence,we strive to travel beyond the boundaries of mere books.

I can proudly say that Rohini College of Engineering and Technology is the most modern and sophisticated multidisciplinary institution, imparting quality education and providing a wide and varied arena for the staff and students to showcase their academic and extracurricular talents.

RCET has made a tremendous progress in all areas crossing several milestones within a very shot span of time. I feel happy to know that the students and faculty of BME department of RCET bringing out the technical magazine BIOTRONIX 2k25.

The role of a department magazine is therefore vital in promoting what an institution offers. It brings out into the open things hitherto unrevealed. It brings to light the names of the unsung heroes and their mighty deeds.

I am proud to say that once our students step in RCET, they step out with selfconfidence and knowledge to face all future endeavors with full conviction. Fly in the plane of Ambition, Landin the Airport of Success, the luck is yours the wish is mine. May your future always shine. Good Luck.

Cordially,

SHRI.K.NEELA MARTHANDAN

CHAIRMAN, ROHINI GROUPS.

MESSAGES

FROM THE DESK OF THE PRO CHAIRMAN,RCET

"Education is not the learning of facts, but the training of the mind to think." – Albert Einstein

At Rohini College of Engineering and Technology, we believe that true education goes beyond classrooms and textbooks — it shapes character, nurtures creativity, and inspires innovation. Our goal is to provide an environment where every student discovers their potential and transforms into a confident professional ready to serve society.

I take immense pride in witnessing the continuous growth of RCET as a center of excellence in technical education. The dedication of our faculty and the enthusiasm of our students have helped the institution reach new heights in academics, research, and innovation.

The Biomedical Engineering Department has consistently demonstrated brilliance through innovative projects, research initiatives, and student-driven publications. The release of the departmental magazine BIOTRONIX 2k25 stands as a testament to their creativity and teamwork.

I extend my heartfelt congratulations to the students and faculty members of the department for their collective effort in bringing out this technical magazine. May this initiative continue to inspire young minds to explore, invent, and excel in the ever-evolving world of technology.

Cordially,
Dr.N.NEELA VISHNU
PRO-CHAIRMAN, ROHINI GROUPS.

MESSAGES

FROM THE DESK OF THE MANAGING DIRECTOR,RCET

"Success is the result of perfection, hard work, learning from failure, loyalty, and persistence." – Colin Powell

At Rohini College of Engineering and Technology, we believe that education is the most powerful tool to transform lives and shape a better tomorrow. Our vision is to create a generation of engineers who are not only technically sound but also socially responsible and ethically strong.

It fills me with immense pride to see our students striving for excellence in academics, innovation, and research. The Biomedical Engineering Department has consistently shown remarkable progress through creative ideas, project innovations, and active participation in interdisciplinary ventures.

The publication of BIOTRONIX 2K25 reflects the enthusiasm, technical knowledge, and creative thinking of our budding biomedical engineers. This magazine serves as a vibrant platform that highlights their accomplishments, innovation, and teamwork.

I wholeheartedly appreciate the sincere efforts of the students and faculty members for bringing out this magazine successfully. May you continue to dream big, innovate fearlessly, and contribute meaningfully to the world of healthcare and technology.

Cordially,
Dr.V.M.BLESSY GEO
MANAGING DIRECTOR, ROHINI GROUPS.

PRINCIPAL'S MESSAGE

Dear All,

"All things are within you"

Good to see an another magazine BIOTRONIX 2k25 from the department of Biomedical Engineering.

I honor the peoples those who put hard work to complete the magazine for the successful publication.

I greet the Students for their great efforts and contribution in BIOTRONIX 2k25. Education does not happen just within the four walls of a classroom, but without too – in the corridors, the playgrounds and every corner of the campus.

I extend my wishes to the dillgent Faculties, the backbone of this magazine who spent their time and expertise to make the students believe in themselves.

Best Wishes,

Dr. R. RAJESH, M.E., Ph.D.

Principal,

Rohini College of Engineering & Technology

Palkulam,Kanyakumari.

HOD'S MESSAGE

Dear Biomedical Students,

As you embark on your journey in the field of biomedical sciences, remember that you are entering a realm where every discovery has the potential to transform lives. Your dedication to understanding the intricacies of biology, medicine, and technology holds the promise of breakthroughs that can revolutionize healthcare.

Stay curious, stay passionate, and never underestimate the impact of your work. Whether you're exploring new treatment modalities, deciphering the mysteries of the human body, or developing innovative medical devices, know that your contributions matter.

Embrace challenges as opportunities for growth, collaborate with your peers and mentors, and never lose sight of the ultimate goal: improving the health and well-being of individuals and communities around the world.

Your journey in biomedical sciences will be demanding, but it will also be immensely rewarding. Keep pushing boundaries, keep pushing forward, and remember that the world eagerly awaits the discoveries that you will make.

Best wishes on your academic and professional endeavors

Sincerely

Dr.R.B.Benisha

Hod/BME

FROM THE DESK OF EDITOR

The Creative minds of the Biomedical Engineering department of Rohini College of Engineering and Technology have come together to present what they have always wanted to and we congratulate every student who has given their contribution.

They can't be appreciated enough and we can't explain how difficult it was to compile all their accomplishments into a single magazine. We take pride in showing you of how our very own Rohini students have imaginations which spread across the horizons.

We would like to thank the Management and all the staffs who have supported the 'BIOTRONIX 2K25' initiative and for having trust in the Editorial board by giving us full freedom to choose the contents and design for out magazine. The magazine should serve as a pillar of motivation for every other student who is yet to emerge as an Achiever and to carry the legacy of BIOTRONIX 2K25. The students who follow in the next academic years, we advise you to do the same.

Go Mad, B.E. productive but at the same time B.E. creative!

Best Wishes,

Mrs.Dhanees surya Jenifer.K
Assistant Professor / BME
Associate Editor

FROM THE DESK OF EDITOR

The Department of Biomedical Engineering at Rohini College of Engineering and Technology proudly presents BIOTRONIX 2K25, a reflection of creativity, innovation, and collective effort. This magazine is not just a compilation of works — it is a celebration of the imagination, talent, and dedication of our students.

Each page captures the essence of Biomedical Engineering — where science meets innovation and ideas transform into impact. We extend our heartfelt appreciation to every student who has contributed to making this edition possible.

We express our sincere gratitude to the Management, Head of the Department, and all the faculty members for their unwavering support, encouragement, and trust in the Editorial Board. Their belief in our vision allowed us the creative freedom to design and develop this magazine with passion and purpose.
May BIOTRONIX 2K25 inspire every student to explore, innovate, and achieve beyond boundaries — continuing the legacy of excellence that defines our department.

Be the pulse of innovation — where creativity meets technology!

Best Wishes,
Mrs.Anlin Sahaya Infant Tinu
Assistant Professor / BME
Associate Editor

ABOUT THE DEPARTMENT

The objective of biomedical research is to understand the underlying mechanisms of diseases and develop innovative solutions for diagnosis, treatment, and prevention. This field aims to improve healthcare outcomes by advancing medical technology, drug discovery, and personalized medicine. Biomedical research also focuses on addressing global health challenges, such as infectious diseases and chronic conditions. Collaboration between scientists, clinicians, and engineers is essential to achieve these objectives. Ultimately, the goal is to enhance human health and wellbeing through scientific discovery and innovation.

SCOPE

In Research Areas

- Biomedical Electronics
- Biomedical Imaging
- Tissue Engineering and Biomaterials
- Biomechanics
- Neuroengineering
- Cardiovascular Engineering
- Bioinformatics System
- Physiology

UNIQUENESS

- An ISO Certified institution, Autonomous and NAAC A+ Grade.
- Project cost of Rs.26,75,000/- sanctioned by AICTE under the Modernization and removal of Obsolescence Aspirational-(MODROB-ASP)
- Project sanctioned worth Rs.5, 00,000/- by Tamil Nadu State Council for science and Technology (TNSCST) for the proposal “Mapping of Science and Technology needs of Tamil Nadu”.
- Received fund of Rs.1.5 Lakhs for the Scheme Unnat Bharat Abhiyan under the Ministry of Human Resource and Development (MHRD).
- The outcome of the faculty research is published in major research journals and reputed international conferences in India and abroad.
- The Institute boasts of about 42 patents including 1 Australian patent, out of which 39 patents have been published and 3 granted till date.
- All the departments have set up Product Development Centre to inculcate research practices in the student community.
- The Institute facilitates the placement training activities with the help of industry experts and corporate trainers to prepare the students industryready, apart from providing placement training right from First year in the regular schedule for the Distinctive Syllabus framed.
- Over 90% of the eligible students are placed in reputed companies such as Cognizant Technology Solutions (CTS), Capgemini, Infosys, Tata Consultancy Services, Wipro India Limited, Ramco Systems, Nggawe Nirman Technologies etc., with a salary package ranging from 2.5 LPA to 4 LPA.
- RCET has signed Memorandum of Understanding(MoU) with certain leading industries and Premier Institutes to attain symbiosis and to reduce the gap between Industry expectations and Academics.
- The Institute has MOU with: SWAYAM - NPTEL Local Chapter. Nodal Centre for Virtual Lab of IIT, Kharagpur. , Siemens Centre of Excellence in Manufacturing, NIT Trichy. ,IREL(India) Limited,Natural Resources Development Project -Vivekananda Kendra

ABOUT

Rohini college of Engineering and Technology (RCET), founded in the year 2012 by Shri.K.Neela Marthandan, a great Industrialist and philanthropist, stands out as a prestigious Institution of higher learning with a mission of pursuing excellence in education and research.

The institution is run by Dr.N.Neela Vishnu as the pro chairman and Dr.V.M.Blessy Geo as Managing Director.

The institution, with dynamic community of students offers 7 undergraduate programs, 5 postgraduate programs and a research program in the Department of Mechanical Engineering with accomplished faculty, high class facilities and premium hostels. RCET is located at Palkulam near Anjugram which is 5 kms from Kanyakumari and 14 kms from Nagercoil junction.

LATEST

NEWS

ARTICLE

AI–DRIVEN APPROACHES FOR ACCURATE CANCER DIAGNOSIS AND PROGNOSIS

Transforming Cancer Care Through Artificial Intelligence

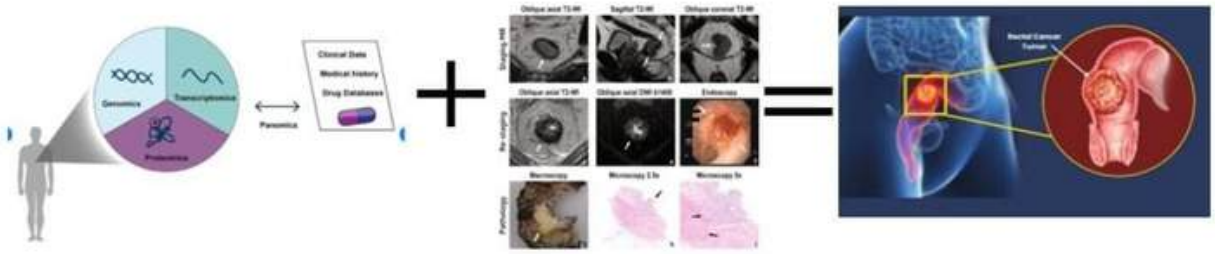
Artificial intelligence (AI) is transforming cancer diagnosis by overcoming the limitations of traditional methods like histopathology and imaging. With vast genomic, transcriptomic, and proteomic data now available, AI-driven models can uncover hidden molecular patterns, offering faster, more precise, and personalized insights into cancer detection, prognosis, and treatment planning.

The Power of AI in Cancer Research

Recent advances in AI, especially Transformers and Graph Neural Networks (GNNs), are transforming biomedical data analysis by revealing complex biological interactions. The proposed framework integrates AI, biology, and imaging to create an interpretable multimodal deep learning model for accurate cancer diagnosis, reliable prognosis, and transparent clinical decision-making.

Aims and Objectives

- Develop specialized AI models (encoders) for genomic, transcriptomic, and proteomic data.
- Use Vision Transformers and graph-based models to analyze medical images like CT or MRI scans.
- Fuse multi-omics and imaging data through cross-attention transformers for better prediction.
- Ensure the model's interpretability using visualization tools like SHAP and Grad-CAM.



A Unified Framework for Precision Oncology

This AI-driven system supports multiple cancer types, including breast, lung, liver, prostate, and colorectal cancers. It enables early detection, personalized treatment, and therapy response prediction by merging genetic and imaging data, linking molecular mutations to tissue-level changes for a comprehensive understanding of cancer progression and behavior.

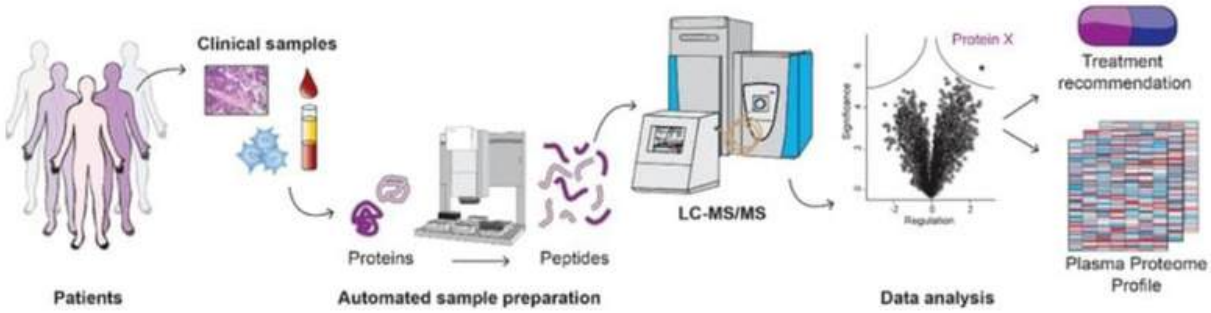
What Makes This Approach Unique?

- **Graph-Aware Learning:** The framework uses Graph Attention Networks (GATs) to explore relationships among genes and proteins, guided by biological databases such as KEGG and STRING.
- **Advanced Image Intelligence:** Vision Transformers (ViT) and Swin Transformers extract meaningful visual patterns from medical images.
- **Cross-Attention Fusion:** Combines image and molecular features using cross-attention mechanisms, ensuring each modality strengthens the other.

- **Contrastive Learning:** Aligns data from different sources, enabling robust generalization and improving prediction accuracy.
- **Explainability and Reliability:** Every prediction is supported by interpretable visualizations, making it easier for doctors to understand *why* the AI made a particular decision.

Beyond Prediction: Building Clinical Confidence

Trust is vital in AI-based medicine. This framework ensures reliability through validation on real patient data (TCGA, METABRIC, LIDC-IDRI) and phantom models. Performance metrics like Accuracy, F1-Score, ROC-AUC, and Concordance Index confirm clinical readiness, ensuring predictions are accurate, reproducible, and meaningful for real-world cancer diagnosis and prognosis.



Potential Impact on Healthcare

The integration of AI into cancer diagnostics represents a major step toward **precision oncology**—a healthcare model where every patient receives individualized treatment based on their genetic and clinical profile. The benefits include:

- Faster and more accurate cancer detection.
- Early identification of high-risk patients.
- Discovery of new biomarkers for drug development.
- Personalized therapy planning to improve survival outcomes.

A Glimpse into the Future

This AI-driven research unites computational intelligence and clinical oncology, offering oncologists powerful tools for diagnosis and treatment guidance. As multimodal data systems advance, AI evolves from an analytical tool to a vital healthcare partner, enabling informed, explainable, and personalized cancer diagnoses that enhance patient care and save lives.

Mr. R. Vijay Prakash M.E., (Ph.D)
Assistant Professor (2401124)
Department of Biomedical Engineering
Rohini College of Engineering and Technology

MATHEMATICS IN BIOMEDICAL ENGINEERING

Abstract:
Mathematics is the invisible force that connects engineering and medicine. In the field of Biomedical Engineering, mathematics provides the foundation for understanding biological processes, designing medical instruments, and developing technologies that improve human health. From modeling blood flow to reconstructing medical images, mathematical principles form the heart of innovation in modern healthcare.
Keywords:
Mathematics, Biomedical Engineering, Modeling, Medical Imaging, Signal Processing, AI in Healthcare, Applications

Introduction:

Biomedical Engineering is a multidisciplinary field that combines engineering principles with biological sciences to create technologies that advance medical care. Among its various supporting disciplines, mathematics plays the most fundamental role. It acts as a universal language that helps engineers describe biological systems, simulate physiological functions, and analyze medical data precisely. Mathematical models allow engineers to understand how organs work, how diseases spread, and how treatments can be optimized.

Applications of Mathematics in Biomedical Engineering:

Mathematics has a wide range of practical applications in biomedical engineering, from the design of medical devices to the analysis of biological systems. Some of the major applications include:

1. Modeling and Simulation of Biological Systems: Mathematical equations describe how blood flows through vessels, how oxygen diffuses through tissues, and how neurons transmit electrical impulses. These models are used to understand diseases and test new treatments.
2. Medical Imaging: Mathematical algorithms like the Fourier Transform, Radon Transform, and matrix reconstruction techniques help in creating high-quality images in CT, MRI, and PET scans. They convert raw data into meaningful medical visuals.
3. Biomedical Signal Processing: Mathematics helps analyze signals such as ECG, EEG, and EMG by filtering noise, detecting abnormalities, and interpreting patterns to assist doctors in diagnosis.
4. Drug Delivery and Pharmacokinetics: Using differential equations, engineers can model how drugs move, react, and are absorbed in the body. This ensures precise drug dosage and timing.
5. Biomechanics and Prosthetic Design: Mathematical models of motion and force are applied to study human movement, joint pressure, and muscle stress, which are crucial for designing prosthetics and rehabilitation systems.
6. Bioinformatics and Genomics: Statistical and computational mathematics are essential in analyzing genetic sequences, predicting protein structures, and identifying disease-related genes.

7. Machine Learning and AI in Healthcare: Mathematical models based on probability, statistics, and optimization are used to train algorithms that detect cancer, predict diseases, and automate diagnosis.

Mathematics in Action:

1. Modeling the Human Body: Differential equations are used to describe the heartbeat, blood circulation, and lung function. These models help in designing pacemakers, ventilators, and artificial organs.
2. Medical Imaging: Techniques like X-rays, CT scans, and MRI rely on mathematical transformations such as the Fourier Transform and Radon Transform to reconstruct clear images from raw data.
3. Signal Processing: Biomedical engineers use mathematical filters and algorithms to clean and interpret ECG, EEG, and EMG signals. This helps in early diagnosis of heart and brain disorders.
4. Drug Delivery Systems: Calculus and diffusion equations help predict how a drug spreads inside the human body, allowing for precise dosage and timing.
5. Biomechanics: Using mathematical and mechanical models, engineers analyze forces acting on bones, joints, and muscles to design prosthetics and rehabilitation devices.

Emerging Trends

Recent advances in Artificial Intelligence (AI) and Machine Learning also depend heavily on mathematical concepts such as linear algebra, probability, and optimization. These tools are now used for disease prediction, image-based diagnostics, robotic surgery, and smart wearable technologies.

Conclusion:

Mathematics is not just a subject—it is the heartbeat of biomedical engineering. It empowers researchers and engineers to transform abstract equations into life-saving technologies. As the world moves toward smarter healthcare, the integration of mathematics and biology will continue to shape the future of medicine.

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Mr. J. MUTHUERULAPPAN,
AP/Mathematics,RCET

"The Self-Evolving Student:
Generation Z's Path to Overcoming Its Own Barriers"

Dr.Jackson Daniel,
Professor, Department of Biomedical Engineering, RCET

Generation Z students (born mid-1990s to early 2010s) face unique challenges from growing up in a digital world. Constant online exposure affects focus, makes judging reliable information difficult, and increases stress through social media and academic pressure. The rise of AI tools has made it harder to separate genuine learning from cheating, and many students now look for education that offers quick, practical career outcomes. Yet, Gen Z's greatest strength is their ability to adapt and grow. By learning to turn challenges into opportunities and managing their digital habits wisely, they can overcome these hurdles effectively.

- ✓ Practice Digital Discipline: Set dedicated study hours, limit distractions, and use technology strictly to support learning, not interrupt it.
- ✓ Boost Self-Motivation: Stay driven by setting clear, personal goals and consistently tracking daily progress toward them.
- ✓ Prioritize Balance: Maintain mental and emotional health through regular exercise, engaging hobbies, and seeking emotional support when needed.
- ✓ Embrace Growth: Learn from mistakes and continuously improve by maintaining a positive and resilient mindset.
- ✓ Use AI Ethically: Utilize AI tools wisely to aid comprehension and research, but never to replace their own effort or critical thinking.
- ✓ Build Social Skills: Actively engage with peers and mentors face-to-face to develop essential teamwork, empathy, and strong communication skills.
- ✓ Stay Future-Ready: Commit to continuous learning of new skills to remain adaptable and prepared for an ever-changing professional landscape.

By managing technology wisely, prioritizing their mental well-being, and maintaining curiosity, Gen Z students can become self-evolving learners capable of shaping their own paths to success.

*****

Robotics — Shaping the Future with Precision and Purpose

By: Subhalakshmi,
Department of Biomedical Engineering

In today's rapidly evolving world, robotics has become the heart of innovation, transforming the way we live, learn, and work. From healthcare and manufacturing to space exploration and education, robots are no longer just machines — they are intelligent partners improving accuracy, efficiency, and safety.

In hospitals, surgical robots assist doctors in performing complex procedures with remarkable precision, reducing pain and recovery time for patients. In industries, robotic arms assemble components tirelessly, ensuring quality and speed. Even in classrooms, educational robots are nurturing creativity and curiosity among young minds, preparing them for a technology-driven future.

What makes robotics truly fascinating is its blend of engineering, artificial intelligence, and human imagination. It's not just about building machines; it's about creating systems that think, sense, and act — making life simpler and smarter.

As we step into an era of automation, let us remember — robots may work tirelessly, but it's human intelligence and compassion that guide their purpose. The future belongs to those who can collaborate with technology to build a better, brighter world.

**"Robotics is not the replacement of humans,
but the refinement of human potential."**



Pride of Biomedical Engineering

Mr. Hejin N M

Reg. No. 963323121026
B.Y. 2023-2027

"The future belongs to those who dare to dream, believe in their strength, and never give up — no matter how high the tide."

We take immense pride in honoring Mr. Hejin, a shining star of the Biomedical Engineering Department, for his extraordinary achievements in both academics and career.

With an outstanding CGPA of 8.655 up to the 4th semester, securing the 5th rank in the department, and maintaining a spotless academic record with no backlogs, Hejin has been a symbol of consistency, dedication, and excellence.

His active participation and winning spirit in technical quiz competitions at college and district levels reflect his enthusiasm for knowledge and his strong technical competency in biomedical engineering. Hejin's thirst for learning and his disciplined attitude have always made him stand out among his peers.

Crowning his journey of perseverance and passion, Mr. Hejin has now achieved a prestigious position as an Officer in the Indian Navy Force — a dream turned into reality through his relentless hard work, determination, and patriotic zeal.

His remarkable journey from a committed student to a dedicated Indian Navy Officer inspires every aspiring engineer to dream beyond limits and work with purpose.

We, the faculty and students of Biomedical Engineering Department, Rohini College of Engineering and Technology, feel deeply honored to celebrate Mr. Hejin's success. His achievement brings immense pride and glory to our institution.

"Success is not just about reaching heights, but about inspiring others to climb with courage and conviction — and Mr. Hejin truly embodies that spirit."

Congratulations, Officer Hejin!

Your success is our pride, and your journey is our inspiration.

Impact of Biomedical Engineering in Today's World

Biomedical engineering plays a vital role in shaping modern healthcare. By combining medicine, engineering, and technology, it has brought revolutionary changes that improve the quality of life and save millions of lives every year. One of the major contributions of biomedical engineering is in diagnosis and treatment. Advanced imaging systems like MRI and CT scans allow early detection of diseases, while portable diagnostic kits provide quick and accurate results. Personalized medicine is also becoming possible through biomedical research, making treatments more effective.

Biomedical engineers have developed life-saving devices such as pacemakers, prosthetic limbs, and wearable health monitors. These technologies help patients live healthier, more independent lives. Robotic surgeries and 3D printing have improved surgical precision and reduced recovery times, while rehabilitation devices like exoskeletons support patients in regaining mobility.

Biomedical research has led to breakthroughs in genetic engineering, stem cell therapy, and vaccine development, helping combat global health challenges. Moreover, affordable medical devices and telemedicine are making healthcare more accessible in remote areas.

In conclusion, biomedical engineering has transformed healthcare by enabling better diagnosis, treatment, and prevention. As technology advances, its impact will continue to grow, shaping a healthier and more innovative future.

P.ELDIN RINO
IV-BE BIOMEDICAL

GAMIFIED WEARABLE POSTURE CORRECTION SYSTEM

A gamified wearable posture correction system is a smart device designed to help users improve their posture through interactive feedback. Poor posture is a common issue today, especially among students and professionals who spend long hours sitting in front of screens. Over time, this can lead to back pain, spinal problems, and reduced physical well-being. Unlike traditional posture reminders that simply vibrate, gamified systems make the process more engaging by turning posture improvement into a playful experience.

The device typically uses sensors such as IMUs (Inertial Measurement Units) to monitor body angles and detect slouching in real time. It connects wirelessly to a mobile application that displays the posture data in the form of a simple game. For example, when the user maintains good posture, a character in the game progresses or earns points, but when the user slouches, the character slows down or loses rewards. This real-time feedback keeps users aware of their posture while also motivating them to improve through fun challenges.

Gamification elements like points, rewards, levels, and progress tracking make posture correction more enjoyable and sustainable. Instead of treating posture improvement as a chore, users become actively involved and motivated to maintain healthy habits. These systems are usually low-cost, lightweight, and easy to use, making them suitable for daily use by students, office workers, and anyone looking to improve their sitting habits in an interactive way.

FIONNA ANANTH
IV-BE BIOMEDICAL

CASE STUDY: AI-ENABLED PACEMAKER

Background

Traditional pacemakers regulate heartbeats at a fixed rate but can't adapt to sudden changes in a patient's activity or stress levels. This often leads to discomfort and frequent hospital visits for manual adjustments.

Innovation

Biomedical engineers developed an AI-powered pacemaker that:

- Monitors heart signals & activity in real time
- Learns patient-specific patterns
- Automatically adjusts pacing as needed
- Sends data wirelessly to doctors

Clinical trials showed a 30–40% reduction in unnecessary pacing and improved patient comfort.

Real Impact

- A 58-year-old cardiac patient experienced:
- 70% fewer hospital visits
- Stabilized heart rhythms
- Improved quality of life

Takeaway

This case shows how Biomedical Engineering + AI can transform traditional medical devices into intelligent, adaptive life-saving systems.

R.RENITA
IV-BE BIOMEDICAL

FAILURE IS DATA

In biomedical engineering, failure is not just an obstacle — it's a crucial source of data that drives innovation and improves patient outcomes. When new devices, diagnostic tools, or treatments don't work as expected, it's tempting to see these moments as setbacks. But in reality, each failure uncovers vital information about how biological systems interact with technology, revealing flaws and guiding engineers toward better solutions.

Medical devices and implants operate in complex, dynamic environments. When a prototype fails—whether it's a stent that clogs or a biosensor that loses accuracy—that failure provides data about biocompatibility, mechanical stress, or biological response. Instead of discarding these attempts, biomedical engineers analyze what went wrong, using the data to refine designs, select better materials, or adjust algorithms. This iterative process transforms failure into progress.

Many life-saving technologies we take for granted today came through multiple cycles of testing and failure. Pacemakers, artificial joints, and advanced imaging tools were all honed by learning from errors. By embracing failure as informative data rather than defeat, biomedical engineers push the boundaries of what's possible in healthcare.

Understanding failure also encourages a mindset of resilience and continuous learning. It inspires engineers to ask deeper questions about human physiology, material science, and device integration. Each "failure" is a step closer to safer, more effective medical innovations that improve lives worldwide.

In the high-stakes field of biomedical engineering, failure is not a dead end—it's a powerful signal that guides research, fuels creativity, and ultimately saves lives. By treating failure as data, engineers can unlock new frontiers in medicine and technology.

B.PRIYA DHARSHINI
IV-BE BIOMEDICAL

THE PERPETUAL PATIENT SURVEY: AI-INTEGRATED SMART INHALERS REVOLUTIONIZE RESPIRATORY CARE

The age of passive patient reporting has ended. AI, IoT connectivity, and mobile technology are revolutionising respiratory health management. The AI-integrated smart inhaler is evolving from a simple device into an intelligent digital companion.It transforms routine medication use into continuous, real-time health monitoring.This innovation promises significant improvements in care for patients with asthma and COPD worldwide.

The Technology: Sensors, AI, and Seamless Data Flow:

1. *Comprehensive Monitoring:* Smart inhalers use embedded sensors to track dose usage, timing, and inhalation technique, ensuring accurate adherence and performance assessment.

2. *Contextual Awareness:* Advanced models capture environmental and geolocation data, linking respiratory patterns with triggers like air quality and pollen levels

3. *Seamless Connectivity:* All collected data is securely transmitted via Bluetooth to mobile applications for real-time analysis and personalised insights.

The Engine of Insight: Artificial Intelligence

The mobile app serves as the patient's primary interface, but the real intelligence lies in the backend AI algorithms. The continuous stream of data becomes a "perpetual survey," which the AI analyzes to:

1. Real-time inhalation feedback
2. AI-driven error correction
3. Early exacerbation prediction
4. Personalised treatment insights
5. Trigger and adherence analysis

FLASHBACK

Asthma treatment began with inhaling herbal vapours such as stramonium and ephedra. Early 1900s discoveries of adrenaline led to the first handheld nebulisers. In 1956, the Medihaler revolutionised care with the first pressurised metered-dose inhaler. The 1970s introduced corticosteroid and combination inhalers for better inflammation control. Environmental shifts in the 1990s replaced CFCs with HFA propellants, and DPIs and SMIs emerged. Today's AI-driven smart inhalers reflect a journey from herbal smoke to intelligent, sustainable technology.

D. LIPNI SHERMA DAVID
IV-BE BIOMEDICAL

ROBOTIC SURGERY AND AUTOMATION

INTRODUCTION:

Robotic surgery and automation represent one of the most significant advancements in modern medical technology, reshaping how surgical procedures are performed. By combining precision engineering, artificial intelligence (AI), and advanced control systems, robotic-assisted surgeries have transformed traditional methods into highly accurate, minimally invasive operations.

EVOLUTION OF ROBOTIC SURGERY:

The concept of robotic surgery began in the late 20th century, primarily developed to assist surgeons in performing delicate procedures with greater control. Early systems, such as the da Vinci Surgical System, paved the way for a new era in surgery. These systems provided surgeons with magnified, 3D visualization and articulated instruments capable of movements more precise than the human hand.

HOW AUTOMATION ENHANCES SURGERY:

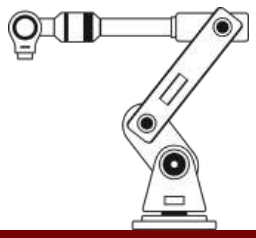
Automation plays a vital role in improving surgical outcomes. Through the integration of AI and machine learning, robotic systems can analyze preoperative imaging, plan incision sites, and even guide surgical tools with exceptional precision. Automated systems reduce human error, shorten operation times, and enhance patient recovery. Some systems can autonomously suture, cauterize, or make complex incisions while maintaining consistent accuracy.

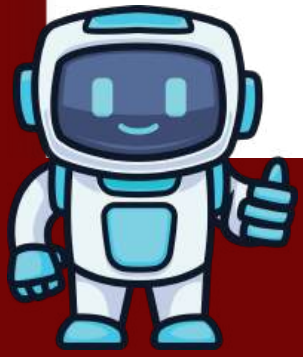
BENEFITS TO PATIENTS AND SURGEONS:

Robotic and automated surgeries offer numerous advantages. Patients experience smaller incisions, minimal blood loss, reduced pain, and faster recovery times. For surgeons, robotic assistance improves ergonomics, eliminates hand tremors, and provides enhanced visualization of complex anatomical structures. These factors collectively improve surgical efficiency and patient safety.

APPLICATIONS IN MEDICINE:

Robotic surgery is now widely used across multiple specialties — including cardiology, urology, neurosurgery, orthopedics, and gynecology. Procedures like prostatectomy, heart valve repair, and spinal surgeries benefit from robotic precision. Emerging technologies even enable remote robotic surgery, where surgeons can operate on patients from distant locations using high-speed data networks.





M.R. SHOMA
IV-BE BIOMEDICAL

WEARABLE AND IMPLANTABLE HEALTH TECHNOLOGIES

INTRODUCTION:

Wearable and implantable health technologies are transforming modern healthcare by providing continuous monitoring, early disease detection, and personalized treatment. These smart devices collect real-time data from the human body, enabling healthcare professionals to make faster and more accurate decisions. By combining biotechnology, electronics, and data analytics, these innovations are bridging the gap between patients and healthcare providers.

WEARABLE HEALTH TECHNOLOGIES:

Wearable devices are external electronic tools worn on the body to track physiological parameters. They have become a part of daily life for millions of people worldwide.

EXAMPLES AND APPLICATIONS

1. Fitness Trackers and Smartwatches

Devices like Fitbit and Apple Watch monitor heart rate, physical activity, oxygen saturation, and sleep patterns. They encourage users to maintain a healthy lifestyle and detect irregularities such as arrhythmias.

2. Continuous Glucose Monitors (CGMs)

These devices are used by diabetic patients to monitor blood glucose levels in real time. Data from CGMs helps in adjusting diet, exercise, and insulin dosage without frequent finger-prick tests.

3. Smart Clothing and Biosensors

Smart textiles embedded with sensors can monitor muscle activity, body temperature, and posture. These are particularly useful in sports medicine and rehabilitation.

4. Wearable ECG and Blood Pressure Monitors

Advanced wearables can record electrocardiograms (ECG) and blood pressure throughout the day, helping detect cardiovascular issues early.

IMPLANTABLE HEALTH TECHNOLOGIES:

Implantable devices are placed inside the body, often surgically, to restore or enhance physiological functions. These devices are crucial for patients with chronic or life-threatening conditions.

EXAMPLES AND APPLICATIONS

1. Pacemakers and Defibrillators

These life-saving devices regulate heart rhythm and prevent sudden cardiac arrest. Modern pacemakers can wirelessly transmit health data to doctors for remote monitoring.

2. Cochlear Implants

Used to restore hearing in individuals with severe hearing loss, cochlear implants convert sound into electrical signals that directly stimulate the auditory nerve.

3. Neurostimulators

These devices send electrical impulses to the nervous system to manage chronic pain, Parkinson's disease, or epilepsy.

C.BENI
IV-BE BIOMEDICAL

AI AND MACHINE LEARNING IN MEDICAL DEVICES

INTRODUCTION:

Artificial Intelligence (AI) and Machine Learning (ML) are revolutionizing the medical device industry by enhancing diagnostic accuracy, enabling predictive healthcare, and improving patient outcomes. These technologies allow devices to learn from data, recognize patterns, and make intelligent decisions — capabilities that are transforming how diseases are detected, monitored, and treated.

APPLICATIONS IN MEDICAL DEVICES:

1. Diagnostics and Imaging

AI-powered imaging systems can analyze X-rays, CT scans, and MRIs with remarkable precision. Algorithms trained on large datasets can detect early signs of conditions such as tumors, fractures, and cardiovascular diseases faster than traditional methods. For example, AI-based software assists radiologists in identifying subtle abnormalities that may go unnoticed.

2. Wearable and Remote Monitoring Devices

Smart wearables, such as fitness trackers and continuous glucose monitors, use ML algorithms to track heart rate, sleep patterns, oxygen levels, and blood sugar trends. These devices provide real-time data to clinicians, supporting remote patient monitoring and reducing hospital visits.

3. Predictive Analytics and Personalized Treatment

Machine learning enables predictive modeling, helping clinicians forecast disease progression and optimize treatment plans. Personalized medicine devices use AI to tailor therapies based on a patient's genetic profile, lifestyle, and response to previous treatments.

4. Robotic Surgery and Automation

AI-driven surgical robots enhance precision and minimize human error. These systems can assist surgeons with delicate procedures by interpreting data in real time and making micro-adjustments during surgery, leading to faster recovery and improved patient safety.

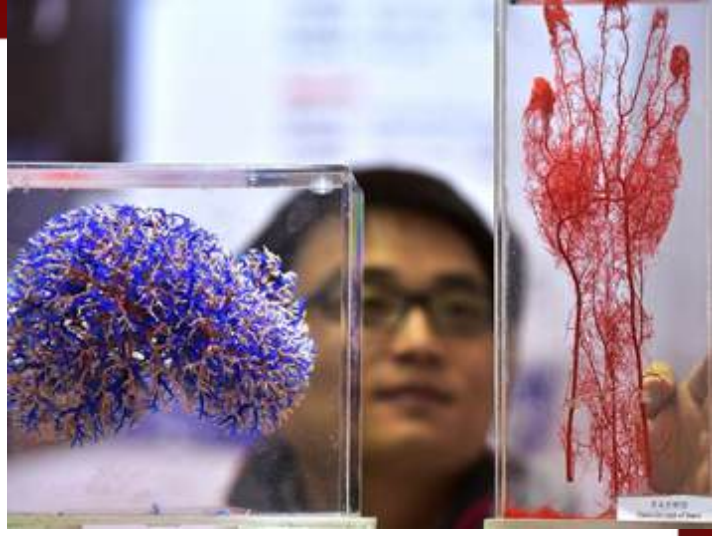
5. Drug Delivery and Therapeutic Devices

Smart drug delivery systems utilize ML to adjust dosages automatically based on patient feedback and physiological data. This helps maintain optimal therapeutic levels and minimizes side effects.

T.DHARSHINI

IV-BE BIOMEDICAL

3D BIOPRINTING AND REGENERATIVE MEDICINE



INTRODUCTION:

3D bioprinting and regenerative medicine are transforming the landscape of modern healthcare by enabling the creation of living tissues and organs through advanced printing technologies. These innovations promise to solve critical challenges such as organ shortages, slow tissue healing, and the limitations of traditional transplants.

UNDERSTANDING 3D BIOPRINTING:

3D bioprinting is an advanced manufacturing process that uses bio-inks — mixtures of living cells, biomaterials, and growth factors — to print biological structures layer by layer. Similar to traditional 3D printing, it follows a digital blueprint, but instead of plastics or metals, it uses living materials. This process allows scientists to construct complex tissue architectures that mimic natural human tissues.

ROLE IN REGENERATIVE MEDICINE:

Regenerative medicine focuses on repairing, replacing, or regenerating damaged tissues and organs. By combining it with 3D bioprinting, researchers can create patient-specific tissues, reducing the risk of immune rejection. For instance, bioprinted skin, bone, cartilage, and even miniature organ models (called organoids) are already being used for research and therapeutic purposes. In the future, entire functional organs such as kidneys, livers, and hearts could be printed for transplantation.

HOW 3D BIOPRINTING WORKS:

The process begins with creating a 3D digital model of the target tissue using imaging technologies like MRI or CT scans. Specialized software slices the model into layers, which are then printed using a bioprinter. The bio-ink is deposited precisely to form the desired shape, and the printed structure is matured in a controlled environment called a bioreactor to promote cell growth and tissue development.

BENEFITS AND APPLICATIONS:

The benefits of 3D bioprinting in regenerative medicine are immense. It enables personalized treatments, reduces dependence on donor organs, accelerates drug testing using realistic tissue models, and improves the study of diseases in laboratory settings. Bioprinted tissues can also be used to repair wounds, restore nerve connections, and enhance cosmetic reconstruction.

CHALLENGES AND FUTURE PROSPECTS:

Despite its potential, several challenges remain — including maintaining cell viability during printing, ensuring vascularization (blood supply) in thick tissues, and scaling up production for clinical use. Researchers worldwide are actively developing new biomaterials and printing techniques to overcome these barriers. With continuous innovation, fully functional bioprinted organs could become a clinical reality within the next few decades.

CONCLUSION:

3D bioprinting and regenerative medicine represent a remarkable fusion of biology, engineering, and technology. They offer hope to millions of patients waiting for organ transplants and pave the way toward personalized, sustainable healthcare solutions. As science progresses, the dream of “printing life” is moving closer from imagination to reality — redefining the very essence of healing in the 21st century.

R.S. DELEN RAM
III-BE BIOMEDICAL

Biomedical Ultrasound

A Symphony of Sound Waves

At its core, ultrasound is about using high-frequency sound waves—way above the range of human hearing—to generate images. A handheld device called a transducer is the star of the show. It contains a bunch of piezoelectric crystals.When we apply an electric voltage to these crystals, they vibrate rapidly, creating sound waves that travel into the body. Think of it like a tiny, super-fast speaker.

These sound waves travel through different tissues, and when they hit a boundary between two different types of tissue (like fat and muscle, or an organ and its surrounding fluid), some of the waves are reflected back to the transducer. The same piezoelectric crystals then act as a microphone, converting these returning sound waves (or echoes) back into electrical signals.

A computer then processes these signals, analyzing the time it took for the echoes to return and their intensity. This information is used to build a real-time, two-dimensional image on a screen. The longer it takes for an echo to return, the deeper the structure is. The stronger the echo, the more different the two tissues are. It's pretty brilliant, right?

Why Ultrasound is a Game-Changer

Ultrasound has become a cornerstone of modern medicine for a bunch of reasons.5

First off, it's non-invasive. Unlike X-rays or CT scans, it doesn't use ionizing radiation.6 This makes it incredibly safe, especially for vulnerable patients like pregnant women and their developing fetuses. It's also why we can do repeated scans without worrying about cumulative radiation exposure.

Secondly, it provides real-time imaging. This is a huge advantage. Doctors can watch organs move, blood flow through vessels, and even guide a biopsy needle to its target in real-time.7 This dynamic capability is something static imaging techniques just can't offer.

And let's not forget about portability and cost. Ultrasound machines can be a fraction of the cost of MRI or CT scanners and are often compact enough to be moved easily.8 This makes them perfect for use in ambulances, remote clinics, or even at a patient's bedside in a hospital room.

Doppler and Elastography

Ultrasound isn't just about static pictures. It has some cool tricks up its sleeve:

l Doppler Ultrasound: This technique uses the Doppler effect to measure the direction and speed of blood flow.9 By analyzing how the frequency of the sound waves changes as they bounce off moving red blood cells, doctors can detect blockages, blood clots, or even narrowings in blood vessels.10 It's a lifesaver for diagnosing conditions like deep vein thrombosis (DVT) and peripheral artery disease.

l Ultrasound Elastography: This is a newer, exciting application that measures the stiffness of tissue.11 Think of it like a sound-based palpation. Stiffer tissues often indicate disease (like liver fibrosis or tumors), and by measuring how sound waves deform

the tissue, we can get a stiffness map. It's a powerful tool for diagnosing liver disease and could reduce the need for invasive biopsies.

The Future of Ultrasound

The field of biomedical ultrasound is far from stagnant.12 Researchers are pushing the boundaries in so many ways. We're seeing the development of micro-ultrasound for super high-resolution imaging of tiny structures and contrast-enhanced ultrasound, which uses microbubbles to improve the visibility of blood flow and tumors.

Even more futuristic is the concept of therapeutic ultrasound, where we use focused sound waves to treat diseases, not just image them.13 Think of high-intensity focused ultrasound (HIFU), which can be used to non-invasively ablate tumors or fibroids without surgery.14

As a biomedical engineering student, I'm constantly inspired by how this technology is becoming more accessible, more powerful, and more integrated into clinical practice. It's a field where physics meets medicine in the most impactful way, and I can't wait to see what comes next.

S.G. SHIVESH
III-BE BIOMEDICAL

THE ROLE OF BIOMEDICAL ENGINEERS IN ROBOTICS

Introduction:

Biomedical robotics and automation have revolutionized the field of healthcare by offering innovative solutions to improve surgical procedures and rehabilitation processes. This cutting-edge technology combines the precision and accuracy of robotics with the expertise of medical professionals, leading to better patient outcomes, reduced risks and enhanced efficiency in healthcare settings [1].

Biomedical robotics in surgery:

Robotic-assisted surgery: Robotic-assisted surgery, also known as robot-assisted surgery, is one of the most prominent applications of biomedical robotics in the surgical domain. It involves the use of robotic systems to enhance the capabilities of surgeons during minimally invasive procedures [2]. Robotic surgical systems offer several advantages, such as increased dexterity, precise movements and reduced hand tremors, enabling surgeons to perform complex surgeries with greater accuracy.

Description:

The da Vinci Surgical System is a leading example of robotic-assisted surgery. It consists of a console where the surgeon controls the robotic arms that hold surgical instruments. The system provides a 3D view of the surgical site and translates the surgeon's hand movements into smaller, more precise actions performed by the robotic arms. This technology has been successfully employed in various surgeries, including prostatectomy, gynecologic procedures and cardiac surgeries.

Benefits of robotic-assisted surgery:

The integration of robotics in surgery brings several benefits to both patients and healthcare professionals. Firstly, the minimally invasive nature of robotic-assisted surgery results in smaller incisions, reducing the risk of infection and post-operative complications. Patients experience less pain and discomfort, leading to shorter hospital stays and faster recovery times.

Secondly, the increased precision of robotic systems allows surgeons to target specific areas with greater accuracy, preserving healthy tissues and minimizing damage to surrounding structures. This precision is especially crucial in delicate surgeries, such as neurosurgery and ophthalmic procedures [3].

Thirdly, robotic-assisted surgery enables experienced surgeons to remotely assist or train less experienced colleagues across geographical distances. This capability has significant implications for global healthcare, as it facilitates the dissemination of specialized medical expertise to regions with limited access to surgical care.

Challenges and future directions:

Despite its promising potential, robotic-assisted surgery faces several challenges. High costs associated with acquiring and maintaining robotic systems can limit their widespread adoption. Additionally, concerns about the learning curve for surgeons and potential technical malfunctions during procedures require ongoing research and training.

To overcome these challenges, ongoing advancements in artificial intelligence (AI) and machine learning hold the promise of making robotic systems more intuitive, autonomous and efficient. The integration of haptic feedback, virtual reality and augmented reality could further enhance the surgeon's capabilities, enabling more natural interactions with robotic systems and improving surgical outcomes.

Biomedical robotics in rehabilitation:

Robotic-assisted rehabilitation: Biomedical robotics and automation have also made significant contributions to the field of rehabilitation. Robotic assisted rehabilitation involves the use of robotic devices to assist patients in regaining motor functions and improving physical strength and flexibility [4]. These devices offer personalized therapy programs and real-time feedback, which are essential for maximizing the effectiveness of rehabilitation treatments.

Robotic exoskeletons are a prominent example of robotic-assisted rehabilitation devices. These wearable robotic structures are designed to support and augment a patient's movements during therapy sessions. They can be used for various conditions, such as spinal cord injuries, stroke recovery and musculoskeletal disorders.

Benefits of robotic-assisted rehabilitation: Robotic-assisted rehabilitation offers several advantages over traditional rehabilitation methods. Firstly, these devices provide precise and controlled movements, ensuring that patients perform exercises correctly and consistently. This consistency is crucial for promoting neuroplasticity and accelerating recovery.

Secondly, robotic-assisted rehabilitation allows therapists to customize treatment plans according to each patient's needs and progress. The devices collect data on the patient's performance, enabling therapists to monitor progress, make data-driven adjustments and optimize the rehabilitation process.

Thirdly, robotic devices can assist patients with severe impairments in performing exercises that would otherwise be challenging or impossible [5]. This capability expands the scope of rehabilitation and offers hope to patients with limited mobility.

Challenges and future directions:

Despite the potential benefits of robotic-assisted rehabilitation, there are challenges that need to be addressed. The cost of these devices can be prohibitive for some healthcare facilities and patients. Moreover, the compatibility of robotic devices with different rehabilitation protocols and the need for extensive training for therapists remain areas of concern.

Looking ahead, researchers are exploring the integration of brain-computer interfaces (BCIs) with robotic devices to create more intuitive and personalized rehabilitation experiences. BCIs can allow patients to control robotic devices using their brain signals, enabling a more natural and engaging interaction during therapy sessions.

Additionally, advancements in soft robotics, which involve the use of flexible and compliant materials, may lead to more comfortable and adaptable robotic devices, enhancing patient comfort and acceptance during rehabilitation.

Conclusion:

Biomedical robotics and automation applications in surgery and rehabilitation have redefined the landscape of healthcare by offering novel solutions to improve patient outcomes and optimize the efficiency of medical procedures. Robotic-assisted surgery has enabled surgeons to perform complex operations with higher precision, reduced invasiveness and improved patient recovery. Similarly, robotic-assisted rehabilitation has enhanced the effectiveness of physical therapy, leading to better functional outcomes for patients with various neurological and musculoskeletal conditions.

The continued research and development in the field of biomedical robotics hold the promise of even more sophisticated and accessible technologies in the future. As we move forward, it is essential to address the challenges related to cost, training and integration to ensure that these technologies become widely available and bring transformative changes to the field of healthcare. The collaboration between engineers, medical professionals and researchers will pave the way for a new era in medicine, where biomedical robotics and automation play a central role in enhancing human health and well-being.

K.RASIHA
III-BE BIOMEDICAL

Nanotechnology in Drug Delivery

INTRODUCTION:

Nanotechnology has emerged as a groundbreaking innovation in modern medicine, particularly in the field of drug delivery. By manipulating materials at the nanometer scale (one-billionth of a meter), scientists can design systems that deliver medications more effectively, precisely, and safely to specific sites in the human body. This technology is transforming the way diseases are treated — from cancer to infections and neurological disorders.

Understanding Nanotechnology in Medicine

Nanotechnology involves creating and using materials and devices with dimensions typically between 1 and 100 nanometers. At this scale, materials exhibit unique physical, chemical, and biological properties that make them highly useful for medical applications. In drug delivery, nanoparticles serve as carriers that transport therapeutic agents directly to target cells or tissues, improving efficacy and reducing side effects.

How Nanotechnology Enhances Drug Delivery

Traditional drug delivery methods often face challenges such as poor absorption, rapid degradation, or unintended distribution throughout the body. Nanoparticles overcome these limitations by encapsulating the drug and protecting it until it reaches the target site. They can be engineered to release drugs slowly (controlled release) or in response to specific stimuli like pH, temperature, or enzymes.

Common nanocarriers include:

Liposomes – spherical vesicles that deliver both water-soluble and fat-soluble drugs.

Polymeric nanoparticles – biodegradable carriers that provide sustained drug release.

Dendrimers – tree-like molecules with branching structures that can hold multiple drug molecules.

Applications in Healthcare

Nanotechnology-based drug delivery is already making a major impact. In cancer treatment, nanoparticles can deliver chemotherapy drugs directly to tumor cells, minimizing damage to healthy tissues. In neurology, nanosystems can cross the blood-brain barrier to treat diseases like Alzheimer's and Parkinson's. Similarly, antimicrobial nanocarriers enhance the effectiveness of antibiotics against resistant bacteria.

Advantages

Targeted delivery: Directs drugs to diseased cells only.

Improved bioavailability: Enhances absorption and utilization of drugs.

Reduced side effects: Limits exposure of healthy tissues to toxic drugs.

Controlled release: Ensures long-lasting therapeutic effects.

Challenges and Future Outlook

Despite its potential, nanotechnology faces hurdles such as high production costs, long-term toxicity concerns, and complex regulatory approval processes. Ongoing research focuses on making nanoparticles biocompatible, biodegradable, and safe for large-scale use. Future developments may lead to personalized nanomedicine — where treatment is tailored to an individual's genetic and cellular profile.

SHAMIL
III-BE BIOMEDICAL

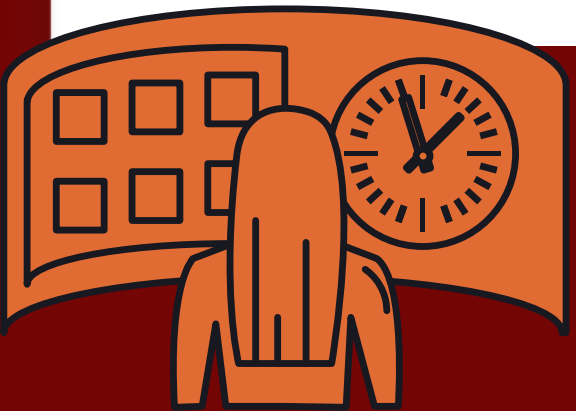
The Future of Biomedical Engineering

Biomedical engineering is shaping the future of healthcare by combining technology and medicine to improve human lives. From artificial organs to advanced prosthetics, innovations in this field are turning science fiction into reality.

In the years ahead, breakthroughs in artificial intelligence, nanotechnology, and tissue engineering will transform medical treatment. Devices like wearable sensors and 3D-printed implants will make healthcare more personalized, faster, and efficient. These advancements not only help in early disease detection but also enhance the quality of life for millions of patients worldwide.

Biomedical engineers play a crucial role in bridging the gap between doctors and technology. Their creativity and technical knowledge make modern healthcare more accessible and effective. As global health challenges increase, the demand for skilled biomedical engineers continues to grow.

The future of biomedical engineering is not just about machines—it's about humanity, innovation, and compassion. By merging science with empathy, biomedical engineers are building a healthier and more hopeful world for generations to come.



J. JENUSHA
II-BE BIOMEDICAL

SMART GLASSES FOR THE BLIND

An Innovative Wearable Technology for Blinds

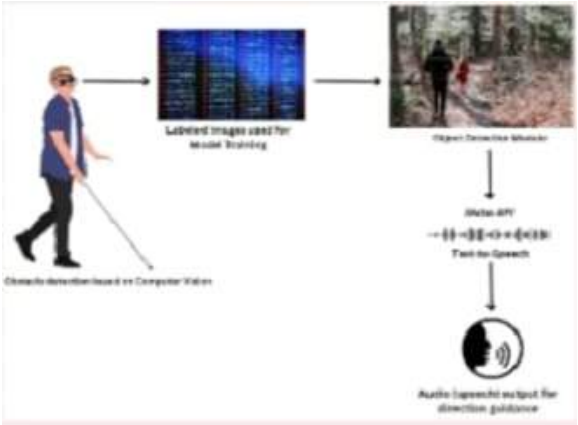
These “Smart Glasses” are designed to help blind people read and translate typed text written in theEnglish language. Such inventions provide solutions that motivate blind students to pursue education despite their challenges. The main objective is to introduce a new way of reading texts and facilitating communication for blind individuals.

The glasses perform two main tasks:

1. Scanning any text image and converting it into audio so the user can listen through connected headphones.
2. Translating the entire text or specific words upon pressing a button linked to the glasses.

To achieve these functions, the system integrates technologies such as Optical Character Recognition (OCR), Google Text-to-Speech (gTTS), and Google Translation API. Text detection was carried out using OpenCV, Tesseract OCR, and the EAST text detector, while ultrasonic sensors ensured correct distance for image capture. Motion assistance was provided via RFID sensors to guide users through locations.

All computing and processing were managed with Raspberry Pi 3 Model B and B+. Testing showed that combining OCR with EAST detector yielded up to 99% text recognition accuracy. However, the current prototype is limited to English language support and requires images to be captured within a 40–150 cm distance. Future improvements include multi-language support, design miniaturization, and increased comfort for everyday use .



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II-BE BIOMEDICAL

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Performance Evaluation of GaN-Based HEMTs with Cu Trap Layer Using Multi-Stacked AlGaN Barriers

Publisher: IEEE

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Abstract

Document Sections

I. Introduction

II. Related Work

III. Device Methodology

IV. Results and Discussion

V. Conclusion

Authors

Abstract:

This work presents a comprehensive performance evaluation of GaN-based High Electron Mobility Transistors (HEMTs) fabricated on a SiC substrate, incorporating a multistacked AlGaN barrier and a copper (Cu) trap layer. The device structure includes graded AlGaN layers-Alo.soGao.soN, $Al_{0.35}Ga_{0.65}N$, and $Al_{0.20}Ga_{0.80}N$-along with a GaN channel and spacer to enhance polarization-induced 2DEG formation and carrier confinement. A Cu-doped buffer layer is introduced to generate deep-level traps, effectively suppressing buffer leakage and improving thermal stability. The DC and RF performance metrics such as threshold voltage, drain current, transconductance, cutoff frequency, and breakdown voltage are analyzed to understand the influence of Cu doping on overall device behavior. Results confirm that **Cu** is an efficient trap material, maintaining carrier mobility while enhancing electrical reliability. This makes it a promising approach for high-power and high-frequency GaN-based HEMT applications.

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AI-DRIVEN VOC SENSOR SYSTEM FOR EARLY ALLERGEN DETECTION AND PROACTIVE ALLERGY MANAGEMENT

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ABSTRACT

The early detection of airborne allergens is essential for individuals with allergies and respiratory sensitivities, as exposure to allergenic compounds can trigger adverse health effects. This paper presents an advanced allergen monitoring system that integrates Volatile Organic Compound (VOC) sensors with Artificial Intelligence (AI)-driven scent recognition to enable real-time detection, classification, and mitigation of airborne allergens. The system employs a multi-sensor array comprising Metal Oxide Semiconductor (MOS) sensors, Photoionization Detectors (PID), and Electrochemical sensors to detect and analyze allergenic VOCs such as floral compounds, mold spores, and food-based triggers. Calibration using Gas Chromatography-Mass Spectrometry (GC-MS) ensures high specificity and sensitivity in VOC identification, providing a reliable basis for sensor accuracy. To enhance classification and predictive accuracy, AI-based machine learning models, including Support Vector Machines (SVM), Random Forest (RF), Convolutional Neural Networks (CNNs), and Long Short-Term Memory (LSTMs), process sensor data to detect allergenic VOC patterns while filtering environmental noise. The system also features a mobile application that delivers real-time exposure risk assessments and personalized mitigation strategies, empowering users to take preventive actions. This paper details the methodology, system architecture, real-world applications, and future research directions, emphasizing the potential of AI-driven VOC sensing technology for proactive allergen management and improved quality of life for allergy-sensitive individuals.

Keywords: Proactive allergen management, VOC sensors, AI-driven scent recognition, allergy detection, early intervention, personalized alerts

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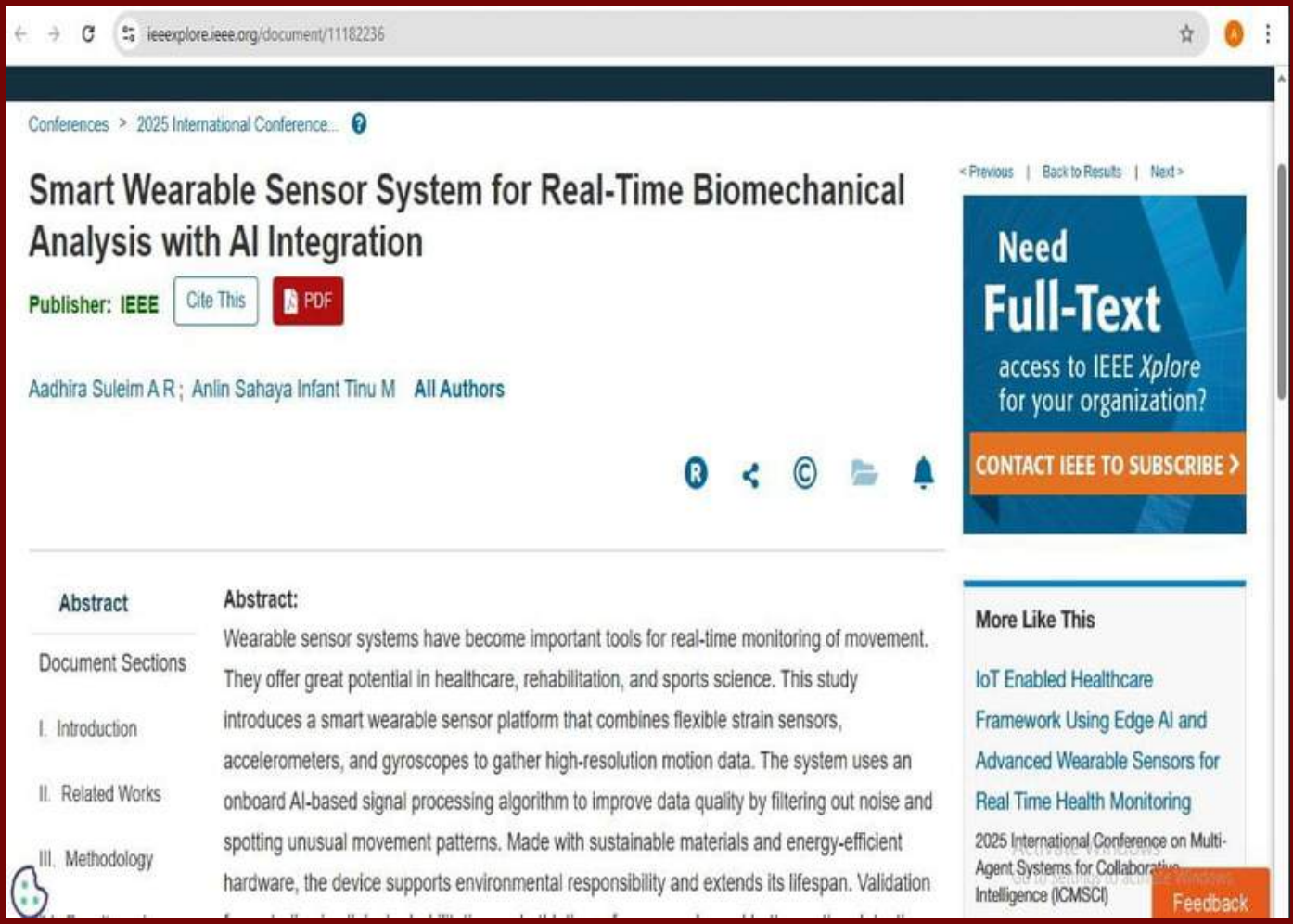

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YOGI-WELL: AN AI-ENABLED WIRELESS WEARABLE FOR POSTURE CORRECTION, YOGA GUIDANCE & STRESS MONITORING

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Abstract

This paper presents YOGI-WELL, an innovative AI-enabled wireless wearable system designed to support yoga practitioners through real-time posture correction, personalized pose recommendations, and stress management via biofeedback. YOGI-WELL represents a convergence of traditional Indian knowledge systems (IKS) — particularly Yoga and Ayurveda — with modern biomedical sensing technologies and artificial intelligence, offering a holistic approach to wellness.

The YOGI-WELL system incorporates an array of advanced sensors embedded within a lightweight and non-intrusive yoga belt. These sensors include Inertial Measurement Units (IMUs) to capture detailed motion and orientation data, breathing stretch sensors to monitor respiratory patterns, and heart rate and galvanic skin response (GSR) sensors to detect physiological indicators of stress. Together, these sensors provide a comprehensive real-time assessment of the user's physical posture, breathing quality, and emotional state.

Sensor data is transmitted wirelessly to a mobile application using Bluetooth Low Energy (BLE) for seamless connectivity and minimal power consumption. The mobile app processes incoming data with the help of AI algorithms that perform real-time analysis to deliver immediate corrective feedback. Users receive posture adjustment alerts to ensure safe and effective yoga practice. The system also offers breathing guidance based on respiratory monitoring, enhancing the alignment of body and breath according to yogic principles. Additionally, personalized yoga pose recommendations are generated based on the user's Ayurvedic Prakriti profile, tailoring the practice to the individual's body constitution and mental tendencies.

Preliminary trials of the YOGI-WELL system have shown promising results, with users demonstrating significant improvements in posture alignment and reductions in stress levels over time. By integrating ancient wisdom with cutting-edge technology, YOGI-WELL provides a culturally rooted yet modernized solution for holistic health management. It encourages personalized, mindful practice and supports the broader movement toward sustainable, preventive wellness.

Keywords: Yoga, Wearable, Posture Correction, Stress Monitoring, BLE, AI, Ayurveda, IKS

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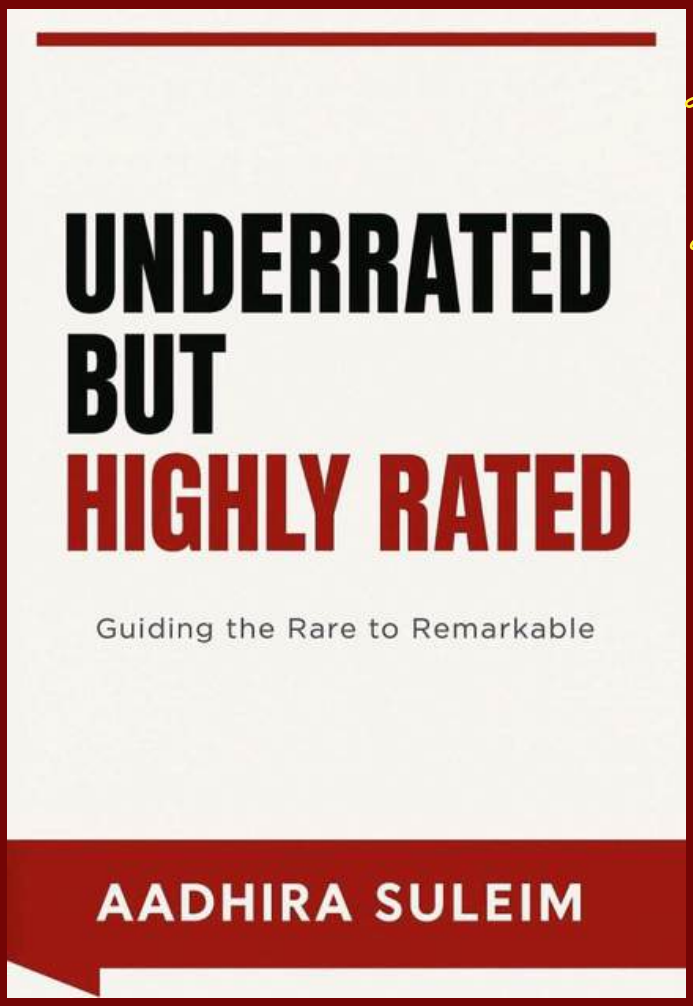
Overview:

"Underrated but Highly Rated" is an inspiring and practical guidebook crafted especially for biomedical engineering students and young professionals who aspire to make a meaningful impact in healthcare technology.

The book sheds light on the often-overlooked potential of biomedical engineers — the innovators who stand at the intersection of medicine, technology, and humanity. It offers clear direction on career opportunities, skill development, industry expectations, and future trends in the biomedical field.

Through real-world insights, motivational reflections, and practical strategies, the author helps readers navigate the challenges of internships, placements, research, and entrepreneurship. Each chapter encourages readers to value their field, embrace innovation, and pursue excellence with confidence — even when the world underestimates their role.



"Underrated but Highly Rated" not only serves as a career roadmap, but also as a source of motivation, reminding every biomedical engineer that their work silently saves lives and shapes the future of healthcare.

A.R.Aadhira Suleim
963322121001

Raja Rammohun Roy National Agency for ISBN
Department of Higher Education, Ministry of Education
Government of India

AI - DRIVEN BUSINESS AND HEALTH MANAGEMENT SYSTEM FOR FINANCIAL AND HEALTH CARE AUTOMATION

MS. FIONNA ANANTH (Student)
MR. ELDIN RINO P (Student)
ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGYY
KANYAKUMARI

Abstract *—Professionals across various industries, including business owners, educators, healthcare workers, and corporate executives, often face challenges in efficiently managing their financial responsibilities and personal health routines. Tracking expenses, processing payroll, managing loan repayments, and ensuring medication adherence manually can lead to inefficiencies, errors, and missed deadlines. To address these challenges, this paper presents an AI-driven Integrated Business and Health Management System (IBHMS) that provides a customizable, automated solution tailored to the user's profession, business type, and personal health needs.*

The proposed system allows users to select their profession and business type, ensuring that financial and administrative tools are adapted to their specific needs. Additionally, it provides a personalized pill reminder system with adjustable alarm settings, ensuring adherence to prescribed medication schedules. By integrating Artificial Intelligence (AI), Machine Learning (ML), and the Internet of Things (IoT), the system offers automated financial tracking, salary processing, loan management, and IoT-based health reminders. A mobile-based dashboard delivers real-time insights, personalized alerts, and AI-driven recommendations, improving efficiency and reducing errors.

A comparative study between traditional manual methods and the proposed system demonstrates a 70-90% improvement in time efficiency, a significant reduction in financial mismanagement, and enhanced medication compliance. The research highlights the potential of AI-driven automation to streamline business processes, improve financial accuracy, and promote better health management. Future advancements will focus on banking API integrations, AI-powered voice assistants, and predictive analytics for optimized decision-making.

Keywords-
Business Process Automation, AI in Finance, Customizable Payroll Management, Loan Tracking, IoT-Based Pill Reminders, Predictive Healthcare, AI-Driven Workflow Optimization, Personalized Financial Management, Smart Scheduling, Work-Life Balance

Fionna Ananth
963322121022

P.Eldin Rino
963322121019

DID YOU KNOW?

Father of "Biomedical Engineering"

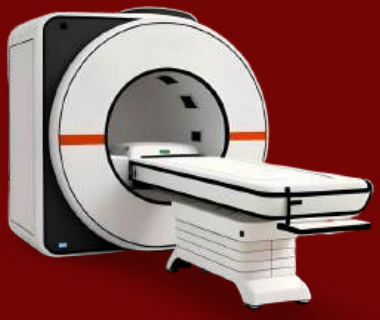
Hermann von Helmholtz

The Father of Biomedical Engineering is Hermann von Helmholtz (1821–1894), a German scientist, physician, and engineer. He made groundbreaking contributions that shaped modern biomedical technology.

Helmholtz invented the ophthalmoscope in 1851, a device that allows doctors to look inside the human eye. This invention transformed eye care and is still used in clinics today. He also made key discoveries in hearing, vision, and nerve impulses, helping bridge the gap between biology and technology.

His unique ability to combine medicine, physics, and engineering laid the foundation for biomedical engineering as we know it. Helmholtz's innovative spirit continues to inspire scientists, doctors, and engineers around the world, making him a true pioneer in the field.

Today, his work influences modern technologies such as medical imaging, hearing aids, artificial organs, and diagnostic tools. Without his early contributions, many of the advanced medical devices we use today might not have been possible. His legacy continues to shape healthcare and technology even in the 21st century.



S.ANUSHUYA
IV-BE BIOMEDICAL

Notable Biomedical Breakthroughs

1.Creation of Human Eggs from Skin Cells
Researchers at Oregon Health and Science University successfully converted human skin cells into eggs in the lab, potentially paving new paths in fertility treatments.

2.Mini Hearts with Immune Cells
Scientists engineered miniaturized heart tissues that include immune cells, allowing study of diseases like myocarditis and pericarditis in more realistic models.

3.New Genomics Tool for Faster Biomedical Discovery
A new tool was developed to accelerate genomic research, making it easier to map and analyze genomes across species — this speeds up identification of disease genes and therapeutic targets.

4.Advances in CRISPR Clinical Trials
Progress is being made in CRISPR-based therapies, especially targeting heart disease and liver conditions. Several new trials have been initiated, and editing techniques (base/prime editing) are becoming more precise.

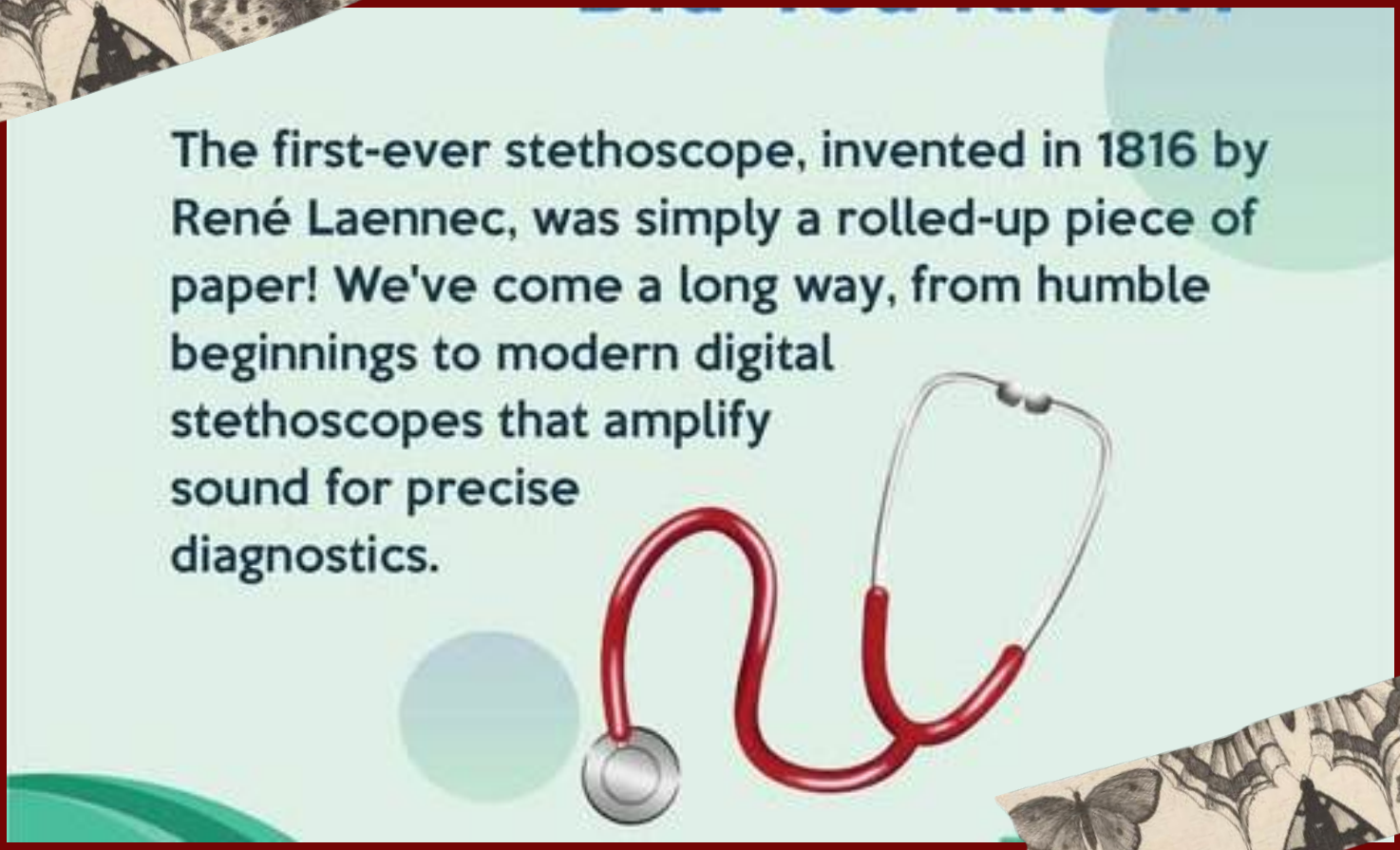
5.Biocompatible Material Derived from Seashell Mineral
Biomedical engineers developed a new material for medical applications that is safe for marine life and avoids microplastic contamination — promising for implants, scaffolds, or eco-friendly biomaterials.

K.G.KAMALI
IV-BE BIOMEDICAL

Medical Waste Facts

- 5.9 Million Tons Per Year
- 85% is Non-Hazardous
- 16 Billion Injections Per Year
- 2 Million Needles Per Day
- 800,000 Needle Sticks Per Year, per NIOSH

DHANALAKSHMI
IV-BE BIOMEDICAL



AKALYA LEKSHMI
IV-BE BIOMEDICAL

POEM

Ode to Biomedical

Where circuits meet a heartbeat's song,
Where science and care together belong.
Blending machines with life's own art,
Healing the world, part by part.
From tiny cells to tech so grand,
Biomedical minds take a stand.
Innovate, inspire — break every wall,
For health and humanity,
we give our all.

A.R.AADHIRA SULEIM
IV-BE BIOMEDICAL

உயிரியல் பொறியியலாளன்

உடல் உறுப்பு வீழ்ந்தாலும்,
உயிர் விழாமல் இருக்கட்டும் என்று
மனம் கையெழுத்திடும் அந்த நொடி,
பின்புலத்தில் பணியாற்றும் நம் கனவு கைதறாத வீரன்!

மனித மெஷின் அமைப்பில்,
இலையுதிர் போல கூழ்கின்ற உயிரின் சத்தம்,
அதை மீட்டெடுக்க ஓர் கருவி தேடி,
கண்ணீரில் வழிவைக்கிறார் உயிரியல் பொறியியலாளன்.

திசுக்கள் பேசும்,
நரம்புகள் நெஞ்சம் திறக்கும்,
இதயத்தின் இசையில் இசைக்கிறார் அவன்,
மனிதம் நம்பும் மெக்கானிக்கல் கவிஞன்.

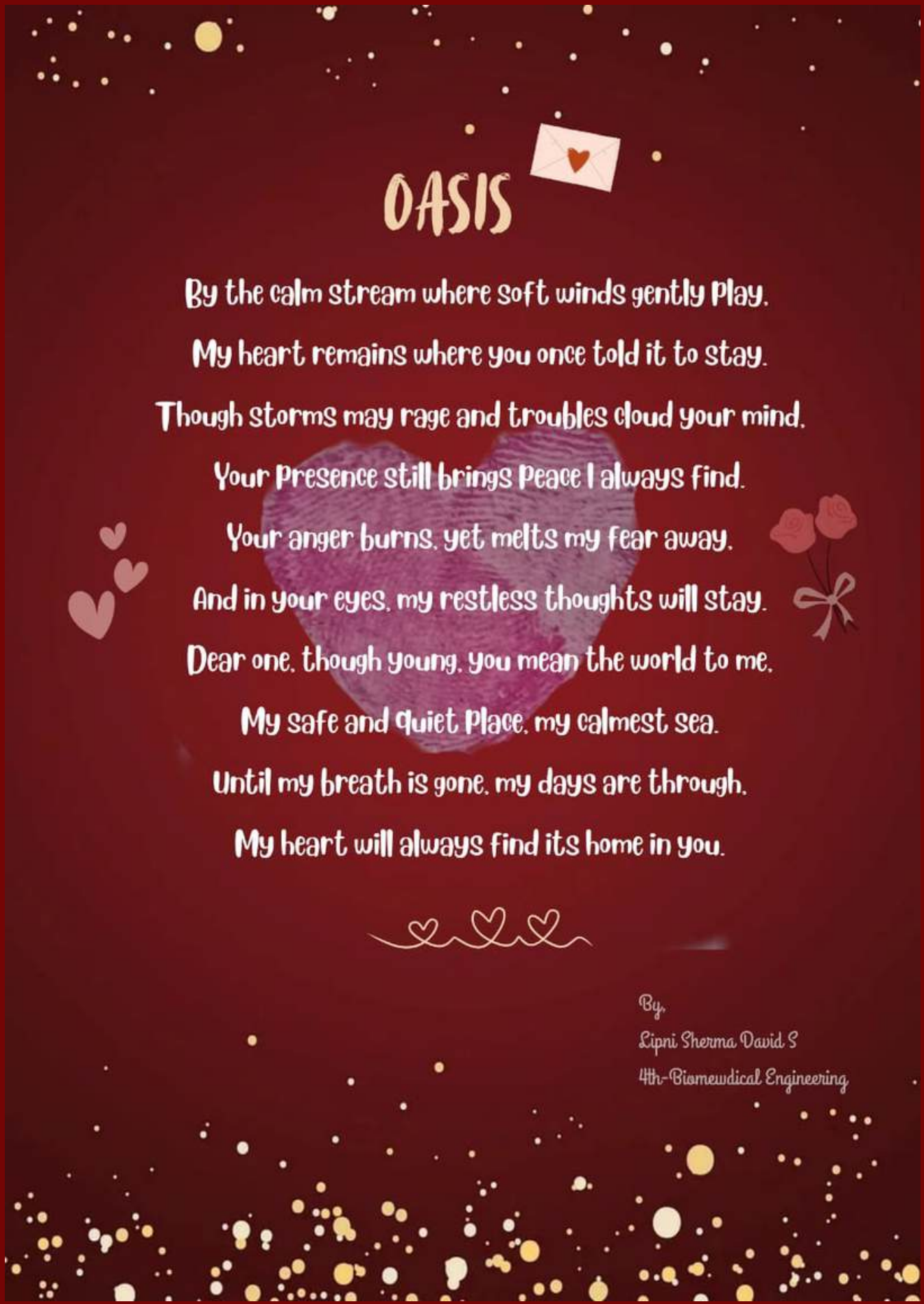
அறிவியல் மொழியில் எழுதினாலும்,
அவனது இலக்கம் – ஒரு உயிரைக் காப்பது!
அவனது கவிதை – ஒரு செயற்கை கை,
அவனது கைவண்ணம் – மீண்டும் நடக்கச் செய்வது!

D.ABEESH RAJA
IV-BE BIOMEDICAL

The Spirit of Engineering

Where ideas soar and dreams ignite,
Engineers emerge — beacons of light.
With courage, logic, and visions clear,
They shape the future year by year.
From bridges to codes, engines that roar,
They craft solutions, unlock every door.
Innovation flows through every hand,
Turning dreams into structures that stand.
Here's to the minds that imagine and dare,
Engineers — building a future beyond compare.

H.S. KARTHIK
IV-BE BIOMEDICAL



D.LIPNI SHERMA DAVID
IV–BE BIOMEDICAL

Story

The Origin Story of Biomedical Engineering

Once upon a time, science and medicine walked on parallel roads —
Doctors healed the body, and engineers built the world.
But one day, these two paths met at a curious crossroad.
A spark was born... and Biomedical Engineering came to life.
It began when healers dreamed of tools to see inside the human form —
X-rays to glimpse hidden bones, ECGs to hear the heart's storm.
Engineers brought their circuits, gears, and codes,
And together, they paved new medical roads.
World War II pushed innovation like never before —
Prosthetic limbs, dialysis machines, and monitors galore.
The marriage of medicine and mechanics grew strong,
As engineers asked, "Why can't tech help us live longer and strong?"
By the mid-20th century, a new field took its name,
"Biomedical Engineering" — a blend of science, purpose, and flame.
Pacemakers began to keep hearts in tune,
Imaging lit up the body like a bright afternoon.
From artificial organs to robotic surgery's grace,
From wearable sensors to tissue grown in place —
Biomedical engineers dared to blend
The logic of machines with the magic humans defend.
Today, it's not just about healing, but thriving,
About AI that predicts, and devices that keep us surviving.
From microchips to cells, from hospitals to space,
Biomedical innovation runs the race.
And so, this field continues its epic quest,
To give life more years — and make those years the best.
Born from curiosity, powered by care,
Biomedical Engineering — science with a heart that's rare.

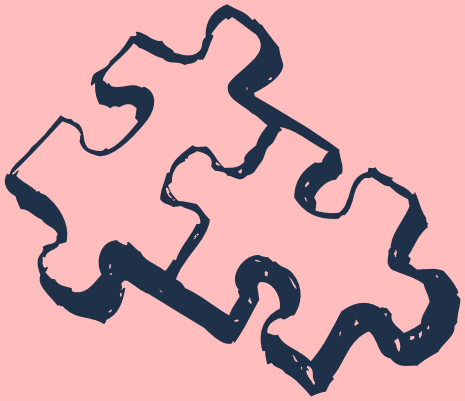
M.SHAHNAS
IV-BE BIOMEDICAL

Mechanical Organs vs Real Organs

The heart said, “I beat on my own,
No charger, no battery — fully grown!”
The pump replied with a cheeky grin,
“I’m metal, but I’ll never give in!”
The lungs boasted, “We breathe fresh air,
Nature’s filters beyond compare.”
The ventilator coughed, “When you rest,
I step in and do my best!”
The eyes blinked, “We see with grace.”
The lens winked, “I zoom every face!”
The kidneys hummed, “We clean with flair.”
Dialysis said, “I’ll back you there!”
The brain chuckled, “I run the show.”
The chip smirked, “I process too, you know!”
Organs and machines took their stance,
In a quirky, brilliant techno dance.
Born or designed, each plays a part —
Science and life, a masterpiece of heart.

J.SURAJ
IV-BE BIOMEDICAL

PUZZLE



Quiz

QUIZ CORNER – Test Your Biomedical IQ!

Think you're a true Biomedical Brainiac?
Take this quick quiz !!!

1. Which sensor is typically used in heart-rate wearables?

a) LDR b) Thermistor
c) PPG sensor d) Ultrasonic

2. MRI works on the principle of:

a) X-rays b) Ultrasound
c) Magnetic fields d) Gamma rays

3. A pacemaker regulates the:

a) Brain b) Liver c) Heart d) Kidney

4. "Biocompatibility" means:

a) Device is waterproof
b) Device functions at high speed
c) Device doesn't harm living tissue
d) Device is recyclable

5.CRISPR is mainly used for:

a) Gene editing b) Blood sugar testing
c) ECG recording d) Tissue printing

Answers:
1. c) PPG sensor
2.c) Magnetic fields
3. c) Heart
4. c) Device doesn't harm living tissue
5. a) Gene editing

J.ASLIN
IV-BE BIOMEDICAL

Who Am I?

Who Am I?
Clue 1: I record tiny electrical signals from your scalp.
Clue 2: I help diagnose epilepsy and sleep disorders.
Clue 3: I'm a three-letter test used in neuro labs.
Answer: EEG (Electroencephalogram)

Who Am I?
Clue 1: I pump about 5 liters of blood every minute.
Clue 2: I have 4 chambers.
Clue 3: Engineers model me using pressure-volume loops.
Answer: Human Heart

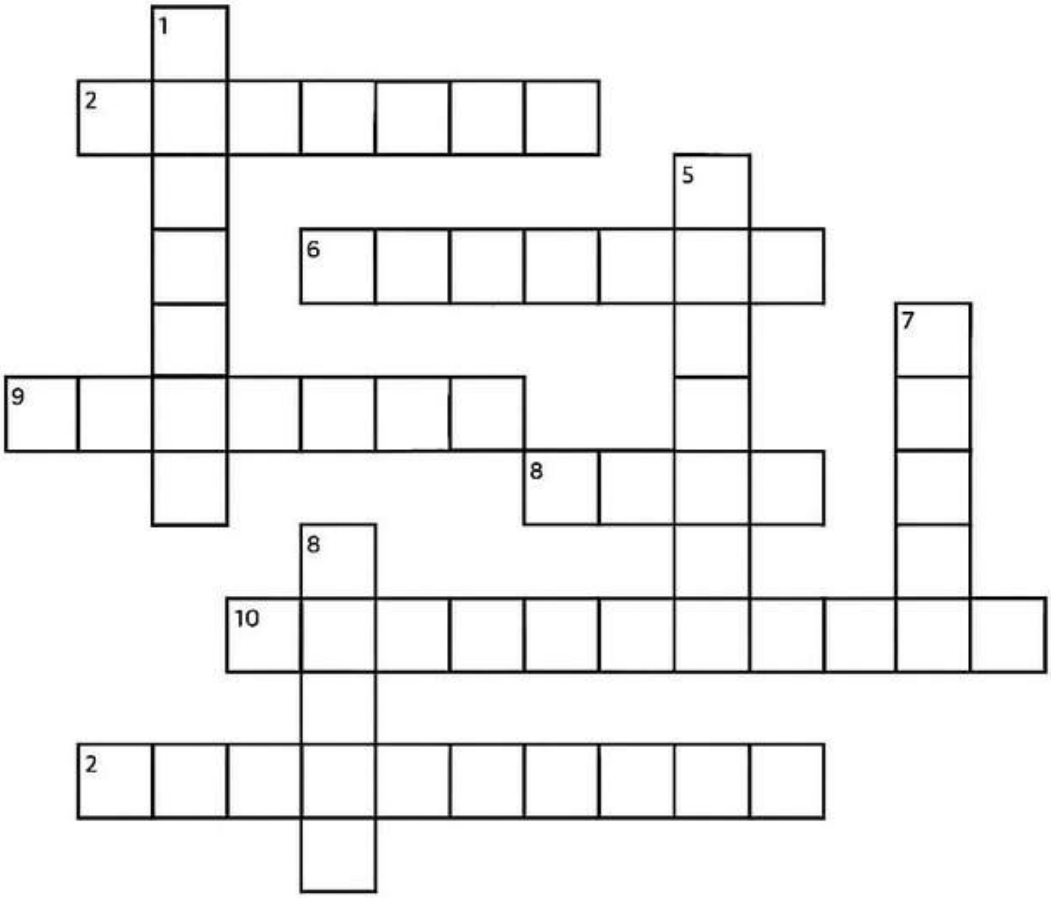
Who Am I?
Clue 1: I measure oxygen levels non-invasively.
Clue 2: I use red and infrared light through your fingertip.
Clue 3: My name sounds like "oxy meter."
Answer: Pulse Oximeter

* Who Am I?*
Clue 1: I developed the first implantable pacemaker.
Clue 2: I'm the reason many hearts keep beating.
Clue 3: My name is Wilson ___.
Answer: Wilson Greatbatch

Who Am I?
Clue 1: I'm known as the father of MRI.
Clue 2: I turned magnetic fields into medical miracles.
Clue 3: I won the Nobel Prize in 2003.
Answer: Paul Lauterbur

JESWIN JOE
IV-BE BIOMEDICAL

CROSS WORD PUZZLE



ACROSS

1. Single-celled organism
5. Technique used to imagee bones
6. CRISPR is a gene ____ technology
7. Instrument to measure blood pressure

DOWN

1. Medical device that regulates heartbeat
2. Energy storage device
3. System that includes he brain and spinal cord
4. Knee replacement or artificial limb, for example

K.ABINAYA
IV-BE BIOMEDICAL

BIOMEDICAL RIDDLES

I have four chambers but no doors.
I beat all day but never get tired.
What am I?

I breathe without lungs,
I pump without a heart,
Machines use me to keep you alive.
What am I?

I cover your body,
I protect without armor,
I heal myself when cut.
What am I?

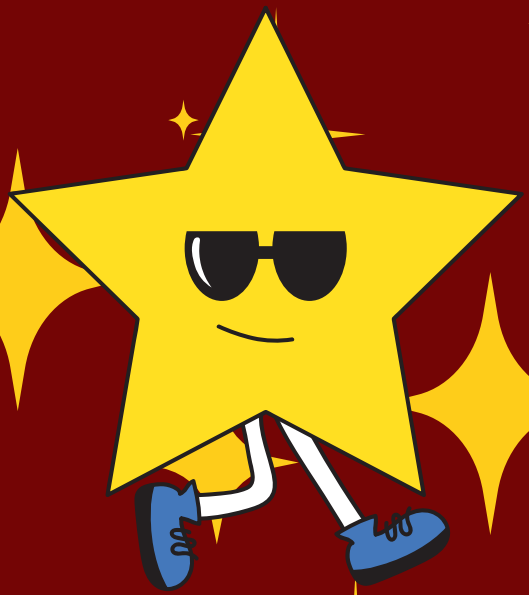
I live in the dark,
I see without eyes,
I help doctors look deep inside.
What am I?

I carry messages without speaking,
I travel fast like lightning,
Without me, you can't move or think.
What am I?

ANSER ,1. Heart, 2. Ventilator 3. Skin,
4. Endoscope / X-ray / Scanner ,5. Nerves /

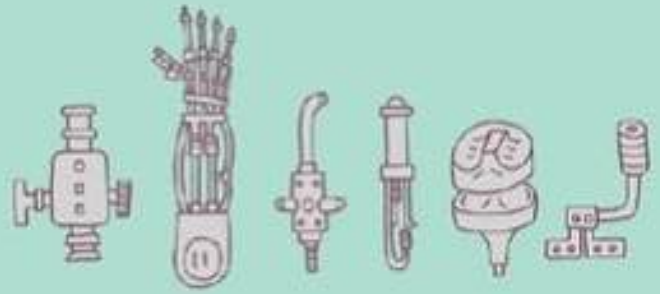
PRAVEENA
IV-BE BIOMEDICAL

MEME



MATHAN BHARATHI
IV-BE BIOMEDICAL

A Day in the Life of a Biomedical Engineer

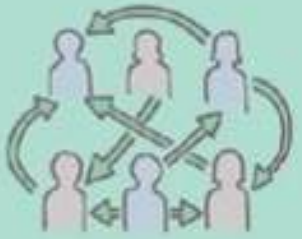


Design, develop, and test all aspects of medical/surgical instruments

Analyze failure, corrective and preventive action to respond to customer complaints

Report research findings through scientific publications, oral presentations, and formal documents

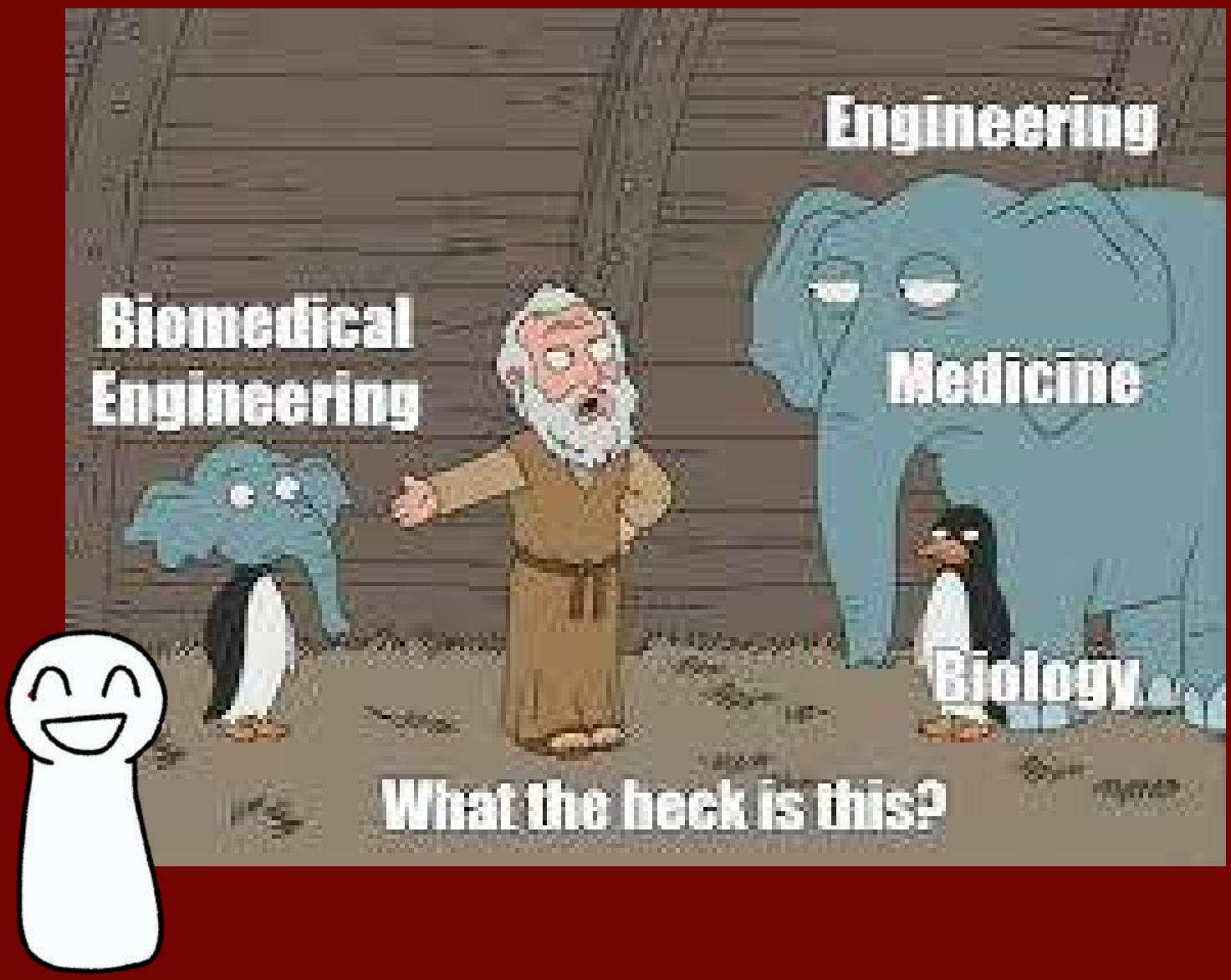
Demonstrate operation of equipment to medical personnel



Work with cross-functional teams to test prototypes

ANISHA MOL A

A.ANISHA MOL
IV-BE BIOMEDICAL



S.NANDHANA
IV-BE BIOMEDICAL

“When your Arduino finally works...
but you forgot to save your code.”

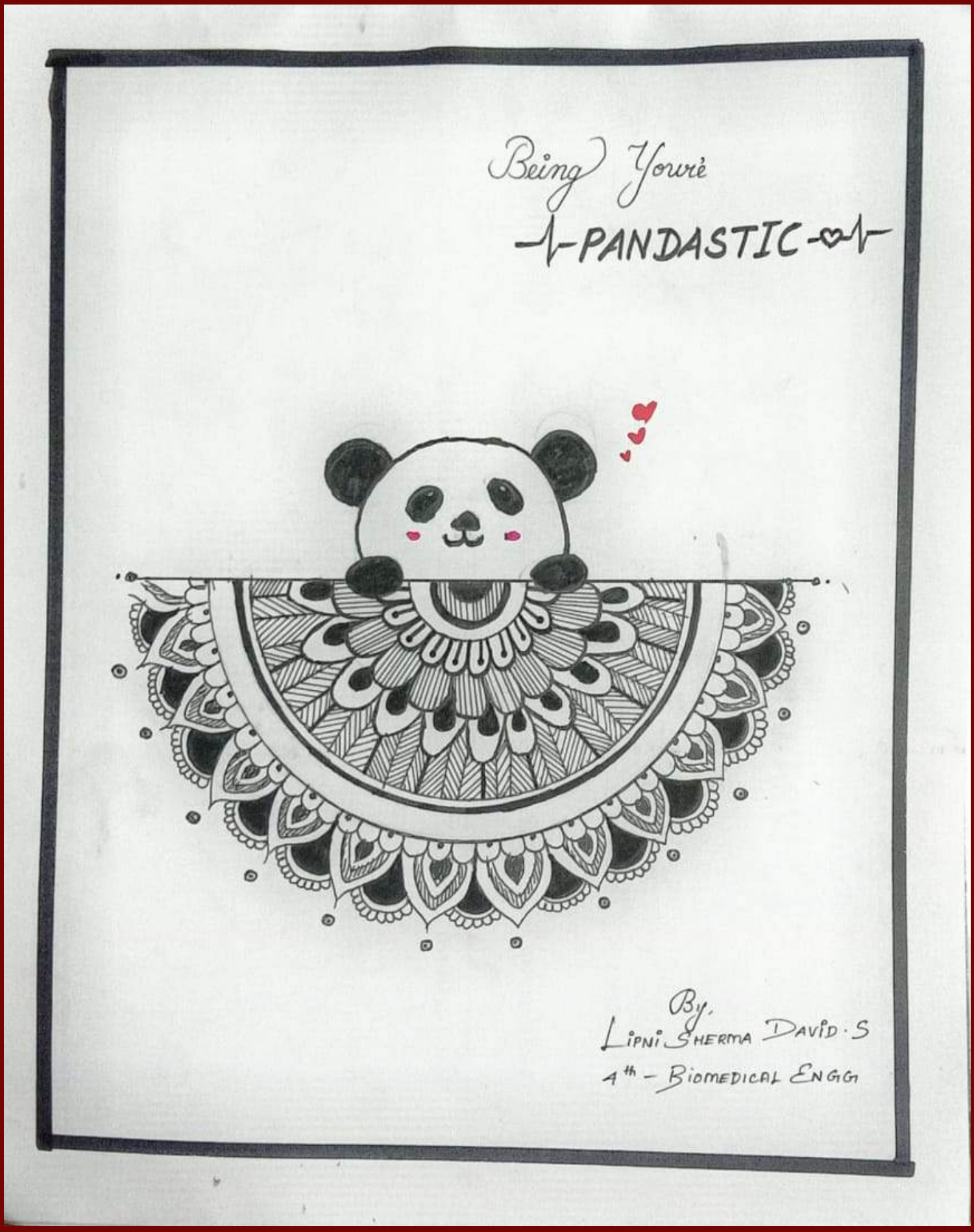
"When your MATLAB code works
on the first run...
I must be dreaming."

"Code doesn’t work... Check everything.
Still doesn’t work...
Add random semicolon. Works."

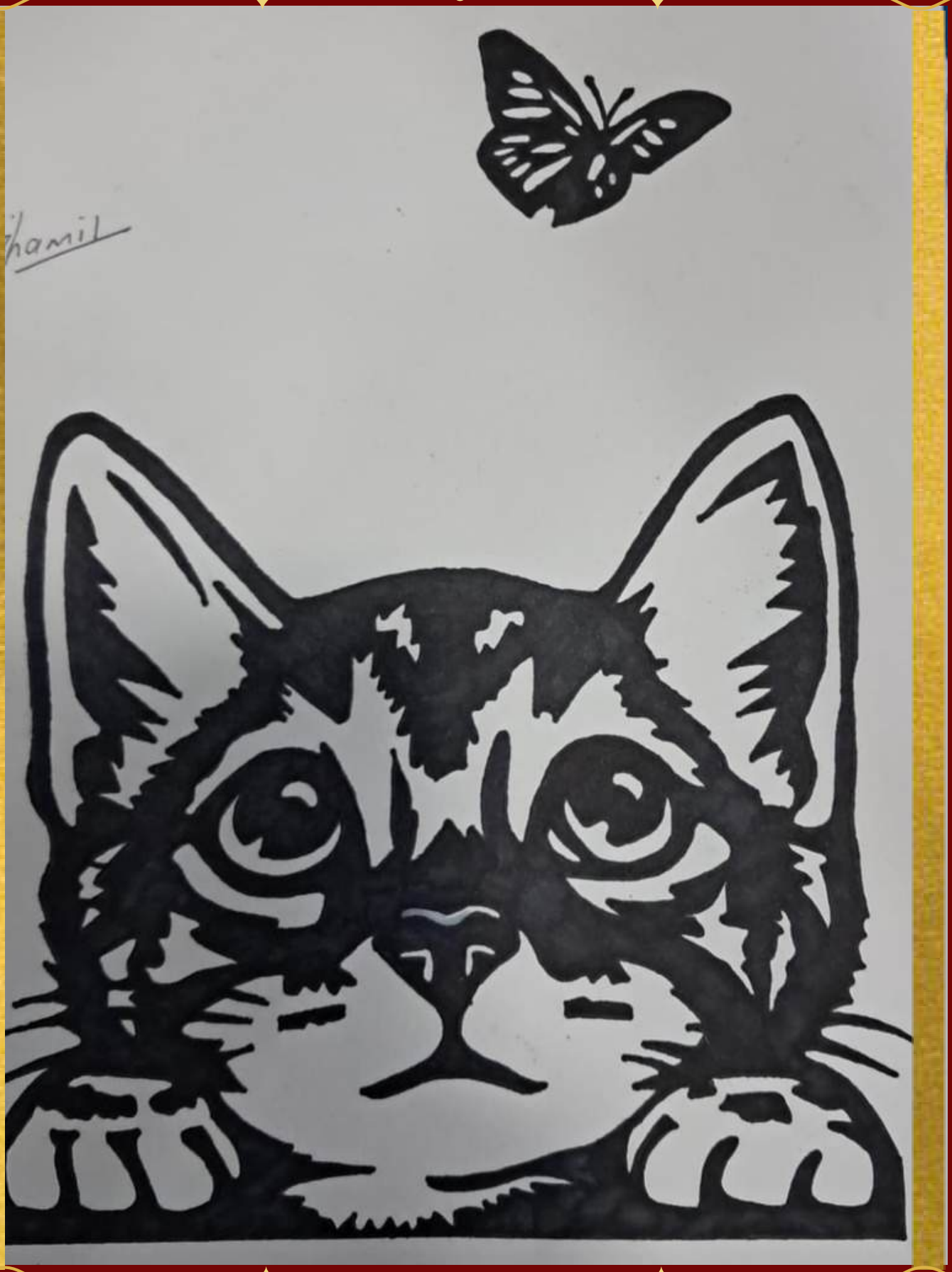
"First time seeing an ECG on patient:
‘Is it supposed to look like this?!’"

M.R. JAI HARISH
IV-BE BIOMEDICAL

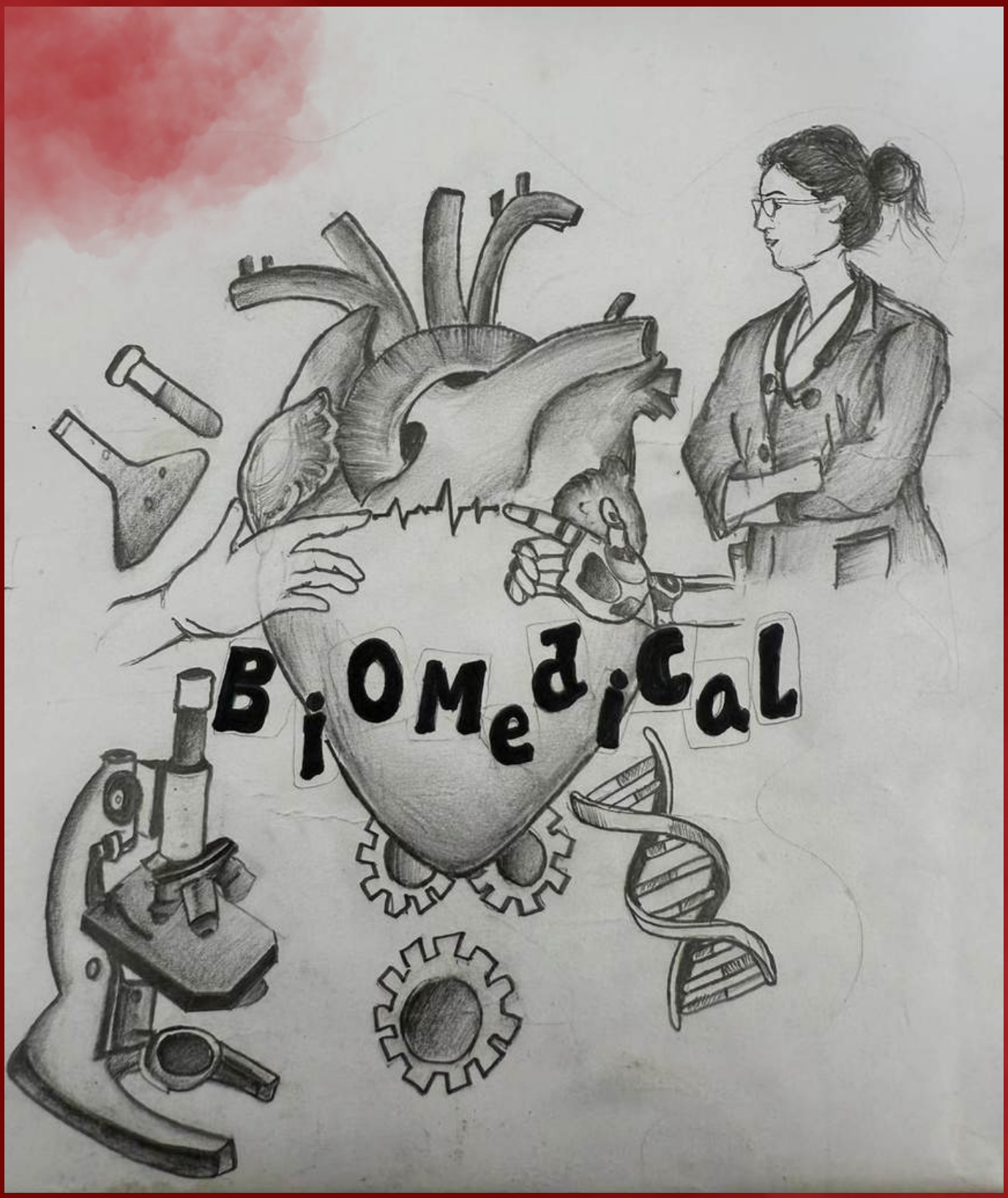

ART WORK



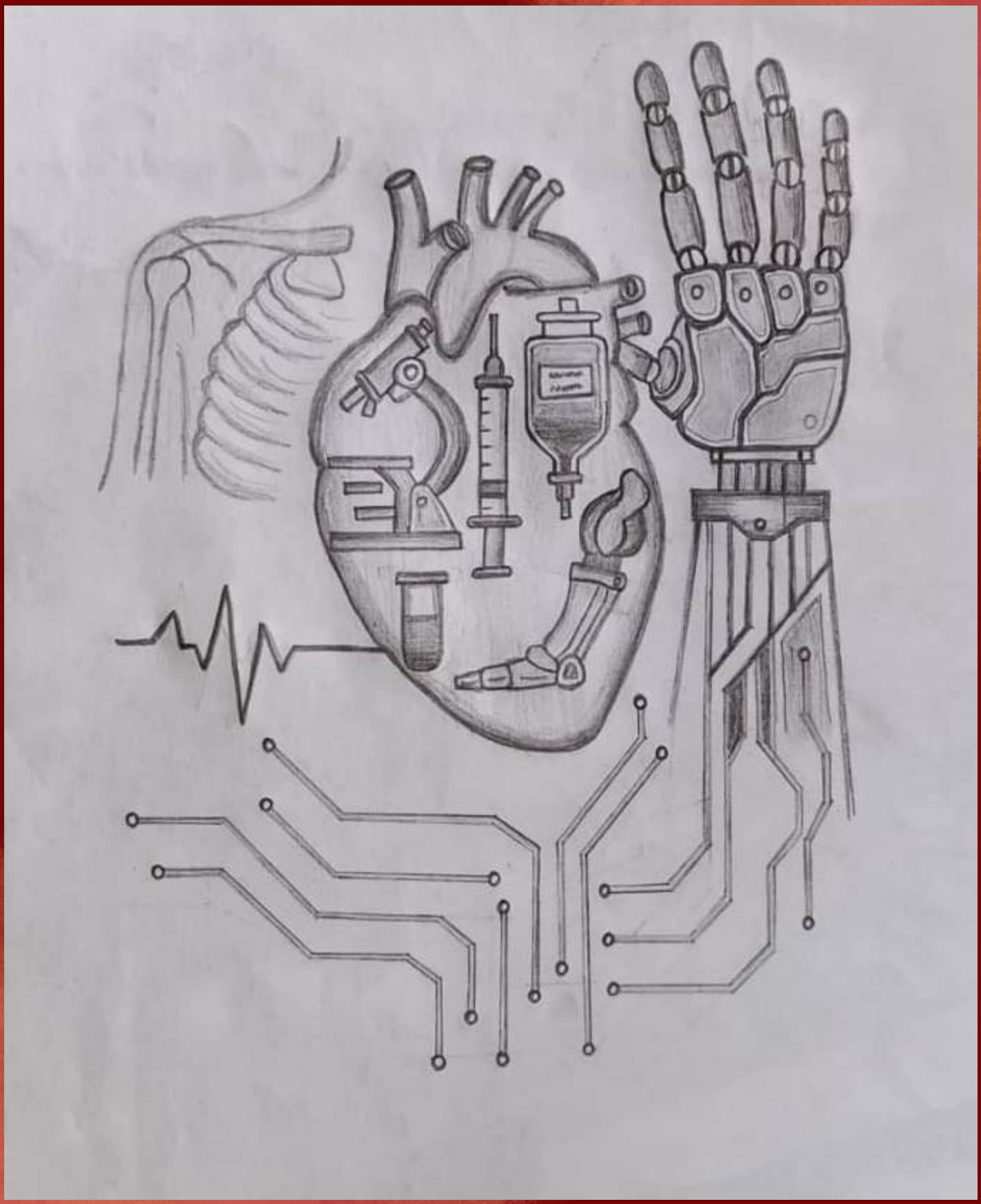
D.LIPNI SHERMA DAVID
IV-BE BIOMEDICAL



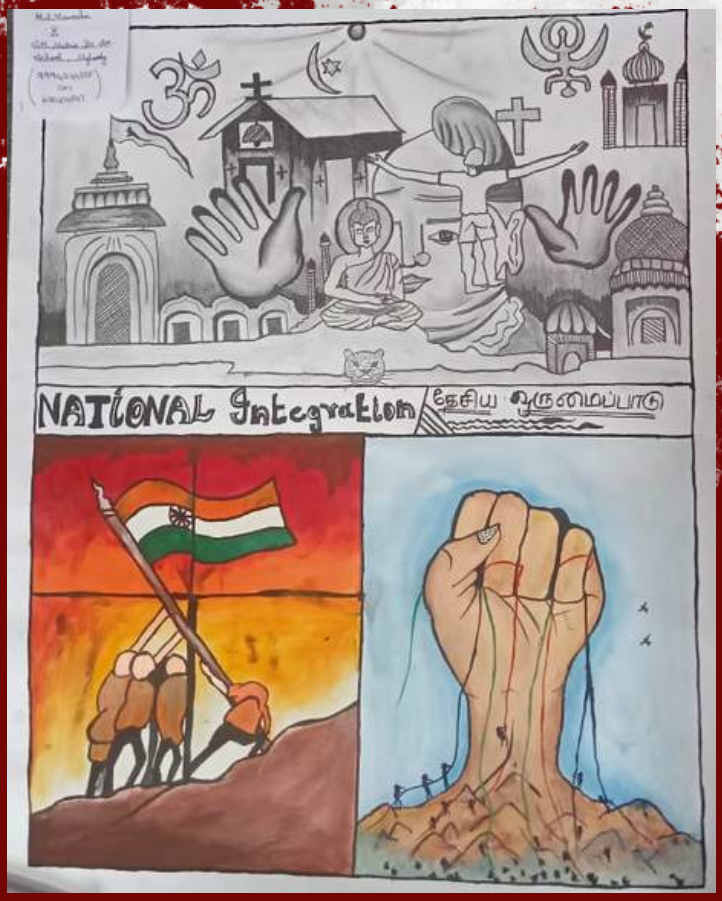
S. SHAMIL
III-BE BIOMEDICAL



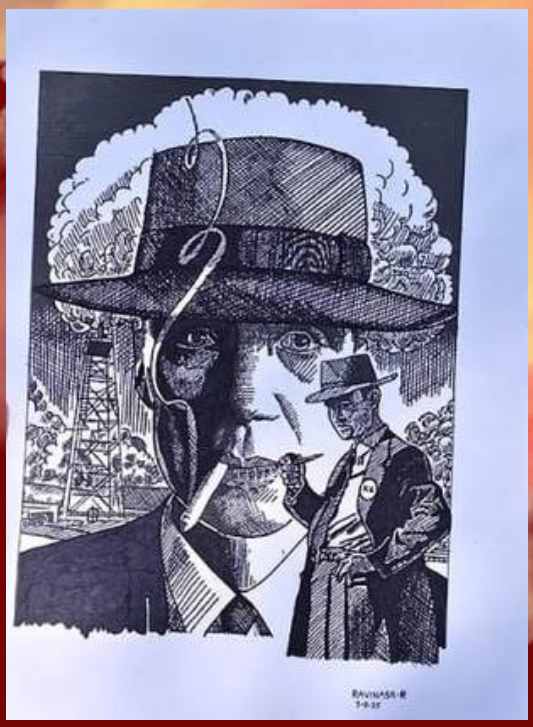
K. ARTHIKA
III-BE BIOMEDICAL



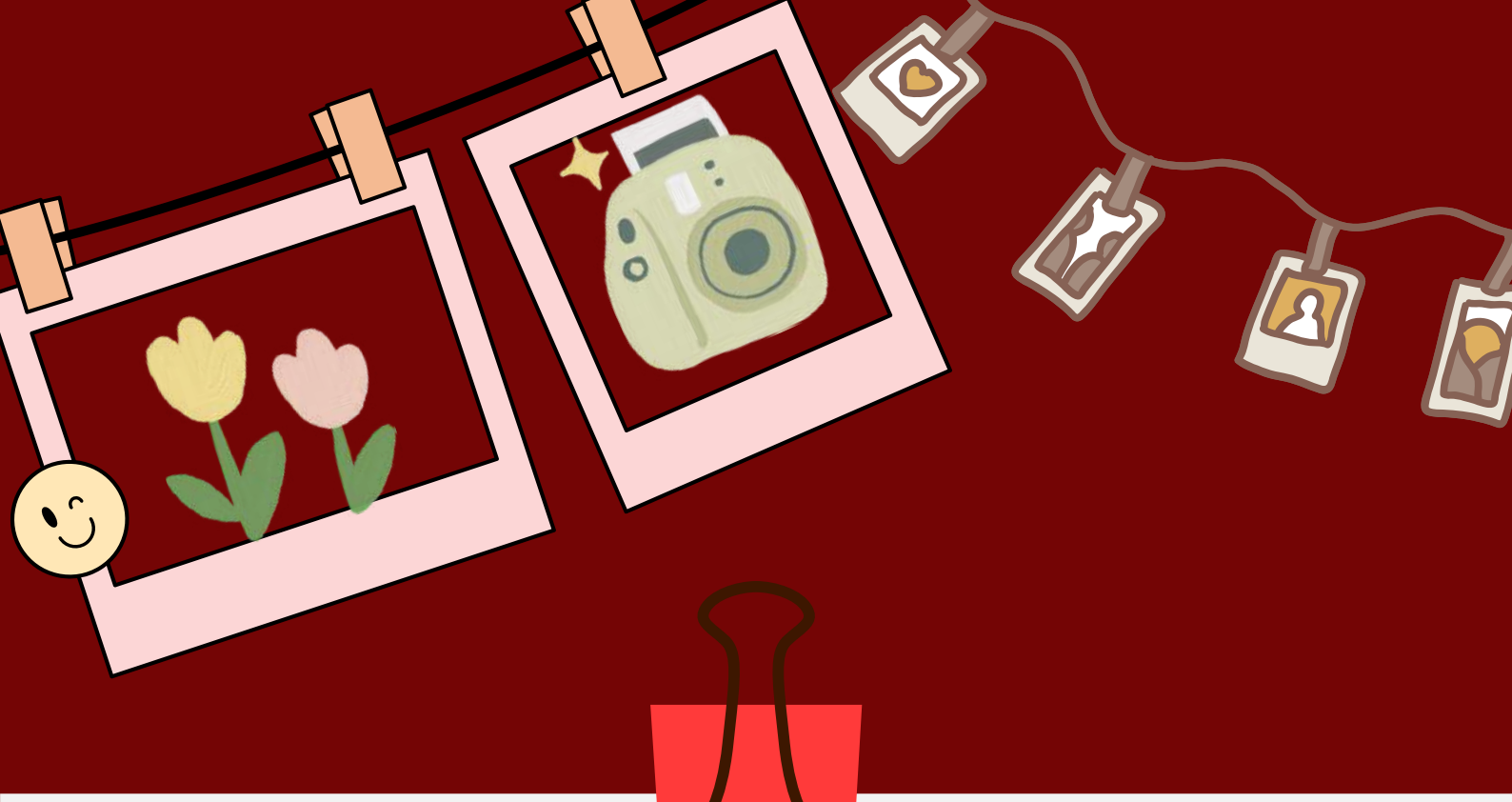
M.MUTHUJA
III-BE BIOMEDICAL



M.R. MANASA
II-BE BIOMEDICAL



RAVINASH R
II-BE BIOMEDICAL



STUDENT CLICKS

K.G. KAMALI
IV-BE BIOMEDICAL

KAVYA

IV-BE BIOMEDICAL

PRATHICKSHA
IV-BE BIOMEDICAL

M.N. VIVITHA
IV-BE BIOMEDICAL

J.JENUSHA
II-BE BIOMEDICAL

HEMALATHA
II-BE BIOMEDICAL

M ASIN BALA
II-BE BIOMEDICAL

RAVINASH R
II-BE BIOMEDICAL

J.JENIN
II-BE BIOMEDICAL

I. JOHN RENO
II-BE BIOMEDICAL

J.M. HELISHA
II-BE BIOMEDICAL

N. MATTIEW NITHIS
II-BE BIOMEDICAL

S.SAJITH
II-BE BIOMEDICAL

VEENUS
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Tykes Valley

Centre for Child Development & Rehabilitation

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Tykes Valley

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Reading &writing challenges,examfear, low confidence

OUR INNOVATIVE APPROACH

Use of AI, VR & AR technologies to support therapy and learning.

Projection, motion-sensing & interactive floor games to boost:

CONDITIONS WE SUPPORT

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ADHD

Down's Syndrome

Cerebral Palsy

Anxiety & Depression

"Tykes Valley - Where Innovation Meets Care"

Empoweringeverychild tolearn,grow& lead a brighter future

Why Choose Tykes Valley??

Early identification of problems

Tailored solutions using advanced technology

Focus on independence, confidence & learning

Support from trained professionals & therapists

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FACULTY AND STAFF

BIOMEDICAL ENGINEERING

Batch 2022-2026

Batch 2023-2027

Batch 2024-2028

ACHIEVEMENTS

- Final Year Student, Anushuya achieved academic excellence with a remarkable CGPA of 9.5, standing as a model of dedication and brilliance.
- Third Year Student, Varshika secured an impressive CGPA of 9.04, reflecting her consistent hard work and academic excellence.
- Second Year Students, Mugesh and Steli S. Phisey excelled with an outstanding CGPA of 9.4, demonstrating their commitment to learning and growth.
- Aadhira Suleim A.R (Final Year) captivated hearts with her expressive performance, winning 3rd prize in Mono Act.
- JaiHarish 4th year have won District 1rst prize in Tamilnadu minority department elocution competition
- Vivitha (4th Year) showcased grace and confidence, earning 1st prize in Fashion Show.
- Anisha Mol A and Lipni Sharma David (4th Year) turned creativity into impact, winning 1st prize in Artfrom Waste.
- Abeesh Raja D ,J.Suraj and Mathan Bharathi (4th Year) impressed the audience with quick wit and talent, securing 1st prize in Anthakshari.
- Jaiharish 4th year have secured state level top 5 in Tamilnadu minority department elocution competition recieving a cash prize of 20,000
- Akalya Lekshmi S and Nanadhana S (4th Year) danced their way to success with 3rd prize in Fusion Dance.
- Asna (3rd Year) displayed versatility and performance excellence, bagging 1st prize in Drama and Ad Competition.
- Arthika,Muthuja and Tamil Selvi (3rd Year) secured the 3rd Prize in Fusion Dance
- Ananthavalli S and Jothi Malar (4th Year) showcased their creative flair, winning 1st prize in Hairstyling.
- Shanie (3rd Year) impressed with innovation and taste, earning 2nd prize in Fireless Cooking.
- Sinderella (4th Year) brought imagination to life, winning **1st prize in Poster Painting

- Anushuya, Nandhini, and Priyadharsini demonstrated innovation by securing 1st prize in Bio Print.

- Priyadharsini, Anuishiya, Monica, Santhiya, Jansi, and Ananthavalli showcased social responsibility through active participation in Health Camp Challenge.

- Fionna Ananth and Eldin Rino impressed judges with their creativity, earning 2nd prize in Biomedical Pitch Innovation.

- Al Qayum N, Akshara S, Shanie J.K, and Saju V.S (3rd Year) excelled technically, winning 1st prize in Project Expo and Quiz Competition.

- Manasha M.R, Helisha J, Jenusha J, and Asin Bala M (2nd Year) showcased teamwork and innovation, securing 1st prize in Project Expo.

- Saju V.S (3rd Year) emerged as the 1 st price in Technical Quiz Competition.

- Aadhira Suleim A.R (4th Year) won 1st prize in Rohini Hackathon 2.0 under the Sustainable Development theme, earning a cash prize of ₹3,000 for her innovative project EcoMediBin: AI-Powered Smart Bins for Sustainable Healthcare.

- JaiHarish 4th year have won District 1rst prize in Kumari kalai kazhagam elocution competition

- Aadhira Suleim A.R (4th Year) made a mark in literature by publishing her inspiring book “Underrated but Highly Rated.”

- Fionna Ananth and P. Eldin Rino (4th Year) published a book chapter titled “YOGI-WELL: An AI-Enabled Wireless Wearable for Posture Correction, Yoga Guidance & Stress Monitoring” in the e-book “Sustainable Growth Through Wisdom” by Henxi Publication (ISBN: 978-81-987316-6-1, 2025).

- Aadhira Suleim A.R and Anlin Sahaya Infant Tinu M (4th Year) showcased research excellence by publishing their IEEE conference paper titled “Smart Wearable Sensor System for Real-Time Biomechanical Analysis with AI Integration” at the 2025 International Conference on Biomedical Engineering and Sustainable Healthcare (ICBMESH).

- Fionna Ananth and P. Eldin Rino (4th Year) won 2nd prize in Paper Presentation at Ponjesely College of Engineering and Technology on 22nd March 2025, highlighting their innovative research in biomedical technology.