



**IETE Sponsored  
2025 National Conference  
on  
Innovations in Science,  
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24 June 2025, (Tuesday)**



**PROCEEDINGS**

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**CSMSS Chh. Shahu College of Engineering  
Kanchanwadi, Paithan Road,  
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# INTRODUCTION & OBJECTIVE

## DATA, METHODS & RESEARCH

In 100 ml of ultra pure water, 0.2 gm of PVP (Polyvinyl pyrrolidone) was dissolved and agitated for 1 hour at 80°C. After that, the solution was gradually added to the homogenous solution of CuNPs generated from the leaf extract. After 1 hour, the mixture's light colour yellowish was converted to a light brown colour. The reaction mixture was allowed to cool for 10 minutes before being centrifuged at 10000 rpm for 15 minutes. The precipitates formed were washed with deionised water and dried in a 70°C oven for 24 hours.

| SR.NO. | Organism               | Zone of Inhibition (In mm) |               |        |           |                        |
|--------|------------------------|----------------------------|---------------|--------|-----------|------------------------|
|        |                        | CuSO4 Solution (1 mM)      | Plant extract | Cu NPs | PVP CuNPs | Streptomycin (1 mg/ml) |
| 1      | Escherichia coli       | 16                         | 16            | 21     | 22        | 18                     |
| 2      | Staphylococcus aureus  | 14                         | 15            | 15     | 18        | 19                     |
| 3      | Bacillus subtilis      | 14                         | 15            | 18     | 19        | 16                     |
| 4      | Pseudomonas Aeruginosa | 15                         | 18            | 17     | 22        | 23                     |

**Absorbance of control**

| Concentration (ug/ml) | CuNPs (%) | PVP CuNPs (%) | Ascorbic Acid (%) |
|-----------------------|-----------|---------------|-------------------|
| 10                    | 53        | 59            | 51                |
| 20                    | 40        | 42            | 40                |
| 30                    | 51        | 53            | 49                |
| 40                    | 55        | 57            | 51                |
| 50                    | 60        | 62            | 58                |
| 75                    | 51        | 55            | 50                |
| 100                   | 50        | 53            | 47                |

**% Scavenging activity**

**Concentration ug/ml**

Legend: CuNPs (blue), PVP CuNPs (red), Ascorbic Acid (green)

Copper nanoparticles were successfully synthesized using an extract of *ocimum sanctum* leaves using copper sulphate pentahydrates salt solution. The formed CuNPs were further functionalized with PVP to enhance its biocompatibility without any hazardous or toxic material further. The metal ions reduced very rapidly, the reduction of Cu ions was completed within 24 hours. They show particle size between 1-200 nm. The polymer capped CuNPs shown good antibacterial and antioxidant activity than copper nanoparticles.

## INTRODUCTION & OBJECTIVE

- The rapid expansion of the Internet of Things (IoT) has resulted in a significant generation of data from smart healthcare systems, cities, industries, and homes. While this data is essential for training machine learning (ML) models, centralized training approaches raise serious privacy concerns, undermining user trust and violating legal regulations such as the GDPR.
- Federated Learning (FL) presents a promising solution by enabling decentralized training across IoT devices. This method keeps sensitive data localized and shares only encrypted or abstracted updates to the model. However, challenges remain, including communication overhead, data heterogeneity, and vulnerability to attacks.
- This research consolidates recent advancements in privacy-preserving FL mechanisms tailored for IoT, spanning from 2020 to 2025. It focuses on encryption methods, communication strategies, and practical applications, laying the groundwork for secure and scalable deployment in real-world IoT ecosystems.

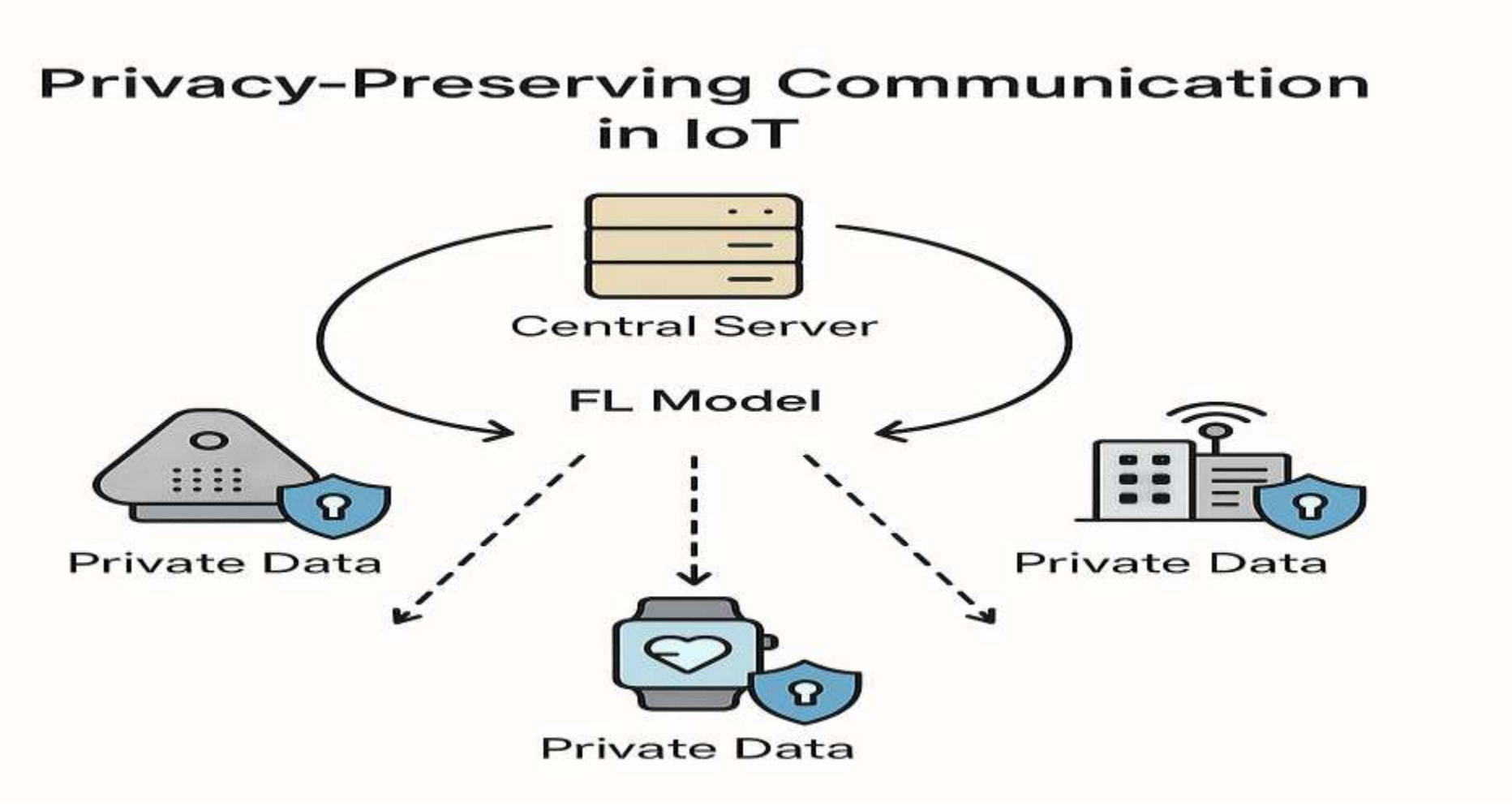


Fig. 1. Privacy-Preserving Communication Using Federated Learning in IoT

## DATA, METHODS & RESEARCH

- The rapid advancement of the Internet of Things (IoT) has led to a substantial increase in data generation from diverse sources, including smart healthcare systems, intelligent urban infrastructures, industrial operations, and connected homes. This abundant data is essential for optimizing and training sophisticated machine learning (ML) models. However, conventional centralized training methodologies introduce significant privacy concerns, thereby undermining user trust and potentially violating legal frameworks such as the General Data Protection Regulation (GDPR).
- In this context, Federated Learning (FL) offers an innovative solution by facilitating decentralized training across Internet of Things (IoT) devices. This approach ensures that sensitive data remains localized, transmitting only encrypted or abstracted updates to the models. Nevertheless, challenges persist, including communication overhead, data heterogeneity, and vulnerabilities to cybersecurity threats.
- This research aims to systematically review recent advancements (2020–2025) in privacy-preserving FL mechanisms specifically tailored for IoT applications. The focus will encompass state-of-the-art encryption strategies, effective communication protocols, and practical applications, thereby establishing a solid foundation for secure and scalable deployment within diverse IoT ecosystems.

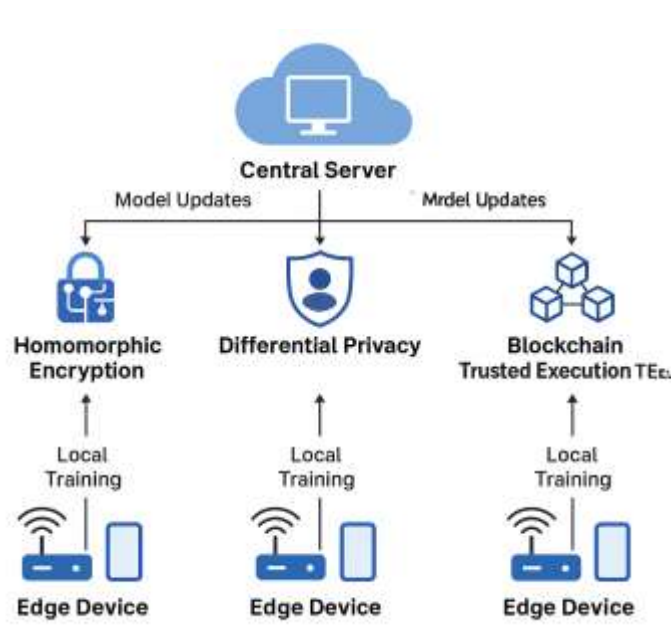


Fig. 2. Flowchart of the Implemented system

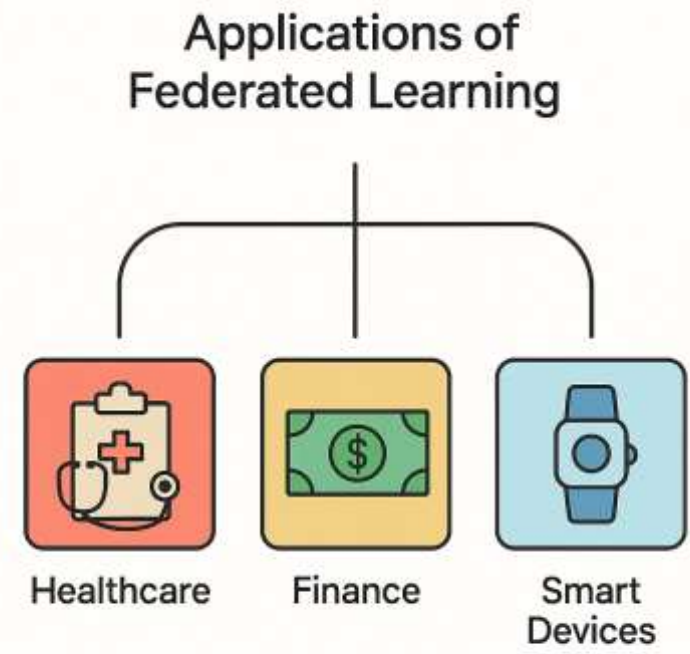


Fig. 3. Applications

## SURVEY

- This survey analyzed the findings are categorized them as follows: -
- These phrases introduce the results but could be streamlined. Instead, simply stating the analysis of 85 peer-reviewed studies (2020–2025) on Federated Learning (FL) in IoT, focused on privacy and communication efficiency, would cover both points succinctly.
  - Technique Strengths Challenges: - The heading format could be simplified to Technique, Strengths, Challenges. This doesn't detract from understanding but avoids unnecessary text and improves readability.
  - Strong privacy guarantees for Secure Multi-Party Computation: - This phrase is somewhat self-explanatory when stated in the context of a privacy-preserving technique; a more concise term like "High privacy level" could replace it without losing meaning.
  - Enabled predictive maintenance and usage modeling under IIOT & Smart Homes: - This could be simplified to just "Predictive maintenance and usage modeling." The word "Enabled" might imply active involvement that is not necessary to convey the concept.

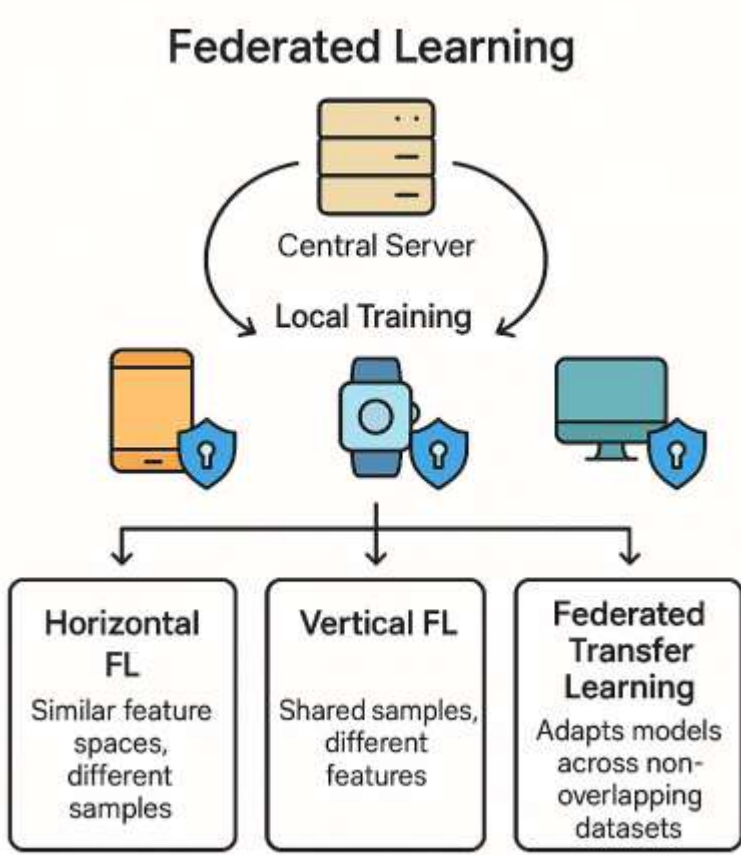


Fig. 3. FEDERAL LEARNING

## DISCUSSION

- Comprehensive Literature Coverage: Conducted an in-depth review of over 85 peer-reviewed studies indexed in Scopus, covering the period from 2020 to 2025, which investigate the intersection of Federated Learning (FL) and privacy concerns in the Internet of Things (IoT).
- Framework Identification: Highlighted innovative hybrid frameworks for privacy preservation, such as PCFL, which seamlessly integrates advanced encryption techniques with model compression strategies to protect sensitive data while maintaining computational efficiency.
- Application Mapping: Detailed various real-world IoT domains—including Healthcare, Smart Cities, and the Industrial Internet of Things (IIOT)—demonstrating how FL can significantly enhance both data privacy and model efficiency, thereby allowing for safer and more effective deployments of connected technologies.
- Gap Analysis: Identified significant research gaps, particularly in the development of lightweight cryptographic methods, adaptive compression techniques, and the alignment of regulatory frameworks, which are crucial for advancing privacy-preserving FL solutions.
- Guiding Future Research: Proposed pragmatic and actionable directions for future research, such as the establishment of standardized benchmarks for evaluating FL systems and the necessity for cross-domain integration to maximize the benefits of Federated Learning across various sectors.

## INTRODUCTION & OBJECTIVE

### Introduction:

Groundwater resources are stressed globally due to over-extraction and climate change, necessitating innovative recharge solutions. Sustainable agricultural practices, often overlooked, offer a powerful solution by enhancing ecosystem services. The Saguna Regenerative Technique (SRT), an Indian no-till method developed by Chandrashekhar Bhadsavle, is a promising approach. SRT, based on zero-tillage on permanent raised beds and continuous weeds and crop residue management, inherently contributes to groundwater replenishment through natural processes. Beyond agricultural benefits, SRT significantly enhances soil health and water retention, leading to improved infiltration and reduced runoff and evaporation . .

### Objectives:

- To explain how Saguna Regenerative Technique (SRT) aids groundwater replenishment.
- To show how SRT improves soil health and water retention through better structure, more organic matter, less runoff, and reduced evaporation.
- To highlight SRT's wider benefits, such as enhanced soil fertility, higher crop yields, and lower production costs.
- To demonstrate SRT's role in mitigating greenhouse gases, boosting biodiversity, and increasing climate resilience.
- To promote SRT adoption for both food security and sustainable groundwater management.

- **Start:** Represents the beginning of the SRT process.
- **Zero Tillage on Permanent Raised Beds:** This is the foundational step of SRT, where the soil is not tilled and crops are grown on permanent raised beds.
- **Residue Management:** Managing crop residues to improve soil health and conserve moisture.
- **Crop Rotation:** Implementing crop rotation to enhance soil fertility and break pest cycles.
- **Water Conservation:** SRT practices that help conserve water, such as reduced irrigation.
- **Groundwater Recharge:** The natural outcome of improved water infiltration and reduced runoff.
- **Sustainable Agriculture:** The overall goal and result of implementing SRT.
- **End:** Represents the conclusion of the SRT process and its continuous cycle.

Fig. 1. Flowchart representing the Saguna Regenerative Technique (SRT)

## DATA, METHODS & RESEARCH

Our research synthesizes existing knowledge on the Saguna Regenerative Technique (SRT) and its environmental impacts, particularly concerning groundwater. We draw upon the core principles of SRT, including minimal soil disturbance, permanent raised beds, and continuous soil cover. The paper analyzes how these practices enhance soil health, leading to improved water absorption and retention. We examine the mechanisms of enhanced soil structure and infiltration, increased soil organic matter, reduced runoff and erosion, promoted biological activity, and reduced evaporation as key contributors to groundwater recharge. The data presented are primarily conceptual and based on the established benefits of conservation agriculture principles, as applied by SRT, with a focus on its indirect yet profound impact on groundwater replenishment without additional cost..



Fig2: Step by Step Method SRT

## RESULTS & DISCUSSION

### Results and Discussion:

The Saguna Regenerative Technique (SRT) consistently enhances groundwater replenishment through several mechanisms. SRT's no-till approach and continuous soil cover improve soil structure, creating channels that boost water absorption and deep percolation, while increased organic matter enhances water retention. The technique reduces surface runoff and erosion through permanent raised beds and crop residue, allowing more water to infiltrate. Furthermore, SRT fosters biological activity, with earthworms creating macro-pores that facilitate deeper water penetration. Continuous soil cover also acts as mulch, significantly reducing evaporative water loss and conserving soil moisture for groundwater recharge. This replenishment is an indirect, no-cost benefit of SRT, which also offers broader advantages like improved soil fertility, higher crop yields, lower production costs, and greenhouse gas mitigation, making it a holistic sustainable agricultural approach.



Fig. 3.Roots of Maize plants



Fig. 4. Roots of Plants



## Achievements

### Achievements:

The Saguna Regenerative Technique (SRT) significantly enhances groundwater replenishment by improving soil hydrological functions, boosting water infiltration, and reducing runoff and evaporation. This technique, a no-cost benefit of agricultural practice, also substantially improves soil health, increasing its water retention capacity through enhanced soil structure, organic matter accumulation, and biological activity. SRT further leads to reduced irrigation needs, lessening pressure on groundwater extraction. Beyond water management, SRT offers broad benefits including improved soil fertility, increased crop productivity, significantly lower cultivation costs, greenhouse gas mitigation, enhanced biodiversity, and greater climate resilience.



Fig. 5. Dead Roots of successive plants Helps Ground water Recharge

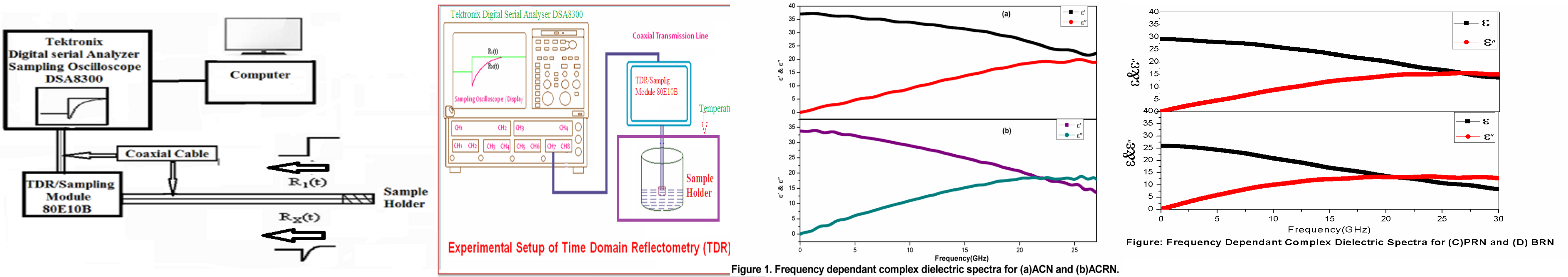
# Advanced Digitizing Tool for Dielectric Pico-Second Relaxation Study

2025 National Conference on Innovations in Science,  
Engineering & Technology

Dept. of First Year Engineering

## INTRODUCTION & OBJECTIVE

- ❖ There is great interest to study the dielectric relaxation behaviour in polar system to understand the molecular structure and dynamics of polar liquid with modification of molecular structure due to the presence of polar or non-polar molecules.
- ❖ Nitriles are polar organic liquids with a large dipole moment. Due to large dipole moment the intermolecular interactions are strong and can cause association of the molecules.
- ❖ The main objective of study to understand non hydrogen bonded aprotic solvent in non-polar solute (like dioxane) which provides information about breaking of molecular multimer structures in the systems.



## DATA, METHODS & RESEARCH

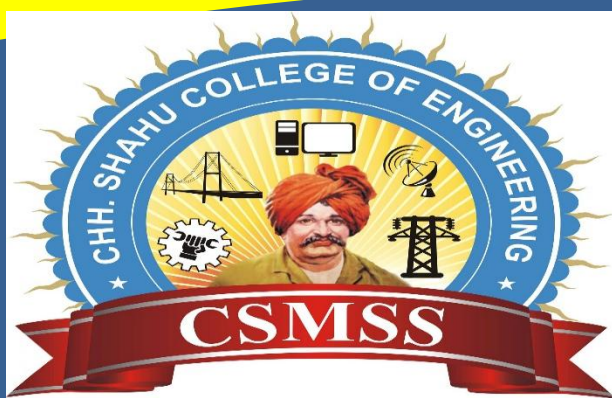
- ❖ The dielectric spectra were obtained by the TDR technique. The Tektronix Digital Serial Analyzer model No. DSA8200 sampling mainframe along with the sampling module 80E has been used for the time domain Reflectometry (TDR).
- ❖ A repetitive fast rising voltage pulse with 20ps incident rise time was fed through coaxial line system having 50 Ohm impedance. Sampling oscilloscope monitors change in step pulse after reflection from the end of line. The reflected pulse without sample  $R_1(t)$  and with sample  $R_x(t)$  were recorded in time window of 5 ns and digitized in 2000 points.
- ❖ The Fourier transformation of the pulse and data analysis were done earlier to determine complex permittivity spectra  $\epsilon^*(\omega)$  using non linear least square fit method.
- ❖ Frequency dependent complex permittivity spectra for ACN, ACRN, PRN and BRN at 25°C temperature, is shown in fig
- ❖ To obtain the values of static dielectric constant  $\epsilon_0$  and relaxation time  $\tau$ , the frequency dependent complex permittivity data were fitted in Havriliak-Negami equation using least square fit method

$$\epsilon^*(\omega) = \epsilon_{\infty} + \frac{(\epsilon_0 - \epsilon_{\infty})}{[1 + (j\omega\tau)^{(1-\alpha)}]^{\beta}}$$

where  $\epsilon_0$  is the static permittivity,  $\epsilon_{\infty}$  is the permittivity at high frequency,  $\tau$  is the relaxation time and  $\alpha, \beta$  are the empirical parameters for the distribution of relaxation times with values between 0 and 1.

## RESULTS & DISCUSSION

- ❖ The complex permittivity spectra for Nitrile Dioxane binary mixture in the frequency range 10MHz to 50GHz.
- ❖ This spectrum shows the systematic variation of dielectric permittivity  $\epsilon'$  and dielectric loss  $\epsilon''$ . As frequency increases, dielectric permittivity decreases.
- ❖ In dielectric loss spectrum the loss peak for ACN is at higher frequency than that of BRN.
- ❖ The value of dielectric permittivity decreases from ACN to BRN as the no. of carbon atoms increases.
- ❖ Also, the values of relaxation time increases as the no. of carbon atom increases from ACN to BRN
- ❖ An advanced picosecond digitizing tool for the measurement of Dielectric properties of liquids has been established school of physical sciences SRTMU Nanded and gives good results for Polar and Non-Polar Liquids.
- ❖ The complex permittivity spectra of ACN, ACRN, PRN and BRN with dioxane have been studied at 25°C, using TDR technique in the frequency range of 10 MHz to 50 GHz. The dielectric relaxation for the mixture can be explained by using Debye model.





## INTRODUCTION & OBJECTIVE

• INTRODUCTION

This study presents a demonstration of erosion resistance in toner-stabilized soil slopes. The objective is to evaluate how waste toner, a byproduct of printing industries, can enhance soil stability and reduce erosion on slopes. By integrating toner into the soil, the mixture’s cohesion and water resistance improve, offering a sustainable and cost-effective method for slope protection. Laboratory tests and field observations confirm the potential of toner as an environmentally friendly soil stabilizer.

• OBJECTIVES

- To evaluate the effectiveness of waste printer toner ink as a soil stabilizer for reducing erosion on sloped surfaces through a physical model.
- To compare erosion behavior between untreated and toner-stabilized soil slopes under simulated rainfall conditions.
- To promote sustainable and low-cost alternatives to conventional stabilizers by utilizing industrial waste materials like toner ink.
- To raise awareness about circular economy practices in geotechnical engineering, combining waste management with improved soil performance.

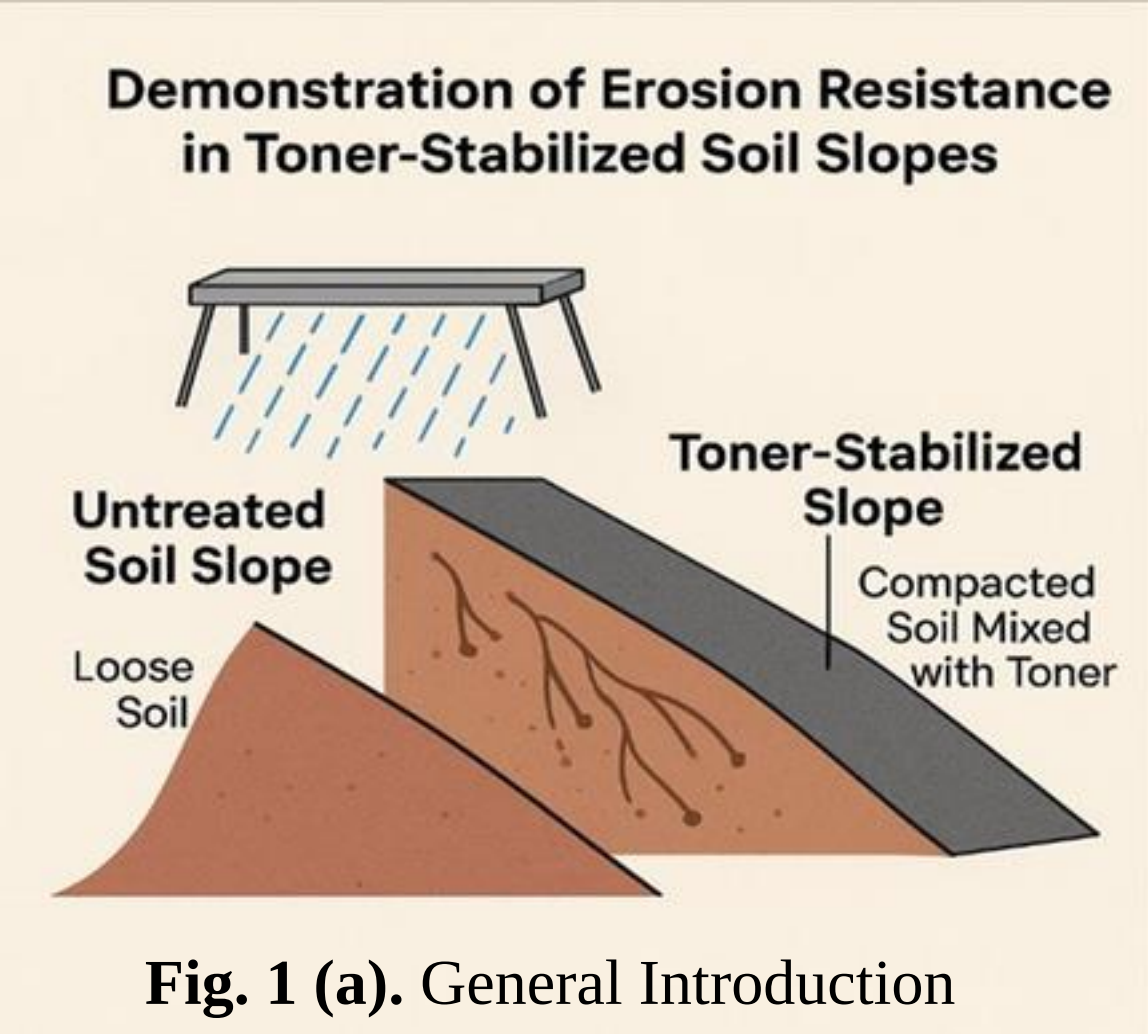


Fig. 1 (a). General Introduction

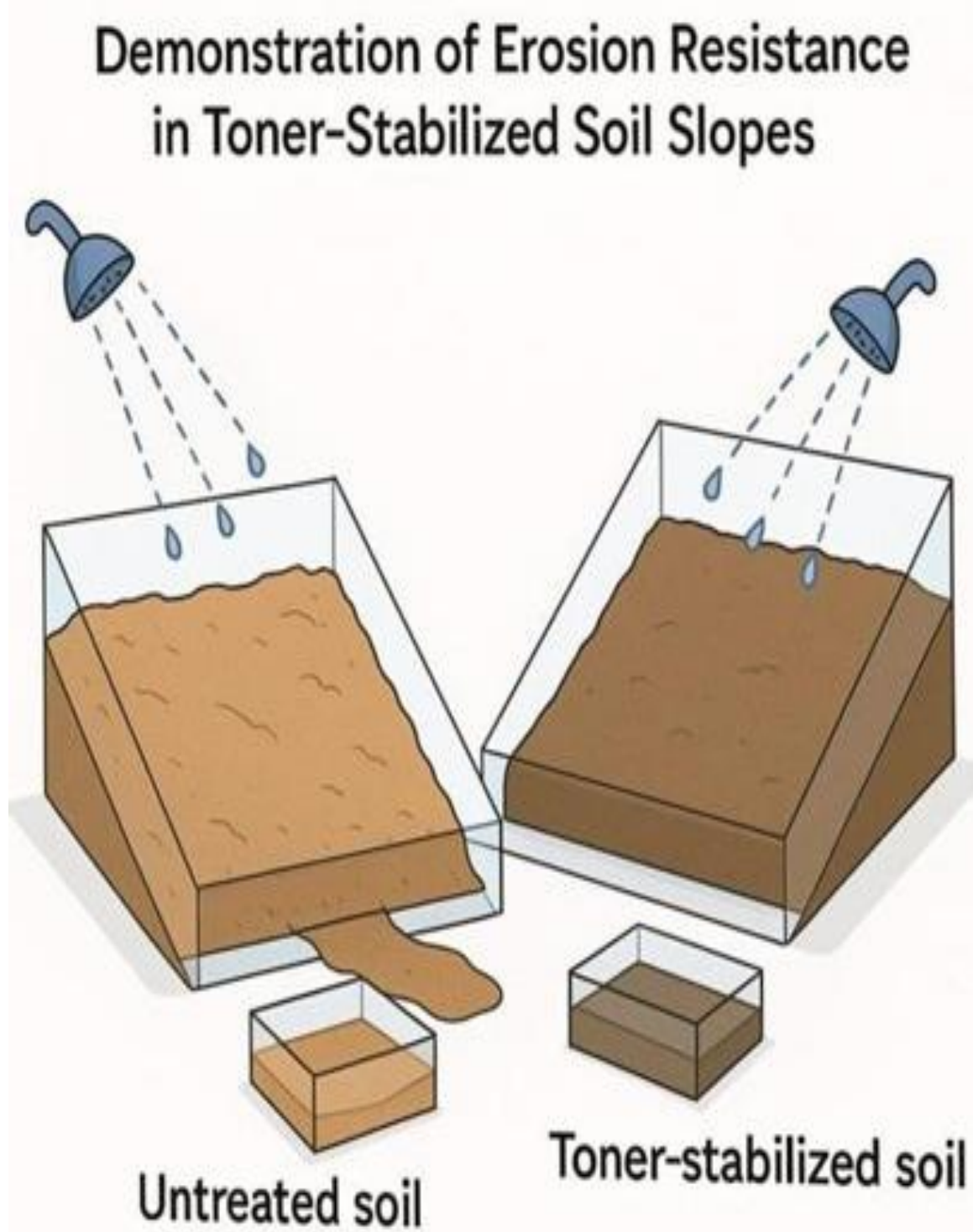


Fig. 1 (b). Setup Prototype

## DATA, METHODS & RESEARCH

• DATA:

| Parameter           | Details                                                                        |
|---------------------|--------------------------------------------------------------------------------|
| Soil Type           | Locally available clayey/silty soil                                            |
| Toner Content       | 0%, 0.5%, 1%, 1.5%, 2%, 2.5%, 3% (by weight)                                   |
| Water Applied       | Approximately 500 ml per slope using a shower sprayer                          |
| Slope Angle         | 30° (same for both untreated and stabilized models)                            |
| Runoff Observations | - Sediment loss (visual estimation) - Water turbidity (clear vs. muddy runoff) |

• METHODOLOGY:



Fig. 2. Flowchart of the Implemented system

• RESEARCH:

| Aspect               | Details                                                                                                 |
|----------------------|---------------------------------------------------------------------------------------------------------|
| Research Focus       | Use of waste printer toner ink to improve erosion resistance in soil slopes                             |
| Innovation           | First-time application of toner ink as a stabilizer in erosion control                                  |
| Scientific Basis     | Toner contains carbon black, polymers, and metal oxides that enhance soil strength and cohesion         |
| Sustainability Angle | Promotes reuse of industrial waste and reduces reliance on cement/lime                                  |
| Goal                 | Demonstrate the environmental and geotechnical benefits of toner-stabilized soil using a physical model |

## RESULTS & DISCUSSION

| Toner Content (%)   | (UCS, kPa) | (CBR, %) | Observed Erosion (Qualitative)         |
|---------------------|------------|----------|----------------------------------------|
| 0% (Untreated Soil) | 58         | 3.2      | Heavy surface erosion, muddy runoff    |
| 0.5%                | 64         | 4.1      | Moderate erosion                       |
| 1.0%                | 72         | 5.6      | Slight erosion                         |
| 1.5%                | 81         | 6.8      | Very minimal erosion                   |
| 2.0%                | 85         | 7.5      | Slope remains stable, clear runoff     |
| 2.5%                | 80         | 6.9      | Stable, but signs of brittleness begin |
| 3.0%                | 73         | 6.2      | Slight surface cracking observed       |

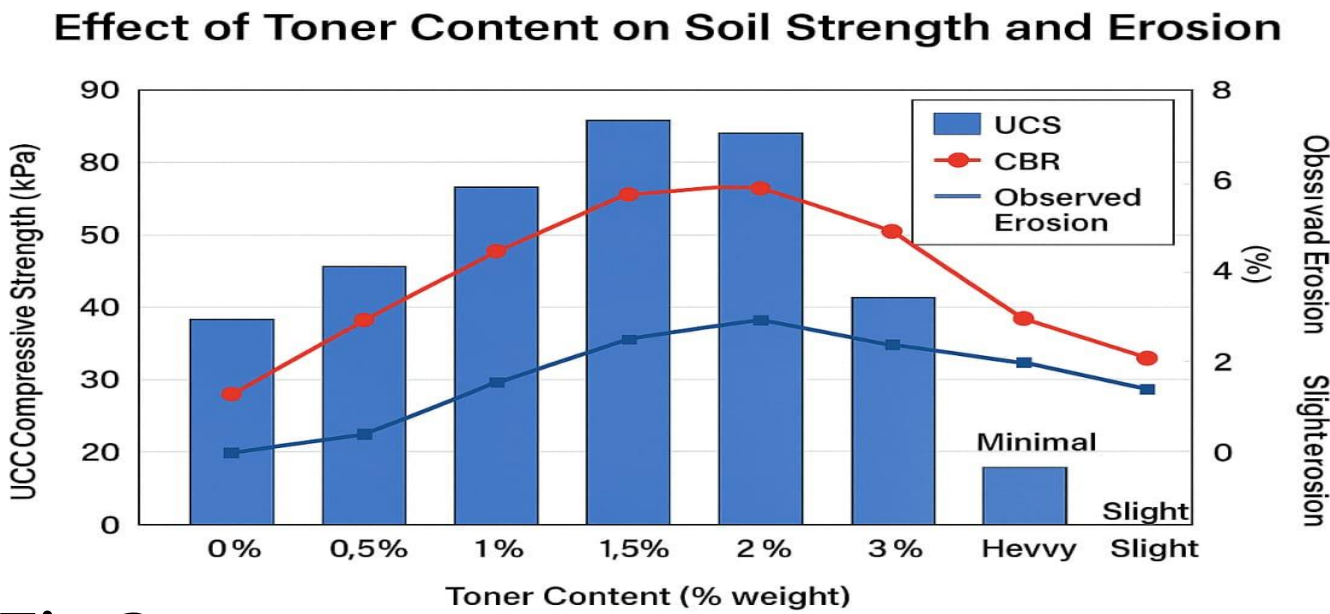


Fig. 3. Effect of Toner content on soil strength and erosion

• DISCUSSION:

Toner ink-enhanced soil showed significant improvement in erosion resistance due to better particle bonding provided by carbon black and polymers. The stabilized slope retained its shape, suggesting improved cohesion and compaction, even under simulated rainfall. Reduced sediment in runoff indicates toner ink’s ability to bind soil particles and prevent detachment. While the untreated soil slope failed to hold structure under water impact, the toner-treated slope remained intact, proving its field potential in slope and embankment applications. The study confirms the dual benefit of waste toner ink: soil stabilization and environmental waste utilization.

## Achievements

- Research Excellence Recognized Internationally
- Our project has been officially selected for publication by CRC Press – Taylor & Francis, a globally renowned academic publisher.
- Global Exposure at Premier Conference
- Presented our innovative work at the International Conference on Advances in Engineering, Science, Research, and Technology Applications (ICAESRTA 2025) hosted at KBP College, Satara.
- Top Tech Talent Showcase – INNOHACK 2025
- Actively participated in the prestigious INNOHACK competition organized by the Department of Artificial Intelligence and Data Science, CSMSS CSCOE – showcasing innovation in sustainable engineering.
- Cross-Departmental Innovation – IGNITE 2025
- Engaged in IGNITE 2025, a dynamic idea exhibition hosted jointly by the Engineering Exploration and VLSI & DT Departments, CSMSS CSCOE – demonstrating interdisciplinary collaboration and creativity.

# Comparative Study of Radiation Shielding Parameters for NiCuFe2O4 and NiMgFe2O4 Nanoparticles

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Dept. of Physics\_

## INTRODUCTION & OBJECTIVE

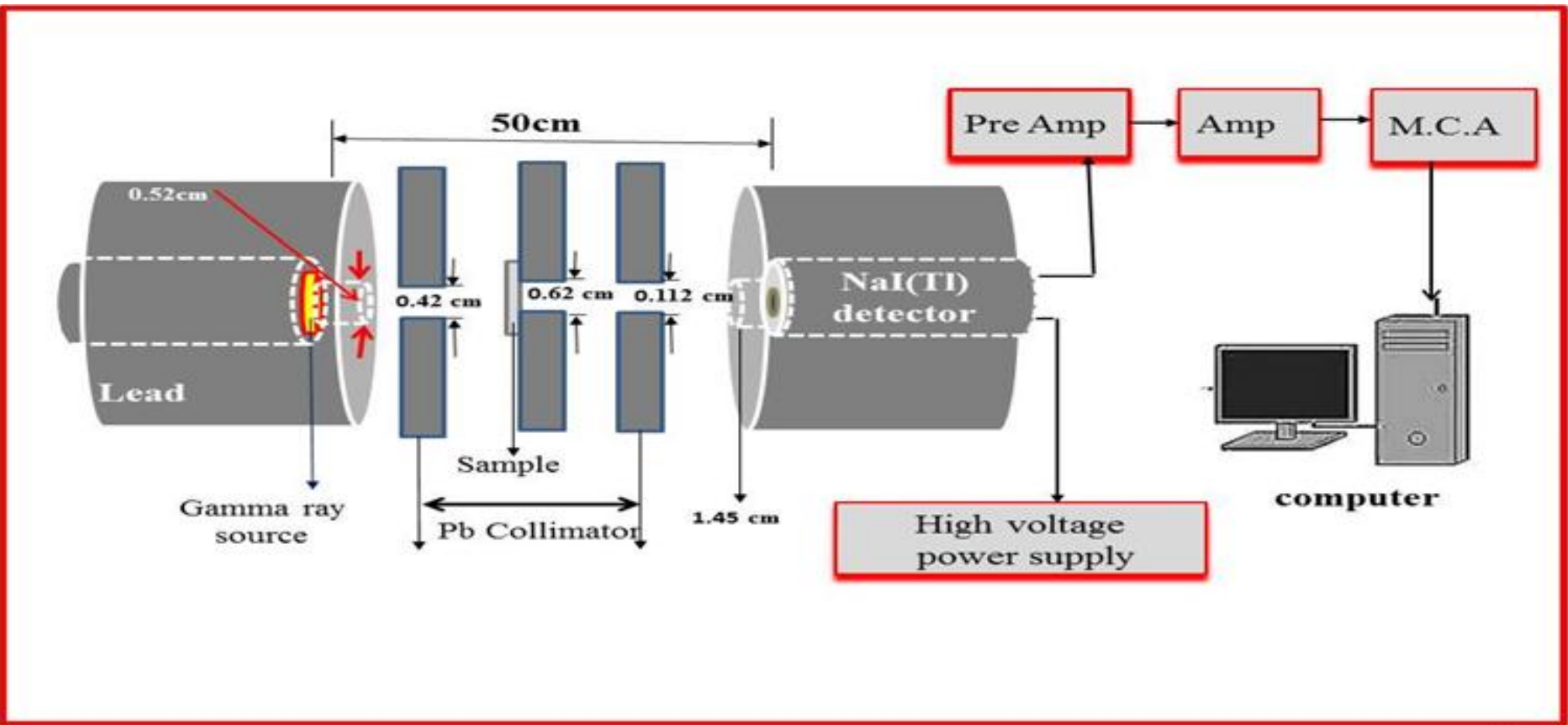
**Introduction:** Radiation physics and dosimetry have recently become quite prominent in physics due to their widespread application in various scientific research. In the field of nuclear medicine, different shielding materials are constantly in demand to protect human beings from gamma radiation. Nanotechnology is a rapidly growing scientific field with applications in a wide range of fields, including electronics. One of the most demanding tasks during the last century was to deal with electromagnetic interference pollution.

The goal of this research is to create single-phase nanocrystalline spinel ferrite materials using the environmentally friendly sol-gel technology and then test their performance when exposed to gamma radiation to determine their functioning in a radiation environment. The experimental approach was utilized to assess the radiation attenuation properties of spinel ferrites. Various types of spinel ferrites, such as NiCuFe2O4 and NiMgFe2O4, were subjected to ionizing gamma radiation with varied dose intensity. The effect of direct ionizing radiation on the shielding properties of spinel ferrite materials was investigated using Phy-X/PSD Software. The collected radiological data can be extremely beneficial in understanding the gamma ray shielding properties of spinel ferrite electronic materials.

## DATA, METHODS & RESEARCH

**Method:** The synthesized nanocrystalline spinel ferrites in pellet form were irradiated with gamma rays generated by the radioactive sources, 57Co, 133Ba, 22Na, 137Cs, and 60Co, via the narrow beam geometry setup NaI (Tl) scintillation detector. All these radioactive sources acquired from Bhabha Atomic Research Centre (BARC), Mumbai, India producing different energies viz. 57Co (122 keV), 133Ba (356 keV), 22Na (511 and 1275 keV), 137Cs (662 keV), 54Mn (835 keV) and 60Co (1173 and 1332 keV) were collimated.

Fig.1: The experimental setup

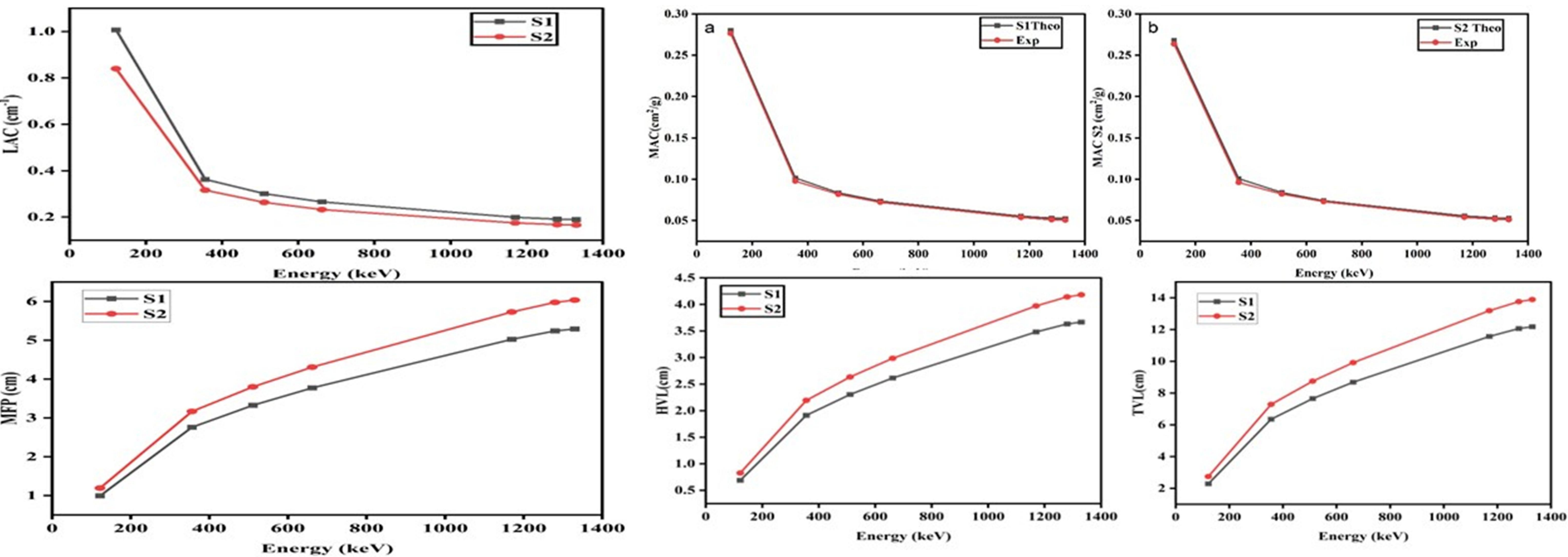


The linear radiation attenuation coefficient is given by the

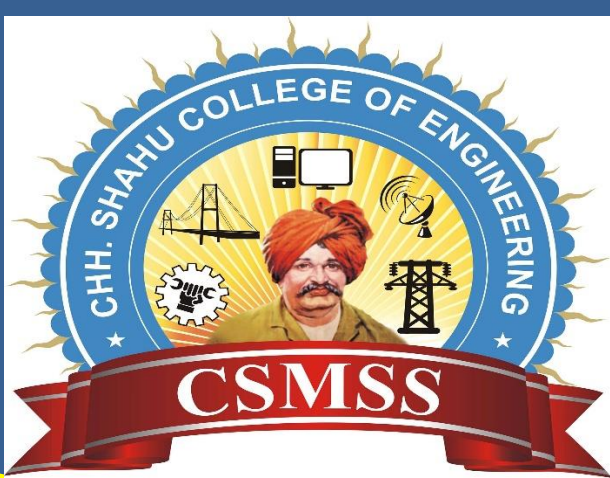
$$I= I_0 e^{-\mu t}$$

$$MFP = 1/\mu \quad HVL = \ln 2/(\mu) \quad TVL = (\ln(10))/\mu$$

## RESULTS & DISCUSSION



**Conclusions:** The mass attenuation coefficient of the ferrites was calculated at various incident photon energies ranging from 122-1330 keV. The mass attenuation coefficient, linear attenuation coefficient, half value layer, tenth value layer, and mean free path determined with Phy-X/PSD software and an experimental approach were all in good agreement. NiCuFe2O4 outperformed NiMgFe2O4 in terms of shielding properties. This experimental and theoretical study proposes a novel approach to spinel ferrite nanoparticles at various penetration depths and energy atmospheres. This provides important information about the physicochemical properties of spinel ferrites and their shielding properties when exposed to gamma radiation, which can be applied in the biomedical field, radiation protection for shielding purposes, and the performance of electronic appliances in radiation environments



Dept. of ELECTRICAL ENGINEERING

INTRODUCTION & OBJECTIVE

INTRODUCTION:

A Large amount of energy is wasted by the vehicles on the speed breakers through friction, every time it passes over it, Energy can be produced by using the vehicle weight and speed. So here we propose a smart speed breaker that generates power.

OBJECTIVE:

- To made a generate electricity system by speed breaker for using wasted energy.
- Low cost evaporating system.

PELTIER EFFECT:

- The reciprocating motion of the speed breaker is connected into rotary motion using the rack and pinion arrangement.
- When we design a smart speed breaker that can pass vehicles coming from both sides and yet generate energy from it.

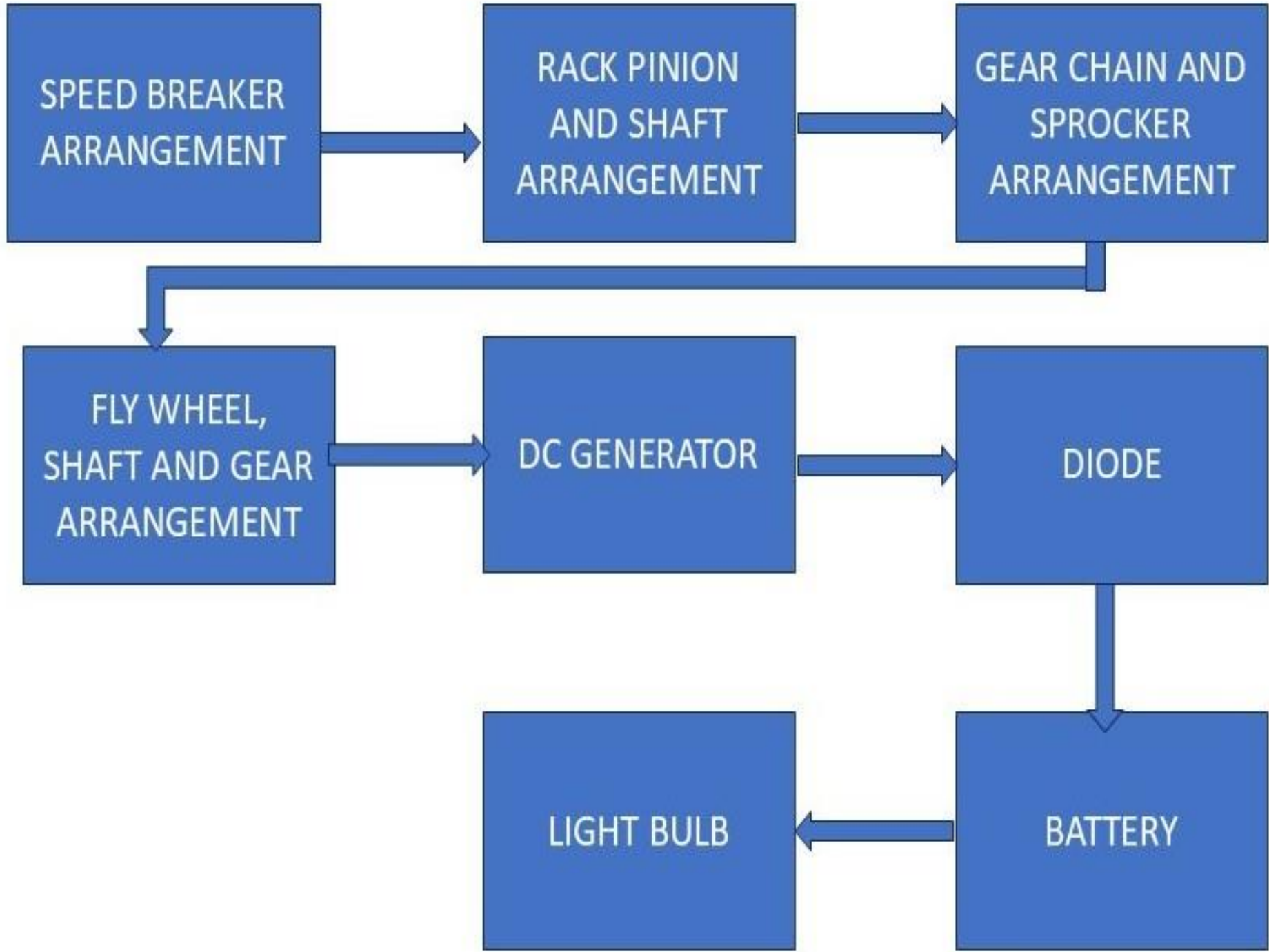


Fig. 1. General Flowchart

DATA, METHODS & RESEARCH

WORKING PROCESS

- Here the reciprocating motion of the speed breaker is converted into rotary motion using the rack and pinion arrangement.
- Rack and pinion gears normally change rotary motion into linear Motion but sometimes we use them to change linear motion into rotary motion.
- The axis of the pinion is coupled with sprocket arrangement.
- The axis of the smaller sprocket is coupled to a gear arrangement.
- Finally the gear arrangement is coupled with the generator.

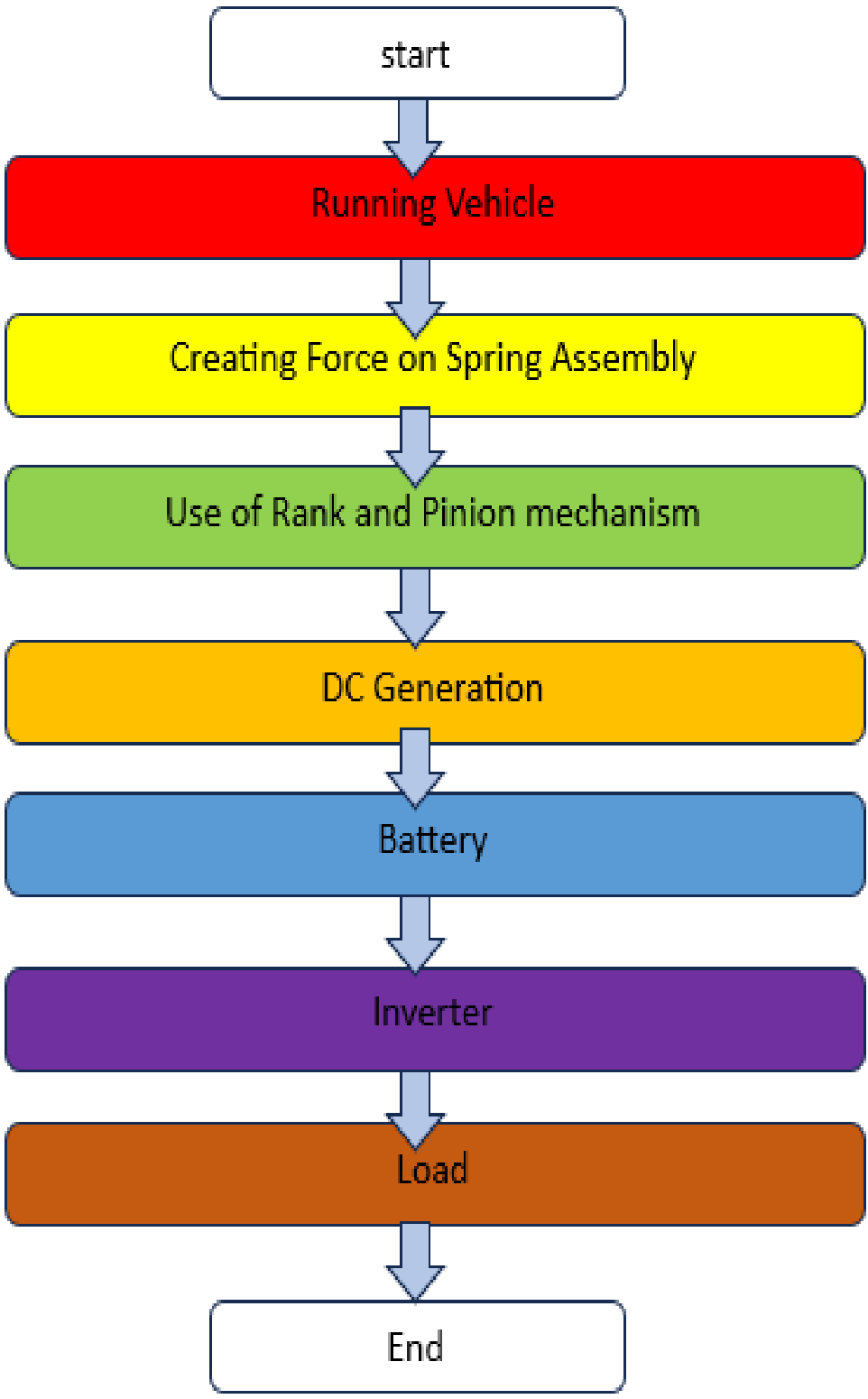


Fig. 2. Flowchart of the Implemented system

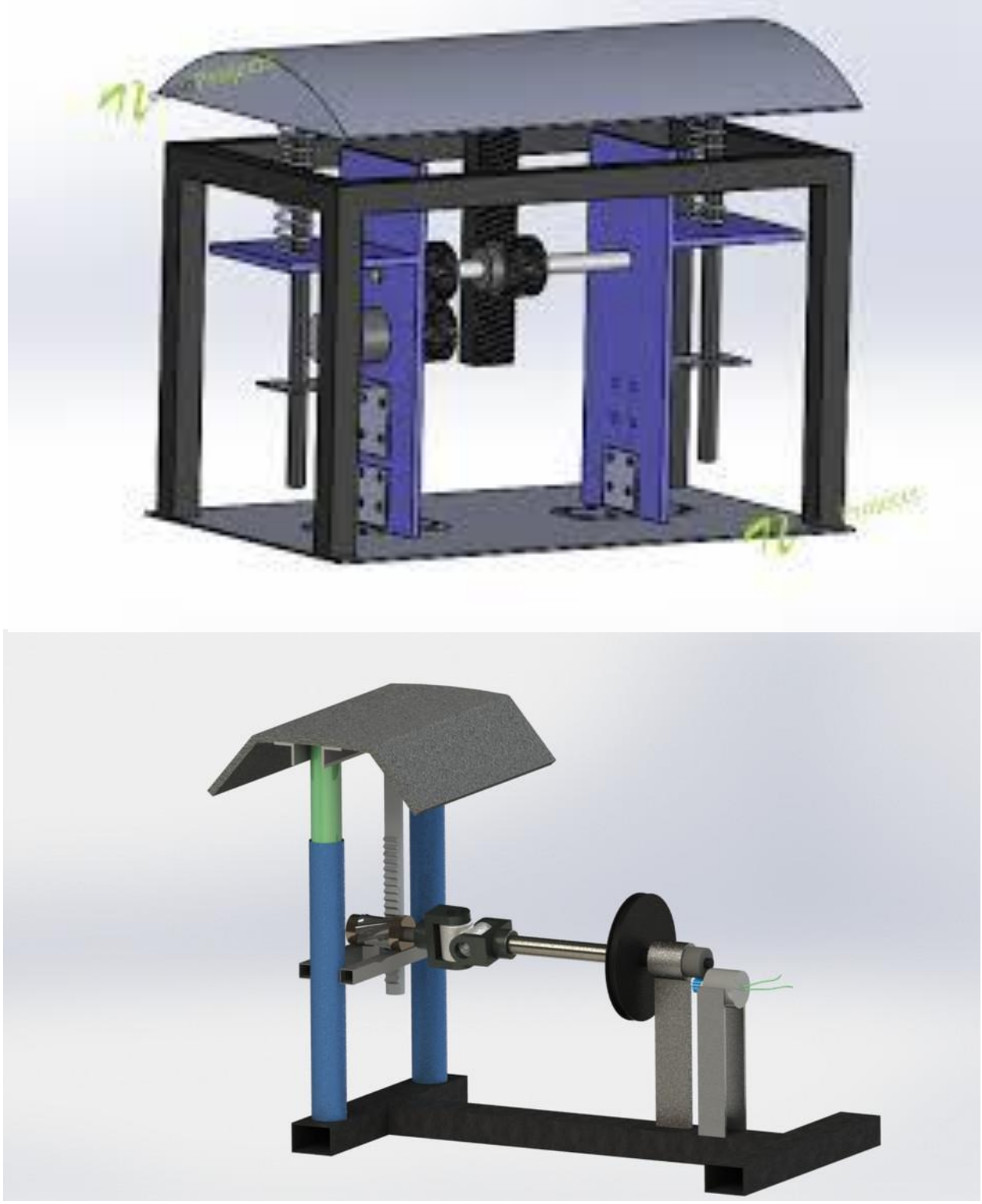


Fig. 3. Project Photo

RESULTS & DISCUSSION

CONCLUSION

- After studying, it can be concluded to use wasted energy and generate electricity.
- By doing proper arrangement we may generate high power electricity from road traffic.

DISCUSSION

- This method provides an efficient way to generate electricity from the kinetic energy of moving vehicles in roads, highways, parking lots etc.
- Advanced WPT: Enhance wireless charging efficiency (>90%) and range (up to 30 cm) for broader EV adoption.

Achievements



- Participated in IGNITE - 2025 DESIGN INNOVATE COMPETITION.
- Participated in AVISHAKAR EVENT in 2023-24

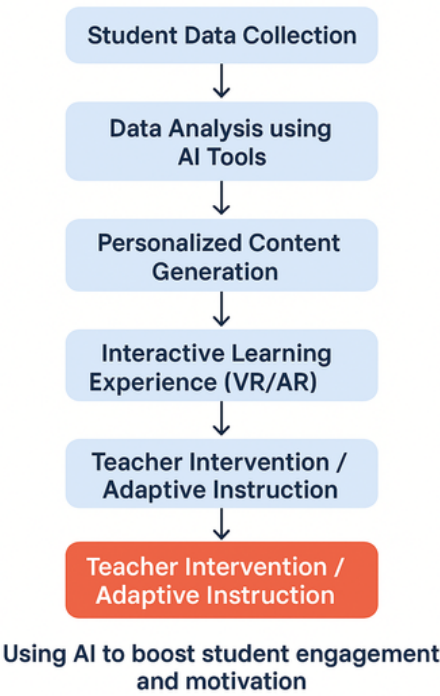
# “Boosting Student Motivation through AI in Education”

Author Name : S.Kirti Shobhita (student) & Dr. Kavitha Thakur(Guide), Asst professor from St Mary’s College.



Dept. of Commerce

## INTRODUCTION & OBJECTIVE



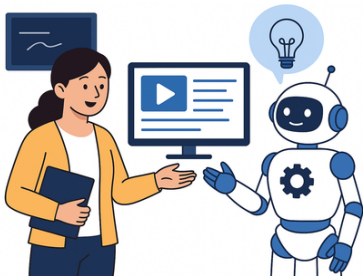
Flowchart

- Artificial Intelligence (AI) is transforming the education sector by enhancing learning experiences, personalizing instruction, and improving student outcomes.
- This study aims to explore how AI-based tools impact student engagement and motivation by offering interactive, personalized, and data-driven educational solutions.

## DATA, METHODS & RESEARCH

The foundation of AI in education relies on collecting diverse types of data such as:

- Student performance metrics
- Engagement logs from AI-based platforms
- Behavioral and interaction data (clicks, time spent, etc.)
- Application of machine learning algorithms to analyze student engagement patterns.
- Implementation of natural language processing (NLP) to enhance accessibility and feedback mechanisms.
- AI tools were evaluated for their ability to deliver personalized learning, improve content delivery, and automate administrative tasks.



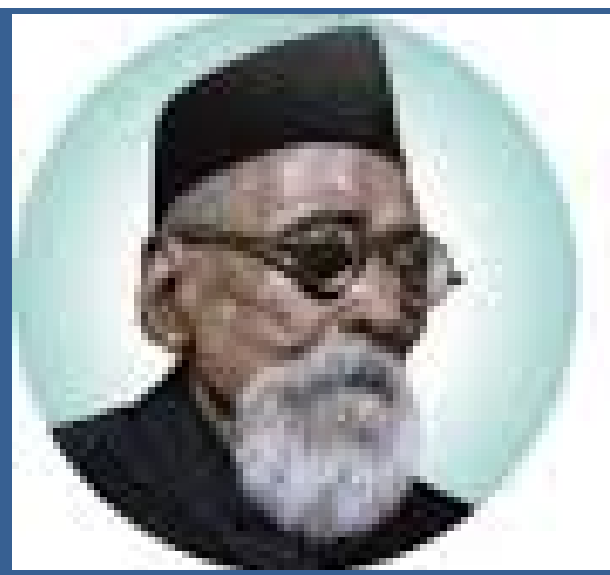
## RESULTS & DISCUSSION

- Increased engagement with interactive tools (e.g., VR history lessons, AR science simulations).
- Personalized pacing and content boosted motivation in students who struggled with traditional methods.
- Challenges identified:
  1. Data privacy concerns
  2. Dependence on technology
  3. Cost and resource limitations



## Achievements

- Enhanced personalization led to improved student motivation.
- Teachers saved time through automation of administrative and grading tasks.
- Developed a framework for ethical and responsible AI integration in classrooms.
- Contributed to scalable, equitable access to quality education through technology.



## LOCKING AWAY CARBON : NATURE'S SILENT GUARDIAN

### INTRODUCTION

Due to the fast pace of industrialisation and globalisation, number of industries and vehicles in cities is getting increased.



It ultimately results in causing air pollution and various health issues (Asthma, cancer and respiratory diseases)



### GOAL/SOLUTION



SIMPLE

+

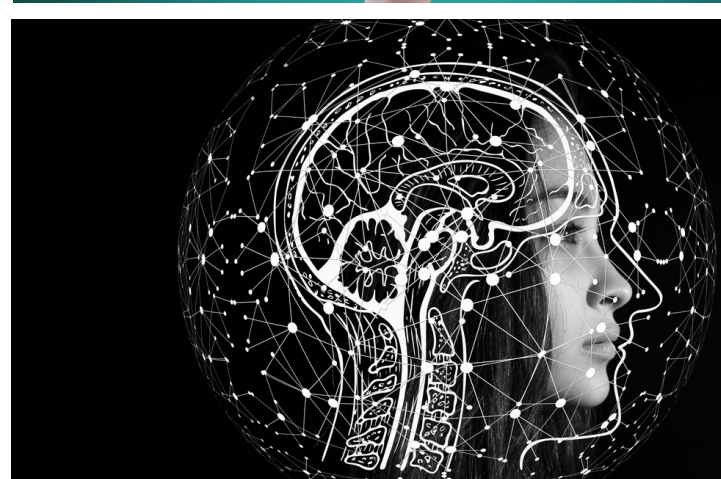
EFFECTIVE

+

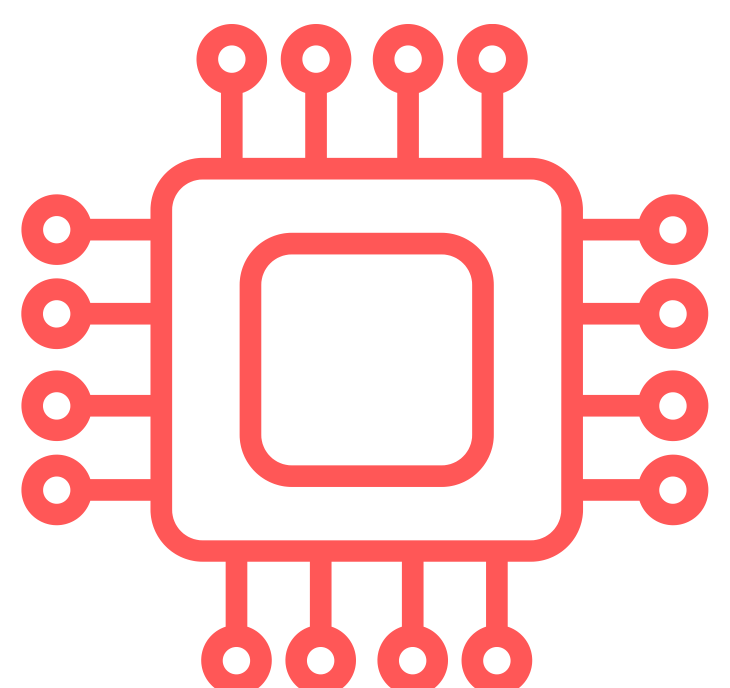
EFFICIENT

+

ECONOMICAL



### ABSTRACT



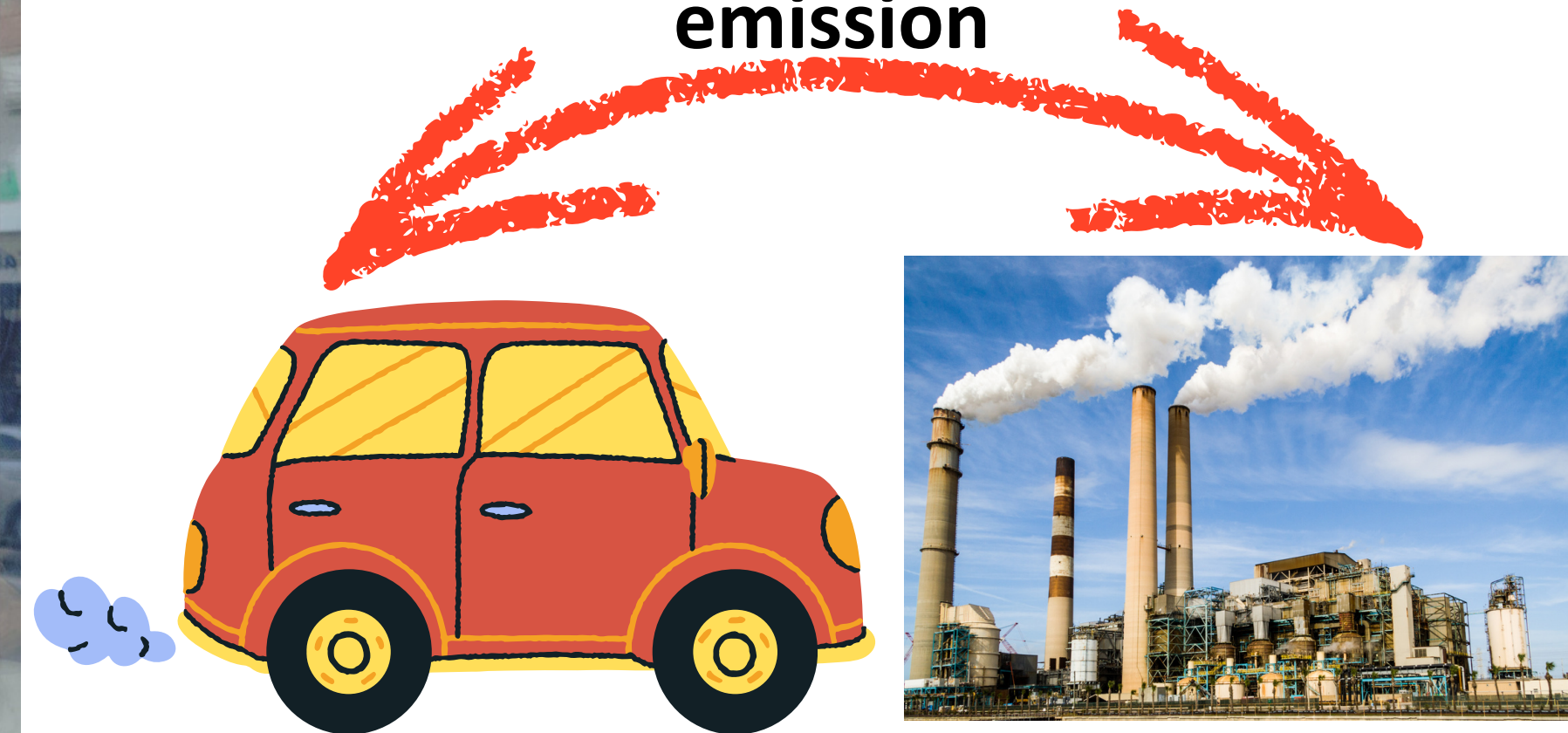
Here, I have tried to develop an innovative hardware solution for Locking away the unburnt carbon present in the atmosphere mainly with the help of my Electronics knowledge.

### SURVEY



### METHODS AND MATERIALS

There are majorly two sources of carbon emission



Please have a look at the below given pictures



You could clearly see a layer of unburnt carbon particles accumulated on the top of these leaves.



### COMPONENTS REQUIRED

- Peltier Plate Module
- MQ-135 Gas Sensor
- Inlet and Outlet fan
- PVC pipe like structure
- HEPA filters
- Air conditioning
- Solar Panel
- Battery

### DISCUSSION

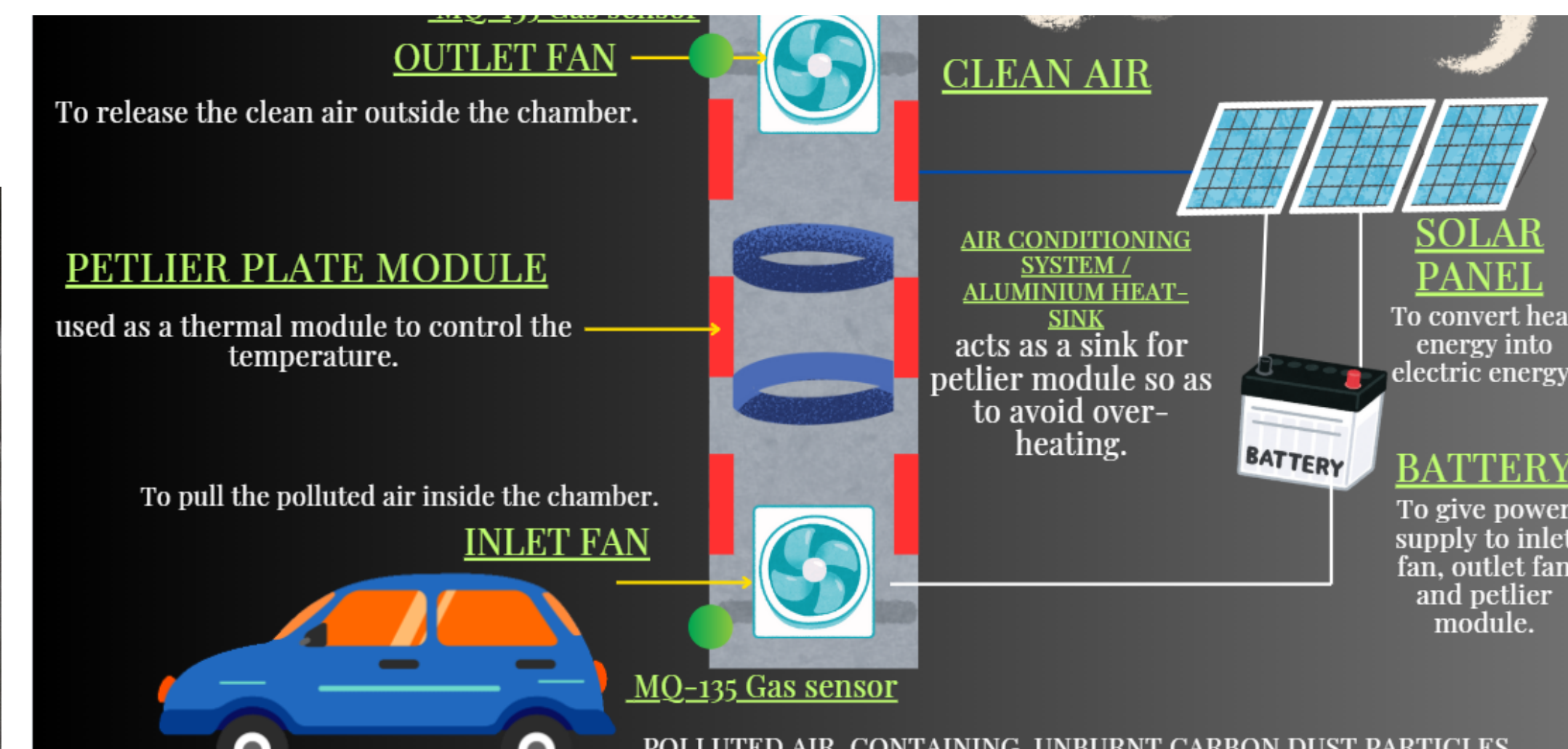
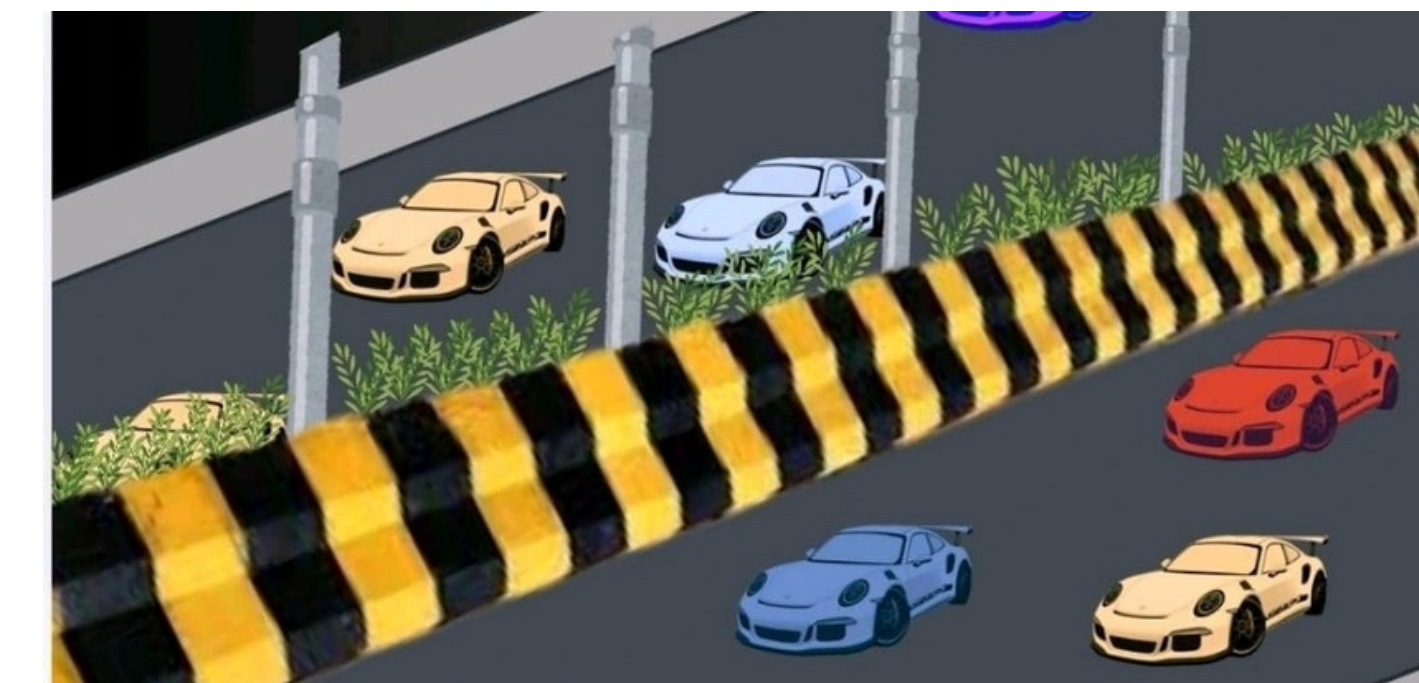
## PELTIER PLATE MODULE

It is basically a thermoelectric module which has both heating and cooling effect in a single module.

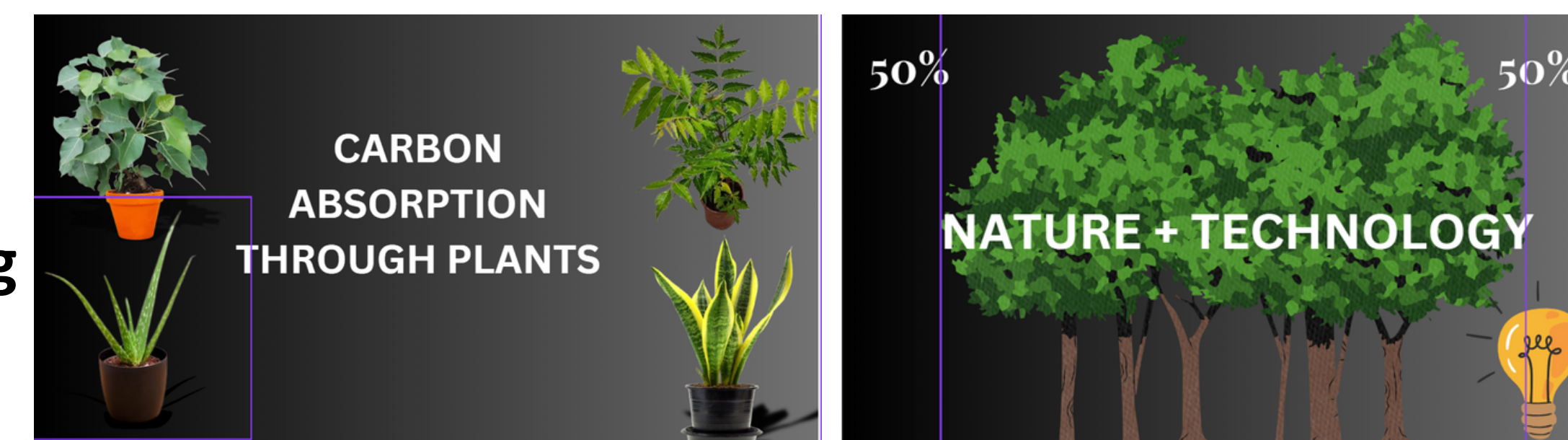
## MQ-135 GAS SENSOR

It detects the presence of carbon containing gases present in the atmosphere.

INSTALLATION LOCATION OF PROJECT ie, ON THE DIVIDERS OF ROAD



### CIRCUIT DIAGRAM AND WORKING



### ADVANTAGES

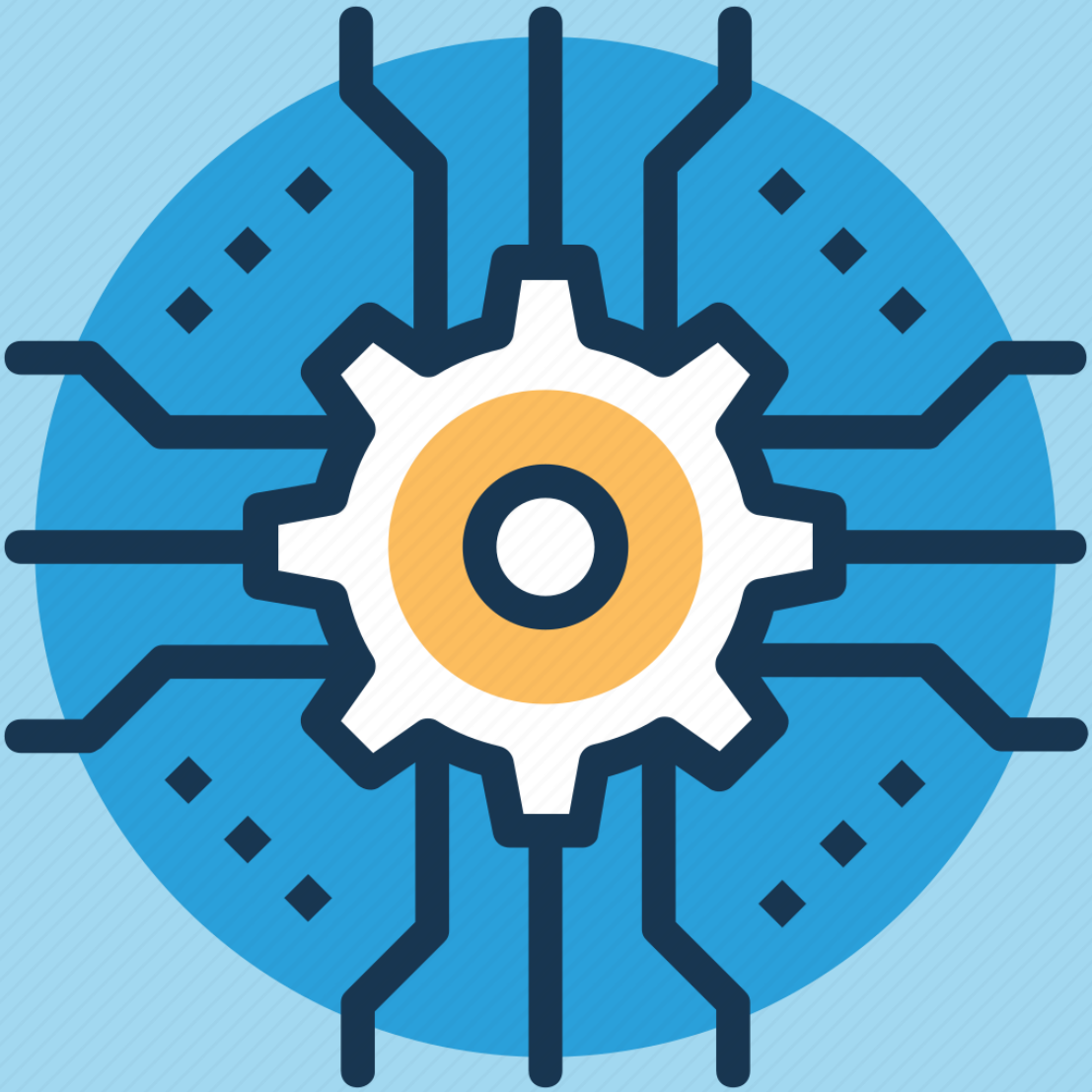
- Cost effective.
- Reduces air pollution.
- Simple Structure.
- Simple operation.
- Reduces health problems.
- Requires less space.
- Operates on solar panel so, no external power supply is needed to operate it.

### FUTURE SCOPE

- The collected carbon particles can be sold directly to the cosmetic industry, beverage industry, pharmaceutical industry, etc.
- We can use the similar concept in chimnies of industries by doing certain modifications in it so as to reduce the industrial carbon pollution.
- The accumulated carbon can be collected and dumped deep inside the earth, which further gets converted into coal and fossil fuels.

### RESULT

Reduce carbon contents present in air at both gaseous and particle level. It will ultimately result in declining number of health issues.



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