HERITAGE INSTITUTE OF TECHNOLOGY, KOLKATA

ELECTRICAL ENGINEERING DEPARTMENT

SPARK

PRESENTED BY

EE DEPARTMENT



CONTEMPORARY TECHNOLOGY PAINTINGS CWC 2023

SPARK

Electo-mobile Edition

1st EDITION

SPARK HITK @hitkeespark ee_spark_hitk

FROM THE HOD'S DESK

I am thrilled to announce the publication of our departmental magazine, "Spark". I want to express my deep appreciation to both our dedicated students and faculty members who worked diligently within a tight time frame to make this publication possible. I extend my heartfelt gratitude to Prof.(Dr.) Nabamita Banerjee Roy for her visionary leadership in spearheading the creation of "Spark".

Her dedication and exceptional leadership have been instrumental in bringing this project to fruition.

"Spark" promises to be an invaluable platform for all the students in the EE department, offering opportunities to refine their skills in innovation, research, literacy, and poetry. Our esteemed staff will play a pivotal role in enhancing the magazine's content by featuring articles on emerging technologies and lateral developments.

I am confident that "Spark" will exceed expectations and become a source of delight, inspiration, and intellectual enrichment for everyone in our department.



Prof. Dr. Saibal Dutta

MESSAGE FROM THE TEAM

To be the lead designer of the 1st Edition of our departmental magazine is a moment I can keep talking about for ages. This edition not only gave us an opportunity but it also helped creating memories.
-Arya Ghosh
3rd Year

Collaboratively, we have metamorphosed concepts into captivating narratives, nurturing a dynamic community. Here's to our joint triumph!
-Ranadhir Roy
3rd year

Memories are always Special! Sometimes we laugh by remembering the days we cried, And we cry by remembering the day we laughed.
-Praneet Kumar Ghosh
3rd Year

A glorifying moment that actually was so sparkling from the very moment it got it's name. "SPARK" even this name has a story.
- Kiran Kumar Mondal
3rd Year

Electrical Engineering Department makes me feel at home. Everyone is supportive and I am blessed and grateful to be a part of it.
- Tanisha Haldar
2nd year

Success is not the final and Success is not resting on your laurels, but finding new laurels to rest upon.
- Subhojit Roy
3rd Year

SPARK is here for all the Scientific, Technical, Yet Realistic Aspect of this World. A Combined Effort by the Team and Some Patience is What we acclaim.
- Debopriya Ghosh
2nd Year

MESSAGE FROM THE TEAM

The upcoming departmental magazine, SPARK, presents an exciting platform to showcase the brilliance, innovation, and knowledge within the Electrical Engineering Department at Heritage Institute of Technology.
-Yugant Nayak
4th year

SPARK, the departmental magazine, ignites a space where the vibrant ideas, accomplishments, and expertise of students and faculty in the Electrical Engineering Department at Heritage Institute of Technology shine brightly, uniting a community of innovators and knowledge seekers.
-Debolina Sarkar
4th year

The stunning contribution of our department where creative & innovative abilities are very much in evidence to see in the multifarious work & activities is absolute joy.
-Deblina Boral
2nd Year

Thrilled to contribute to our departmental magazine, where knowledge, creativity, and innovation come together to showcase the best of our field fostering intellectual growth and community!
-Aishanee Bhattacharya
2nd Year

So, here it is, SPARK,a magazine containing collection of ideas from the future generation who will lead not just India but the whole world into a better place to live in. Just a few more sleepless nights until we deliver you what you all have been waiting for the entire year.
-Kinjal Pal
2nd Year

🎏 _Exciting news_ 🎏
Brace yourself for an extraordinary journey that captures the essence of life's brilliance. Your one year wait is about to be rewarded with a treasure trove of captivating stories and enriching experiences.
- Parthib Sarkar
2nd Year

Magazines, books and movies have an immense impact on mobilising and directing the society and the culture. May our magazine 'Spark' become the propagator of new scientific, cultural and economic ideologies.
-Debjit Manna
3rd Year

Contents

1. VOLTVISIONS 6

2. ARTERSTIA 17

3. ELECTRIC VEHICLES 26

4. SNAP STATION 33

5. CWC 2023 38

6. COZY SCRIBBLES 42

7. SKETCHY SCRIBBLES 46

8. PUJO এবং BANGALI 50

9. EE REWINDS 56

10. MYSTIC MOMENTS 61

VOLT VISIONS

HARVESTING ENERGY FOR TOMORROW: THE EVOLUTION OF NANOGENERATORS AS SUSTAINABLE POWER SOURCES AND SELF-POWERED SENSORS

Energy is one of the most essential resources that influence the quality of our lives. With limited fossil energy for the next century, finding alternative energy has become a serious concern for today's civilization. Solar, wind, and tide energy are the most well-known renewable energies, and they are intended to contribute to the main power grid in order to satisfy the requirement for mega- to giga-watt power scale. Low cost, high stability and great efficiency are the general conditions for harvesting these forms of energy.

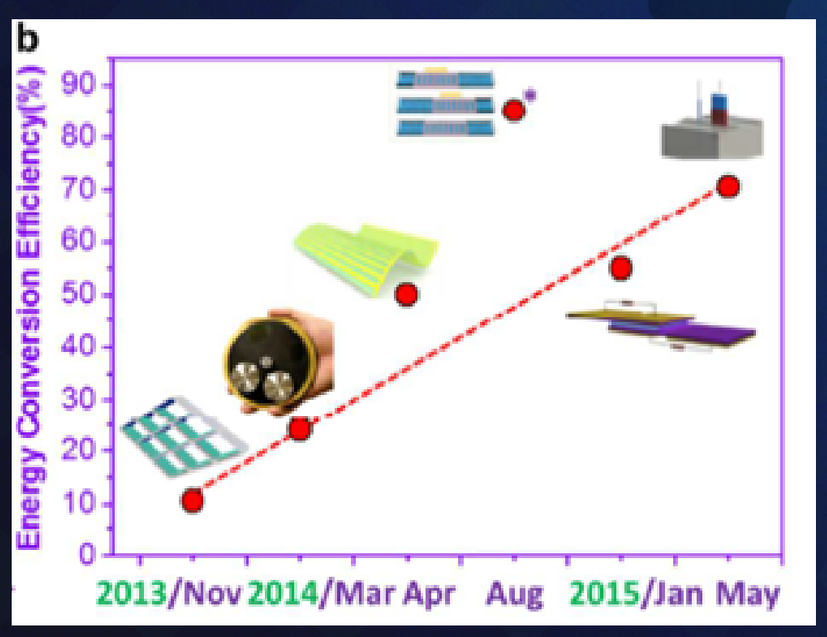




The broad uses and dissemination of mobile devices have penetrated every area of our lives during the last two decades. A wide range of sensors are available for health monitoring, medical treatment, environmental protection, infrastructure monitoring, and security. The power required to drive each unit is minimal, down to mille-even micro-Watts, but the number of devices can be massive. There will be billions of sensor units distributed across the globe as predicted by various research organizations. With the fast expansion of internet of things (IoTs), portable electronics, and sensor networks, the need for sustainable, renewable, and environmentally friendly energy is growing. The most common technique is the use of batteries, which may not be the best choice for IoT. Monitoring, replacing, recycling, and swapping batteries for billions of batteries that are widely spread and each has a finite life span would be a massive, if not impossible, undertaking. The majority of IoT would be hard to implement without making the devices self-powered. Integrating an energy harvester with a battery to build a self-powered system is thus likely to be an appropriate solution. This was the setting for the development of nanogenerators, a groundbreaking approach to nanoenergy.

Electronics in today's world are largely related with human activities for the sake of health, safety, and communication. Mechanical energy produced by a person's moving body is the most prevalent type of energy that a person possesses. Utilizing two phenomena, piezoelectricity and triboelectricity, the nanogenerator was initially developed to capture human energy from activities such as walking, talking, breathing, typing, and more. This is the basic idea of or piezoelectric nanogenerators (PENGs). Prof. Zhong Lin Wang's research group has spent almost 10 years in developing PENGs which has been reported systematically in existing literatures.



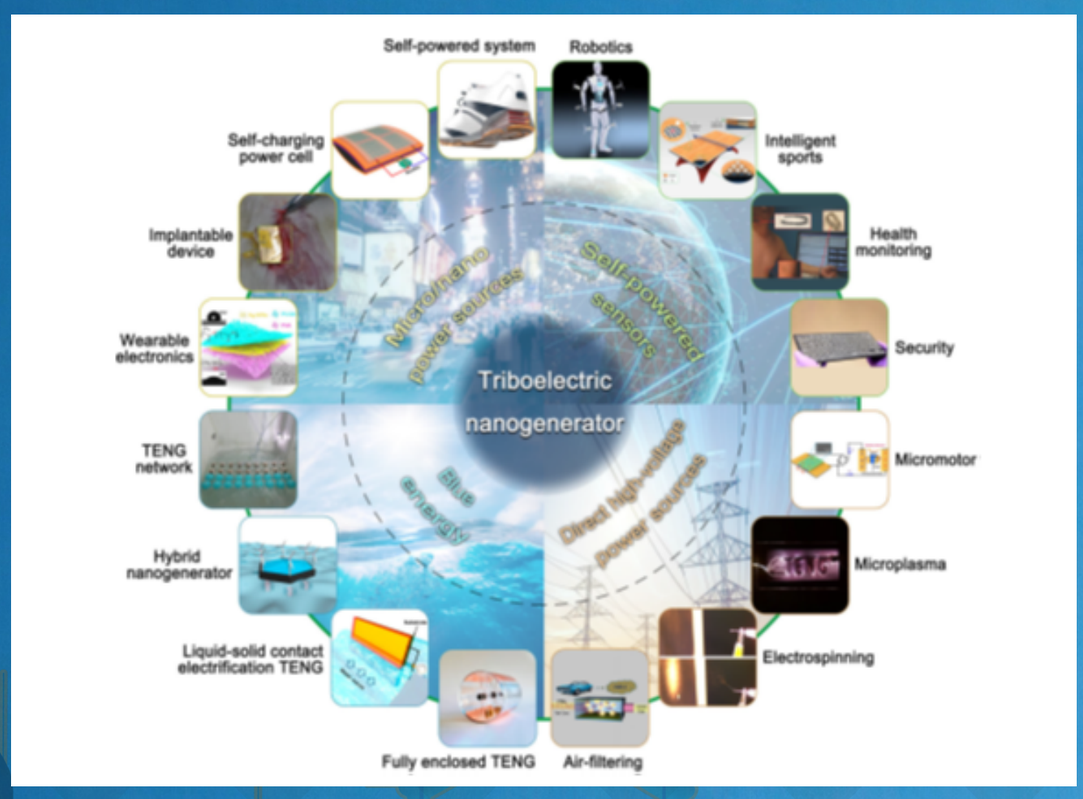


Summary on the progress in the performance of TENG made in the
(a) area output power density
(b) energy conversion efficiency till May 2015.

The contact-induced triboelectric charges can produce a potential drop when two surfaces are mechanically separated using the electrostatic charges created on the surfaces of two dissimilar materials when they come into physical contact. This potential drop can then cause electrons to flow between the two electrodes constructed on the top and bottom surfaces of the two materials. The triboelectric nanogenerator (TENG) was invented in this manner in 2012 by Prof. Wang's group. Since its initial disclosure in 2012, the TENG has demonstrated its potent capacity to capture ambiant mechanical energy, with an area output power density of 500 W/m2, a volume power density exceeding 15 mW/m3, and an instantaneous conversion efficiency of 70% being exhibited (Fig. 1). The TENG may be used to capture a variety of mechanical energy that are present but go unused in our daily lives, such as walking, human motion, vibration, mechanical triggering, revolving tires, wind, flowing water, and more. As an alternative, a TENG can also be used as a self-powered sensor to actively detect the static and dynamic processes caused by mechanical agitation using the voltage and current output signals of the TENG, respectively. This has the potential to be used for mechanical sensors as well as touch pad and smart skin technologies. The TENG also has the ability to use a novel methodology to gather wave energy from the ocean, which might represent a new paradigm for large-scale energy.

With flexible operating modes, the TENG may be used in a broad range of situations and harvest a variety of mechanical energies for the large-scale implementation of self-powered electronics networks. So far, TENG applications have permeated many elements of our everyday lives and may be divided into four primary categories: micro/nano power sources, self-powered sensors, blue energy, and direct high-voltage (HV) power sources (Fig. 2). Considering the large number of small electronic devices necessary for IoTs, as well as the present high replacement costs and environmental issues associated with battery use, TENG has been recommended as "the energy for the new era."

TENG research has grown quickly and received widespread international interest as a result of its exceptional performance and huge potential. According to the literature review, There are more than 56 nations and regions, 830 units, and more research on TENG is being conducted by almost 4700 scientists (as of July 2020). The purpose of this article is to summarize the importance of energy harvesting and the progress of nanogenerators as a source of alternative energy and a self-powered sensor. The upcoming editions of the magazine will cover the fundamental knowledge and theory of TENG, as well as the operating principle and modes of operation.



A summary of the four major application fields of TENGs as micro/nano power sources, active self-powered sensors, blue energy, and direct high-voltage power sources

Reference

[1] Zhong Lin Wang, Jun Chen, Long Lin, Progress in triboelectric nanogenerators as new energy technology and self-powered sensors, Energy & Environmental Science, vol. 8, pp. 2250-2282, 2015, doi: 10.1039/C5EE01532D

[2] Jianjun Luo and Zhong Lin Wang, “Recent progress of triboelectric nanogenerators: From fundamental theory to practical applications”, Eco Mat, vol. 2, no. 4, pp. 1-22, Oct. 2020, e12059, doi: 10.1002/eom2.12059.

HARMONICS ANALYSIS USING AI TECHNIQUES

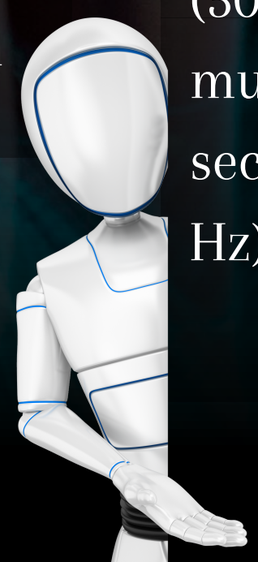


INTRODUCTION: With the advance of power semiconductor technology, the power electronic devices are widely used in industry to improve the manufacturing processes and system efficiency. These devices are likely to introduce the distorted current in the power system, which may not only increase power losses of electrical facilities, but also cause the mal function of protective devices. Besides, the harmonic resonance may also cause serious problem such as overvoltage in the power system. Therefore, it becomes more and more important to perform the harmonic power flow analysis for the system with power electronic devices

Many methods have been proposed to solve the harmonic pollution produced by nonlinear load component. A Newton-Raphson power flow proposed by Xia and Heydt solves the power mismatches to find the harmonic performance of power systems. The admittance matrix method proposed by Pilleggi et al. calculates the harmonic load flow by the current injection method. The impedance matrix method by Mahmoud and Shultz solves the load flow directly. However, it takes too much time for the modification of impedance matrix during the load flow analysis of each harmonic order.

Many methods mentioned above assume that only one bus in the system has harmonic current injection and the theoretical harmonic current components are used. However, for an actual factory, there may be many buses with harmonic sources and the harmonic components vary with the load conditions. In this study, the method of admittance matrix by Gauss elimination is used for the harmonic load flow analysis for computational efficiency. Due to the difference of production processes among the plants in the large factory, the load behavior should be considered separately for each plant. To represent the load characteristics more practically and accurately, the load composition was used in the harmonic load flow analysis. The harmonic current was measured at every plant in the factory and the harmonic current sources were then simultaneously injected into the power system during the computer simulation. Therefore, this study provides a better understanding of the harmonic problem in the factory

A Harmonics is a current or voltage component at a frequency that is an integer (whole number) multiple (2nd, 3rd, 4th, etc.) of the fundamental frequency. For example, when the power supply is 50 Hz AC, the first harmonic (50 Hz) is the fundamental frequency. Other multiples of the fundamental harmonic are the second harmonic (100 Hz), third harmonic (150 Hz), fourth harmonic (200 Hz), etc.



SOURCES OF HARMONICS:

Nonlinear Devices : The primary source of harmonics in electrical systems is nonlinear devices. When voltage and current waveforms are distorted due to nonlinearity, harmonics are generated. Common nonlinear devices include diodes, transistors, and switching power supplies.

Power Electronics : Modern electronic devices, such as variable speed drives (VSDs), uninterruptible power supplies (UPSs), and rectifiers, often use pulse-width modulation (PWM) techniques to controlpower. These techniques can introduce harmonics into the power supply, leading to voltage and current distortion.

Nonlinear Loads : Loads that draw non-sinusoidal current waveforms, such as fluorescent lighting, arc furnaces, and certain types of industrial machinery, can introduce harmonics into the electrical system.

Electric Arcs: Electric arcs, such as those in welding equipment, can generate harmonics due to their non-sinusoidal current waveforms. Harmonic Resonance: When the natural resonant frequency of an electrical system matches one of the harmonic frequencies generated by nonlinear loads or devices, it can lead to amplification of harmonics. Switching and Transients: Rapid switching events in electrical circuits, such as opening or closing switches, can create transient disturbances that include harmonics.



EFFECT OF HARMONICS:

Voltage Distortion: Harmonics can cause distortion in the voltage waveform. This distortion can lead to increased voltage levels, which can stress and potentially damage sensitive electronic equipment. It can also cause overheating in transformers and other components.

Current Distortion: Harmonics in the current waveform can lead to increased current levels, which can overload conductors and components. This can result in increased energy losses and reduced equipment lifespan.

Equipment Damage: Sensitive electronic equipment, such as computers, servers, and medical devices, can be damaged by harmonics. The non-sinusoidal voltage and current waveforms can lead to overheating, malfunctions, and even equipment failure.

Reduced Power Factor: Harmonics can reduce the power factor of a system. A poor power factor can result in increased energy consumption, higher electricity bills, and decreased system efficiency.

Increased Energy Costs: Harmonics can cause increased energy losses in transformers, conductors, and other components. This can lead to higher energy bills and reduced energy efficiency.



MITIGATION TECHNIQUES:

Variable Frequency Drives (VFDs): Install VFDs with built-in harmonic mitigation features. These drives can reduce harmonic distortion caused by motor operations.

Harmonic Filters:

*Passive Harmonic Filters***:** These are tuned to a specific harmonic frequency and use capacitors and inductors to create a path for the harmonics to flow, diverting them away from the main power system.

Active Harmonic Filters: These are more advanced and can dynamically monitor and correct harmonic distortions by generating counteracting harmonic currents.

AI INTEGRATION:

Here are some of the ways AI is being integrated into social distancing:

Data analysis and monitoring: AI algorithms can analyze and analyze voltage and current waveforms and detect harmonics instantly. Machine learnin g models can predict when different combinations will occur based on historical data and performance.

Harmonic Identification: AI can identify specific harmonics and current amplitudes in a given signal; This is important for mitigation. Active har monic filtering: Artificial intelligence controlled filters can be used to eliminate harmonics in electronic systems. Filters provide more efficient and targeted r eduction by dynamically adjusting their parameters according to detected harmonics.



Optimization control: Artificial intelligence can improve and control the quality of electrical equipment such as inverters, converters and acti ve devices. Filter to reduce harmonic distortion. Reinforcement learning can be used to develop time management str ategies in response to changes in the body

Maintenance Analysis: Artificial intelligence can predict equipment failure caused by excessive correlation, ensuring effective maintenance an d reducing downtime.

Integration with IoT and Smart Grid: Artificial intelligence can be used with IoT devices and smart devices to provide instant feedback and social control. Thi s situation has been eliminated in electrical devices and microgrids.

Decisions from data: AI can provide insights and re commendations based on data analysis to help business owners and designers make strategic decisions.

Adaptive control strategy: AI can adapt to changing situations and interactions in the system to eliminate correlation in the environment.

Improve grid security: AI can help with grid security by predicting and resolving grid issues before they cause power outages or current instability

Concept of Multilevel Inverter Topologies (RESEARCH):

Multilevel inverters are power electronic devices used to convert DC (direct current) voltage into AC (alternating current) voltage with multiple voltage levels at the output. They are commonly employed in various applications, including renewable energy systems, motor drives, and high-voltage transmission. Different multilevel inverter topologies have been developed over the years, each with its own advantages and applications.

Diode-Clamped Multilevel Inverter (Neutral-Point Clamped Inverter): Research in this topology often focuses on improving modulation techniques to minimize harmonic distortion, enhance efficiency, and reduce semiconductor losses. Investigation of fault-tolerant control strategies to maintain operation in the presence of faulty devices. Thermal management techniques to prevent overheating of semiconductor devices.

Cascaded H-Bridge Multilevel Inverter: Research explores various configurations of cascaded H-bridge inverters and their control methods for different applications. Development of advanced switching strategies, such as selective harmonic elimination (SHE) and model predictive control (MPC). Investigation into the scalability of cascaded H-bridge inverters for high-voltage applications.

Flying Capacitor Multilevel Inverter: Research focuses on capacitor voltage balancing techniques to ensure the reliability and longevity of the inverter. Development of control algorithms to manage capacitor voltage levels and mitigate voltage imbalance issues. Investigation of fault detection and isolation methods for capacitor failure.



Modular Multilevel Inverter (Submodule-Based Inverter): Research explores submodule configurations and their scalability for various voltage levels. Development of control strategies for modular multilevel inverters with a focus on maintaining the balance between submodule voltages. Investigation into fault-tolerant operation and redundancy in submodule-based inverters.

Hybrid Multilevel Inverter: Research investigates the integration of multilevel inverters with other power electronics components, such as converters and energy storage systems, for hybrid power systems. Development of control strategies to optimize the operation of hybrid multilevel inverters in grid-connected and standalone applications. Study of fault protection and isolation techniques for hybrid configurations.

Topology Integration with Renewable Energy Systems: Research explores the integration of multilevel inverters with renewable energy sources like solar and wind, focusing on grid synchronization, power quality, and grid support. Development of control algorithms for maximum power point tracking (MPPT) and reactive power control in renewable energy systems.

Advanced Switching Strategies: Investigation into advanced switching techniques, such as pulse-width modulation (PWM), space vector modulation (SVM), and predictive control, to optimize the performance of multilevel inverters. Research on the impact of switching frequency on efficiency and harmonic distortion.



Applications in High-Voltage Direct Current (HVDC) Transmission: Research in this area explores the use of multilevel inverters in HVDC transmission systems, with a focus on voltage source converter (VSC) technologies. Development of control strategies for grid interconnection and fault ride-through capabilities. Research in multilevel inverter topologies continues to evolve as these devices play a crucial role in improving the efficiency and performance of modern power systems, especially in renewable energy integration and high-voltage applications. Researchers are continually seeking ways to enhance their performance, reduce costs, and address practical challenges in real-world applications.



Conclusion:

In conclusion, multilevel inverter topologies play a vital role in modern power electronics and electrical systems, offering effective solutions for harmonics mitigation. They provide numerous benefits, including improved output waveform quality, reduced harmonic distortion, and enhanced power quality. Researchers and engineers continue to explore and develop these topologies to address the growing demand for efficient and reliable harmonics mitigation in various applications. Overall, multilevel inverter topologies offer versatile solutions for harmonics mitigation in various applications. Research efforts continue to improve these topologies by developing advanced control techniques, optimizing modulation strategies, and enhancing fault tolerance to ensure reliable and efficient harmonics mitigation in complex electrical systems.

Ritesh Kumar Sah
4th Year

CLIMATE CHANGE:
A MAJOR CONCERN

"If you really think that environment is less important than the economy,try holding your breath while you count your money" - Guy McPherson. Climate change refers to the change in the environmental conditions of the earth. The climatic change has become a global concern over the last few decades.These climatic changes are having various impacts on the ecosystem and ecology.

The climate started changing a long time ago due to human activities but we came to know about it in the last century. During the last century, we started noticing the climatic change and its effect on human life. We started researching on climate change and came to know that the earth temperature is rising due to a phenomenon called the greenhouse effect.The greenhouse effect is a process that occurs when gases in Earth's atmosphere trap the Sun's heat. This process makes Earth much warmer than it would be without an atmosphere.

Although there are hundreds of reason for the climatic change but natural and manmade (human) are the two major reasons for it. Natural include volcanic eruption, solar radiation, tectonic plate movement, orbital variations. Due to these activities, the geographical condition of an area has become quite harmful for survival. Besides, these activities are raising the temperature of the earth to a great extent causing an huge imbalance in nature.

Man due to his need and greed has done many activities that made a major impact on not only to the environment but also to themselves. Many plant and animal species are now extinct due to human activity. Human activities that harm the climate include deforestation i.e. cutting down of trees in a large scale, using fossil fuels, industrial waste, pollution and many more. All these things damage the climate and ecosystem very badly. We are not bothered of our activities and hardly care about our environment. We are continuously doing it at a high rate. These climatic changes have a negative impact on the environment. The ocean level is rising, glaciers are melting, CO2 in the air is increasing, forest and wildlife are declining, and water life is also getting disturbed due to climatic changes.

As per The United Nations Report, Fossil fuels like coal, oil and gas are by far the largest contributor to global climate change, accounting for over 75 percent of global greenhouse gas emissions and nearly 90 per cent of all carbon dioxide emissions. Apart from that, it is calculated that if this change keeps on going then many species of plants and animals will get extinct. If we do not do anything and things continue to go on like right now then a day in future will come when humans will become extinct from the surface of the earth. But instead of neglecting these problems if we start acting on, then we can save the earth and our future.



Although humans mistake has caused great damage to the climate and ecosystem. But, it is not late to start again and try to undo what we have done until now to damage the environment. We must replace coal, oil, and gas with renewable and efficient energy sources. Transitioning from fossil fuels to clean energy is the key to winning the fight against climate change.

Use of non conventional sources, using green energy, using eco friendly vehicles like Electric-Vehicles can reduce the problem to a large extent. Transportation is a top source of greenhouse gases, so eliminating pollution from the billions of vehicles driving across the planet is essential to achieve net-zero global emissions. If every human start contributing to the environment then we can be sure of our existence in the future.

Samarpan Ghoshal
3rd Year

ARTERSTIA



Subhradeep Bose, 3rd Year



Rajanya Bhattacharya
3rd Year



Kinjal Pal, 2nd Year



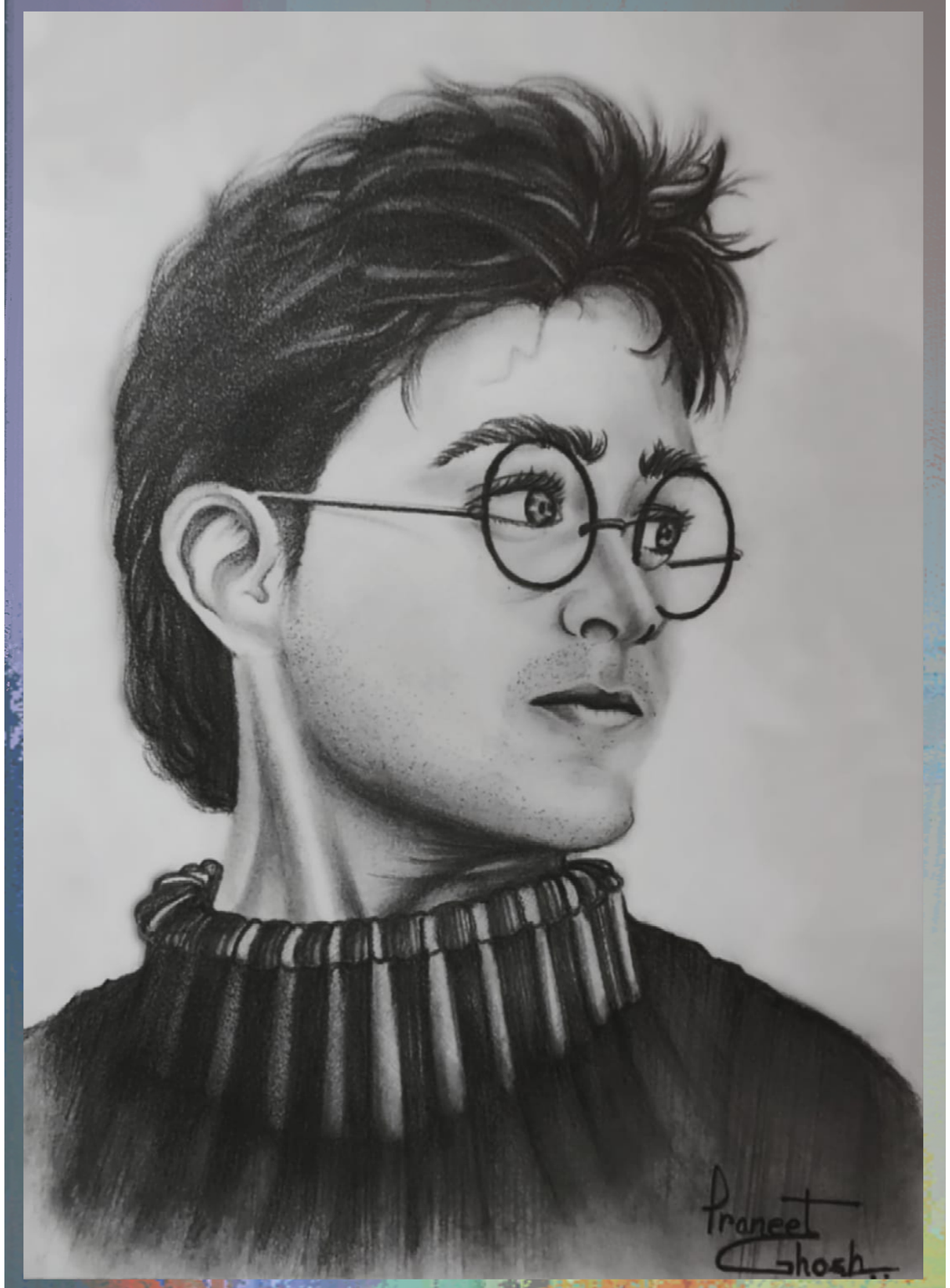
Praneet Kumar Ghosh
3rd Year



Rajanya Bhattacharya
3rd Year



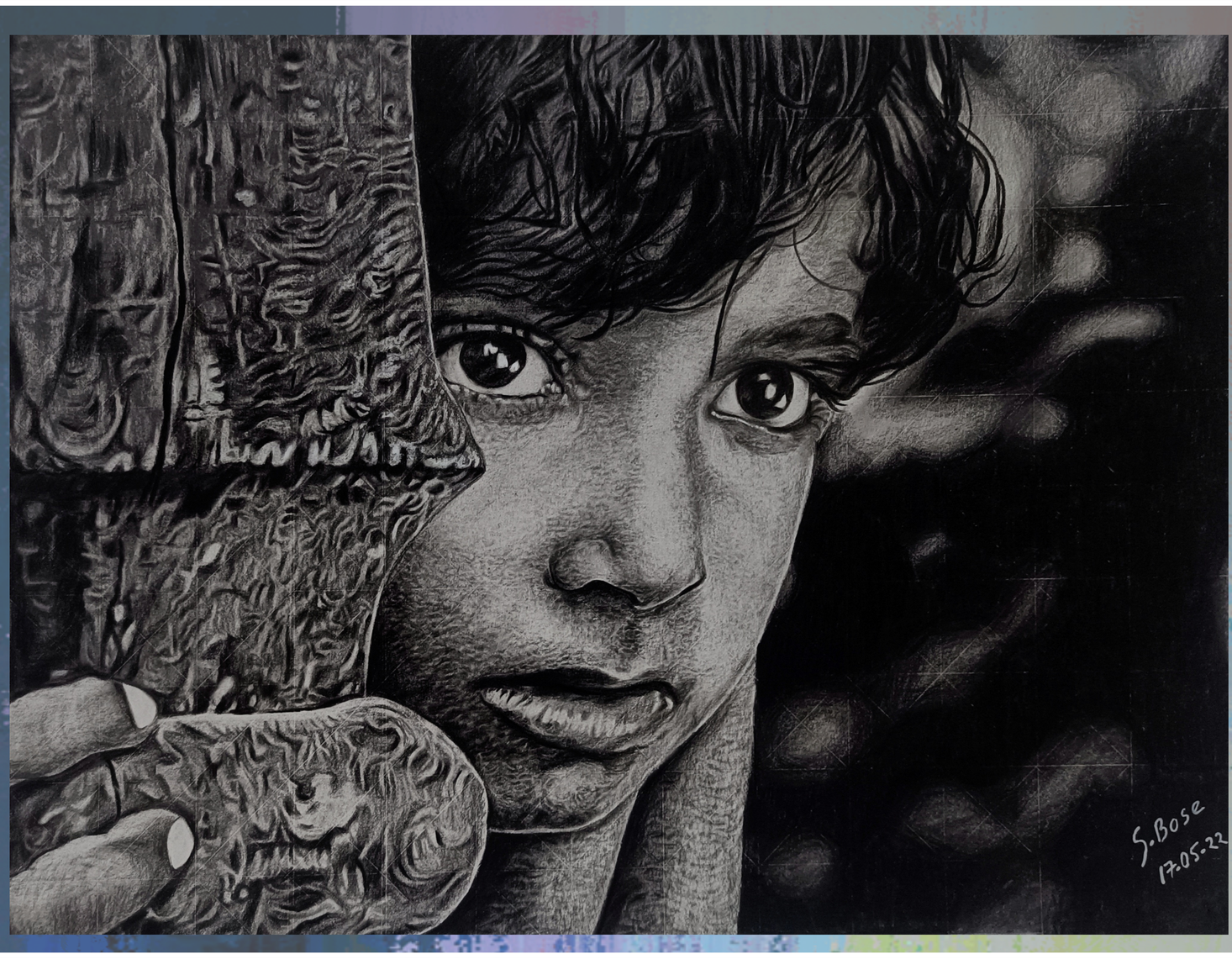
Subhradeep Bose, 3rd Year



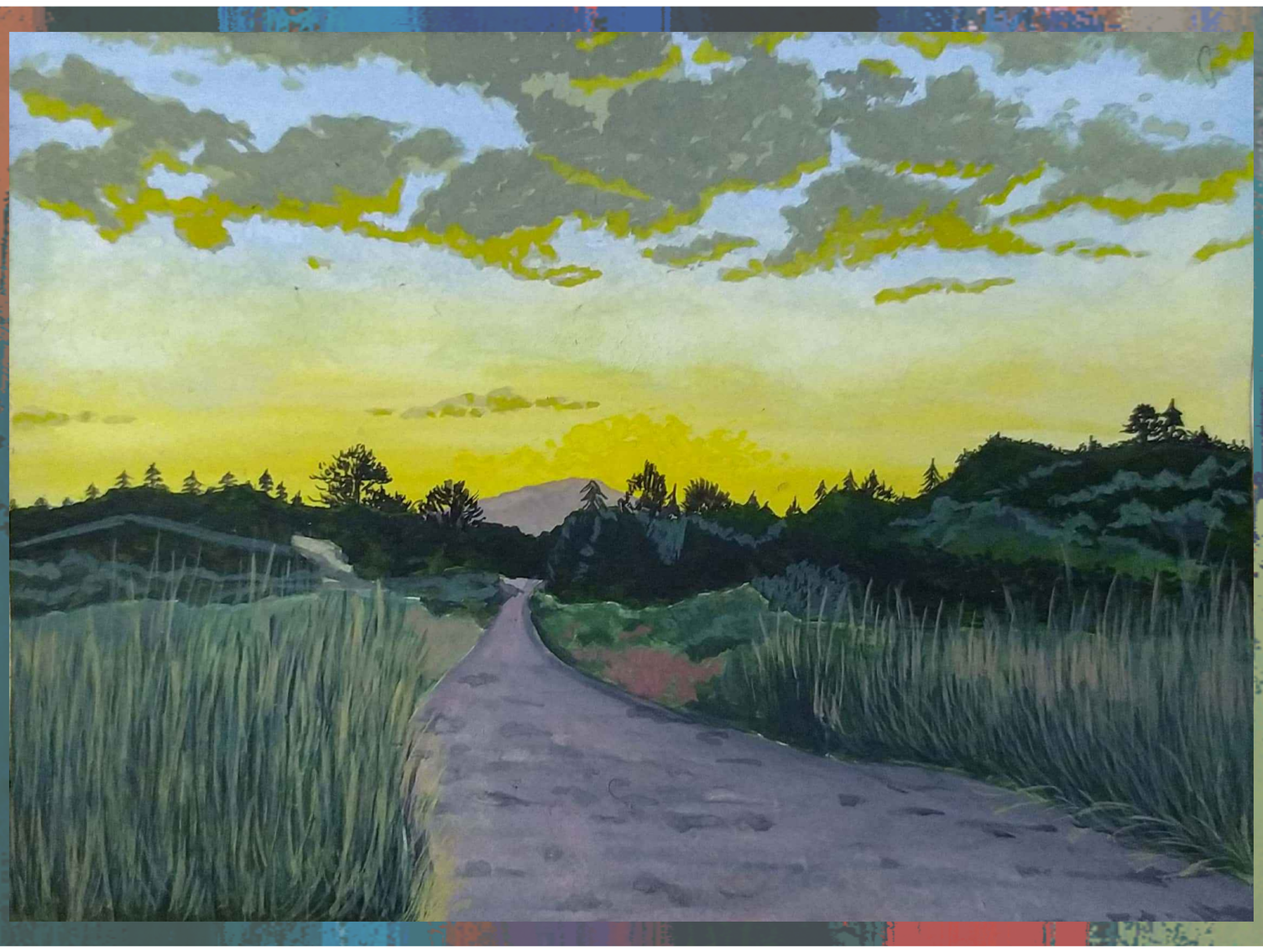
Praneet Kumar Ghosh
3rd Year



Namrata Ghosh
4th Year



Subhradeep Bose, 3rd Year



Pratim Roy, 2nd Year



Aishanee Bhattacharya,
2nd Year



Oimayak Panja,
3rd Year



Subhradeep Bose, 3rd Year



Debopriya Ghosh,
2nd Year



Subhradeep Bose, 3rd Year



Pratim Roy, 2nd Year





ELECTRIC VEHICLES



Disadvantages of petrol and diesel fueled vehicles

Petrol and diesel come from crude oil, which comes from deep underground. Crude oil is refined to make petrol or diesel. Most forms of transport use either petrol or diesel to power their engines - from cars, buses and motorbikes to large ships and aeroplanes. Petrol and diesel make so many things possible that, like electricity, they're now vital to our way of life!

An engine's purpose is to convert the chemical energy of the fuel into kinetic energy, movement! Petrol or diesel is burnt in the internal combustion engines of vehicles. Engines use heat and pressure to drive the vehicle forward.

Unfortunately, this combustion technique also produces chemical energy as a byproduct. This chemical energy leaves the engine via the exhaust pipe as exhaust fumes. Many of these fumes are harmful for us, animals and the environment. There are different chemicals that one might find in the fumes –

- *Carbon dioxide (CO2) is a greenhouse gas and contributes to global warming.*
- *Carbon monoxide (CO) is a poisonous gas.*
- *Sulphur dioxide (SO2) is a cause of acid rain and can cause breathing or heart problems*
- *Nitrogen oxides (NOX) and Volatile Organic Compounds (VOC) can irritate and damage the lungs*
- *Particulate matter (PM) is what makes cities hazy and foggy. It contributes to ground-level ozone (a gas which is good for the planet when it is up above the clouds, but bad for us when it is at ground-level). These particles also contribute to asthma and other lung problems.*
- *Lead is poisonous but only in extremely high doses. Various airborne toxins such as benzene, formaldehyde, acetaldehyde can also cause health problems. These chemicals also contribute to ground-level ozone.*
- *The extraction and production of petroleum-based fuels involve significant resource depletion and environmental damage. Oil spills and habitat destruction can occur during the extraction process.*
- *Reliance on finite fossil fuel resources poses long-term sustainability challenges, as these resources will eventually run out. This can also lead to geopolitical conflicts over oil reserves.*
- *Internal combustion engines in these vehicles produce noise pollution, which can disturb both urban and natural environments.*
- *The infrastructure required for petrol and diesel vehicles, such as roads and parking lots, consumes valuable land and contributes to habitat loss and urban sprawl.*

Disadvantages of petrol and diesel fueled vehicles

To mitigate these disadvantages, there's a growing shift towards electric vehicles (EVs) and the development of renewable energy sources to power them. EVs produce zero tailpipe emissions, reducing air pollution and greenhouse gas emissions, and they are generally more energy-efficient than internal combustion engine vehicles. Additionally, advancements in battery technology are making EVs more practical and accessible for consumers, further reducing their environmental impact.

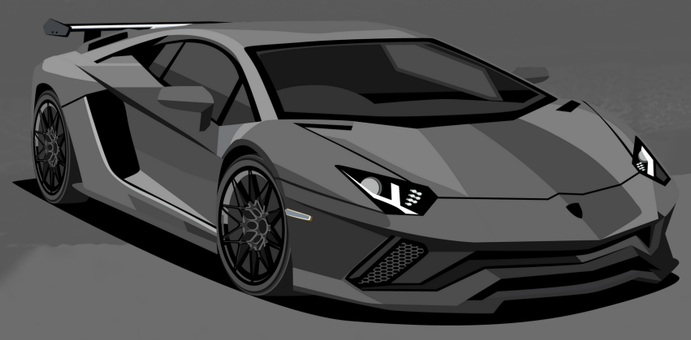
Brishti Acharya
1st year

ACHIEVING A HARMONIOUS ECONOMIC TRANSITION AND EMPLOYMENT SHIFTS IN INDIA DURING THE ELECTRIC VEHICLE REVOLUTION

Over the past few years, there has been a significant transformation in the worldwide automotive industry as electric vehicles (EVs) have emerged as a dominant force. While nations are stepping up their endeavours to tackle climate change and lessen reliance on fossil fuels, India has begun a mission to enhance its electric vehicle infrastructure. Although there are numerous benefits associated with this shift, it also poses various difficulties that affect the economy, employment, and the environment

Economy pros:

The potential economic advantages of introducing electric vehicles in India could be quite substantial. Above all, enhancing India's balance of trade would be the direct result of reducing the country's expensive crude oil imports. Moreover, establishing a strong electric vehicle (EV) sector has the potential to open up a fresh pathway for economic progress, offering opportunities for job generation and increased investment possibilities. Furthermore, the adoption of electric vehicles can also contribute to enhanced public health by reducing air pollution, thereby lowering healthcare expenses and boosting productivity in the workforce.



Challenges and Drawbacks:

Despite the promising outlook, the widespread adoption of electric vehicles in India presents significant challenges. One of the primary obstacles is the initially high cost of EVs, which can discourage widespread adoption, particularly in a market where price sensitivity is a critical factor. Furthermore, the current lack of a comprehensive charging infrastructure across the country hinders the seamless adoption of electric vehicles, causing range anxiety and inconvenience for potential users. Additionally, the reliance on rare earth elements for EV battery production could create vulnerabilities in the supply chain, potentially impacting the overall cost and availability of EVs in the Indian market.

Employment Shifts and Nature Costs:
The shift towards electric vehicles has the potential to have a significant impact on employment dynamics in India. While it may create new job opportunities in the electric vehicle manufacturing and supply chain industries, it could also lead to job losses in the traditional automotive sector. To address potential employment disruptions, it is crucial for governments and industry stakeholders to prioritize reskilling and upskilling initiatives to ensure a smooth transition for the workforce.

Additionally, while the adoption of electric vehicles contributes to reducing emissions and improving air quality, there are concerns about the environmental sustainability of producing and disposing of EV batteries. The extraction of raw materials for battery production and the management of battery waste can potentially create environmental hazards. To address these concerns, it is crucial to implement effective recycling programs and invest in sustainable battery technologies. These steps are necessary in order to minimize the negative environmental impacts associated with the growing EV market.

The Way Forward:
In order to make the most of the advantages of vehicles while minimizing their negative impacts, it's important to take a comprehensive approach. This means continuing to invest in charging infrastructure, conducting research and development to create cost-effective and sustainable battery technologies, and implementing supportive policies to encourage the adoption of electric vehicles. At the same time, focusing on skill development and training programs can help ensure a smooth transition for the workforce, minimizing any disruptions to employment.

In summary, the transition to electric vehicles in India offers both opportunities and challenges. However, it is crucial to adopt a well-planned and comprehensive approach to ensure that the advantages outweigh the disadvantages. By addressing the economic, employment, and environmental aspects simultaneously, India can effectively navigate the complexities of the electric vehicle revolution and position itself as a global leader in sustainable mobility.

Ranadhir Roy
3rd Year

Electric cars setting an example for the future



Mahindra eVerito

- The Mahindra eVerito is an all-electric sedan that combines comfort and eco-friendliness
- It offers a range of around 140 kilometers on a full charge, making it suitable for urban commuting
- The eVerito's regenerative braking system helps recharge the battery while driving, further enhancing its efficiency.

Tiago EV

-With its affordable price tag, the Tiago EV makes electric mobility accessible to a wider audience, contributing to a greener and sustainable future.
-Despite its affordability, the Tiago EV doesn't compromise on performance, offering a decent range and efficient driving experience





MG Comet EV

-known for its impressive electric range, allowing drivers to cover a significant distance on a single charge.
-Additionally, its affordable price point in comparison to other electric SUVs makes it an attractive option for budget-conscious buyers seeking electric mobility.

Hyundai Kona Electric

- The Hyundai Kona Electric is a premium SUV that has been well-received in the Indian market
- It boasts an impressive range of over 450 kilometers, making it suitable for long-distance travel
- The Kona Electric offers advanced features such as wireless charging and smart connectivity options.





XUV 400

-The XUV 400 is a highly anticipated electric SUV set to be launched in India by Mahindra & Mahindra.
-Its sleek design, advanced technology, and impressive performance, the XUV 400 aims to redefine the electric vehicle segment in the country.
-It offers a substantial range and fast-charging capabilities, it emerges to be a game-changer in the Indian automotive market

Tata Nexon EV

- The Tata Nexon EV is India's first fully electric compact SUV
- It offers an impressive range of over 300 kilometers on a single charge
- With its spacious interiors, advanced safety features, and fast charging capabilities, the Nexon EV has become a popular choice among Indian EV enthusiasts.





Kia EV6

-The Kia EV6 is a highly anticipated electric vehicle that showcases Kia's commitment to innovation and sustainability.
-Its futuristic design, cutting-edge technology, and impressive performance, the EV6 is set to make a significant impact in the electric vehicle market.
-It offers a long-range capability, ultra-fast charging, and advanced features, the EV6 represents Kia's vision for the future of electric mobility.



The commercialization of electric vehicles in India has gained momentum in recent years. With advancements in technology and the government's push towards cleaner transportation, these seven EVs have successfully carved a niche for themselves in the Indian market. As more companies join the electric revolution, we can expect to witness further growth and innovation in this sector, contributing to a greener future for India.

Debopriya Ghosh
2nd Year



SNAP STATION



Praneet Kumar Ghosh
3rd Year



Tanisha Haldar
2nd Year



Arya Ghosh
3rd Year



Arya Ghosh
3rd Year



Praneet Kumar Ghosh
3rd Year

Tanisha Haldar
2nd Year





Namrata Ghosh
4th Year



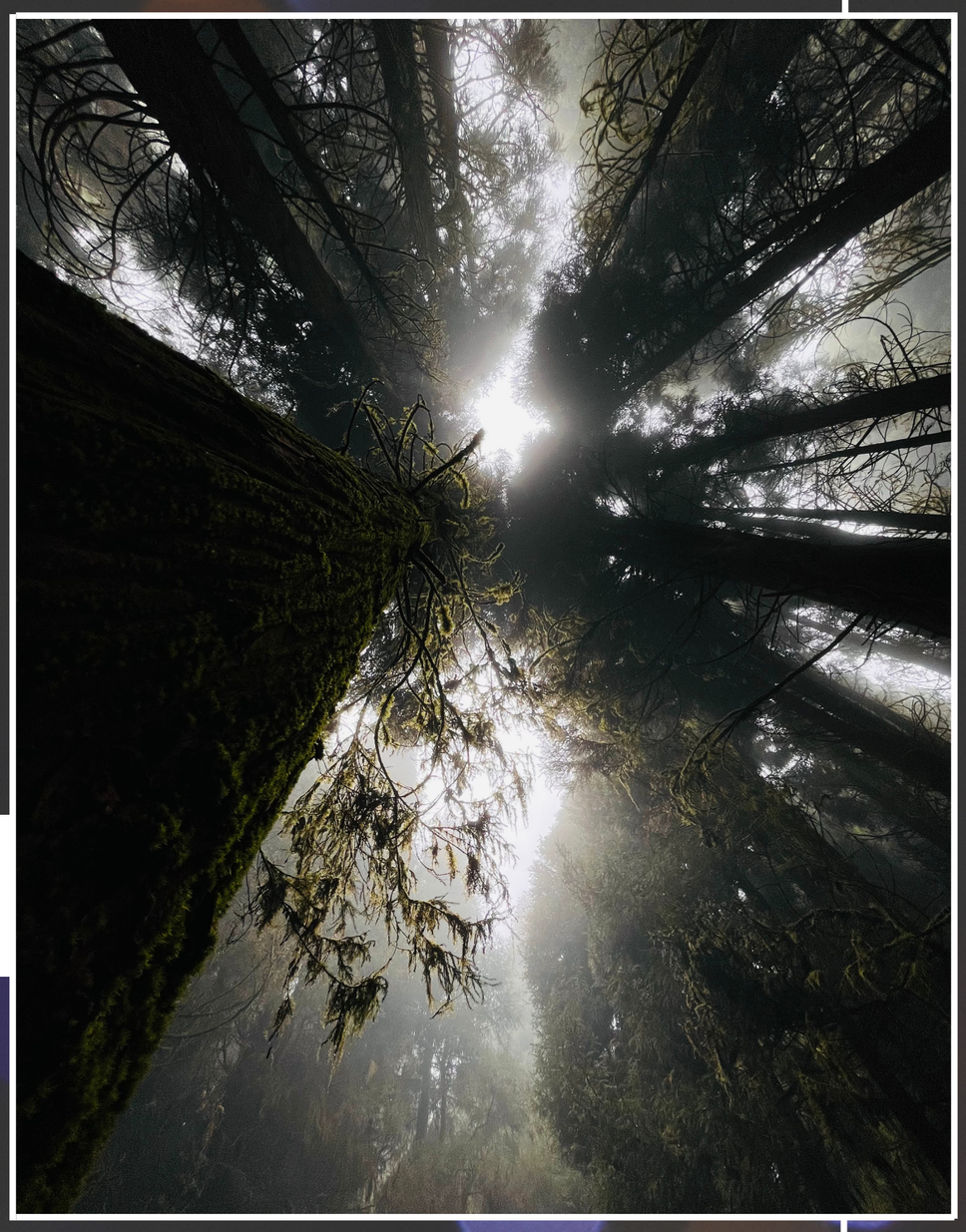
Souryadip Giri
3rd Year



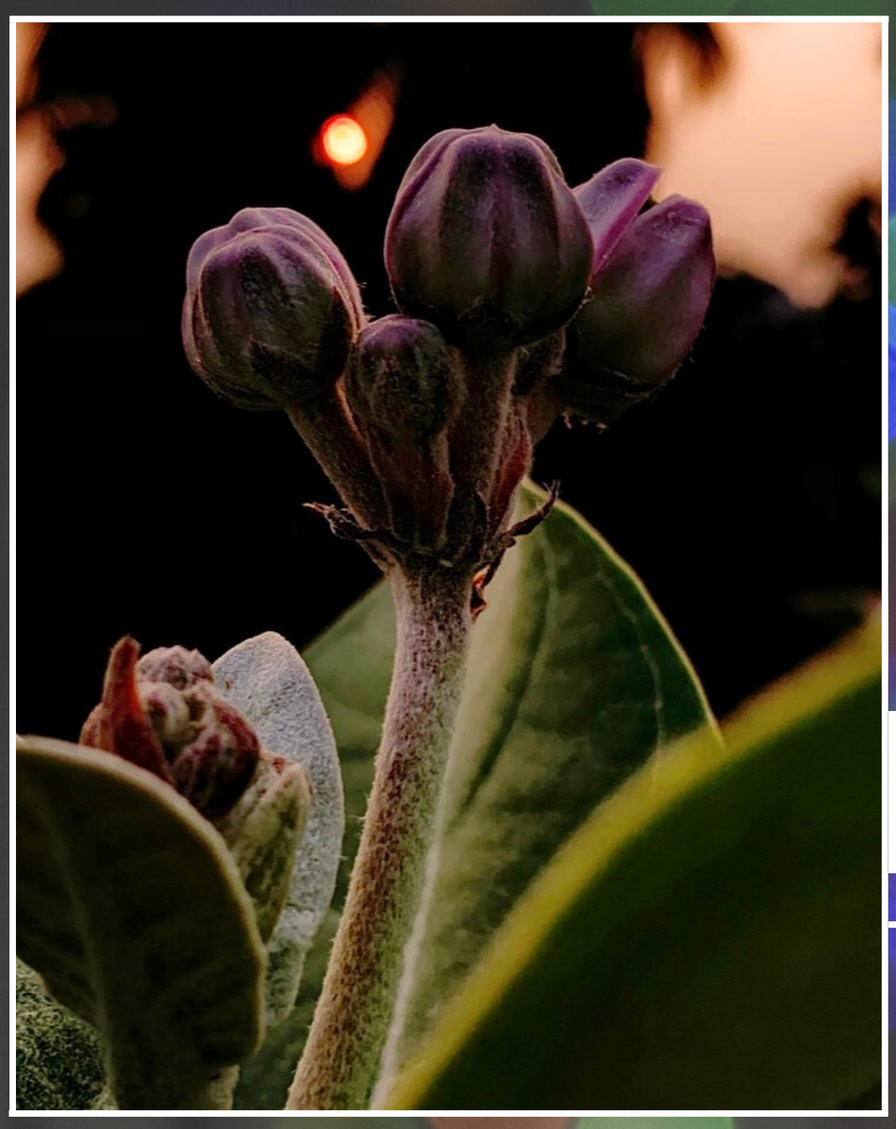
Swarnendu Pal
2nd Year



Praneet Kumar Ghosh
3rd Year



Arya Ghosh
3rd Year



Tanisha Haldar
2nd Year

ICC MEN'S CRICKET WORLD CUP INDIA 2023

CHAMPIONS ARE MADE, NOT BORN

MEN IN BLUES BRIMMING WITH POSSIBILITIES



“DHONI finishes off it in style,a magnificient strike into the crowd! Party starts in the dressing room. India lift the world cup after 28 years!” What a fairytale end it was for the crowd to watch the majestic six by MS DHONI who held his pose watching the ball with YUVRAJ at non striker end showing his celebration of victory.Isn’t it ?



ODI WORLD CUP 2023 is knocking at the door with lots of possibilities in itself for team INDIA. A full strength INDIAN team to host this edition of world cup.INDIA have announced their squad 3 weeks prior to the inauguration of the tournament. Skipper ROHIT SHARMA to lead this team with his co HARDIK PANDYA. SHUBMAN GILL and ISHAN KISHAN are two opening options with ROHIT where ISHAN has been selected as 2nd choice wicket keeping option too.INDIA named top order batters in form of VIRAT KOHLI,SHREYAS IYER and SURYAKUMAR YADAV. KL RAHUL is the 1st choice keeper batsman of the team. HARDIK,RAVINDRA JADEJA and AXAR PATEL has been named as the all round options where HARDIK can bring some pace bowling option with rest two lest arm off spinners.KULDEEP YADAV is the only spinner of the team.The 4 man PACE BATTERY included MOHAMMED SHAMI,MOHAMMED SIRAJ,SHARDUL THAKUR and JASPRIT BUMRAH.





SWOS ANALYSIS

- STRENGTH :This team has its biggest strength in terms of experience. VIRAT and ROHIT has played 250+ ODI matches individually and scored 22000 runs combinedly. HARDIK and JADEJA has been full time members of the team for a long with BUMRAH,SHAMI and KULDEEP.
The team has young talents also with blitzering current form. GILL, ISHAN has potentials to manage pressure situation and to do what the team needs.
- WEAKNESS :There is no off spin option available in the team.The middle order batters RAHUL and IYER have not been played for a long due to injury.
- OPPORTUNITIES :Suryakumar has not been in great touch in ODI format but we all know what he can do in white ball game. So he can grab this opportunity to perform in such a big platform.
- STRATEGY :Top 3 have to perform well.The pillar of INDIA’s batting ROHIT and VIRAT have to score daddy hundreds to make sure INDIA to score 300+ . SIRAJ,SHAMI and BUMRAH have to take responsibilities to take wickets in powerplay. Spinners have to do the rest in middle overs.



Team India will badly miss SHIKHAR DHAWAN's experience in this level. YUZI CHAHAL could have been an option. The 15 warriors selected for this 'BATTLE FOR THE AGES', have done their jobs many times in the past. Once again they have the responsibilities to achieve something bigger for the nation 1.4 Billion brothers and sisters will eagerly wait for something majestic, something extraordinary in 22 yards. It is time to forget the agony of 2015 and 2019 world cups. It is also time of getting an ICC trophy after 10 years. So, what are you waiting for !!! Let's cheer for team India and pray for team India. May the MEN IN BLUES make our TIRANGA shining at its best.

Parthib Sarkar
2nd Year



Cozy Scribbles

A SMASHED FLOWER ON THE SIDEWALK

Heart laden with gloom
footsteps laden with dubiety
I stomped across the painted zebra skin
and I ran over to the pavement.
I scurried past myriads of awaiting
lifeless niceties ready to find heavy purkes.
I scurried past coffee shops filled with
frontiers of heartbreaks and jerys.
I came to a sudden halt when a splash of lively
pink caught my eyes.
My stone slowed down and I neared it, a smashed
flower on the sidewalk.

Half the petals strewn about
with only a speck of life left, it lay
there still full of ease, drawing me in.
I crouched beside it, gazing at it longingly,
Hanging up the phone, he ran out of the door
with her voice still whispering ecstasy into his
heart.
He picked the most beautiful flower from the
branch and ran through the sidewalk longing to
meet her.



Blinded by his haste, he crashed into a tall man,
leaving away the flower to the pavement.
Looking at the man, his heart slipped and he ran
back
his history pulling him, hammering in his heart
were
the words “You don’t deserve love”
He walked away,
leaving behind a smashed flower on the sidewalk.
I crouched beside it, gazing at it longingly.

The blue Monday of the week had arrived.
His daughter, the naughty little girl was waiting.
He picked her favorite pink flower and walked,
walked with a huge smile on his face, forgetting
that he was late and she was slipping away.
He saw her from afar, leaving the café with her
favourite spider man and a frown on her little
face.
His heart fell along with life in his hand.
He walked away,
leaving behind a smashed flower on the sidewalk.
I crouched beside it, gazing at it longingly,
He inched closer, about to touch it, when his ears
picked up a buzzing.
A happy little bee flew around him, searching,
searching for a little divine scent.

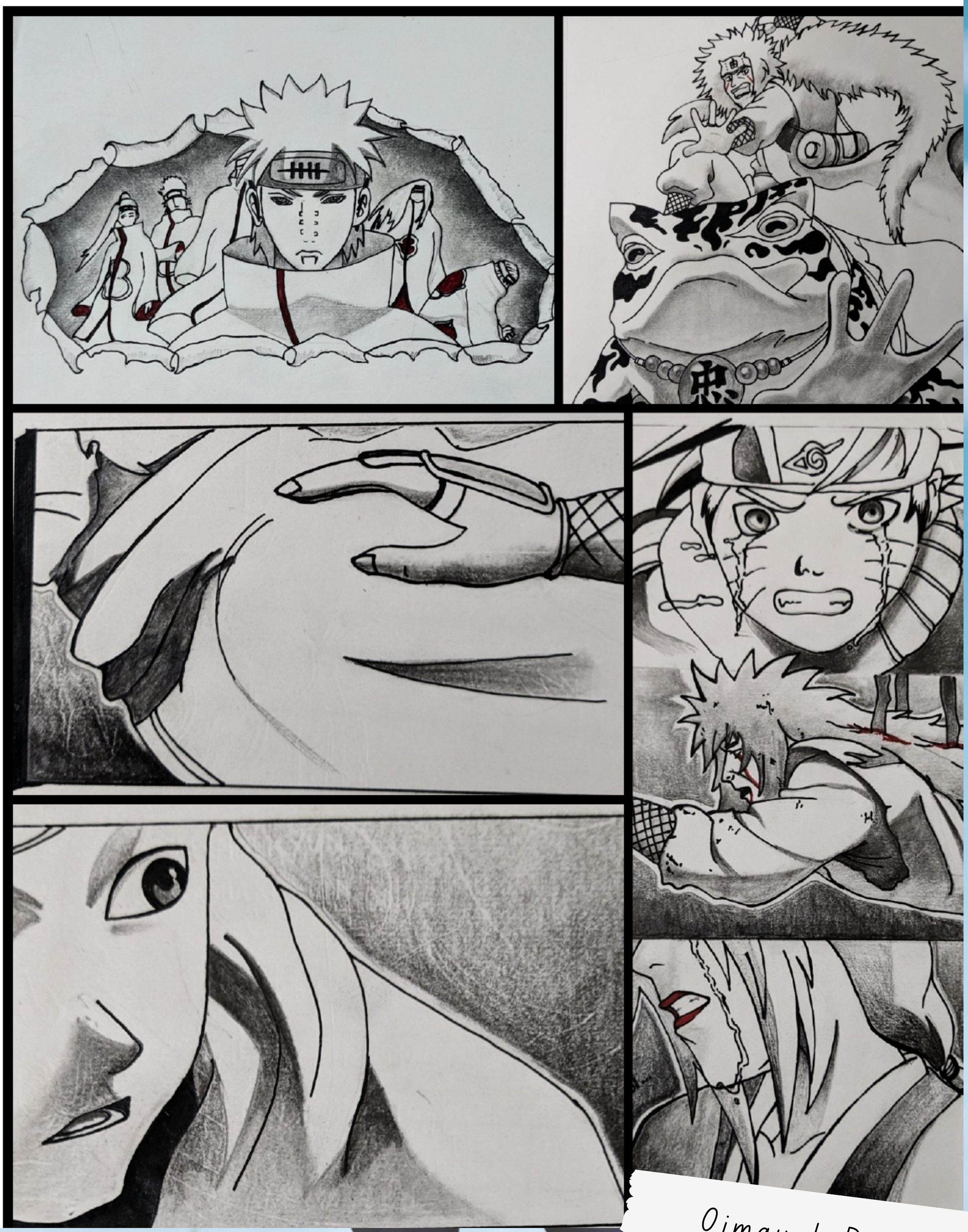


It slowly flew near the dying flower, sat near it
and buzzed away happily.
He stood up with his heart a smidge lighter,
as an unknown hope creeped up,
with a slight smile, he turned back, gazed at the
duo a final time before he walked away,
leaving behind a smashed flower on the sidewalk.

Kinjal Pal
2nd year



Sketchy Scribble



Oimayak Panja
3rd Year



Kiran Kumar Mondal
3rd Year



Nandanik Shome

3rd Year

জয়
মা

PUJO
এবং
Bangali



TRINAYANI AJNA

As I submit myself in veneration to you,
I join my hands and my free mind can view:
Your left represents ‘desire’ and your right
‘action’,
But your centre is what is the real attraction.

That fire of knowledge that burns so bright
Is the ability to see things beyond our might.
Connecting us with our intuition and
heightening our perception
It illuminates our path of purpose, wisdom
and direction.

The gateway to my consciousness is finally
open
And I, now bold, will take this small token,
As I manifest the knowledge deep within me
My tiny soul ‘dhunuchi’ dances in glee.

Prof. Sarmistha Sinha

শারদীয়া

শরৎ এসে গেছে। নীল আকাশের সাদা পাল তোলা মেঘ জানান দিচ্ছে ঊমার আগমনী বার্তার। কাশফুলের দোলা আর শিউলি ফুলের সুগন্ধে চারিদিক ভরে উঠেছে। আমরা বাঙালিরা মনে করি এই সময় চার দিনের জন্য ঊমা বাপের বাড়িতে আসে। ঊমার এই আগমনকে অভ্যর্থনা জানাবার জন্য সবাই মেতে উঠি। চারিদিকে সাজো সাজো রব। এবার মা দুর্গা আসছেন ঘোটকে চড়ে। যার ফল নাকি খুবই খারাপ। কিন্তু আমরা এসব মনেই রাখি না। আমাদের যাবতীয় দুঃখ–কষ্ট যন্ত্রণাকে দূরে সরিয়ে রেখে এই চার দিন আমরা উৎসবের আনন্দে মেতে উঠি। সাধ্যমত নতুন জামা কাপড় পরে আমরা পুজোয় অংশগ্রহণ করি। যাদের জামা কাপড় কেনার ক্ষমতা নেই তাদের সাহায্য করে আমরা এই আনন্দটাকে সবার সাথে ভাগ করে নিতে চাই। যারা কর্মসূত্রে প্রবাসে থাকে বা পড়াশোনার জন্য বাইরে থাকে তারাও এই সময়ে নিজের বাড়িতে ফিরে আসে। চারিদিকে উৎসবের আমেজ তৈরি হয়। মা দুর্গার গমনও ঘোটকে। আমরা মাকে প্রার্থনা জানাই–

মঙ্গলময়ী ঊমা
মর্ত্যলোকে আবির্ভূত হয়ে
দুষ্টরে করো দমন
কোরোনা তাদের ক্ষমা।

অশুভ শক্তি যত
বিনাশ করো নির্বিবাদে
ধন্য হোক বঙ্গভূমি
মাগো তোমার আশীর্বাদে।

শুনতে কি পাচ্ছো
দুর্গতদের হাহাকার
জেগে ওঠো তুমি
করো এর প্রতিকার।

তুমি তো দুর্গতিনাশিনী
শক্তিরূপেণ নারী,
তোমার অভয়দানে যেন
আমরা এগিয়ে যেতে পারি।

Aishanee Bhattacharya
2nd Year

ইতিহাসের আলোয় দেবী দুর্গা
"বাজলো তোমার আলোর বেণু"

শরৎ ঋতুর প্রাক্কালে কাশফুলের নির্যাস এবং পুঞ্জিভূত মেঘের মধ্য দিয়ে সূর্যের আলো ঘোষিত করে মর্ত্যে দেবী দুর্গার পদার্পণের পুণ্যতিথি । মহালয়ার দিন দেবীর চক্ষুদান করে দেবী পক্ষের সূচনার মাধ্যমেই শুরু হয়ে যায় নিঃসন্দেহে বাঙালির শ্রেষ্ঠ উৎসব দুর্গাপূজা। দেবীর আদ্যোপান্ত ইতিহাস নিয়ে তর্ক–বিতর্ক থাকলেও, মহালয়ায় মহিষাসুর–মর্দিনীতে আমরা দেখতে পাই ব্রহ্মার বরে অবধ্য মহিষাসুরকে বধ করতেই সৃষ্টি হয় নারী শক্তির মূর্ত প্রতীক দেবী দুর্গার। দেবীর এই মহিষাসুর–মর্দিনী রূপের কথা বর্ণিত হয়েছে মার্কন্ডেয় পুরাণে। তবে ঊমার অন্যান্য রূপের ব্যাখ্যাও রয়েছে অনেক পুরাণে। ইতিহাসের পাতা ঘেঁটে সেই রূপগুলির কথাই জানাতে চলেছি এই স্বল্প বিশ্লেষণ এর মাধ্যমে।

স্কন্দপুরাণ মতে বলা হয়েছে অতি দুর্গম দুর্গদৈত্যকে বধ করে দেবী পরিচিত হন দুর্গা নামে। দেবী ভক্তকুলকে দুর্গতি বিনাশ করে রক্ষা করেন বলেই দেবীর আরেক নাম দুর্গতিনাশিনী। ব্রহ্মবৈবর্ত্ত্য পুরাণেও দেবী দুর্গার দুর্গতিনাশিনী তবে সেখানে তিনি নারায়ণী। শ্রী শ্রী চন্ডী মতে দেবী স্বয়ং বলেছেন দুর্গম নামক অসুরকে বধ করে তিনি দুর্গা নামে খ্যাত হবেন। দেবী পুরানে আবার জগতমাতাকে ব্যাখ্যা করা হয়েছে দুর্গের অধিষ্ঠাত্রী দেবী দুর্গেশ্বরী রূপে। কোনোপনিষদ প্রথম ব্যক্ত করে দেবীর 'ঊমা' রূপ। ঊমা সেখানে পর্বত হিমোবতের কন্যা হৈমবতী। পদ্মপুরাণে বর্ণিত আছে দেবী রাত্রির প্রভাবে তার গায়ের রং কালো হয়ে যায়। প্রাচীন তৈত্তীরিয় আরণ্যকেও মেশকন্যা পার্বতীর উল্লেখ রয়েছে। দেবী দুর্গার উৎস নিয়ে বেদ এ কোনো উল্লেখ নেই কারণ দেবী বৈদিক দেবী নয়। মাতৃতান্ত্রিক অনার্য সভ্যতায় ই দেবীর পূজা শুরু হয়েছে প্রথম।

সভ্যতার প্রাক্কালে অরণ্যচারী মানুষ বনদেবীর পূজা শুরু করে। শস্য দেবীর পূজা শুরু করেছিল সেই যুগের মানুষ, যার নাম রাখা হয় 'শাকম্বরী'।

দুর্গা পূজার সময় বর্তমানে নবপত্রিকা স্নান করানো হয়। কলা ,কচু, হলুদ ,জয়ন্তী,ডালিম , বেল , অশোক , মান কচু ও ধান মিলে সৃষ্টি করেছে নবদূর্গার রূপক নবপত্রিকা। এই বিশ্লেষণ আমাদের কৃষি প্রধান মাতৃভূমিকে প্রতিফলিত করে। কৃষি নির্ভর এই সভ্যতার উর্বরাশক্তির পূজাকে চিহ্নিত করে সিন্ধু সভ্যতায় চল হওয়া কুমারী পূজা।

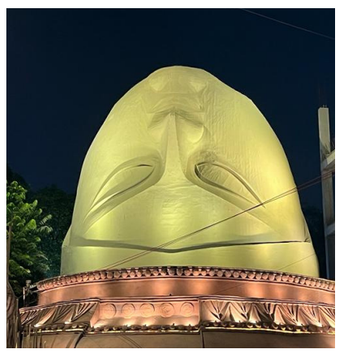
দেবীর বাহন সিংহ সহ ইঁদুর , পেঁচা, হাঁস , বাঘ অথবা ময়ূরও প্রাচীন সভ্যতার এক অবিচ্ছেদ্য অংশ। আদিমকালে গোষ্ঠীদ্বন্দ্বের ফলস্বরূপ রূপকারিত হয় দেবীর বাহন পশুরাজের জয় মহিষের বিরুদ্ধে। সমস্ত গল্প ইতিহাস ও পুঁথিগত আচার সমাচারের মাধ্যমে বর্তমানে দেবীর পূজা পদ্ধতি আলাদা মাত্রা পেয়েছে। যাই হোক প্রতিবারের মতো দেবীর মর্ত্যে পা দেওয়ার সময় আসন্ন। ঘরে ঘরে মায়ের আশীষ বর্ষিত হোক। ধরিত্রী হয়ে উঠুক প্রাণবন্ত সমস্ত দুঃখ বেদনার বিনাশ ঘটুক এই শারদীয়ায়। শারদীয়ার অগ্রিম প্রীতি ও শুভেচ্ছা সকলকে।

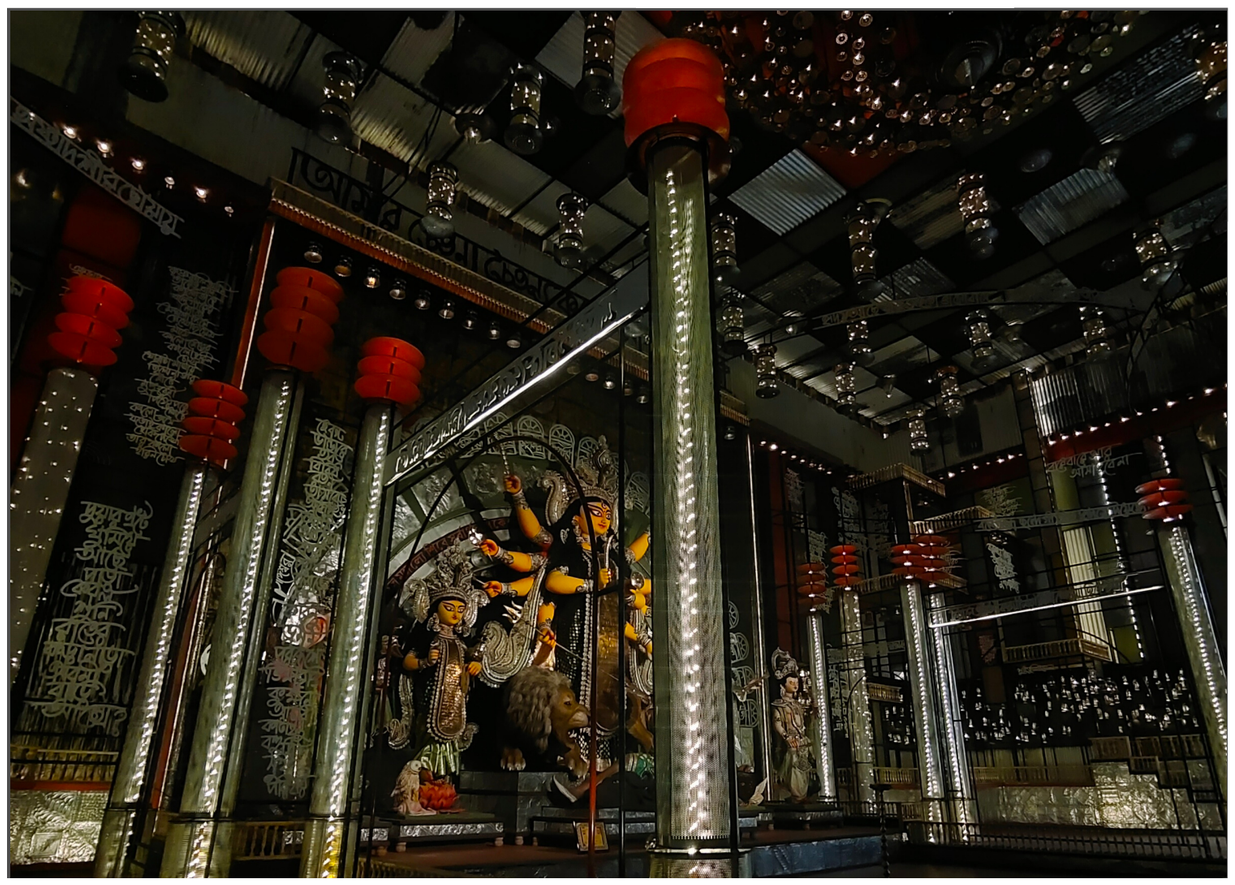
Parthib Sarkar
2nd Year

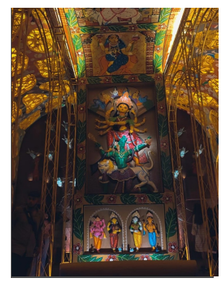
Clicks



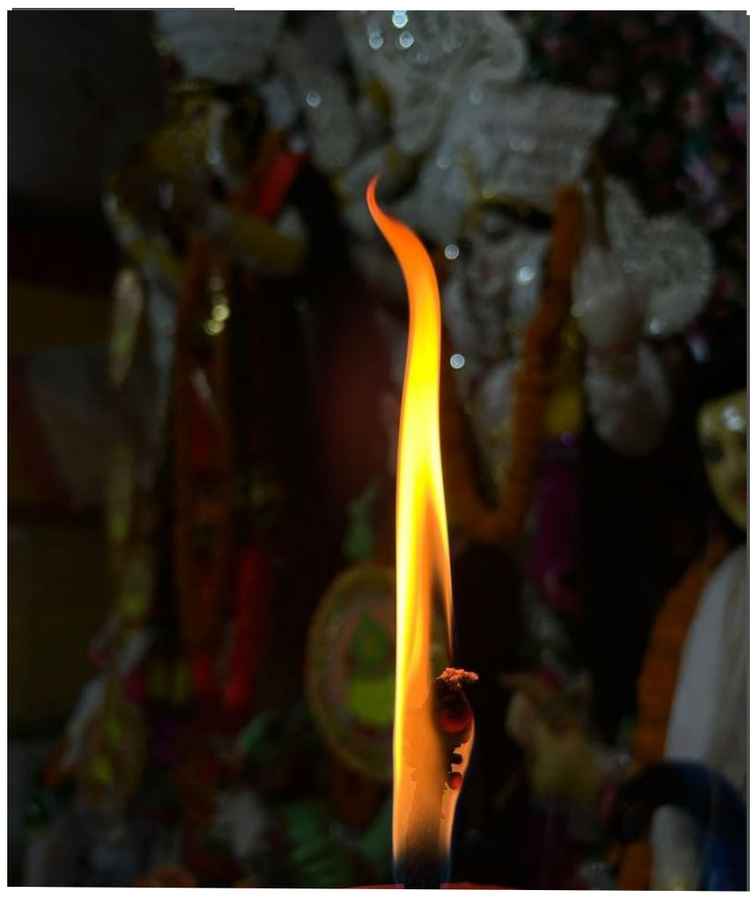






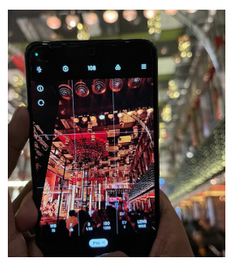


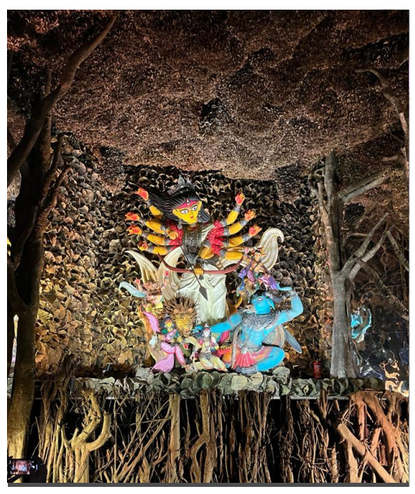


















EE

REWINDS

Ankit Chatterjee
Senior Associate | PwC India
IIT Delhi Gold Medalist



Greetings, I am Ankit Chatterjee, and I'm delighted to share my remarkable journey through the corridors of Heritage Institute of Technology, Kolkata (HITK) and subsequently, my transformative experience at the prestigious Indian Institute of Technology Delhi (IIT Delhi).

My advice to my juniors at HITK is this: Embrace every opportunity, challenge yourself, and never underestimate your potential. Your time at HITK is a stepping stone to greater horizons, and with dedication and determination, you can achieve the extraordinary. Your journey will be unique, and the lessons learned here will stay with you throughout your life. So, make the most of your time at HITK, and let it be a springboard to a future filled with success and fulfillment.

Anindita Dutta
IIM Raipur PGP'25 (2021 Passout)



Hello,

When I joined HITK, the Electrical Department was famous for its unity across all years. Our seniors instilled that bond among us, and it is still prevalent. There is no department with cooler faculty and more exciting peer dynamics. 4 years will pass in a blink, and irrespective of your fears and apprehensions, you all would be doing exceptionally well in a few years' time. So don't fret and just experience every opportunity that EE at HITK has to offer. This is going to be the best time of your life, and your present cohort will be your future family.

You all are Electrical Engineers from HITK, you are gonna succeed anyway. Just dont miss out on having fun and making memories.

With truckload of best wishes and nostalgia,

Anindita Dutta

Anik Ghosh
University of Michigan



My journey from Heritage Institute of Technology's Electrical Department to the University of Michigan's Electrical and Computer Engineering Department was propelled by my teachers' unwavering support. Their guidance was pivotal in securing my place in a Public Ivy. Both my teachers and my immediate seniors were instrumental in the feat that I was able to achieve.

To my juniors, I offer a humble reminder that your potential is limitless, and with determination, you can achieve anything. Your future is in your hands; utilize the opportunities available to excel. Our Alumni network is very strong and very diverse. Hence, be it engineering or entrepreneurship you will always have guidance in every field if asked the right question.

Best Regards,
Anik Ghosh,
Batch of EE 2023.
(anikg@umich.edu)

PS: For guidance on US graduate school admissions, I am just an email away.

Tathagata Roy
IIT MADRAS

Hello Folks,

I extend a heartfelt thank you to all of you who have taken the time to read this blog. Let's embark on a brief journey through my B.Tech adventure at HITK, formally known as The Heritage Institute of Technology, Kolkata. My journey through HITK has been nothing short of a transformative experience. It is here that I discovered my passion, honed my skills, and forged lifelong connections. The support and encouragement I received from my peers, seniors, and teachers were the pillars of my success.

I am excited to continue this new chapter of my academic journey at IIT Madras, and I am grateful for all the experiences that have brought me here. As I move forward, I carry with me the lessons, memories, and relationships formed during my time at HITK.

Thank you for being a part of my journey, and I look forward to sharing more of my experiences with you in the future.

Warm regards,
Tathagata Roy





Sanket Basu
Deputy Manager
NTPC Ltd

My journey at Heritage Institute of Technology is a lifetime memory. I was part of the first batch of Electrical Engineering Department. I was very much skeptical when I first stepped inside the CME building on the day of induction. But believe me the time I have spent there is cherishable and worth every moment. HITK has reshaped my personality during my stay there and has gifted me with a different outlook on life.
In brief, HITK gifted me lot more than I had expected. I have developed lifelong bonds with some of the best people, both friends and teachers, I have ever met. I represented HITK Football Team , as a left back , for four years. Fetching good grades was common for all , but very few were lucky enough to win trophies and tournaments for college. I still remember the day when our department won the Inter Department Football Tournament under my captaincy. Those moments will be everlasting part of me.

But attention buddies, all of the aforesaid statements would not have mattered to me if I had failed to carry out my primary responsibility. Whoever says that Engineering is easy is a fool. At whatever position today I am my department has played a immense role in that. I never imagined that I will ever secure a Gate Air of 79, but I did. All you need is to think differently from others.
Study hard , party hard and make the best of memories while you are at Heritage. These Four Years of life will payback to you, depending on how you utilise the time frame. In any need ,I am a just one call away.

Sanket Basu
Deputy Manager
NTPC Ltd.

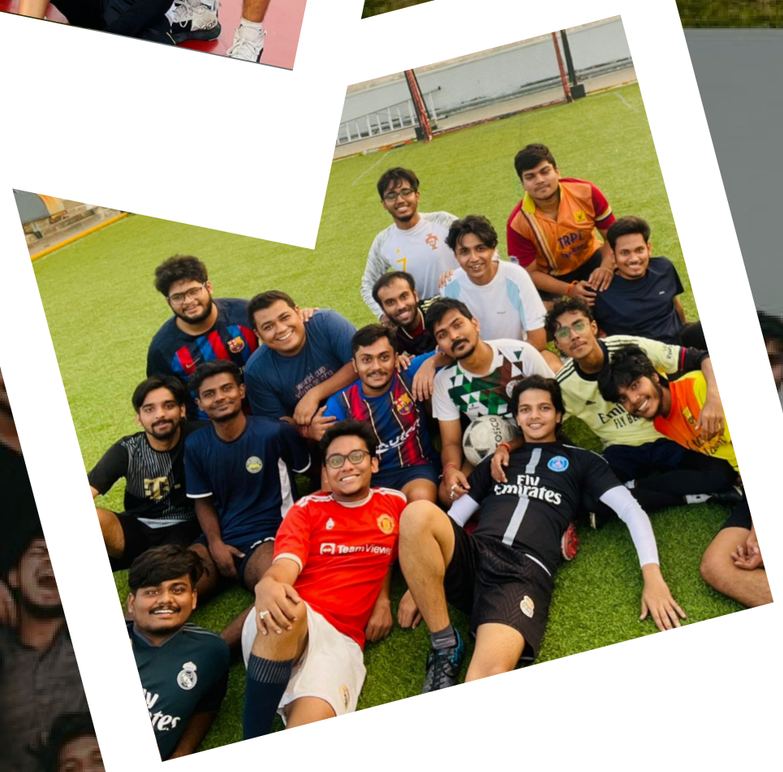
MYSTIC

MOMENTS

MOMENTS BECOMING MEMORIES









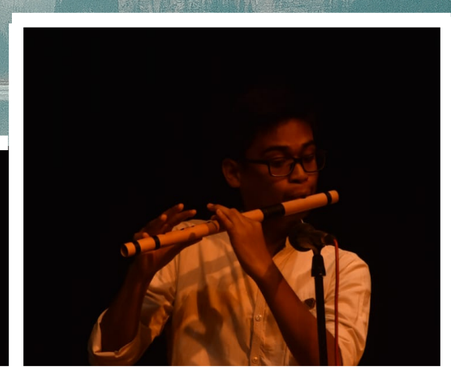






Teachers' Day Celebration 2023











Odyssey'23







HackHeritage 23

On the 22nd of September, our team, **TrashCanGang**, embarked on an exhilarating journey at HackHeritage'23, a hackathon that brought together 90 teams for a 24-hour creative marathon. For most of us, it was our first time participating in such an event, and we had clear goals in mind: to have fun, to learn, and to win.

Our Creation: We built a remarkable CNN-based image classification algorithm capable of discerning implicit properties of terrain, such as slipperiness, rockiness, or grassiness. This project delved into the genre of machine learning, and when tested, it displayed really high accuracy

The event culminated in final presentation, resulting in the selection of the top 30 teams.

Sports Week' 23



















A short message from Football team captain ~

Gave everything till the last minute for electrical.

-Shiva Nandi



Sports Week' 23

VOLLEYBALL RUNNERS UP



THE TEAM



THE MYSTICAL MOMENT

THANK YOU

Team

SPARK

SPARK HITK

@hitkeespark

ee_spark_hitk