# THE MIT COMMUNIQUE


*The Techno-Cultural-Literary E-Magazine of Mallabhum Institute of Technology*

***Published by***
***Mallabhum Institute of Technology***

***First Edition: March, 2024***

# *Dedicated to*

## The Auspicious Soul

## And

## Immortal Memory

*Of*

# Sri Lakshmi Narayan Banerjee,

Whose Inspiration

Always Stands on Our Way Forward

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# Message from the Hon'ble Chairperson

I am pleased to learn that Mallabhum Institute of Technology has published an e-magazine on the occasion of the techno-cultural fest, Pulse – 2K24. The magazine possesses poems, essays, scholarly articles and so on. Hope, the magazine will satisfy the intellectual hunger of the readers. I wish every success of the e-magazine.

**Mrs. Sampa Banerjee**

*Chairperson,*

*Mallabhum Institute of Technology*

# Message from the Hon'ble Executive Director

Mallabhum Institute of Technology always promotes co-curricular and extra-curricular activities, simultaneously with academic exercises. The Institute always gives scope to the students to prove their excellence in multi-faceted roles and responsibilities. The publication of the e-magazine is the result of this endeavour. If the magazine serves its desired purpose, our efforts will be fulfilled. I convey best wishes for the success of the e-magazine.

**Er. Subrata Banerjee**

*Executive Director,*

*Mallabhum Institute of Technology*

# Message from the Hon'ble Advisor, MIT

I'm happy to note that the annual techno-cultural fest, Pulse -2K24 is back again in the heart of MIT after several years' pause in the wake of covid – 19 pandemic. The new attraction of this year's festival is the publication of an e-magazine. Both the educator and educating communities have enthusiastically submitted their creative writings which have been published in this book. As the magazine has been prepared and published within a short span of time, there may be shortcomings; but I appeal to the readers to evaluate this work of art with openness of mind and soul. I wish success of this e-magazine.

**Prof. (Dr.) A. K. Mukhopadhyay**

*Advisor,*

*Mallabhum Institute of Technology*

# Message from the Hon'ble Principal, MIT

Annual Techno-cultural fest, Pulse – 2K24 is a much-awaited event of the MIT family for which all MITians wait. This 'greatest show of MIT' enriches the students both technically and culturally. In this year, the addendum, they are getting is the publication of e-magazine. The e-magazine is going to enrich the literary skills of the students. I congratulate all the young students and teachers, whose creative works have been published in this e-magazine. I wish all success of the document.

**Prof. (Dr.) Manab K. Das**

*Principal,*

*Mallabhum Institute of Technology*

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# Contents

# The Editorial

The vibrancy of creativity has the potential to touch every heart irrespective of class, caste and creed. Young ones, specially teenagers desire to delve deep into the well of creativity to fetch any form of writing which includes poetry, prose, essays, paintings and so on. The imaginative power of youth is so strong that they have capacity to sail on the wings of their imaginations. MIT respects and honours this imaginative emotional flight of the youths; the inception of 'The MIT Communique' is the result this endeavour.

'The MIT Communique' has documented poems, technical essays, travel blogs, stories etc. in its abode which showcase the intellectual, imaginative and creative journey of both the educator and educating communities. The thirst of the readers of various segments may be quenched if they attempt to read this e-magazine as it houses writings of the said segments. The creative writings, published in this e-magazine may not be eligible to compete with the elite writers and litterateurs of the globe but the writings are rich in terms of emotional fervour and earnest effort.

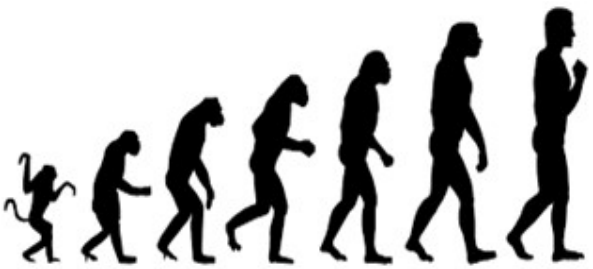
Within a short period of time, the e-magazine has witnessed the light of the world. So I appeal to the readers not to judge the book with any sophisticated theory as well as any pre-conceived notion; rather evaluate the work of art with openness of mind and soul. Hope, 'The MIT Communique' will lay an imprint in the readers minds with its literary and creative values.

**Dr. Soumitra Chakraborty**

**Executive Editor, The MIT Communique**

# Genetic Algorithms: Exploring Their Practical Applications

Dr. Mousumi Karmakar

## Introduction

Genetic algorithms originated from the studies of cellular automata, conducted by John Holland and his colleagues at the University of Michigan in 1962. Holland's book, published in 1975, is generally acknowledged as the beginning of the research of genetic algorithms.

Genetic algorithms (GAs) operate on a population of potential solutions applying Darwin's principle of survival of the fittest to produce (hopefully) better and better approximations to a solution. At each generation, a new set of approximations is created by the process of selecting individuals according to their level of fitness in the problem domain and breeding them together using operators borrowed from natural genetics. This process leads to the evolution of populations of individuals that are better suited to their environment than the individuals that they were created from, just as in natural adaptation.

Genetic Algorithms (GAs) are powerful optimization algorithms inspired by the principles of natural selection and evolution. They mimic the process of natural selection to solve complex optimization problems by iteratively evolving a population of candidate solutions.

GAs have found widespread applications across various domains, including engineering design, finance, scheduling, and machine learning. Their ability to efficiently explore large solution spaces, handle nonlinear and multimodal objective functions, and adapt to changing environments makes them valuable tools for solving challenging optimization problems.

In essence, Genetic Algorithms offer a versatile and effective approach to optimization, leveraging principles from nature to tackle complex real-world problems in diverse fields.

## Key Principles of GA

Genetic Algorithms (GAs) represent a powerful class of optimization algorithms inspired by the process of natural selection and evolution. These algorithms are designed to solve complex optimization problems by mimicking the principles of survival of the fittest observed in biological systems. At their core, GAs maintain a population of candidate solutions, each represented as a chromosome composed of genes encoding potential solutions. Through a process of selection, crossover, and mutation, the algorithm iteratively evolves these solutions over multiple generations to find optimal or near-optimal solutions to the given problem. Here are the basics of Genetic Algorithms:

Representation: GAs represent candidate solutions as strings of symbols called chromosomes. Chromosomes are composed of genes, which encode potential solutions to the optimization problem. The representation can vary depending on the problem domain, such as binary strings, real-valued vectors, permutations, or trees.

Initialization: The algorithm starts by creating an initial population of chromosomes, typically randomly generated. The population size is a parameter that can be adjusted based on the problem's complexity and computational resources.

Fitness Evaluation: Each chromosome in the population is evaluated using a fitness function, which quantifies how well the solution performs in solving the optimization problem. The fitness function guides the selection process by assigning higher fitness scores to better solutions.

Selection: A subset of chromosomes is selected from the current population to serve as parents for the next generation. Selection is based on the fitness values of chromosomes, with fitter individuals having a higher probability of being selected. Various selection methods, such as roulette wheel selection, tournament selection, or rank-based selection, can be used.

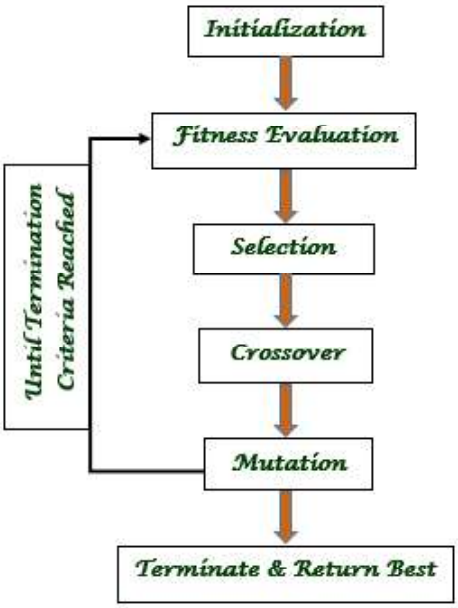
Crossover: Selected parent chromosomes undergo crossover, a genetic operator that combines genetic material from two parents to create offspring. During crossover, segments of genetic information (genes) are exchanged between parents to generate new candidate solutions. Common crossover techniques include single-point crossover, two-point crossover, and uniform crossover.

Mutation: After crossover, some offspring chromosomes may undergo mutation, a genetic operator that introduces random changes or perturbations to individual genes. Mutation helps maintain genetic diversity within the population and allows the exploration of new regions of the solution space. Mutation rates are typically low to avoid excessive disruption of good solutions.

Replacement: The offspring population replaces some individuals in the current population. This replacement strategy ensures that the population size remains constant across generations and that only the fittest individuals survive.

Termination Criteria: The algorithm continues to iterate through the selection, reproduction, and replacement steps until a termination criterion is met. Termination criteria may include reaching a maximum number of generations, finding a satisfactory solution quality, or exceeding a predefined computational budget.

By iteratively applying selection, crossover, and mutation operations, Genetic Algorithms efficiently explore the solution space and converge towards optimal or near-optimal solutions to a wide range of optimization problems. They offer a versatile and adaptive approach to optimization, capable of handling complex, nonlinear, and multimodal objective functions across various domains




## Real-world Applications

Engineering Design Optimization: GAs are widely used in engineering disciplines for design optimization of complex systems and components. They can optimize parameters such as shape, size, material properties, and configurations to meet performance objectives while satisfying design constraints.

Manufacturing & Process Optimization: GAs play a crucial role in optimizing manufacturing processes, production scheduling, and resource allocation. By optimizing production schedules, minimizing downtime, and maximizing efficiency, GAs help reduce costs and improve productivity in manufacturing industries such as automotive, aerospace, and semiconductor manufacturing.

Finance & Investment: In the financial sector, Genetic Algorithms are applied to portfolio optimization, risk management, and trading strategies. GAs can dynamically adjust investment portfolios based on market conditions, historical data, and risk preferences to maximize returns while minimizing risk. They are also used for credit scoring, fraud detection, and algorithmic trading.

Telecommunications & Networking: GAs are employed in telecommunications and networking for optimizing network routing, bandwidth allocation, and resource allocation. They can optimize network configurations to improve performance, minimize latency, and maximize throughput, leading to better quality of service and higher network efficiency.

Transportation & Logistics: GAs are used in transportation and logistics for route optimization, vehicle scheduling, and supply chain management. They can optimize delivery routes, vehicle assignments, and inventory levels to minimize transportation costs, reduce delivery times, and streamline logistics operations.

Healthcare & Medicine: GAs find applications in healthcare for medical image processing, treatment planning, and drug discovery. They can optimize treatment plans for radiation therapy, design personalized drug regimens, and analyze medical images to assist in diagnosis and treatment decisions.

Environmental Management: In environmental science and resource management, Genetic Algorithms are used for environmental modelling, ecosystem management, and renewable energy optimization. They can optimize land use planning, water resource allocation, and renewable energy systems to mitigate environmental impacts and promote sustainability.

Machine Learning & Data Learning: GAs are integrated with machine learning algorithms for feature selection, model optimization, and hyper-parameter tuning. They can optimize the performance of machine learning models by automatically selecting relevant features, optimizing model parameters, and improving generalization capabilities.

In summary, Genetic Algorithms have a wide range of practical applications in solving real-world problems across diverse domains, from engineering and finance to healthcare and environmental management. Their ability to efficiently explore large solution spaces, handle complex objective functions, and adapt to changing environments makes them indispensable tools for tackling challenging optimization problems in today's complex and dynamic world.

**Acquaintance with the Author : Associate Prof. & Head, ECE, MIT**

# নিরুপায়

খান্দেকার আনিসুর রহমান

অসহায় মানুষ করে না আন্দোলন
করে না কোনো লড়াই,
সে শুধু প্রাণে বাঁচতে চায়,
তাকে বাঁচানোর যে কেহ নাই।
হাসপাতালের বিছানায় বসে,
বারবার সে সহযোগিতা চায়
একটু ভালো হবার আশায়।
হাজার সহমর্মিতার ভিড়ে,
অর্থ ছাড়া তার কাছে,
আর নেই কোনো উপায়।
অসীম আতিমারির যুদ্ধে,
সে এক নিরুপায়।
অনেক পরে পাওয়া সহযোগিতায়,
সমস্যার সমাধান আর হয় না,
প্রাণ তাই আর সয় না।

**Acquaintance with the Author : Lecturer, CE, MIT**

# The Prospect of Core Engineers in the Era of Industry 5.0

**Suprakash Mondal**

**Introduction:**

As the world progresses into the era of Industry 5.0, characterized by increased connectivity, collaboration between humans and machines, and advanced automation, the role of core engineers—mechanical, electrical, and civil—becomes pivotal. This article delves into the profound implications of Industry 5.0 on each discipline and explores the evolving prospects for engineers in these fields.

**Mechanical Engineers in Industry 5.0:**

Mechanical engineers have traditionally been instrumental in designing, analyzing, and optimizing mechanical systems and processes across various industries. In Industry 5.0, their expertise takes on new dimensions as they integrate cutting-edge technologies into manufacturing and production environments.

*a. Advanced Robotics and Automation:* Mechanical engineers play a central role in the deployment of advanced robotics and automation solutions. They design robotic systems capable of collaborating with human workers, increasing productivity, and enhancing safety on the factory floor.

*b. Additive Manufacturing (3D Printing):* Industry 5.0 brings additive manufacturing to the forefront, enabling rapid prototyping, customized production, and on-demand manufacturing. Mechanical engineers lead the optimization of 3D printing processes, materials, and equipment to drive innovation and efficiency.

*c. Internet of Things (IoT) Integration:* With the proliferation of IoT devices in industrial settings, mechanical engineers facilitate the seamless integration of sensors, actuators, and

smart machines. They leverage data analytics to optimize performance, predict maintenance needs, and minimize downtime.

**Electrical Engineers in Industry 5.0:**

Electrical engineers are indispensable in the development, implementation, and maintenance of electrical systems, control systems, and power infrastructure. In the era of Industry 5.0, their role expands to encompass the integration of renewable energy sources, smart grids, and IoT-enabled devices.

*a. Smart Grids and Renewable Energy:* Electrical engineers lead the transition towards sustainable energy solutions by designing and optimizing smart grids that integrate renewable energy sources such as solar, wind, and hydroelectric power. They develop advanced monitoring and control systems to optimize energy distribution and consumption.

*b. IoT-enabled Systems:* In Industry 5.0, electrical engineers leverage IoT technology to create interconnected systems that monitor and manage energy usage, optimize resource allocation, and enhance operational efficiency. They design IoT-enabled devices and networks that enable real-time data collection, analysis, and decision-making.

*c. Automation and Control Systems:* With the emphasis on human-machine collaboration, electrical engineers design sophisticated automation and control systems that enable seamless interaction between humans and machines. They develop algorithms, software, and hardware solutions that enhance process automation, reduce errors, and improve overall system reliability.

**Civil Engineers in Industry 5.0:**

Civil engineers are responsible for designing, constructing, and maintaining the infrastructure that supports modern society. In Industry 5.0, they embrace digital technologies and sustainable practices to address emerging challenges and opportunities in infrastructure development.

*a. Building Information Modeling (BIM):* Civil engineers leverage BIM technology to create digital representations of buildings, bridges, and infrastructure projects. BIM enables collaborative design, simulation, and analysis, leading to improved project coordination, cost efficiency, and quality control.

*b. Smart Infrastructure and Urban Planning:* Industry 5.0 drives the development of smart cities and infrastructure projects that prioritize connectivity, sustainability, and resilience. Civil engineers integrate sensor networks, IoT devices, and data analytics to create intelligent infrastructure systems that enhance safety, efficiency, and quality of life.

*c. Environmental Sustainability:* With growing concerns about climate change and environmental degradation, civil engineers play a vital role in promoting sustainable infrastructure practices. They design green buildings, implement renewable energy solutions, and incorporate nature-based solutions into urban planning to mitigate environmental impacts and enhance ecological resilience.

**Conclusion:**

As Industry 5.0 unfolds, the demand for skilled engineers—mechanical, electrical, and civil—continues to grow, driven by the need for innovation, sustainability, and efficiency across diverse sectors. By embracing emerging technologies, interdisciplinary collaboration, and a commitment to lifelong learning, core engineers can seize the opportunities presented by Industry 5.0 to shape a more connected, resilient, and sustainable future for generations to come.

**Acquaintance with the Author : Assistant Prof. , ME, MIT**

# Study

**Rahul Batabyal**

**Study is a way to achieve success**

**Study is a way solving complex problems.**

**Study is important for our life**

**By reading all unknown information we can believe.**

**For study we can serve people by becoming doctors**

**We can increase sense of others by becoming masters.**

**By study we can brighten our country's face**

**You can do everything study build the confidence.**

**Our India moving forward by better education**

**By studying we must see our India in no. one position.**

**No one can compare with studies**

**Study is divine power that everyone has**

**So, don't be fool and see the world is beautiful**

**With our own eyes.**

**Acquaintance with the Author : 1st Year Student**

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# কাশ্মীর স্ক্যাম

অপরূপা দত্ত

কাশ্মীর কথাটা শুনলেই যে কথাটি মাথায় আসে স্বর্গ বা ভূস্বর্গ যার রূপের কোন তুলনা নেই সেই ভূস্বর্গ নিয়েই আজ আমার কিছু অভিজ্ঞতা লিখলাম।
অপূর্ব টিউলিপ ফুলে সজ্জিত টিউলিপ গার্ডেনের রূপ মনোমুগ্ধকর আর আপেল ফুলের গন্ধ যেন পৃথিবীর সমস্ত সুগন্ধির থেকে আলাদা আর বরফের চাদরে মোড়া পাহাড় যার রূপের যতই বর্ণনা করি কম হয়ে যায়। সোনামার্গ, গুলমার্গ এবং পেয়ালগাও এইগুলি কাশ্মীরের মেইন এট্রাকশন।

কাশ্মীর যতটাই মনমুগ্ধকর ততটাই ভয়ানক ছিল আমার কাছে। ডে ওয়ানের অভিজ্ঞতা ছিল লালচকে অত্যন্ত খারাপ লোকজন যেন ভয়ানক কোন কেনাকাটার বার্গেনিং করাটাও যেন ভয়ানক একজন সেলার আমায় প্রশ্ন করে আচ্ছা বলুন তো নিউজ চ্যানেলের যে কাশ্মীরিয়ান্স নিয়ে এত বাজে মন্তব্য করে তা কি ঠিক আমি কিছু উত্তর না করায় সে আমাকে বাই ফোর্স বলানোর চেষ্টা করে না ঠিক নয়। কাশ্মীরে লাল চকের একটি হোটেলে আমাদের রাত্রি বাস সেই হোটেলে রাত্রি বারোটার পর কলিডোরে কেউ হাঁটাচলা করছে সাথে রুমের ব্যালকনিতে কারোর প্রেসেন্সও অনুভব করেছি সেই রাত্রে আমরা কেউ ঘুমোতে পারিনি পরের দিন সকাল হতেই আমরা হোটেল খোঁজার জন্য রওনা দিলাম। হোটেল পেলাম ডাল লেকের কাছে অত্যন্ত মনোরম পরিবেশে।

তারপর ডে টুতে সেই ভয়ানক স্ক্যাম আমাদের সাথে আমরা ফুল ফ্যামিলির জন্য একটি ট্রাভেলার বুক করেছিলাম অমৃতসর থেকে, সেই গাড়ির ড্রাইভার ছিল মেন কালপ্রিট যেদিন আমরা গুলমার্গ ভ্রমণের জন্য বেরোয় সেদিন ডেস্টিনেশনে পৌঁছানোর ১০-১৫ কিলোমিটার আগে উনি আমাদের বলেন গুলমার্গ ঘুরতে গেলে নাকি আমাদের ট্যুর গাইড নিতে হবে সেই আমাদের বরফে হাঁটার জন্য জুতোও দেবে সাথে পুরো গুলমার্গ আমাদের ঘুরিয়ে দেখাবে তার জন্য নাকি চার্জ নেবে জনপ্রতি দুই হাজার টাকা করে। তো আমরা অনেকেই ছিলাম গাড়িতে তার জন্য একটা হিউজ অ্যামাউন্ট পেমেন্ট করতে হবে কিন্তু কাশ্মীরে যাওয়ার আগে যেটুকু আমরা ইনফরমেশন কালেক্ট করেছিলাম তাতে কোথাও জানতে পারিনি যে আমাদের গুলমার্গ যেতে হলে টুর গাইড নিতে হবে, তার জন্য আমরা কিছুতেই রাজি হলাম না ড্রাইভারের কথাতে। তারপর আমরা ওনাকে বললাম আপ জিত্না দূর ঘুমা শাকতে হে ওতনা দূর ঘুমাকার হাম লোগো কো হোটেলমে ছোড় দিজিয়ে কিছুটা দূর যাওয়ার পর দেখলাম একটি কাশ্মীরিয়ান ছেলে গাড়িটাকে হাত দেখালো ড্রাইভার গাড়িটি থামালো আমাকে বলল আপনি পিছনের সিটে চলে যান। তারপর দেখলাম ছেলেটিকে গাড়িতে তুলল। কাশ্মীরিয়ান ছেলেটি আমাদের ওনার কার্ড দেখালো বা আদার্স অনেক কথা বলতে লাগলো আমরা রাজি না হওয়ায় উনি আমাদের জোরাজুরি করলো। তারপর বলল আপনাদের সাথে কিন্তু খারাপ কিছু হতে পারে ড্রাইভারের সাথে ইশারায় কথা বলার পরে ড্রাইভার গাড়িটা বারবার একটি চৌকির রাস্তাতে ঘুরতে লাগল আমাদের সাথে দুটো বাচ্চা থাকায় ব্যাপারটা আমরা একটু ভয় পেলাম। তারপরও রাজি না হওয়ায় উনি গাড়ি যত এগিয়ে নিয়ে যেতে লাগলো কিছু দূর ছাড়াই একটি করে কাশ্মিরিয়ান ছেলে হাত দেখাচ্ছিলো আর ফোনে যেন কি ল্যাঙ্গুয়েজ, জানিনা উনি কথা বলছিলেন।তারপর ওই আমরা ১২০০-১৩০০ টাকায় পার হেড রাজি হলাম সাথে সাথে ক্যাশ আমাদের কাছ থেকে নিয়ে নিলেন ছেলেটি। একটি নির্জন রাস্তায় দেখি আগে একটি গাড়ি দাঁড়িয়ে আছে

ড্রাইভার আমাদের গাড়িটি থামালেনছেলেটি আমাদের বলল আপনারা গাড়ি থেকে নেমে ওই গাড়িতে গিয়ে বসেন সেই কথায় আমরা তো আরো ভয় পেলাম। তারপর নিজেদের মধ্যে আলোচনা করার পরে যখন ওই অন্য গাড়িটিতে গিয়ে বসবো তখন দেখি আরেকটি উইথ প্যাসেঞ্জার গাড়ি ওই জায়গাতে এসে দাঁড়ালো আমি ছুটে যায় তাদের কাছে, দেখি তারাও বাঙালি তাদের জিজ্ঞেস করি যে আপনাদের কি কোন টাকা লেগেছে গুলমার্গ ঘোরার জন্য উনারা বলেন না তখন আমি আমাদের পুরো এক্সপেরিয়েন্সটা শেয়ার করলাম কথা বলতে বলতেই কাশ্মীরিয়ান ছেলেটি এসে দাঁড়ালো আমায় বলে চালিয়ে চলিয়ে আপ ইহাসে চালিয়ে খুব হুজ্জুতি করছিল আমরা অন্য গাড়িটিতে এসে বসলাম তারপর ৭ থেকে ৮ কিলোমিটার রাইড করার পর গাড়িটি আবার সেই জায়গাতেই এসে দাঁড়ালো হয়ে গেলাম এভাবে বোকা। যাই হোক বেঁচে ছিলাম ওই ধূর্ত কাশ্মীরিয়ান টির কাছ থেকে এই ছিল আমার কাশ্মীর ভ্রমণের গুলমার গুন্ডামির একটি বাজে অভিজ্ঞতা এইরকম কাশ্মীরে আরো কয়েকবার ঠকেছি, তো তাই আমার কাছে ভালো অভিজ্ঞতা তো সেইরকম কিছুই ছিল না শেয়ার করার মত খারাপটাই ছিল বেশি যেটি সারা জীবন মনে রাখার মত।কাশ্মীর যতটাই রূপবতী কাশ্মীরিয়ান্সরা ততটাই গুণবতী তাদের এইরকম বাজে কাজকর্মের জন্য। অনেক ধন্যবাদ আমার লেখাটি পড়ার জন্য।

**Acquaintance with the Author : Assistant Prof., EE, MIT**

# Advancements in Battery Technologies of Electric Vehicle

**Subhajit Bhattacharyya**

The growing enthusiasm for electric vehicles (EVs) in India can be attributed to a compelling reason: the country is grappling with severe air pollution, with 14 of its cities ranking among the 20 most polluted globally. While pollution emanates from various sources, the COVID-19 lockdown offered a unique perspective. During this period, as conventional petrol and diesel vehicles were taken off the roads, those who ventured outside experienced a breath of fresh air after years of enduring polluted atmospheres. This observation underscores the potential of electric vehicles to contribute significantly to reducing air pollution and fostering a cleaner environment.

The internal combustion engine heavily relies on imported petrol and diesel, with a meager domestic production of not more than 10 percent of our consumption in India. This consistent reliance on imports significantly contributes to our escalating purchases, leading to a continuous outflow of foreign exchange. Consequently, it plays a crucial role in the depreciation of the Indian rupee compared to global currencies.

We aim to significantly reduce our substantial imports by transitioning to electric vehicles (EVs). Shifting to EVs allows us to leverage India's abundant electricity production, leading to a substantial reduction in imports. This serves as a pivotal motivation for our commitment to electric mobility. Furthermore, the transition to electric vehicles brings surprising revelations in terms of energy efficiency. Remarkably, electric vehicles prove to be four times more energy efficient compared to traditional petrol, diesel, or internal combustion engines. This unexpected revelation further strengthens our resolve to embrace electric mobility for its positive impact on energy efficiency and environmental sustainability.

The internal combustion engine typically operates with an efficiency ranging from 22 to 24 percent. In contrast, electric motors and controllers exhibit an initial efficiency of around 90 percent, marking a significant fourfold increase in energy efficiency. The global trend is increasingly shifting towards greater energy efficiency, emphasizing the importance of minimizing energy consumption and reducing waste. This shift is crucial not only for mitigating environmental impacts in local areas but also for preserving the well-being of the entire planet.

Whether we embrace it willingly or not, the era of internal combustion engines powered by petrol and diesel is inevitably coming to an end. The timeline for this shift may be subject to debate, but there's a clear trajectory towards the rise of electric vehicles (EVs). Beyond the environmental considerations, the transition to EVs brings forth a crucial advantage: the substantial reduction in moving parts. Traditional internal combustion engine (ICE) vehicles, fueled by petrol and diesel, are characterized by a vast number of intricate moving components.

In stark contrast, electric vehicles boast an incredibly streamlined design with significantly fewer moving parts—approximately 50 times less, to be precise. This inherent simplicity results in enhanced reliability.

Electric vehicles stand out as a superior choice from an environmental perspective, boasting higher efficiency and the advantage of not necessitating frequent replacements. Despite these merits, several obstacles impede their widespread adoption. The question arises: why haven't we embraced electric vehicles sooner, and why does progress seem slow?

The main challenge associated with transitioning to electric vehicles (EVs) revolves around the battery technology. In traditional petrol vehicles, the energy is stored in a petrol or diesel tank, and refueling involves filling up with the respective fuel. In contrast, electric vehicles rely on batteries as the energy container, where electrical energy is stored and charged. Replacing a petrol tank with a battery presents several issues. Firstly, electric batteries are significantly heavier than even fuel tanks. Additionally, they occupy a larger volume, and the cost involved is considerably higher. These factors contribute to the overall hesitancy and challenges associated with the widespread adoption of electric vehicles.

The commonly recognized unit of energy for most individuals is the Watt-hour. It's important to note that the Watt is the unit of power. When we use 1 Watt for duration of 1 hour, the resulting measurement is a Watt-hour. Essentially, the Watt-hour is a unit that quantifies energy. In our exploration, we will delve into understanding energy density, expressed in terms of Watt-hours. If you possess a battery with a weight of 20 kg, determining its energy capacity involves calculating the watt-hours it can provide. This is commonly expressed as the energy density of the battery, denoted in terms of watt-hours per kilogram (Wh/kg).

**The energy Density (MJ/kg) of a variety of different fuels**

| Fuel type | Reaction type | Energy Density(MJ/Kg) | Typical uses |
|---|---|---|---|
| Wood | Chemical | 16 | Cooking |
| Coal | Chemical | 25 | Power plants, Electricity generation |
| Ethanol | Chemical | 26.8 | Gasoline mixture, Alcohol, Chemical products |
| Diesel | Chemical | 45 | Diesel engines |
| Natural Gas | Chemical | 55 | Gasoline engines |
| Uranium-235 | Nuclear | 3900000 | Nuclear reactor electricity generation |

The prevailing battery technology employed in contemporary electric vehicles is the lithium-ion battery. This choice stems from significant advancements observed in the past decade, coinciding with the rise in popularity of electric vehicles. Notably, two key developments have shaped the dominance of lithium-ion batteries.

Firstly, there has been a consistent and noteworthy augmentation in the energy density of lithium-ion batteries. In 2011, the energy density stood at a mere 80 watt-hours per kilogram (Wh/kg). Presently, this figure has surged to approximately 300-310 Wh/kg. The trajectory of progress suggests a continuous increase in energy density. The pivotal question on the horizon is whether we can reach the milestone of 500 Wh/kg and, eventually, the ambitious target of 1000 Wh/kg.

Examining another crucial aspect, the reduction in the cost per kilowatt-hour is closely tied to advancements in watt-hour per kilogram efficiency. Specifically, in the context of cell pricing, the cost per kilowatt-hour has experienced a notable decline. Initially, when the energy density was at 80 watt-hours per kilogram, the cell price stood at $800 per kilowatt-hour. Presently, with an improved energy density of 300 watt-hours per kilogram, the cost has substantially dropped to $100 per kilowatt-hour.

**Energy Density vs Cell Price over the years**

| Year | Energy Density(Wh/Kg) | Cell price per Kwh |
|---|---|---|
| 2011 | 80 | $800 |
| 2015 | 140 | $275 |
| 2018 | 220 | $140 |
| 2020 | 310 | $110 |

This phenomenon can be attributed to various factors, with advancements in battery technology and increased production volumes playing significant roles. However, the primary driver of this cost reduction lies in the quantity of raw materials utilized. When considering a kilowatt-hour of energy, the improvement in energy density directly impacts the amount of material required. For instance, at an energy density of 80 watt-hours per kilogram, 12 kilograms of material were needed. As we've achieved a milestone of 300 watt-hours per kilogram, our material usage has significantly reduced to approximately 3 kilograms. This represents a remarkable decrease from the previous 12 kilograms. The key driver behind this reduction is the improvement in the watt-hour per kilogram ratio of the battery. Essentially, by enhancing the energy density, we have managed to bring down the material requirement by nearly fourfold.

It's crucial to note that the cost is predominantly influenced by the material used. Therefore, with a material reduction of almost four times, the cost is expected to decrease proportionately by a factor of four.

Henceforth, the cost aspect will cease to be a significant concern. As the watt-hour per kilogram metric advances, the efficiency of obtaining 1 kilowatt-hour or 50 kilowatt-hours diminishes, resulting in a reduction in weight. Furthermore, volume is closely linked to this improvement. As energy density increases, the battery dimensions decrease for a given range, leading to a decline in both battery weight and cost.

Today the batteries that are used are also called NMC or NCA these are two most commonly used nickel, manganese and cobalt is the use of these batteries or NCA nickel, cobalt and aluminum.

Our objective revolves around enhancing the watt-hour per kilogram ratio, indicating the drive to pack more energy into increasingly compact spaces. While this advancement is promising for efficiency, there's a critical concern related to safety. The higher energy density poses potential risks, akin to the concept of creating a miniature bomb if mishandled.

Balancing the pursuit of increased watt-hour per kilogram with safety considerations is imperative. The inherent risk associated with densely packed energy demands a strategic approach. A parallel can be drawn to the historical evolution of petrol usage. Several decades ago, petrol was considered hazardous, much like the current perception of high-energy-density batteries. However, over time, we have learned to harness and manage the inherent risks of petrol, exemplified by its commonplace usage today.

Understanding the dynamics of risk and energy density is essential. Just as we have successfully navigated the challenges posed by petrol, we must adapt and develop expertise in handling high-energy-density batteries. A crucial point to note is that the risks associated with petrol, often underestimated, are greater than those posed by modern batteries. It underscores the need for a comprehensive learning and adaptation process to ensure the safe utilization of high-energy-density solutions.

To illustrate, consider discussing the energy density of petrol. Upon investigating reputable sources, it becomes evident that petrol boasts an energy density of 12,500 watt-hours per kilogram. In comparison, the figure for electric vehicles is 300 watt-hours per kilogram, indicating a substantial difference of 40 times in favor of petrol. This stark contrast underscores the lightweight nature of petrol when stored in a vehicle's tank, granting it a significant advantage.

It is crucial to acknowledge the fourfold increase in energy efficiency inherent in electric vehicles. This implies that electric vehicles require only a quarter of the materials needed for traditional vehicles. While petrol maintains a 40-fold edge in energy density, the enhanced efficiency

narrows this gap to a factor of 10. Despite the apparent weight advantage of petrol, the superior efficiency of electric vehicles mitigates the material requirement considerably.

The weight of batteries is approximately 10 to 12 times greater than that of petrol for every kilometer traveled, considering the current energy density. Additionally, the size of batteries is about 5 to 6 times larger in comparison.

The Indian electric car sector is experiencing rapid expansion, presenting numerous opportunities for businesses operating within this domain. The increasing popularity of electric vehicles is closely tied to the escalating fuel prices. Furthermore, as awareness regarding sustainability and the long-term well-being of the planet continues to grow, the presence of EVs is set to increase substantially in the years ahead.

**Acquaintance with the Author : Assistant Prof. ECE, MIT**

# একজন বিস্মৃত বাঙালী অধ্যাপক তথা বিজ্ঞানীর রচনা থেকে পাওয়া আমার আত্ম উপলব্ধি

**JOY BISWAS**

একজন বাঙালী অধ্যাপক ও বিজ্ঞানী আচার্য "জগদীশ- চন্দ্র বসু" কে শ্রদ্ধা জানিয়ে তার হস্তলিখিত একটি রচনা যেটি জনপ্রিয় অব্যক্ত অন্ত্রে বিদ্যমান আছে, তাহা সকল ছাত্র ছাত্রীদের পাঠমুগ্ধ করেছে।

30 শে নভেম্বর 1859 থেকে 23 শে নভেম্বর 1937 পর্যন্ত শ্রীযুক্ত জগদীশ চন্দ্র বসু, যার আদি নিবাস ঢাকা, বিক্রমপুর এর রাড়িখাল, তিনি শ্রেষ্ঠ পদার্থবিদ ও জীববিজ্ঞানী রুপে নিজেকে প্রতিষ্ঠিত করতে পেরেছিলেন। তার পিতা ভগবানচন্দ্র যার প্রচেষ্টায় জগদীশচন্দ্র তার শিক্ষাজীবন অতিবাহিত করেছিলেন, কেম্‌ব্রিজ বিশ্ববিদ্যালয় থেকে BSC পাশ করে কলকাতা প্রেসিডেন্সি কলেজে পদার্থবিদ্যার অধ্যাপক পদে নিযুক্ত হন, লন্ডন বিশ্ববিদ্যালয় তাকে D.S.C উপাধি প্রদান করে। 1901 সালের 10 ই মে লন্ডনের রয়াল ইনস্টিটিউশনে। জড় ও জীবের সাড়ার বিষয়ে জগদীশচন্দ্র আলোচনা করেন, পদার্থ ও উদ্ভিদবিদ্যা বিজ্ঞানে মূল্যবান গবেষণা করেছিলেন, তিনি রবীন্দ্রনাথের অন্তরঙ্গ সুহৃদ ছিলেন, তার রচিত অব্যক্ত গ্রন্থে সৌন্দযচেতনা ও বিজ্ঞানচেতনার আশ্চর্য সমন্বয় ঘটেছে তিনি লিখেছেন। --

" মানুষ কেবল অদৃষ্টের দাস নহে, তাহারই মধ্যে এক শক্তি নিহিত আছে- যাহার দ্বারা সে বহির্জগৎ নিরপেক্ষ হইতে পারে । তাহারই ইচ্ছানুসারে বাহির ও ভিতরের প্রবেশদ্বার কখনো উদ্ঘাটিত,কখনো অবরুদ্ধ হইতে পারিবে। এইরুপে দৈহিক ও মানসিক দুর্বলতার উপর সে জয়ী হইবে। যে ক্ষীনবার্তা শুনিতে পায়নাই তাহা তাহার নিকট জাজ্জ্বল্যমান হইবে, অন্যপ্রকারে সে বাহিরের সর্ব বিভীষিকার অতীত হইবে, অন্তর রাজ্যে স্বেচ্ছাবলে সে বাহিরের ঝঞ্ঝার মধ্যেও অক্ষুদ্ধ রহিবে,"

দেখা যায়, আলোকররূপে যাহা বাহিরের শক্তি ছিল, গাছ তাহা গ্রহন করিয়া নিজস্ব করিয়া লইয়াছে, এবং বাহির হইতে সঞ্চিত শক্তি গাছ এখন ভিতরের শক্তিরূপে ধারন করিয়াছে। সুতরাং বাহির ও ভিতরের শক্তি প্রকৃতপক্ষে একই। তিনি আরোও লিখেছেন।-

"জন্মিবার সময় ক্ষুদ্র ও অসহায় হইয়া এই শক্তি সাগরে নিক্ষিপ্ত হইয়াছিলাম। তখন বাহিরের শক্তি ভিতরে প্রবেশ করিয়া আমার শরীর লালিত ও বর্ধিত করিয়াছে। মাতৃস্তন্যের সহিত স্নেহ, মায়া, মমতা অন্তরে প্রবেশ করিয়াছে এবং বন্ধুজনের প্রেমের দ্বারা জীবন উৎফুল্ল হইয়াছে। দুর্দিন ও বাহিরের আঘাতের ফলে ভিতরের শক্তি সঞ্চিত হইয়াছে এবং তাহারই বলে বাহিরের সহিত যুঝিতে সক্ষম হইয়াছি,"

- সমাপ্ত

**Acquaintance with the Author : CSE, 3rd Year, MIT**

# ভোর

(শিল্পা বস্যানি)

বছরগুলো পার হয়ে যাবে মাত্র,
যাওয়ার অনেক পরেও, হয়তো নতুন করে চলে
যাওয়ার আরও দুটো কারণ খুঁজে বার করবে তুমি।
আর আমার স্বভাবটাও থেকে যাবে
আমি আবার একা, ব্রিজে বৃষ্টি ভিজতে
একরাশ দুঃখগুলো বাতাসে উড়িয়ে দেবো...
পলেস্তারা খসে পরা নোনা দেওয়ালের ইট গুলো,
আবার খিলখিলিয়ে হেসে উঠবে আমার অসফলতা দেখে।
তবে শান্তি এটা দেখে, আমার উঠাফনের কোনে এখনো ফুলের চারা,
কাঁঠাল গাছের ডালে, আজও দোয়েল পাখির বাসা।
ঘোর নাস্তিকের রাস্তা বারবার কেটে যাওয়া বেড়াল ছানা।
লাল-নীল-হলুদ আকাশ, বেয়ে বাড়ি ফেরা কাকের ঝাঁক।
জানি কিচ্ছু বদলাবে না, তফাতটা চিরকাল থেকে যাবে।
লোকাল বাস আর ক্যাবের, ক্যাডবেরি আর বাদাম পাটালির।
বড় হওয়ার সাথে সাথেই মান্না দে-এর কফি হাউসের নিয়মে
নিখিলেশ মহিদুল গুলো সব দেশে-বিদেশে ছড়িয়ে পড়েছে।
শুধু আমিই যেন বাইরে থেকে প্রযুক্ত বলের অভাবে স্থির বস্তু
চিরকাল স্থির থেকে, নিউটনের দ্বিতীয় গতিসূত্রের উপমা দিয়ে চলেছি।
তবে এরকম জীবনে কোনো দুঃখ , লজ্জা বাক্লান্তি নেই।
ভয়ও থাকে না, কারণ আমি রাত জেগে দেখেছি
পাখিটা বাসায় না ফিরলেও ভোর হয়, ভোর হতেই হয়।

**Acquaintance with the Author : Technical Assistant, CE, MIT**

# My first Experiences on Indian Philosophy

**AKASH RAKSHIT**

" ঈশ্বর ব্যতীত জীবনের উচ্চতর লক্ষ্য আর কী হইতে পারে? ঈশ্বর স্বয়ংই মানুষের সর্বোচ্চ লক্ষ্য, তাঁহাকে দর্শন কর, তাঁহাকে সম্ভোগ কর, ঈশ্বর অপেক্ষা উচ্চতর বস্তু আমরা ধারণাই করিতে পারি না, কারণ ঈশ্বর পূর্ণস্বরূপ।"

স্বামী বিবেকানন্দ

Being an engineering student I have great interest in our Dharma. For gaining knowledge about our Dharma the best way is to study of philosophy. This subject create thinking in human mind. Human are becoming thinker after acquiring knowledge about the subject. If we define the word philosophy then we get philos mean love and sofies mean knowledge or wisdom according to Western culture. According to Indian poet Sarveshwar Dayal " once three men were shoot out by killer, before dying they had been uttering three different words from their mouth. One said Ram , other one said Mao, last one said Alu ( potato)."form this line we can easily understand that the first two person were not hungry before death but the last person was hungry at that time. That's why he took the name of a food that was Alu ( potato in English). From this quite we easily understand that philosophy is the thinking process of people when their stomach is fully fed. Now we are trying to understand philosophy with the help of science.

**The exact time when philosophy was starting on the earth by the process of revolution:**

According to science the earth had made 5 billion years ago approximately. Approx 3 billion years ago first time life came on earth. Approx 1.2 billion years ago the first animal named "Primet" had come in this world.

***PRIMETS KIND:***

- Apes who use four arm for walking, example orangutan, Gorilla)
- Other one has used two arm for walking, other two for work.

These last kind who use two arm for work , were evaluated and create new species, that was Australopithecus .

- Australopithecus trans into Homo Hebilis 2.8 million years ago and it's brain size was 500-700 cubic cm.
- Homo Hebilis trans into Homo Sapiens 3 lakh year ago . Their brain size was 1260 cubic cm.

After that by cognitive revolution approximately 70 thousand years ago the first species came on earth who have 1. Memory 2. Intelligence 3. Imagination power —By this process language has created in world—There after Society has created—Then Family has come in world—Then state has made — Then economy has created . Then first time human get a chance for thinking about nature aspect, about the world, cosmos. It is the time when philosophy has born first time in world.

**PHILOSOPHY has divided into two parts**

- ***INDIAN PHILOSOPHY***
- ***WESTERN PHILOSOPHY***

Here we are going to discuss about Indian Philosophy . It is the oldest philosophy in the world. This philosophy was invented in Vedic age. We divided it 6 phase. One by one phase we are going to discuss in this topic.

**PHASE NO 1.**

This phase was formed 1500bc approximately. Here we got the topic of Vedic age. Vedic age have two parts.

- *Veda.*
- *Upanishad.*

From the Veda we are aware about four Veda. 1. Rigveda 2.Samavesda 3.Yajurveda 4.Atharvaveda . It was written by VEDABASE .

Another part is Upanishad. It consists by the concept of soul, moksha, rebirth.

**Phase no 2& 3.**

In this phase we get the concept of 1. Heterodox 2. Orthodox.

Mainly 9; philosophy took birth in this time. They are giving bellow . Among them 3 are heterodox 6 are orthodox.

3 heterodox are 1.charvak ( create by Guru Brihaspati) 2. Jainism( Mahaveer) 3. Buddhism ( Goutam Buddha)

6 kinds are Samkhya and yoga , Nyaya and vaishavik, mimansa and vedanta. This 6 kinds are the origin of Hinduism. It was known as Santana darshan , it call Sat darshan.. Their have six Book written in this time , they are

- Samkhya Sutra ( written by Sage KAPILA)
- Yoga Sutra (maharishi Patanjali)
- Nyaya Sutra (Akshapad Goutam )
- Vaishvika Sutra (Rishi Kanad)
- Mimangsha Sutra(Rishi Jamini)
- Vedanta Sutra( Acharya Badrayan)

**Phase 4.**

Here we are aware about **vedanta.** It is interpreted easily.It is consist of three part

- Main Upanishad (1. Brihadaranyka 2. Chandoyga 3 snvestaswar 4.kathopanshad 5. Kenopanishad 6. Ishupanishad)
- Geeta ( Written by VEDABASE)
- Brahma Sutra

Here we get concept of 1.Advaita Vedanta ( created by Shankaracharya , he was died at age of 32. Here he maintained about Maya, soul, Brahma) 2. Vasnab Vedanta ( who believes in lord Vishnu)

**Vasnab Vedanta Books and author.**

- **Ramanujacharya – Vishishtadvaita**
- **Vallabhacharya – Suddhdwitvad**
- **Nimbarka Acharya – Dwaitvaad**
- **Shri Chaitanya mahaprabhu—Achintyadwaitaad aita**

**After that the Sikhism philosophy grownup. Guru Nanak was the inventor of it.**

**Phase 5.**

There after in 1900 century when Renaissance had done in the world then some changes come to INDIAN PHILOSOPHY. We get the concept of 1.NEO VEDANTA.( SWAMI VIVEKANANDA) ,

2.NEO HINDUSM Here we aware about brahma samaj made by Raja Ram Mohan Roy ,Devendra Nagar Keshav Chandra Sen.,

Apart from Aurobindo Ghosh , Mahatma Gandhi , Swami Dayanand Saraswati nationalist were working for NEO HINDUSM.

**PHASE 6**

**POST-INDEPENDENCE.**

Before independence some famous philosopher were given their theory on Indian Philosophy. They are

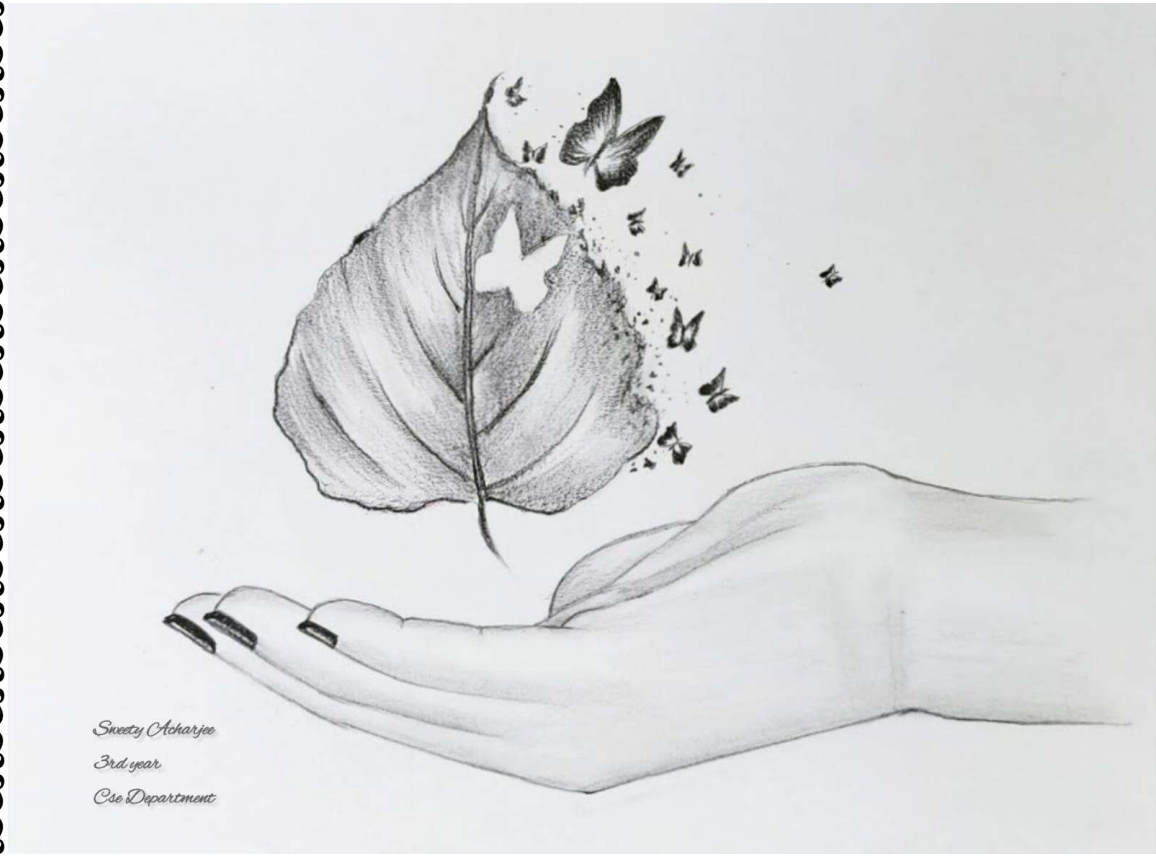
- Dr. BR Ambedkar creation Nabyajaan in 1956
- J .Krishna Murthy son of Ani Besant created Theosophical Society
- Osho

Here the end of INDIAN PHILOSOPHY. We are oldest and largest philosophy in the world. Philosophers get their contribution time to time that's why Indian Philosophy is rich in culture. It is the only philosophy in the world where we get the contribution of female Philosopher **Lopamudra,Maitri Gargi,Ghosa.** In this philosophy we get the concept of KARMA.

"The only true wisdom is in knowing you know nothing."

Socrates

**Acquaintance with the Author : 3rd year student of Electrical Department.**




**Acquaintance with the Painter : 3rd Year Student, CSE, MIT**

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