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TECHNIZ

COMPUTER DEPARTMENT
SIES GRADUATE SCHOOL OF TECHNOLOGY
NBA Accredited 2021-2024

This is the annual magazine of the "Department Of Computer Engineering", SIES Graduate School Of Technology.

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Vision

To be a centre of Excellence in Computer Engineering to fulfill the rapidly growing needs of the Society.

Mission

- To Impart quality education to meet the professional challenges in the area of Computer Engineering.
- To create an environment for research, innovation, professional and social development.
- To nurture lifelong learning skills for achieving professional growth.
- To strengthen the alumni and industrial interaction for overall development of students.

PEO

- Practise Computer engineering in core and multi-disciplinary domains.
- Exhibit leadership skills for professional growth.
- Pursue higher Studies for career advancement.

PSO

- To apply computational and logical skills to solve computer engineering problems
- To develop interdisciplinary skills and acquaint with cutting edge technologies in software industries

EDITORIAL BOARD

Message from HOD's desk

Dr. Aparna Bannore

Dear Reader,

I am delighted and congratulate the TECHNIZ team for their brilliant and original efforts. I sincerely thank everyone for submitting articles and contributing to the success of TECHNIZ. Without innovation, there would be no progress, and we would be forever repeating the same patterns.

This is an opportunity to appreciate the role of science, technology and innovation in the development of the country. I sincerely hope that all the articles will significantly contribute to the long term dream and to ensure that it benefits the development and improving quality of life.

I wish all the readers Best of Luck & a bright future ahead, filled with joy and success.

HOD-CE

Message From Faculty Incharge

Prof. Anindita A Khade

We are glad to introduce Issue 5 of the departmental magazine of Computer Engineering Department of SIES GST, Techniz. Techniz is all about technology that inspires students to do something, that leaves an everlasting mark in the world of technology. Thus, it is our job to ensure inspiring technological developments are being brought to the students of SIES GST, by the students and faculty members of SIES GST itself.

We retained most of the members from the previous issue team. Everything right from the collection of articles up to the final edits was quite smooth. We worked closely as team to ensure that everything was done according to the deadlines. The magazine was compiled and edited in professional manner.Thanks to the team of Techniz for their commendable efforts.

I would also like to thank each member of Techniz without whose support this would not have been possible. I hope that you all enjoy reading this magazine.

Bitcoin : Is the hype real ?

Bitcoin is a type of money that is completely virtual. The reason it is called virtual is that it only exists as a balance in one's bitcoin wallet. Now you might be thinking if something is completely virtual how people earn it. People buy bitcoin using real money, or by selling things online in return of which they get bitcoins, or by mining bitcoin using the computer's processing power.

Pritam Negi
(2015-19)

The peculiar feature of bitcoin is that it is an electronic or digital currency that works on a peer-to-peer basis. This means that it is decentralised and has no central authority controlling it. Like currency notes, it can be sent from one person to another, but without a central bank or the government attempting to track it.

Origin of Bitcoin

The idea behind Bitcoin was introduced to the world on Oct. 31, 2008 by a pseudonymous person called Satoshi Nakamoto. Nakamoto posted a message on a cryptography mailing list titled, "Bitcoin P2P e-cash paper." In it was a link to a white paper called "Bitcoin: A Peer-to-Peer Electronic Cash System." Both of these are still available online.

How are new Bitcoins created

In order for the Bitcoin system to work, people can make their computer process transactions for everybody. The computers are made to work out incredibly difficult sums. Occasionally they are rewarded with a Bitcoin for the owner to keep. People set up powerful computers just to try and get Bitcoins. This is called mining.

But the sums are becoming more and more difficult to stop too many Bitcoins being generated. If you started mining now it could be years before you got a single Bitcoin. You could end up spending more money on electricity for your computer than the Bitcoin would be worth.

What is Blockchain

The blockchain is a shared public ledger on which the entire Bitcoin network relies. All confirmed transactions are included in the blockchain. It allows Bitcoin wallets to calculate their spendable balance so that new transactions can be verified thereby ensuring they're actually owned by the spender. The integrity and the chronological order of the blockchain are enforced with cryptography.

Blockchain is a specific type of database. One key difference between a typical database and a blockchain is the way the data is structured. A blockchain collects information together in groups, also known as blocks, that hold sets of information. Blocks have certain storage capacities and, when filled, are chained onto the previously filled block, forming a chain of data known as the "blockchain." All new information that follows that freshly added block is compiled into a newly formed block that will then also be added to the chain once filled.

Advantages of Bitcoin:-

1. User Autonomy

The primary draw of bitcoin for many users, and indeed one of the central tenets of cryptocurrencies more generally, is autonomy. Digital currencies allow users more autonomy over their own money than fiat currencies do, at least in theory. Users are able to control how they spend their money without dealing with an intermediary authority like a bank or government.

2. Discretion

Bitcoin purchases are discreet. Unless a user voluntarily publishes his Bitcoin transactions, his purchases are never associated with his personal identity, much like cash-only purchases, and cannot easily be traced back to him. In fact, the anonymous bitcoin address that is generated for user purchases changes with each transaction. This is not to say that bitcoin transactions are truly anonymous or entirely untraceable, but they are much less readily linked to personal identity than some traditional forms of payment.

3. Peer-to-Peer Focus

The bitcoin payment system is purely peer-to-peer, meaning that users are able to send and receive payments to or from anyone on the network around the world without requiring approval from any external source or authority.

4. Elimination of Banking Fees

While it is considered standard among cryptocurrency exchanges to charge so-called "maker" and "taker" fees, as well as occasional deposit and withdrawal fees, bitcoin users are not subject to the litany of traditional banking fees associated with fiat currencies.

This means no account maintenance or minimum balance fees, no overdraft charges and no returned deposit fees, among many others.

5. Very Low Transaction Fees for International Payments

Standard wire transfers and foreign purchases typically involve fees and exchange costs. Since bitcoin transactions have no intermediary institutions or government involvement, the costs of transacting are kept very low. This can be a major advantage for travelers. Additionally, any transfer in bitcoins happens very quickly, eliminating the inconvenience of typical authorization requirements and wait periods.

6. Mobile Payments

Like with many online payment systems, bitcoin users can pay for their coins anywhere they have Internet access. This means that purchasers never have to travel to a bank or a store to buy a product. However, unlike online payments made with U.S. bank accounts or credit cards, personal information is not necessary to complete any transaction.

7. Accessibility

Because users are able to send and receive bitcoins with only a smartphone or computer, bitcoin is theoretically available to populations of users without access to traditional banking systems, credit cards and other methods of payment.

Disadvantages of Bitcoin :-

1. Bitcoins Are Not Widely Accepted

Bitcoins are still only accepted by a very small group of online merchants. This makes it infeasible to completely rely on Bitcoins as a currency.

There is also a possibility that governments might force merchants to not use Bitcoins to ensure that users' transactions can be tracked.

2. Wallets Can Be Lost

If a hard drive crashes, or a virus corrupts data , and the wallet file is corrupted, Bitcoins have essentially been "lost". There is nothing that can be done to recover it. These coins will be forever orphaned in the system. This can bankrupt a wealthy Bitcoin investor within seconds with no way to recover. The coins the investor owned will also be permanently orphaned.

3. Bitcoin Valuation Fluctuates

The value of Bitcoins is constantly fluctuating according to demand. As of June 2nd 2011, one Bitcoins was valued at $9.9 on a popular bitcoin exchange site. It was valued to be less than $1 just 6 months ago. This constant fluctuation will cause Bitcoin accepting sites to continually change prices. It will also cause a lot of confusion if a refund for a product is being made. For example, if a t-shirt was initially bought for 1.5 BTC, and returned a week later, should 1.5 BTC be returned, even though the valuation has gone up, or should the new amount (calculated according to current valuation) be sent? Which currency should BTC tied to when comparing valuation? These are still important questions that the Bitcoin community still has no consensus over.

4. No Buyer Protection

When goods are bought using Bitcoins, and the seller doesn't send the promised goods, nothing can be done to reverse the transaction. This problem can be solved using a third party escrow service like ClearCoin, but then, escrow services would assume the role of banks, which would cause Bitcoins to be similar to a more traditional currency.

5. Risk of Unknown Technical Flaws

The Bitcoin system could contain unexploited flaws. As this is a fairly new system, if Bitcoins were adopted widely, and a flaw was found, it could give tremendous wealth to the exploiter at the expense of destroying the Bitcoin economy.

6. Built in Deflation

Since the total number of bitcoins is capped at 21 million, it will cause deflation. Each bitcoin will be worth more and more as the total number of Bitcoins maxes out. This system is designed to reward early adopters. Since each bitcoin will be valued higher with each passing day, the question of when to spend becomes important. This might cause spending surges which will cause the Bitcoin economy to fluctuate very rapidly, and unpredictably.

7. No Physical Form

Since Bitcoins do not have a physical form, it cannot be used in physical stores. It would always have to be converted to other currencies. Cards with Bitcoin wallet information stored in them have been proposed, but there is no consensus on a particular system. Since there would be multiple competing systems, merchants would find it infeasible to support all Bitcoin cards, and therefore users would be forced to convert Bitcoins anyway, unless a universal system is proposed and implemented.

8. No Valuation Guarantee

Since there is no central authority governing Bitcoins, no one can guarantee its minimum valuation. If a large group of merchants decide to "dump" Bitcoins and leave the system, its valuation will decrease greatly which will immensely hurt users who have a large amount of wealth invested in Bitcoins. The decentralized nature of bitcoin is both a curse and blessing.

How artificial intelligence is transforming the world

Most people are not very familiar with the concept of artificial intelligence (AI). As an illustration, when 1,500 senior business leaders in the United States in 2017 were asked about AI, only 17 percent said they were familiar with it. A number of them were not sure what it was or how it would affect their particular companies. They understood there was considerable potential for altering business processes but were not clear how AI could be deployed within their own organizations.

Prof Anindita K

Despite its widespread lack of familiarity, AI is a technology that is transforming every walk of life. It is a wide-ranging tool that enables people to rethink how we integrate information, analyse data, and use the resulting insights to improve decision making. Our hope through this comprehensive overview is to explain AI to an audience of policymakers, opinion leaders, and interested observers, and demonstrate how AI already is altering the world and raising important questions for society, the economy, and governance.

In this article, a discussion on novel applications in finance, national security, health care, criminal justice, transportation, and smart cities, and address issues such as data access problems, algorithmic bias, AI ethics and transparency, and legal liability for AI decisions is carried out. We contrast the regulatory approaches of the U.S. and European

Union, and close by making several recommendations for getting the most out of AI while still protecting important human values.

To maximize AI benefits, we recommend nine steps for going forward:

o   Encourage greater data access for researchers without compromising users' personal privacy,

o   invest more government funding in unclassified AI research,

o   promote new models of digital education and AI workforce development so employees have the skills needed in the 21st-century economy,

o   create a federal AI advisory committee to make policy recommendations,

o   engage with state and local officials so they enact effective policies,

o   regulate broad AI principles rather than specific algorithms,

o   take bias complaints seriously so AI does not replicate historic injustice, unfairness, or discrimination in data or algorithms,

o   maintain mechanisms for human oversight and control, and

o   penalize malicious AI behaviour and promote cybersecurity.

I. QUALITIES OF ARTIFICIAL INTELLIGENCE

Although there is no uniformly agreed upon definition, AI generally is thought to refer to "machines that respond to stimulation consistent with traditional responses from humans, given the human capacity for contemplation, judgment and intention." According to researchers Shubhendu and Vijay, these software systems "make decisions which normally require [a] human level of expertise" and help people anticipate problems or deal with issues as they come up. As such, they operate in an intentional, intelligent, and adaptive manner.

Intentionality

Artificial intelligence algorithms are designed to make decisions, often using real-time data. They are unlike passive machines that are capable only of mechanical or predetermined responses. Using sensors, digital data, or remote inputs, they combine information from a variety of different sources, analyse the material instantly, and act on the insights derived from those data. With massive improvements in storage systems, processing speeds, and analytic techniques, they are capable of tremendous sophistication in analysis and decision making.

Artificial intelligence is already altering the world and raising important questions for society, the economy, and governance.

Intelligence

AI generally is undertaken in conjunction with machine learning and data analytics. Machine learning takes data and looks for underlying trends. If it spots something that is relevant for a practical problem, software designers can take that knowledge and use it to analyse specific issues. All that is required are data that are sufficiently robust that algorithms can discern useful patterns. Data can come in the form of digital information, satellite imagery, visual information, text, or unstructured data.

Adaptability

AI systems can learn and adapt as they make decisions. In the transportation area, for example, semi-autonomous vehicles have tools that let drivers and vehicles know about upcoming congestion, potholes, highway construction, or other possible traffic impediments. Vehicles can take advantage of the experience of other vehicles on the road, without human involvement, and the entire corpus of their achieved "experience" is immediately and fully transferable to other similarly configured vehicles. Their advanced algorithms, sensors, and cameras incorporate experience in current operations, and use dashboards and visual displays to present information in real time so human drivers can

make sense of ongoing traffic and vehicular conditions. And in the case of fully autonomous vehicles, advanced systems can completely control the car or truck, and make all the navigational decisions.

II. APPLICATIONS IN DIVERSE SECTORS

AI is not a futuristic vision, but rather something that is here today and being integrated with and deployed into a variety of sectors. This includes fields such as finance, national security, health care, criminal justice, transportation, and smart cities.

One of the reasons for the growing role of AI is the tremendous opportunities for economic development that it presents. A project undertaken by Price Waterhouse Coopers estimated that "artificial intelligence technologies could increase global GDP by $15.7 trillion, a full 14%, by 2030." That includes advances of $7 trillion in China, $3.7 trillion in North America, $1.8 trillion in Northern Europe, $1.2 trillion for Africa and Oceania, $0.9 trillion in the rest of Asia outside of China, $0.7 trillion in Southern Europe, and $0.5 trillion in Latin America. China is making rapid strides because it has set a national goal of investing $150 billion in AI and becoming the global leader in this area by 2030.

Meanwhile, a McKinsey Global Institute study of China found that "AI-led automation can give the Chinese economy a productivity injection that would add 0.8 to 1.4 percentage points to GDP growth annually, depending on the speed of adoption." Although its authors found that China currently lags the United States and the United Kingdom in AI deployment, the sheer size of its AI market gives that country tremendous opportunities for pilot testing and future development.

Finance

Investments in financial AI in the United States tripled between 2013 and 2014 to a total of $12.2 billion. According to observers in that sector, "Decisions about loans are now being made by software that can take into account a variety of finely parsed data about a borrower, rather than just a

credit score and a background check." In addition, there are so-called robo-advisers that "create personalized investment portfolios, obviating the need for stockbrokers and financial advisers." These advances are designed to take the emotion out of investing and undertake decisions based on analytical considerations, and make these choices in a matter of minutes.

Fraud detection represents another way AI is helpful in financial systems. It sometimes is difficult to discern fraudulent activities in large organizations, but AI can identify abnormalities, outliers, or deviant cases requiring additional investigation. That helps managers find problems early in the cycle, before they reach dangerous levels.

National security

AI plays a substantial role in national defense. Through its Project Maven, the American military is deploying AI "to sift through the massive troves of data and video captured by surveillance and then alert human analysts of patterns or when there is abnormal or suspicious activity." According to Deputy Secretary of Defense Patrick Shanahan, the goal of emerging technologies in this area is "to meet our warfighters' needs and to increase [the] speed and agility [of] technology development and procurement."

Preparing for hyperwar and defending critical cyber networks must become a high priority because China, Russia, North Korea, and other countries are putting substantial resources into AI. In 2017, China's State Council issued a plan for the country to "build a domestic industry worth almost $150 billion" by 2030. As an example of the possibilities, the Chinese search firm Baidu has pioneered a facial recognition application that finds missing people. In addition, cities such as Shenzhen are providing up to $1 million to support AI labs. That country hopes AI will provide security, combat terrorism, and improve speech recognition programs. The dual-use nature of many AI algorithms will mean AI research focused on one sector of society can be rapidly modified for use in the security sector as well.

Health care

AI tools are helping designers improve computational sophistication in health care. For example, Merantix is a German company that applies deep learning to medical issues. It has an application in medical imaging that "detects lymph nodes in the human body in Computer Tomography (CT) images." According to its developers, the key is labeling the nodes and identifying small lesions or growths that could be problematic. Humans can do this, but radiologists charge $100 per hour and may be able to carefully read only four images an hour. If there were 10,000 images, the cost of this process would be $250,000, which is prohibitively expensive if done by humans.

Transportation

Transportation represents an area where AI and machine learning are producing major innovations. Research by Cameron Kerry and Jack Karsten of the Brookings Institution has found that over $80 billion was invested in autonomous vehicle technology between August 2014 and June 2017. Those investments include applications both for autonomous driving and the core technologies vital to that sector.

Ride-sharing companies are very interested in autonomous vehicles. They see advantages in terms of customer service and labor productivity. All of the major ride-sharing companies are exploring driverless cars. The surge of car-sharing and taxi services—such as Uber and Lyft in the United States, Daimler's Mytaxi and Hailo service in Great Britain, and Didi Chuxing in China—demonstrate the opportunities of this transportation option. Uber recently signed an agreement to purchase 24,000 autonomous cars from Volvo for its ride-sharing service.

The world is on the cusp of revolutionizing many sectors through artificial intelligence, but the way AI systems are developed need to be better understood due to the major implications these technologies will have for society as a whole.

Yet the manner in which AI systems unfold has major implications for society as a whole. It matters how policy issues are addressed, ethical conflicts are reconciled, legal realities are resolved, and how much transparency is required in AI and data analytic solutions. Human choices about software development affect the way in which decisions are made and the manner in which they are integrated into organizational routines. Exactly how these processes are executed need to be better understood because they will have substantial impact on the general public soon, and for the foreseeable future. AI may well be a revolution in human affairs, and become the single most influential human innovation in history.

AI to the rescue in preventing Wildfires

The first chapter of any student's life describes about the importance of a plant in the Ecosystem. Old is gold, but ancient is diamond when it comes to Forests!!

Globally, forests are facing growing challenges from the natural disasters, which continue to strike unabated without notice and are perceived to be on the increase in their magnitude, frequency and economic impact. The most common hazard is the forest fires including the very recent Amazon's rainforest wildfires and Australian bush fires! These pose a menace not only to the forest wealth but also to the Flora and Fauna. Employing drones and AI systems to predict, contain it and extinguish the blaze then and there can help put out the fire quickly and cut down the loss.

Unextinguished campfires, lit cigarette butts, improperly burned debris, and arson are responsible for 84% of wildfires started. Man-made wildfires have tripled the fire season from 46 days to 154 days with a staggering cost of $2 billion. Once considered a natural phenomenon sparked by lighting, wildfires are now being recognized as the result of human error.

The 2019 Amazon rainforest wildfires season saw a year-to-year surge in fires occurring in the Amazon forests and Amazon Biome within Brazil. NASA's AIRS published maps of increased carbon monoxide and carbon dioxide resulting from Brazil's wildfires on the same day.

"One Tree can make a million matches, but one match can destroy a million Trees"

Using a fleet of surveillance drones, equipped with special infrared cameras, or satellite imaging, fires can be spotted during the earliest moments of an uncontrollable disaster. Quicker is the detection, faster can be the resolving action. These specialised drones can not only detect it but can also be used to put out the fire.

The technical specifications of such drones are: fitted with Infrared cameras, range covered is 7000 metres, loaded with mono-ammonium phosphate bombs, can carry a pay load of 3 kgs, total flight time of 40 minutes every full charge, charging time of 60 minutes, number of drones in for periodic surveillance.

Drones that are equipped with infrared cameras can peer through smoke, while using sensors for wind direction and other weather variables to better anticipate how wildfires will spread. Tiny drones can whip through canyons and other confined spaces whereas helicopters often can't fly low enough to capture the necessary high-resolution footage.

Talking about its action, every checkpoint will act as charging point for the drone and when one drone is charging, the other drone is deployed for rounds and this goes on periodically. The drones will analyse the checkpoints and collect the data. These drones are capable of detecting even small fire in the bushes.

Drones give firefighters a bird's-eye view of the terrain and even help them determine where a fire will move next, so they can make swift decisions about where fire crews should go and which residents need to be evacuated. Making use of AI system to predict the pattern of growth of fire and employ sufficient numbers of drones to put off the heat. The biggest pro of this solution is its cost effectiveness and collection of more precise data and the loss of human life employed for rescue is also reduced as the required manual power at the disaster is minimal.

With costs exceeding $2.4 billion, the 2017 fire season was the most expensive ever.The cumulative costs of wildland fire suppression activities, once again, exceed the funding available. India is spending at least ₹ 1,100 crore due to forest fires every year, says a new World Bank report

So basically, we will reduce the expenditure in resolving a forest fire by using drones and fire extinguisher bombs in place of Helicopters and human power. Piloting an aircraft over a raging fire puts both pilots and crew at risk. Plane and helicopter crashes accounted for 24% of deaths attributed to firefighting between 2006 and 2016, according to the U.S. Forest Service.
Someday, swarms of firefighting drones may be launched over wildfires. These would be programmed to fly autonomously, controlled and directed by human intelligence from miles apart, no need for drone pilots on the ground below, comparatively lesser damage caused to wildlife and property, an aid to cut down the costs involved in the process of fighting a wildfire! The world is full of ideas and opportunities and as rightly said by Albert Einstein, "Necessity is the mother of inventions", we shall learn about the urge of employing better technology in nature to help preserve its pristine form soon!

- K.GAURI
(TE-CE)

Why Ethical Artificial Intelligence?

"The greatest danger of Artificial Intelligence is that people conclude too early that they understand it."

In recent times, we can catch sight of a seismic change from A for Apple to A for Artificial Intelligence. The ethics of AI is often concentrated on scrutiny of various sorts which can also be quaint. Amidst all the technologies, AI seems to be closer to our skin because the main idea is to create machines that have a feature central to how we humans see ourselves, involving qualities such as perceiving, feeling, thinking, self-learning.

K GAURI
TE - CE

AI applications also include text analysis, natural language processing, logical reason game-playing, data analytics, predictive analytics, as well as autonomous vehicles and numerous other forms of Robotics. AI takes aid of many numbers of computational techniques to achieve these aims which is inspired by the natural functioning of the human brain.

With increasing mastery in the realm of Artificial Intelligence, we ought to encounter virtuous issues that arise with certain use of these automated systems. The design of these technical artefacts thus has ethical relevance for the final product. So, beyond the thought of responsible use, we also need to shed some light about responsible design in this field.

The digital sphere has opened-up extensively: All data collection and storage methods are now digital. The beholding system collects a greater share of our data, that is later traded between the corporate giants for a fee which often goes unnoticed. AI systems mainly feed on user data most likely involving public information, sensitive details etc. This might hit us hard when we learn how our privacy is at stake with the increased use of this system.
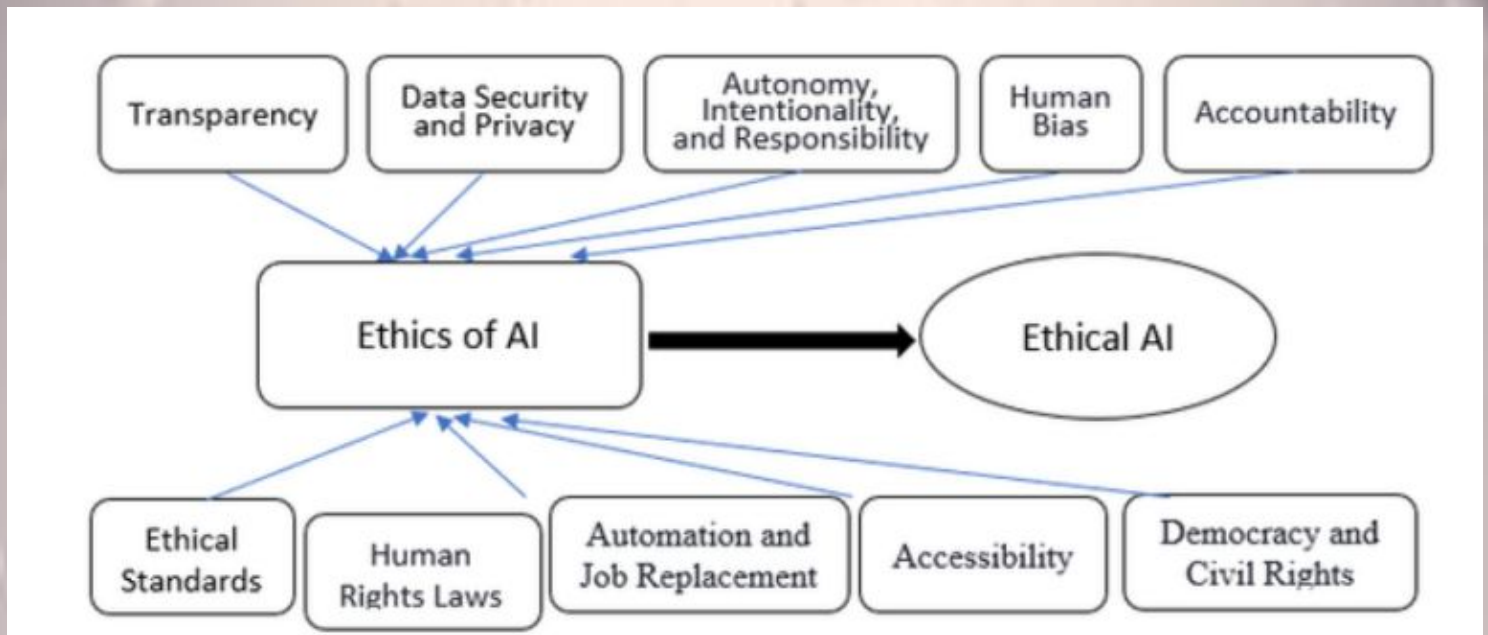
The ethical problems of AI go beyond mere accumulation of data and privacy concerns attached to it: They also include the use of information to manipulate behaviour of the mechanised system which later may result in undesired predictions and solutions. For instance, social media has now become the prime location for political propaganda, so the kind of influence offered by it can be used to direct one's voting behaviour and if it succeeds it will be marked as a deprivation person's autonomy.

The branch has multiple fallacies relating to decrease in human employment, loss of privacy, manipulative errors, human bias which forms a stage for improvement to shift from learning ethics of AI to possessing an ethically sound AI system. As a result, the righteous use of this newly flourishing field of Artificial Intelligence can help many which highly demands the inclusion of methods and solutions that are not only advanced but also moral in nature!

The Curse of Dimensionality in Machine Learning!

SWAPNIL V
TE - EXTC

What is the curse of dimensionality?

It refers to the phenomena of strange/weird things happening as we try to analyze the data in high-dimensional spaces. Let us understand this peculiarity with an example, suppose we are building several machine learning models to analyze the performance of a Formula One (F1) driver. Consider the following cases:

i) Model_1 consists of only two features say the circuit name and the country name.

ii) Model_2 consists of 4 features say weather and max speed of the car including the above two.

iii) Model_3 consists of 8 features say driver's experience, number of wins, car condition, and driver's physical fitness including all the above features.

iv) Model_4 consists of 16 features say driver's age, latitude, longitude, driver's height, hair color, car color, the car company, and driver's marital status including all the above features.

v) Model_5 consists of 32 features.

vi) Model_6 consists of 64 features.

vii) Model_7 consists of 128 features.

viii) Model_8 consists of 256 features.

ix) Model_9 consists of 512 features.

x) Model_10 consists of 1024 features.

Assuming the training data remains constant, it is observed that on increasing the number of features the accuracy tends to increase until a certain threshold value and after that, it starts to decrease. From the above example the accuracy of Model_1 < accuracy of Model_2 < accuracy of Model_3 but if we try to extrapolate this trend it doesn't hold true for all the models having more than 8 features. Now you might wonder if we are providing some extra information for the model to learn why is it so that the performance starts to degrade. My friends welcome to the curse of dimensionality!

If we think logically some of the features provided to Model_4 don't actually contribute anything towards analyzing the performance of the F1 driver. For example, the driver's height, hair color, car color, car company, and the driver's marital status is giving useless information for the model to learn, hence the model gets confused with all this extra information, and the accuracy starts to go down.

The curse of dimensionality was first termed by Richard E. Bellman when considering problems in dynamic programming.

Curse of dimensionality in various domains

There are several domains where we can see the effect of this phenomenon. Machine Learning is one such domain. Other domains include numerical analysis, sampling, combinatorics, data mining, and databases. As it is clear from the title we will see its effect only in Machine Learning.

How to overcome its effect

This was a general overview of the curse of dimensionality. Now we will go slightly technical in order to understand it completely. In ML, it can be defined as follows: as the number of features or dimensions 'd' grows, the amount of data we require to generalize accurately grows exponentially. As the dimensions increase the data becomes sparse and as the data becomes sparse it becomes hard to generalize the model. In order to better generalize the model, more training data is required.

1. Hughes phenomenon

Again let's take an example under this phenomenon. Assume all the features in a dataset are binary. If the dimensionality is 3 i.e. there are 3 features then the total number of data points will be equal to $2^3 = 8$. If the dimensionality is 10 i.e. there are 10 features then the total number of data points will be equal to $2^{10} = 1024$. It is clear that as dimensionality increases the number of data points also increases exponentially which implies dimensionality is directly proportional to the number of data points required for training a machine learning model.

There is a very interesting phenomenon called the Hughes phenomenon which states that for a fixed size dataset the performance of a machine learning model decreases as the dimensionality increases.

2. Distance functions (especially Euclidean distance)

Let's think of a 1D world where n points are spread randomly between 0 and 1, we have a point xi.
From the above two figures, it is clear that the Euclidean distance between pair of points is very close to 0.
Now let me define two terms,
Dist_min (xi) = min{euc-dist(xi, xj} where xi is not equal to xj.
Dist_max (xi) = max{euc-dist(xi, xj} where xi is not equal to xj.
For 1D, 2D and 3D,
{[dist-max(xi) − dist-min(xi)] / dist-min(xi)} > 0

Taking the limit as d -> infinity, {[dist-max(xi) − dist-min(xi)] / dist-min(xi)} tends towards 0. Now you might wonder what happens if this ratio tends to 0.

From the above figures, we can see how those peaks are getting formed as the dimensions are increasing. At the heart of KNN, it works well if the pair of points are closer together in a cluster but at higher dimensions, we can see the pair of points that are very close to each other reduces and we have lot many pair of points having distance 5-10 and 15-20 when d=100 and it only increases on increasing the dimensions. So we know for sure KNN will break apart in such conditions.

Let me break it down for you even further.
{[dist-max(xi) − dist-min(xi)] / dist-min(xi)}

The above ratio will only become 0 when the numerator becomes 0 i.e. dist-max and dist-min are equal, which means in higher dimensional spaces every pair of points are equally distant from every other pair of points. For example, the distance between xi and xj is almost equal to the distance between xi and xk. This is true for every pair of points.

In high dimensional spaces, whenever the distance of any pair of points is the same as any other pair of points, any machine learning model like KNN which depends a lot on Euclidean distance, makes no more sense logically. Hence KNN doesn't work well when the dimensionality increases. Even though this was theoretically proven for n random points, it has been observed experimentally also that KNN doesn't work well in higher dimensional spaces. So what is the solution?

The solution is very simple. Use cosine-similarity instead of Euclidean distance as it is impacted less in higher dimensional spaces. That's why especially in-text problems where we use a bag of words, TF-IDF, word-to-vec, etc., cosine similarity is preferred because of high dimensional space.

It is important to note that all these observations were made assuming the spread of points is uniform and random. So the very next thing that comes into mind is what if the spread of points are not uniform and random. We can think of this from a different angle i.e.

a) When dimensionality is high and points are dense, the impact of dimensionality is high.

b) When dimensionality is high and points are sparse, the impact of dimensionality is low.

3. Overfitting and Underfitting

There is a relationship between 'd' and overfitting which is as follows:

'd' is directly proportional to overfitting i.e. as the dimensionality increases the chances of overfitting also increases.

Let's discuss the solutions to tackle this problem.

a) Model-dependent approach: Whenever we have a large number of features, we can always perform forward feature selection to determine the most relevant features for the
Prediction.

b) Unlike the above solution which is classification-oriented, we can also perform dimensionality reduction techniques like PCA and t-SNE which do not use the class labels to determine the most relevant features for the prediction.

So it is important to keep in mind whenever you download a new dataset that has a large number of features, you can reduce it by some of the techniques like PCA, t-SNE, or forward selection in order to ensure your model is not affected by the curse of dimensionality.
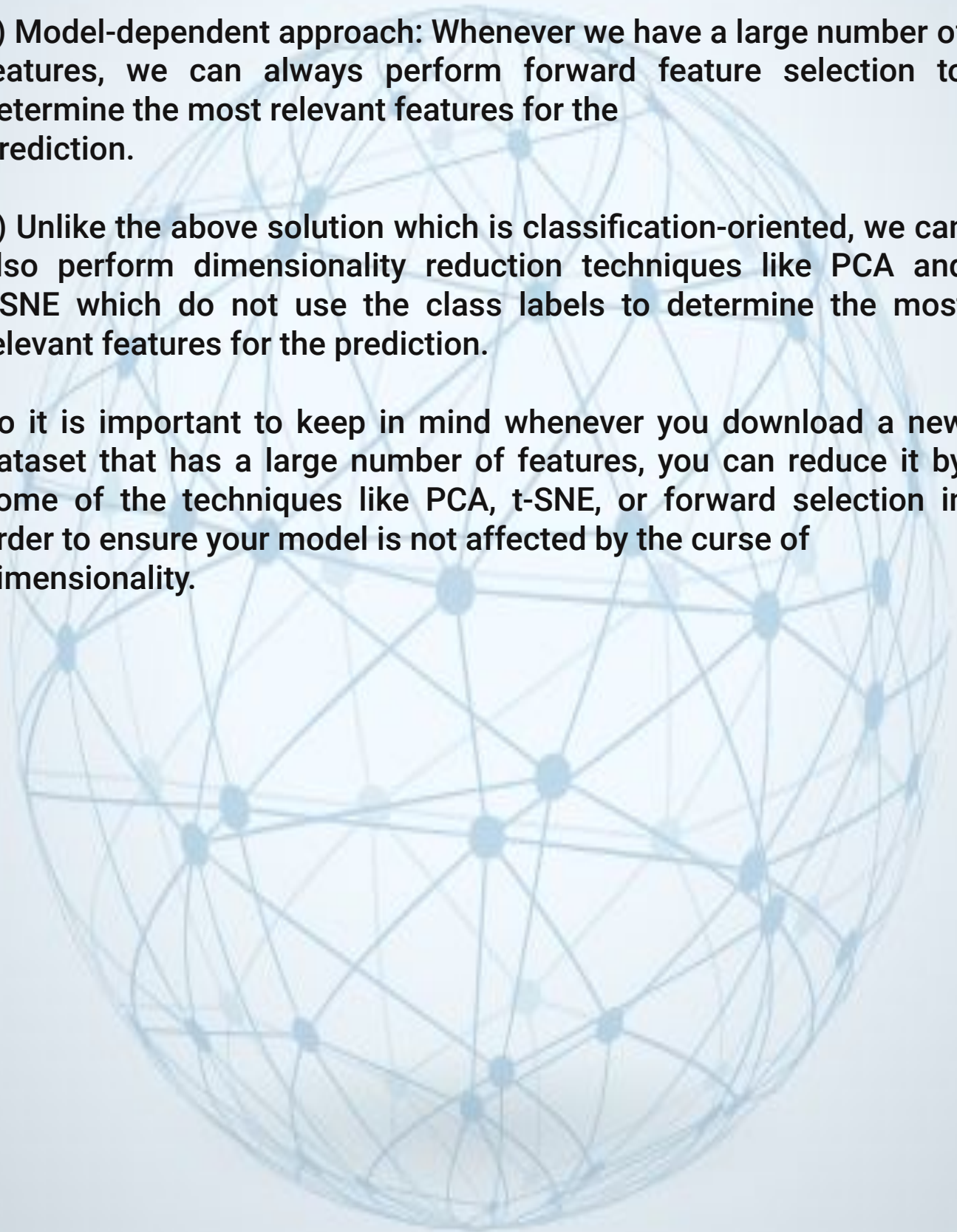
Personal Finance for Beginners

Seldom do young people realize the importance of personal finance and even rarely do actually work on it. The Sooner does one starts understanding and working on personal finance, the stronger will be his/her financial freedom.

Let's begin by asking ourselves what the key elements of personal finance are and how they stack up in the pecking order. Most of

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us are privileged with parents who allow us our share of pocket money as children. More often than not, we end up spending the same on our likes. Have we not heard and read several times "Little drops of water make a mighty ocean"? If we save even a very small portion of our pocket money we would create a sizable wealth that will come in handy as we start getting into professional courses.

Now that we understand the importance of small savings and the benefits of the same, let's look at various elements of savings. As I would see, life insurance is one of the most important elements of personal finance, but mostly ignored. Most of us take a life insurance policy, usually out of an acquaintance with a relative or a friend who happens to be an insurance agent, and a significant portion of those

who do, usually take a money-back policy, with a hope that they would get back the policy amount after a certain age/period. But this in itself defeats the purpose of insurance. A life insurance policy is taken to insure the family in uneventful circumstances. Therefore, one should look at taking a term insurance which is necessarily a pure insurance. This gives the benefit of an extremely low premium for a very high sum assured. Again, if this is started at an early age, one would start with a very low premium due to low age and lock the premium amount for the rest of the entire premium paying period, even with the progress of age. The amount of sum assured should be estimated based on the individual's and his/her family's monthly needs after about 2-3 decades, and not that of the present period.

Personal Provident Fund is the most important avenue of investment which has one of the highest returns and is generally free from income tax. This also gives an opportunity for set-off against income tax liability.

The next important element of personal finance is to create a sizable kitty to be able to invest in quality real estate. This investment mode has a very high potential for capital appreciation with relatively low risk. About 20-30% of the property value has to be met with own down payment while the remaining portion can be funded by banks. There are instances where the capital has appreciated in excess of 30% per annum in this mode of investment. The interest on the housing loan is also eligible for set-off against the income tax liability thereby enabling a lower interest rate. This, if planned well and early, can result in very significant wealth creation.

Another important avenue of investment is equity. We have all heard of people like Warren Buffett and Rakesh Jhunjhunwala, who have made a very big name for themselves in this space. Although, equity is a form of investment which is high in risk of capital, it presents with a

reward factor which is unseen with most of the other avenues. An indirect method of investment into equity with risk minimization is through mutual funds. Here, an asset management company with finance professionals manages the capital with reasonable returns on investment, minimizing risk. A very important mode one should adopt is SIP (Systematic Investment Plan), wherein one would invest an equal amount of money at a regular interval which brings both discipline and results in higher benefits due to the law of average. Both real estate and equity are good forms of investment that can beat inflation.

Most of the other forms of investments like Fixed Deposits, Savings Bank, Recurring Deposits, though minimize risk, will result in much lower yield, often due to inflation and tax on returns. Health insurance is also an important aspect which should not be ignored as we have seen in the recent pandemic.

Personal finance if planned carefully can result in financial freedom.

INNOVATIONS 2022
A National level project competition

Innovations is a national-level project competition conducted annually by the CSI Student Chapter of SIES Graduate School of Technology. It serves as a platform for young minds to take this window of opportunity and bring forward their innovative ideas in the form of projects.

Each year teams from various institutes all over India participate in Innovations in large numbers.

This year, the 10th edition of INNOVATIONS was conducted on 9th April 2022. This year we received over 80+ abstract submissions out of which 35 abstracts were selected for the competition after carefully analyzing each project based on parameters such as novelty, effectiveness, positive impact on society, and scalability. The projects were from various domains such as Computer, IT, Electronics, the Internet of Things, and Mechanics. We had the privilege of having Dr. Rachana Yogesh Patil, Associate Professor at Pimpri Chinchwad College of Engineering, Pune, Dr.Rachana Patil has completed her Ph.D from University of Mumbai, with a specialization of cyber security and digital forensics. as the chief guest for the event. The judges across the venues were Mr. Shubham Dumbre, Founder of Delta The Innovators and Global LightUp Virtual Conference Trainer; Mr. Nilesh Shinde, Azure Developer community lead, organizer for Elastic User group Mumbai Facebook Communiteer for CMX Hub; Mr. Vivek Yadav, Sr. Mobile Developer at Zestmoney, Google developer expert for Flutter and Dart.

We had Delta The Innovators as Technical Sponsor and Brainheaters as the Associate Sponsor for Innovations 2022.

This competition provided an opportunity for students to demonstrate their technical prowess and excellence in their respective domains. The participating teams proved that putting quality efforts gives fruitful results.

<u>WINNERS</u>

Position	Team Members	Project Title
Winner	Shubham Manoj Metkar Jayesh Rajendra Mahajan	Human body gesture controlled gaming application
1st runner up	Shriya Kolambkar Mrunal Kondekar Sanya Sharma	Motion Replicating Robotic Arm
2nd runner up	Kaliappan Sudalai Yadav Rosmi George Shrestha Sharma Nabhya Jha	Countefiet Cosmetic Product Detection

POSTER PRESENTATION COMPETITION 2022

A National level poster presentation competition

The National Level Poster Presentation Competition organized by CSI Student Chapter of SIES GST was conducted on the 28th of January 2022 in an Online Mode.

The Poster Presentation Competition's main goal is to raise public awareness about data privacy scams. With the globe on lockdown as a result of Covid-19, people's lives have taken on a new dimension. People have learned to be robust, self-reliant, and sensitive to the human race throughout these times. With the rise in indoor activities, everything is now done online, resulting in thieves obtaining a large number of people's internet data. The aim of this competition is to encourage participants to show off their poster-making abilities. Along with encouraging creativity, we hope to inculcate a feeling of social awareness among the public about data theft.Data Privacy Day is an international event that occurs every year on 28th January.

On the occasion of International Data Privacy Day, we remain committed to building a privacy-conscious society. Privacy is the responsibility of everyone and we need to create a conducive environment that protects the personal data of one and all. Having a dedicated day to celebrate privacy globally further promotes the larger purpose of privacy awareness and helps bring user-focused attention to the management of personal data. This competition serves as a platform for young minds to take this window of opportunity and bring forward their innovative ideas in the form of posters on a particular domain.

Teams from various institutes from all over Maharashtra as well as other states, participated in this national level poster presentation competition in large numbers.

We received over 70 abstract submissions out of which 30 abstracts were selected for the competition after carefully analyzing each abstract idea based on the theme of data privacy and the parameters such as Quality of theme/concept selected, Societal Influence, Organization of abstract and Inspiration behind the theme.

We had the privilege of having Mr. Arun Parathasarthy , Manager for technical program management focused on security programs at Google as the chief guest for the event. He's a computer engineering graduate of SIES GST, 2005-2009 batch and started his career as a security consultant with Accenture The judges of the competition were Mr.Shubham Dumbre, Founder of Delta The Innovators and Ms. Ruchi Bhatia working at Colgate-Palmolive in the Global IT sector.

This competition provided an opportunity for students to demonstrate their technical prowess and excellence in the domain of Data Privacy. The participating teams proved that putting quality efforts gives fruitful results.

WINNERS

Sr. No.		Team members	Project title
1	Winner	Arfah Upade Shabarish Ramaswamy	You can leave now we have perfect clone of you
2	1st Runner up	Khushi Singh	Social Media Data Privacy
3	1st Runner up	Kritika Pandey	Are you favourite applications/web site misusing personal information?
4	2nd Runner up	Sanskar Sandeep Unkule Pratham Vikas Yashwante	Domains of Data Privacy

SPORTS ACHIEVEMENTS

Sr.no	Name	Roll No	Achievement	National/Zonal
1	Tejas Punde	120A1084	Participated in Boys 2fit 2 quit	Intercollegiate
2	Aditya Bonde	120A1009	Participated in Boys 2fit 2 quit	Intercollegiate
3	Sandesh Dalvi	119A1070	Participated in Boys 2fit 2 quit	Intercollegiate
4	Aditya Borude	118A1016	Participated in Boys 2fit 2 quit	Intercollegiate
5	Shubham Loya	118A1040	Participated in Boys IPL	Intercollegiate
6	Siddharth Jadhav	119A1080	Participated in Boys IPL	Intercollegiate
7	Sharan Murli	117A1073	Secured 2nd position in Kabaddi(Boys) TML 2022	Intercollegiate

CULTURAL ACHIEVEMENTS

Sr.No	Name	Roll No	Achievement	National/Zonal
1	Shabarish Ramaswamy	118A1077	EOC STC - Second Prize	National
2	Iyengar Samiksha	120A093	Consolation in Cartooning-MU Youth Festival	Zonal
3	Sridhar Ananyaa	119A1009	FIRST RANK in Indian Classical Vocal Solo competition- MU Youth Festival	Zonal
4	Ramaswamy Shabarish	118A1077	THIRD RANK in Elocution (Marathi or Hindi or English)-MU Youth Festival	Zonal
5	Sharan Murli	117A1073	Fundraising initiative for Odisha Development Management Programme(ODMP) Jan 2022	Zonal

TECHNICAL ACHIEVEMENTS

Sr.No	Name	Roll No	Achievement	National/Zonal
1	Ganeshan P A Nainar	120A1019	Promethean-2021 : Winner	Zonal
2	Bhakti Ghude	120A1021	Promethean-2021 : Winner	Zonal
3	Jutika Patil	120A1032	Promethean-2021 : Winner	Zonal
4	Mayank Iyer	120A1026	Promethean-2021 : Winner	Zonal
5	Nuha Modak	120A1070	Technopreneur winner 2021	Zonal
6	Varun Ganesh Sondur	120A1121	Technopreneur winner 2021	Zonal
7	Varun Ganesh Sondur	120A1121	Participated in SQUABBLE	Zonal
8	Anirudh Belwadi	118A1012	Bagged "Best Project to solve a big AEC problem" award in AEC Hackathon, Copenhagen, Denmark	National
9	Ganeshan A Nainar, Ananya M	120A1019, 120A1029	Selected for Anveshna	Zonal

10	Ayushi Kombe,Kanishka Raina	119A1013 119A1034	Selected for Anveshna	Zonal
11	Komal Singh,Prapthi Shetty	119A1081 ,119A1074	Selected for Anveshna	Zonal
12	Shabarish R Zainab B Aishwariya V Minoti D	118A1017, 118A1077, 119A1018, 119A1005	Deep Blue Finalists	Zonal
13	Anushka T Vedant B Nachiket B Varun S	120A1121 119A1014 119A1090 118A6052	Deep Blue Finalists	Zonal
14	Kaushik S Shinit S Nandita N Pournami P	119A1036 119A1052 119A1058 119A1076	Deep Blue Finalists	Zonal
15	Vaishnavi A Pournima T Induja R Sneha Saji	119A1059 119A1083 119A1060 119A1094	Deep Blue Finalists	Zonal
16	Varun Sreedhar Srikrishna V Sanjana Kumar	118A1092 118A1093 118A1073	2nd prize in Byte Camp	National
17	Sharan Murali	117A1073	Presented and published the paper titled "Agricultural Supply System with permissioned networks through Hyperledger framework", in IC-TEAM 2022	National
18	Samiksha Iyengar	120A1093	Completed Frontend development training in Technical Coding Research Innovation	National

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