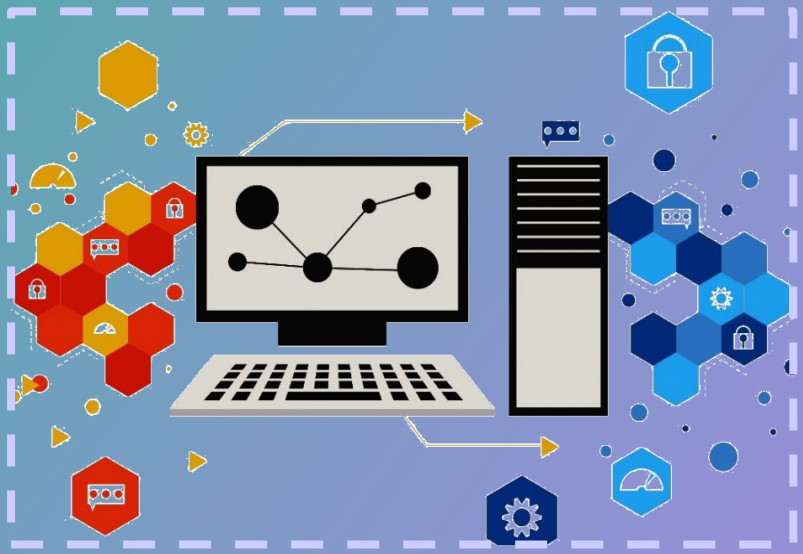
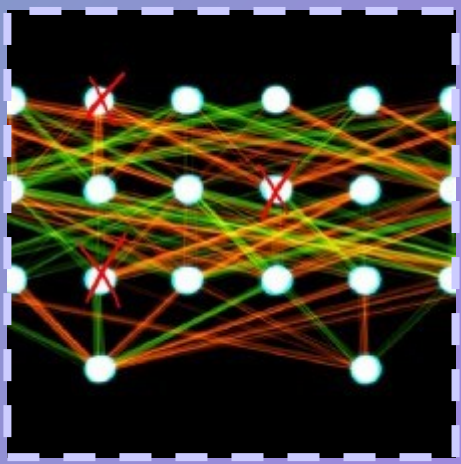
ACE

TECHIE TALK

VOL.12 NO.4, 2022





DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE, CHENNAI - 24

FROM THE HOD'S DESK

- Dr. B. MONICA JENEFER, HOD, DEPT. OF CSE

Greetings!

It gives me immense pleasure in releasing the November edition (Vol. 12 No. 4) of "Techie Talk" - a newsletter from our department through the ACE - Association of Computer Engineering.

Techie Talk aims to keep students informed of the latest technologies through a plethora of articles contributed by the students and faculty members of our department. My heartfelt congratulations to those who have contributed articles and strived to make this newsletter a big success in spite of the academic schedule . I would also like to appreciate the Editorial Board for their sincere efforts.

My best wishes to all the students for their upcoming end semester examinations. I specially wish the final year students for achieving a bright and prosperous career.

FROM THE EDITOR'S DESK

- Dr. M.K. SANDHYA, PROFESSOR, DEPT. OF CSE

Dear Readers,

Greetings!

I'm extremely happy to release the November edition (Vol. 12 No. 4) of Techie Talk. This newsletter presents a wide range of articles on the latest technologies along with snippets of information. This issue highlights the interest, skill and creativity of the students.

It is really heart-warming to see all the contributions from students amidst the busy academic schedule. The Editorial Board appreciates the time and effort that has been devoted by the different contributors. Suggestions to improve the newsletter format and content are always welcome.

CONTENTS

VISION AND MISSION OF THE INSTITUTE

Vision: To impart state-of-the art technical education, including sterling values and shining character, producing engineers who contribute to nation building thereby achieving our ultimate objective of sustained development of an unparalleled society, nation and world at large.

Mission: Meenakshi Sundararajan Engineering College, Chennai constantly strives to be a Centre of Excellence with the singular aim of producing students of outstanding academic excellence and sterling character to benefit the society, our nation and the world at large.

To achieve this, the college ensures

Continuous upgradation of its teaching faculty to ensure a high standard of quality education and to meet the ever-changing needs of the society.

Constant interaction with its stakeholders.

Linkage with other educational institutions and industries at the national and international level for mutual benefit.

Provision of research facilities and infrastructure in line with global trends.

Adequate opportunities and exposure to the students through suitable programs, to mould their character and to develop their personality with an emphasis on professional ethics and moral values

VISION OF DEPARTMENT : To achieve academic excellence in Computer Science and Engineering by imparting quality training, encouraging research activities and innovation, inculcating ethical values and preparing the students to face industrial demands, societal needs and technical challenges.

MISSION OF DEPARTMENT :

To provide quality education in theory and application of Computer Science and Engineering.

To inculcate analytical thinking and innovation within students to become technically competent professionals.

To prepare students to excel in competitive and challenging careers.

To generate socially responsible citizens with ethical values for facing industrial and societal challenges.

To promote research in the emerging areas of technology convergence.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

- Prepare the graduates for a successful career in industry and motivate them for higher education and research.
- Provide graduates with a firm foundation in the principles and practices of computer science and engineering including mathematics, physical sciences, and basic engineering.
- Impart application skills to cover broad range of industrial demands.
- Prepare graduates with ethical values, leadership qualities and entrepreneur skills to contribute to their profession and society.
- Train graduates to be able to use new techniques and skills for professional excellence

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- Ability to identify, analyse, design and implement computer based system of varying complexities.
- To apply hardware/software methods, open ended programming environments and available tools in emerging technologies for solving real-life and R&D problems
- Employing engineering solution for ground-breaking career paths, to become leading entrepreneur and develop interest for further studies

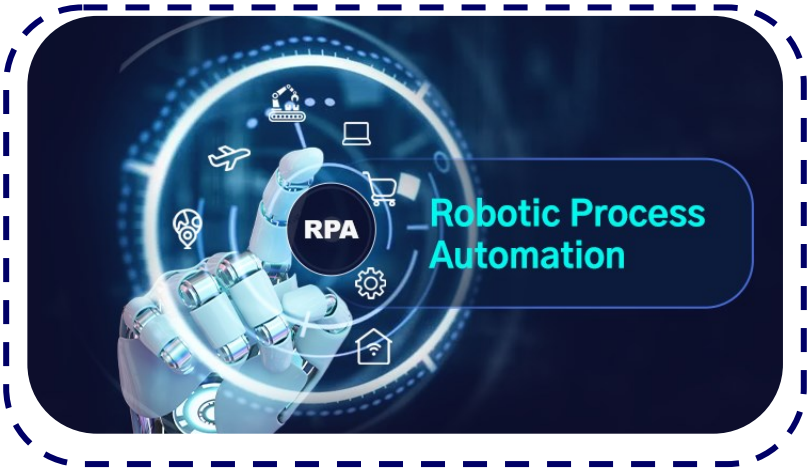
ROBOTIC PROCESS AUTOMATION

-K ANIRUDH, III CSE

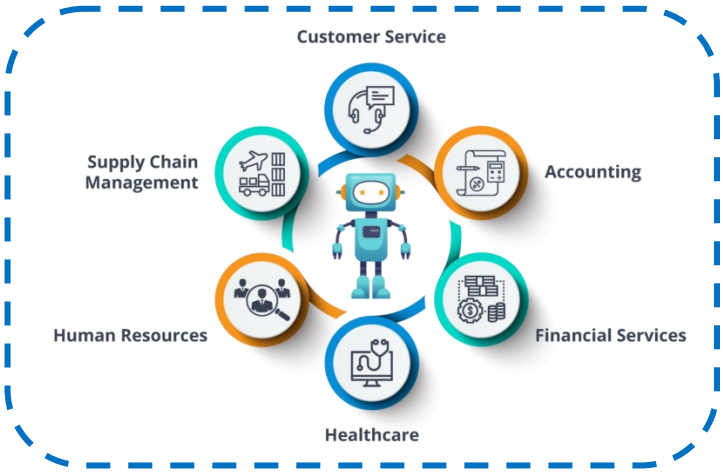
Robotic process automation (RPA) is a software technology that makes it easy to build, deploy, and manage software robots that emulate humans actions interacting with digital systems and software. Just like people, software robots can do things like understand what's on a screen, complete the right keystrokes, navigate systems, identify and extract data, and perform a wide range of defined actions. But software robots can do it faster and more consistently than people, without the need to get up and stretch or take a coffee break. RPA technology is changing how the world gets work done. Software robots (instead of people) do repetitive and lower-value work, like logging into applications and systems, moving files and folders, extracting, copying, and inserting data, filling in forms, and completing routine analyses and reports.

Advanced robots can even perform cognitive processes, like interpreting text, engaging in chats and conversations, understanding unstructured data, and applying advanced machine learning models to make complex decisions. When robots do these types of repetitive, high-volume tasks, humans are freed to focus on the things they do best and enjoy more: innovating, collaborating, creating, and interacting with customers. Enterprises get a boost too: higher productivity, efficiency, and resilience. It's no wonder that RPA is rewriting the story of work. Today, RPA is driving new efficiencies and freeing people from repetitive tedium across a broad swath of industries and processes. Enterprises in industries ranging from financial services , healthcare , manufacturing , the public sector to retail and far beyond have implemented RPA in areas as diverse as finance, compliance, legal, customer service, operations, and IT.

RPA has become so widespread because it is broadly applicable. Virtually any high-volume, business-rules-driven, repeatable process is a great candidate for automation—and increasingly so are cognitive processes that require higher-order AI skills. Low-code solutions are predicted to play a major role in application development. These solutions can provide a solid foundation for digital transformation. Companies can also take the foundation as a launchpad for RPA. Sam Babic, SVP, chief technology officer, Hyland, discusses how low-code solutions simplify the implementation of an RPA strategy.



More and more organizations are investing in flexible coding solutions like low-code applications, which are expected to play a role in 65% of all application development by 2024, according to Gartner. Low-code solutions make it easier to adapt applications to new business needs, lessening the load on IT teams. They are also laying the groundwork for the next generation of automation technology. A low-code platform provides a solid foundation for digital transformation. However, organizations can take the next step by using this foundation as a launching point for robotic process automation (RPA). With both low-code and RPA in place, your organization can automate repetitive processes and allow employees to focus on more meaningful tasks. RPA can be a valuable part of any digital transformation effort. Fortunately, the simplicity of low-code solutions makes it easier to adopt RPA and incorporate it into your organization's processes. With the flexibility of low-code solutions and the improved efficiency of RPA, your organization will have the tools to adjust quickly to changing business needs.



Low-code is an application development method that elevates coding from textual to visual. Rather than a technical coding environment, low-code operates in a model-driven, drag-and-drop interface. All development skill levels — professional developers, novice developers, subject matter experts, business stakeholders, and decision makers — can use low-code to build value-driven enterprise business applications. Rather, the "robot" in robotic process automation is software robots running on a physical or virtual machine. "RPA is a form of business process automation that allows anyone to define a set of instructions for a robot or 'bot' to perform," says Aaron Bultman, director of product at Nintex. "RPA bots are capable of mimicking most human-computer interactions to carry out a ton of error-free tasks, at high volume and speed".

If that kind of automation technology sounds sort of, well, boring especially compared to the Hollywood robots – that's by design. RPA is ultimately about automating some of the most mundane and repetitive computer-based tasks and processes in the workplace. Think copy-paste tasks and moving files from one location to another, for example. RPA automates everyday processes that once required human action – often a great deal of it performed in rote, time consuming fashion. That's also how RPA promises to boost efficiency for organizations.

QUANTUM CRYPTOGRAPHY

-S NIKHILESHWARI, IV CSE

Quantum cryptography is a method of encryption that uses the naturally occurring properties of quantum mechanics to secure and transmit data in a way that cannot be hacked. It uses the laws of quantum physics to transmit private information in a way that makes undetected eavesdropping impossible. Quantum key distribution (QKD), the most widely studied and viable method of quantum cryptography, uses a series of photons to transmit a secret, random sequence, known as the key. By comparing measurements taken at either end of the transmission, users will know if the key has been compromised. In this, there is no way to "listen in" on or observe a quantum encrypted key without disturbing the photons and changing the outcomes of the measurements at each end. This is due to a law in quantum mechanics called the uncertainty principle, which says that the act of measuring a property of a quantum system may alter some of the other properties of the quantum object (in this case, a photon). After keys are exchanged between the involved parties, there is little concern that a malicious actor could decode the data without the key.

If the key is observed when it is being constructed, the expected outcome changes, alerting both the sender and the receiver. This method of cryptography has yet to be fully developed; however, there have been successful implementations of it:

- The University of Cambridge and Toshiba Corp. created a high-bit rate QKD system using the BB84 quantum cryptography protocol.
- The Defense Advanced Research Projects Agency Quantum Network, which ran from 2002 to 2007, was a 10-node QKD network developed by Boston University, Harvard University and IBM Research.
- Quantum Xchange launched the first quantum network in the U.S., featuring 1,000 kilometers (km) of fiber optic cable.
- Commercial companies, such as ID Quantique, Toshiba, Quintessence Labs and MagiQ Technologies Inc., also developed commercial QKD systems.
- In addition to QKD, some of the more notable protocols and quantum algorithms used in quantum cryptography are the following: quantum coin flipping; position-based quantum cryptography; and device-independent quantum cryptography.

Teaching Physics to AI Can Allow It To Make New Discoveries All on Its Own

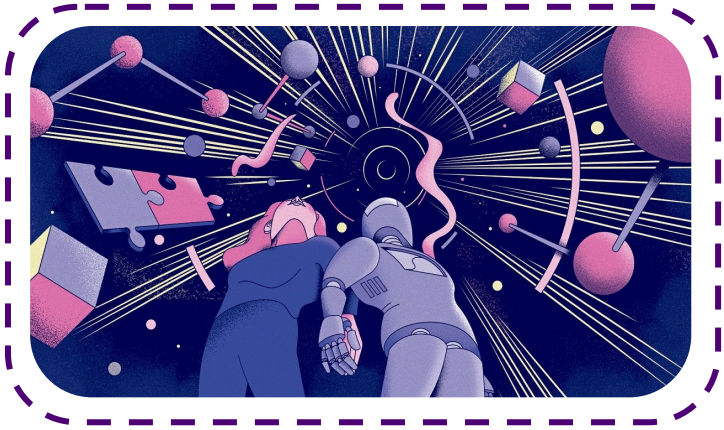
- ANCHANA IV CSE

Incorporating established physics into neural network algorithms helps to uncover new insights into material properties

Incorporating known physics into machine learning algorithms can help the enigmatic black boxes attain new levels of transparency and insight into the characteristics of materials.

Researchers used a sophisticated machine learning algorithm in one of the first efforts of its type to identify the characteristics of a class of engineered materials known as meta materials and to predict how they interact with electromagnetic fields.

The algorithm was essentially forced to show its work since it first had to take into account the known physical restrictions of the meta material. The method not only enabled the algorithm to predict the properties of the meta material with high accuracy, but it also did it more quickly with additional insights than earlier approaches.



Meta-materials are synthetic materials composed of many individual engineered features, which together produce properties not found in nature through their structure rather than their chemistry. In this case, the meta-material consists of a large grid of silicon cylinders that resemble a LEGO baseplate.

Depending on the size and spacing of the cylinders, the meta-material interacts with electromagnetic waves in various ways, such as absorbing, emitting, or deflecting specific wavelengths. In the new paper, the researchers sought to build a type of machine learning model called a neural network to discover how a range of heights and widths of a single-cylinder affects these interactions. But they also wanted its answers to make sense.

The physics that the research team imposed upon the neural network is called a Lorentz model- a set of equations that describe how the intrinsic properties of a material resonate with an electromagnetic field.

Incorporating that extra step, however, is much easier said than done.

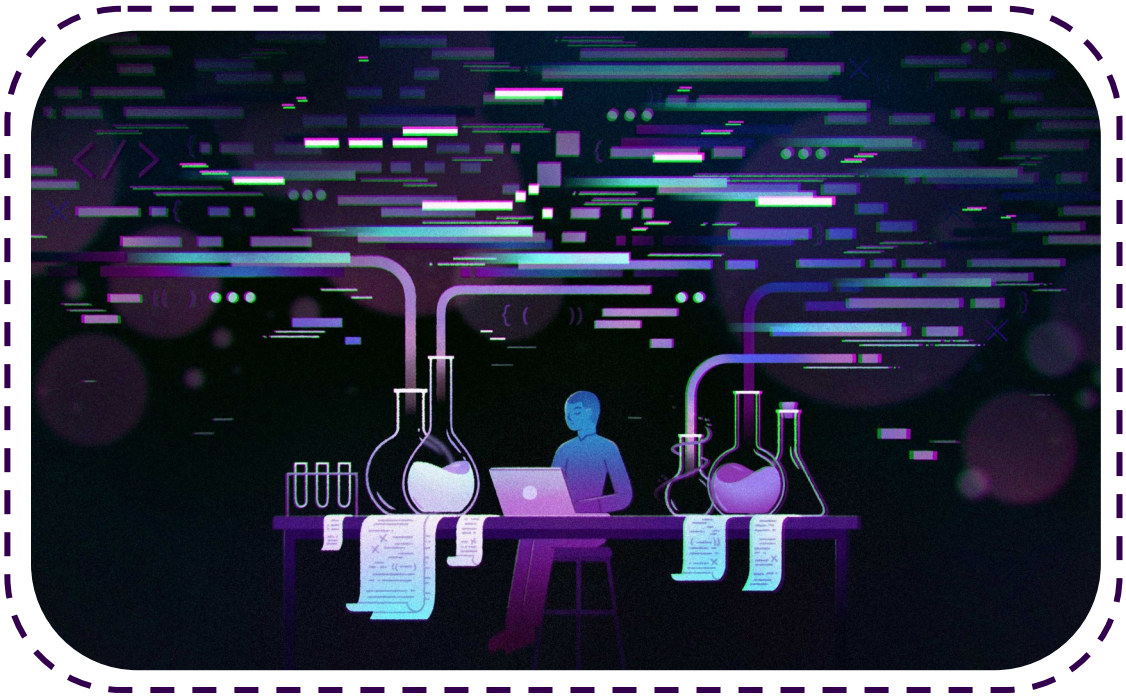
Once the model was working, however, it proved to be more efficient than previous neural networks the group had created for the same tasks. In particular, the group found this approach can dramatically reduce the number of parameters needed for the model to determine the meta material properties. They also found that this physics-based approach to artificial intelligence is capable of making discoveries all on its own.

As an electromagnetic wave travels through an object, it doesn't necessarily interact with it in exactly the same way at the beginning of its journey as it does at its end. This phenomenon is known as spatial dispersion. As the researchers had to tweak the spatial dispersion parameters to get the model to work accurately, they discovered insights into the physics of the process that they hadn't previously known.

Rather than jumping straight to predicting a cylinder's response, the model had to learn to predict the Lorentz parameters that it then used to calculate the cylinder's response.

"Now that we've demonstrated that this can be done, we want to apply this approach to systems where the physics is unknown," Padilla said.

Lots of people are using neural networks to predict material properties, but getting enough training data from simulations is a giant pain," Malof added. "This work also shows a path toward creating models that don't need as much data, which is useful across the board.



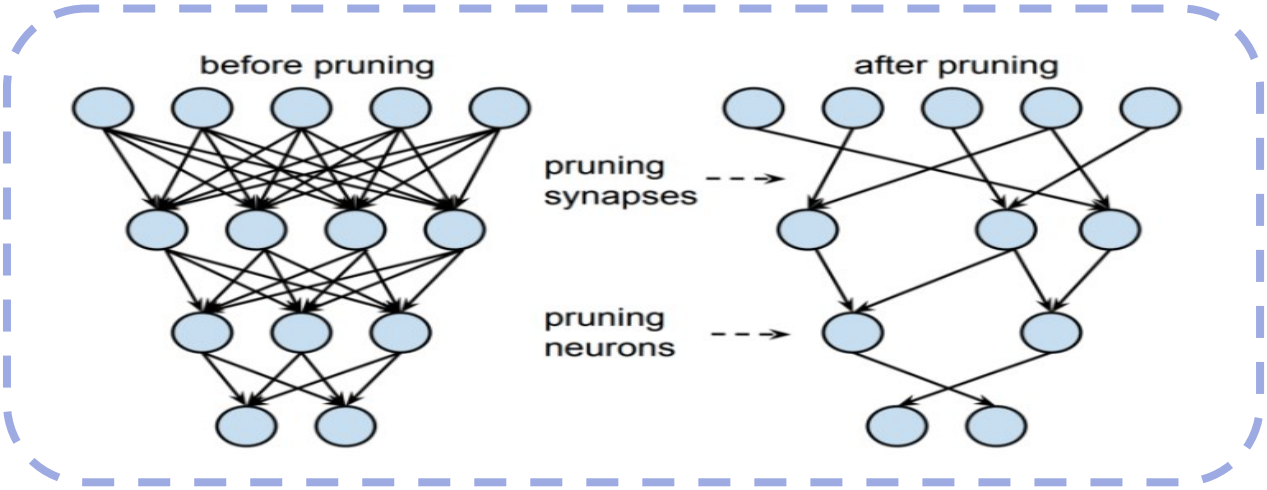
PRUNING NEURAL NETWORKS

-MRS. SUMITHRA, CSE

Neural networks can be made smaller and faster by removing connections or nodes. Pruning is the process of deleting parameters from an existing neural network, which might involve removing individual parameters or groups of parameters, such as neurons to maintain accuracy of the network while increasing its efficiency. This can be done to reduce the computational resources required to run the neural network.

Different ways to prune a neural network:

- Prune weights: It can be done by setting individual parameters to zero and making the network sparse. This would lower the number of parameters in the model while keeping the architecture the same.
- Prune a neural network by removing entire nodes from the network. This would make the network architecture itself smaller, while aiming to keep the accuracy of the initial larger network.

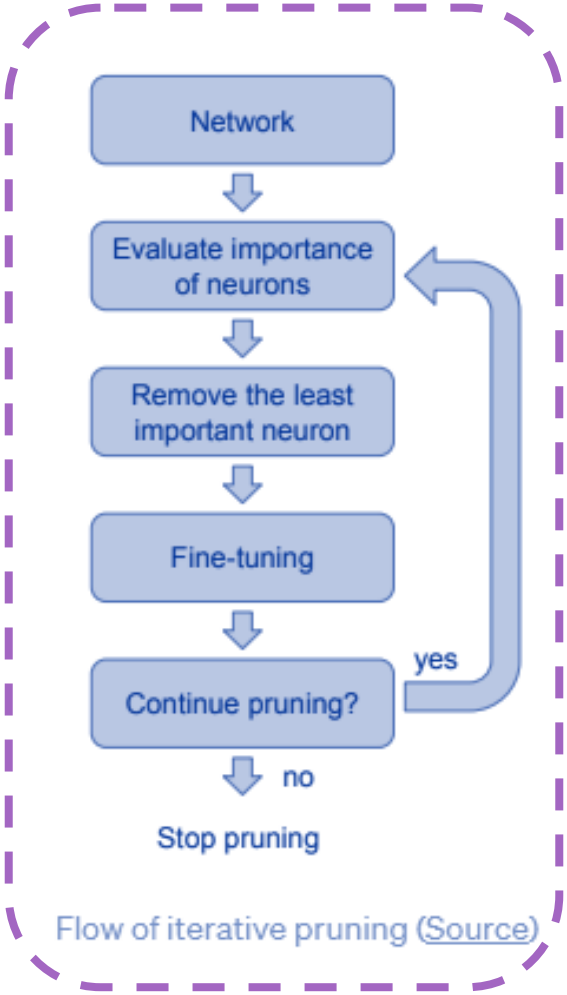


Weight-based pruning is more popular as it is easier to do without hurting the performance of the network. However, it requires sparse computations to be effective. This requires hardware support and a certain amount of sparsity to be efficient. Pruning nodes will allow dense computation which is more optimized. This allows the network to be run normally without sparse computation. This dense computation is more often better supported on hardware. However, removing entire neurons can more easily hurt the accuracy of the neural network.

When to Prune?

A major consideration in pruning is where to put it in the training/testing machine learning timeline. If you are using a weight magnitude-based pruning approach, as described in the previous section, you would want to prune after training. However, after pruning, you may observe that the model performance has suffered. This can be fixed by fine-tuning, meaning retraining the model after pruning to restore accuracy. If we prune too much at once, the network might be damaged so much it won't be able to recover. So iterative process which is often called 'Iterative Pruning' is used.

The usage of pruning can change depending on the application and methods used. Sometimes fine-tuning or multiple iterations of pruning are not necessary. This depends on how much of the network is pruned.



Flow of iterative pruning (Source)

FUN ZONE


IT'S APPLE'S ANSWER TO GOOGLE GLASS, IT'S CALLED iPATCH.
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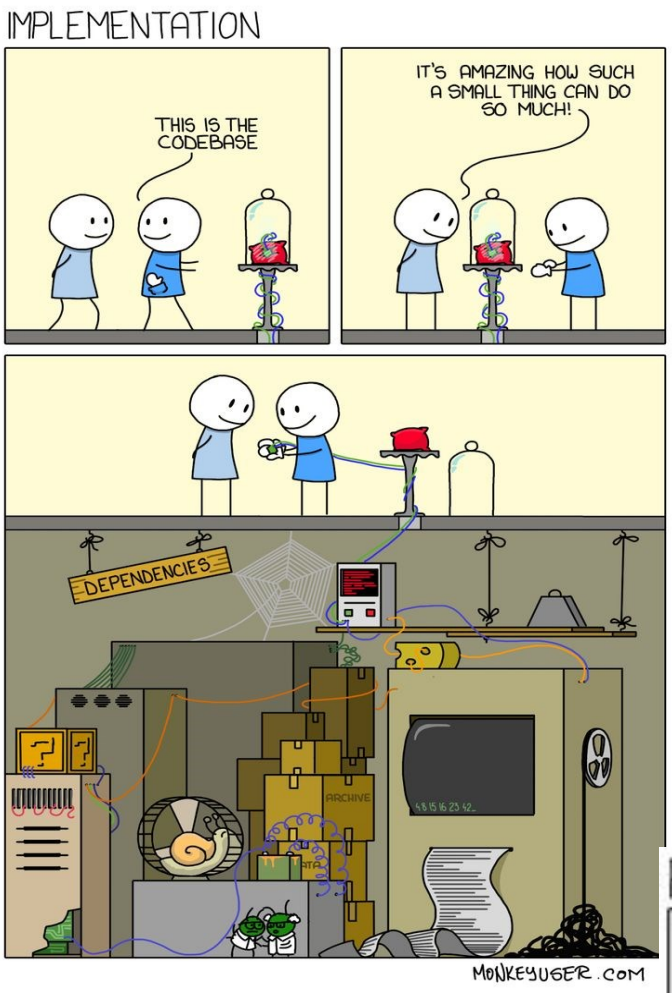
ARE YOU SURE THIS IS HOW WE GET DATA INTO THE CLOUD?
IT


IMPLEMENTATION
THIS IS THE CODEBASE
IT'S AMAZING HOW SUCH A SMALL THING CAN DO SO MUCH!
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MONKEYUSER.COM


FOCUS
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POOF
NEVERMIND
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FACTS CORNER

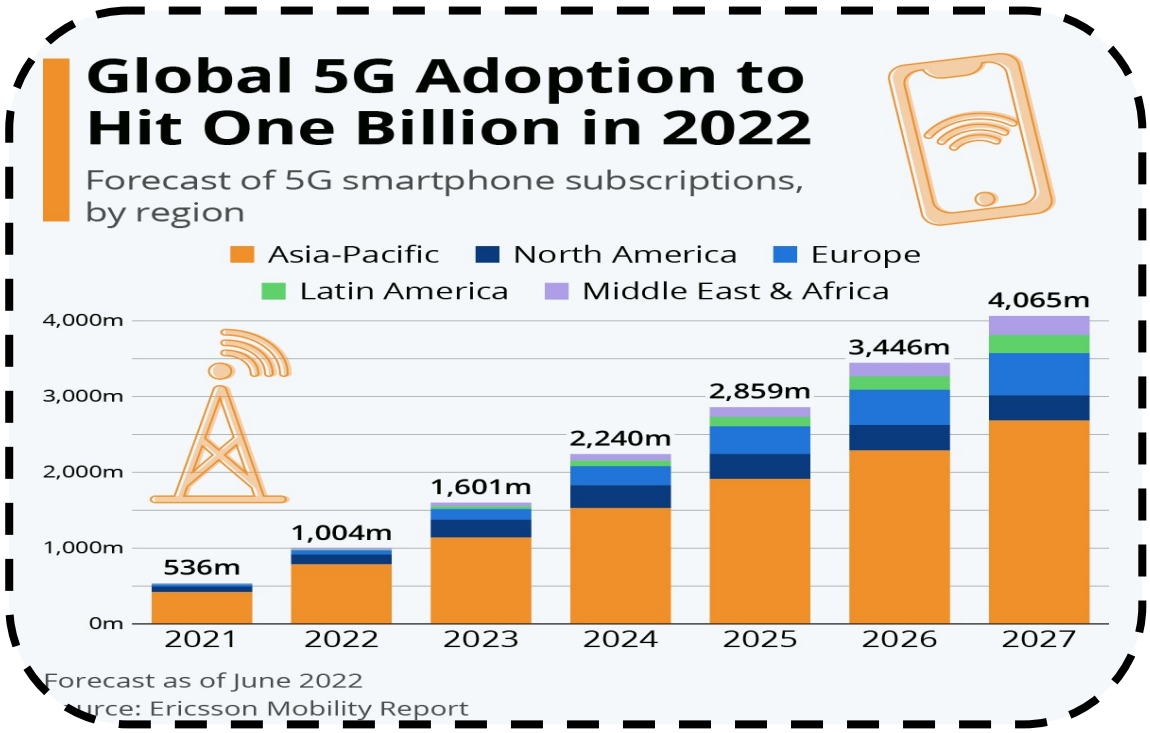
FACTS ON 5G

1.Multimillion dollar industry

While it is no secret, we should remember that, when we discuss mobile technology, we are talking about one of the industries with the fastest economic growth in the world. In short, 5G is set to generate around 113 billion euros a year and it is expected to create over 2.3 million new jobs around the world. The development in infrastructure and technology, as well as all the new fields facilitated by the implementation of 5G, paves the way for a new multimillion dollar industry that will lead the future.

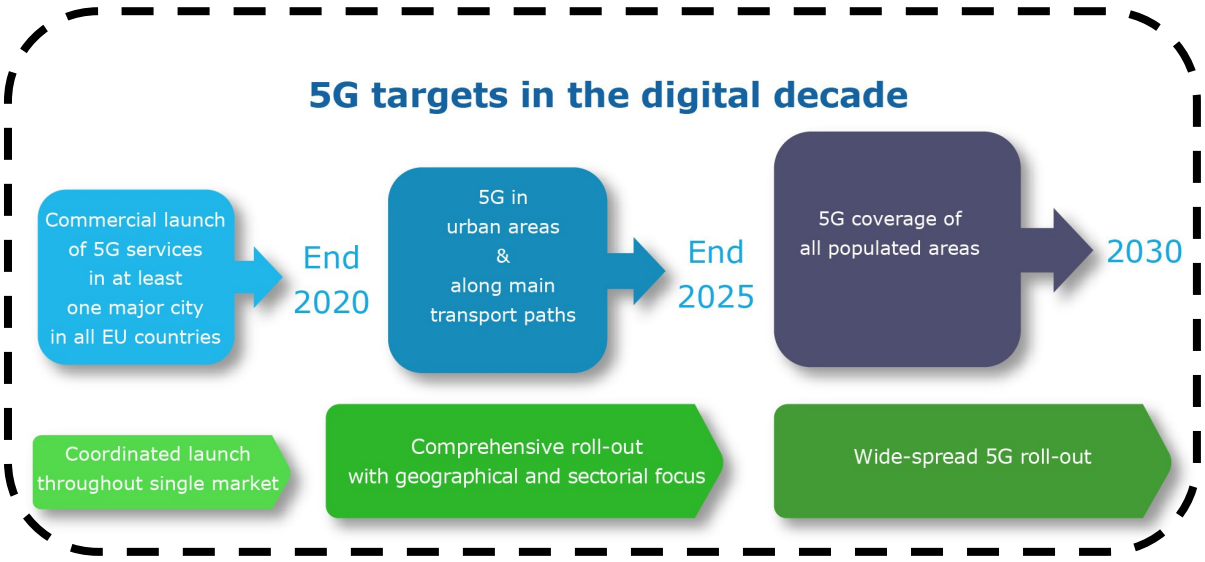
2. Smart network:

The 5G network differs from its predecessors in its capacity to adapt to the needs and configurations that prevail any given time. It is not a static network, but rather dynamic and smart, combining computing and telecommunications. It has the power to take the lead in tackling the great challenges of the modern world. Offering a broader channel for traffic, made up of large and small antennas, the 5G network will enable the development of macro data, but will also take advantage of it to optimize and improve itself constantly.



3. European Action Plan

The implementation of the 5G network is not as easy as it may seem. With this in mind, the European Action Plan has been developed. Since 2016, this plan has been the roadmap used for the development of this technology across the continent. Agreed by the majority of European countries, the plan includes measures ranging from preliminary trials and studies into frequency bands right through to the development of joint scenarios of optic fibre deployment and the confirmation of the viability of the standards for using 5G. Everywhere in Europe should have a 5G connection by

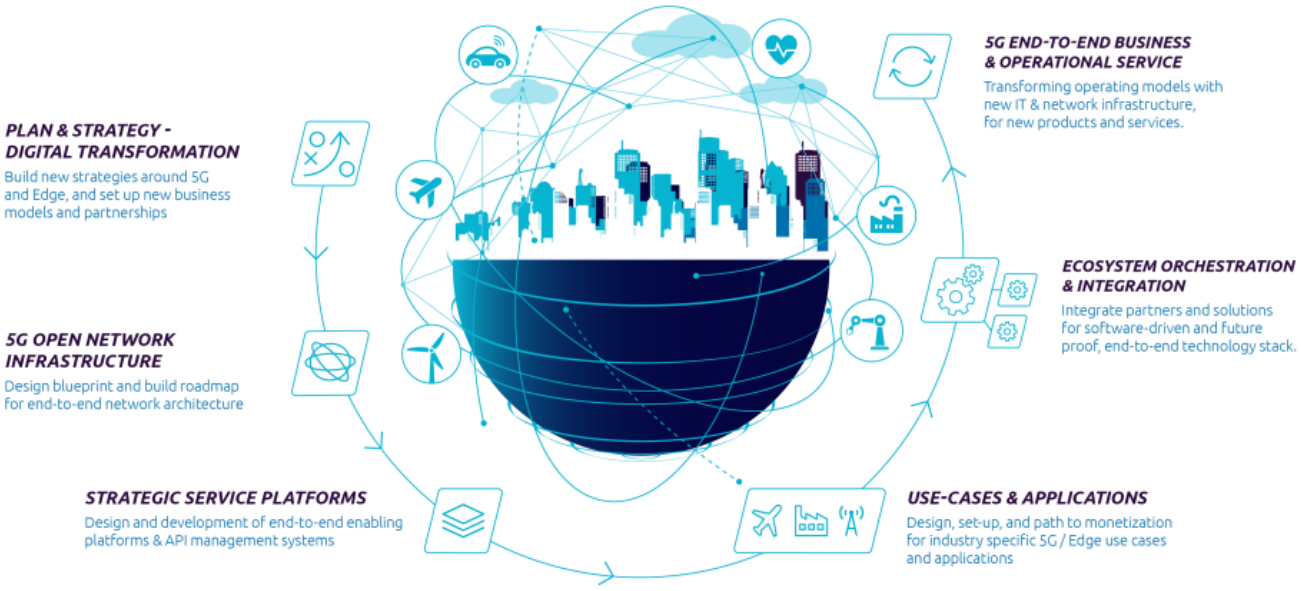


4. Business revolution

As Eduard Martín emphasized, technology is influencing business, as well as the configuration of companies. Therefore, the 5G network is expected to have a big impact on digital services and how these services are configured and provided. Moreover, as mentioned earlier, the 5G network will facilitate the use and evolution of technologies such as big data, artificial intelligence, robotics and the Internet of Things a great deal. As a result, we will see exponential growth in these fields.

5. The 5G network around the world

The 5G network has not progressed at an even rate throughout the world. Some countries are leading the race, while others are lagging behind. As expected, the leaders include China and the United States. However, the country that currently has the best 5G connection is South Korea. Spain and Europe are some way behind the big technological powers, but great progress has been made in recent years.



PLACEMENT BULLETIN

COMPANY	STUDENT COUNT
Kaar Technologies	04
Sirius	01
Walmart	01
Zoho	02
Virtusa	13
Big Think code	01
Elait IT solutions	01
Indium	06
Ganit	01
Cognizant	08
N Compass	01
Propel	01
Expeditors	02
Hexaware	03

DEPARTMENT BULLETIN

Total number of students	**65**
Total number of students placed	**45**
Total percentage of students placed	**69.23% (2019-23 Batch till November 2022)**

EDITORIAL BOARD

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