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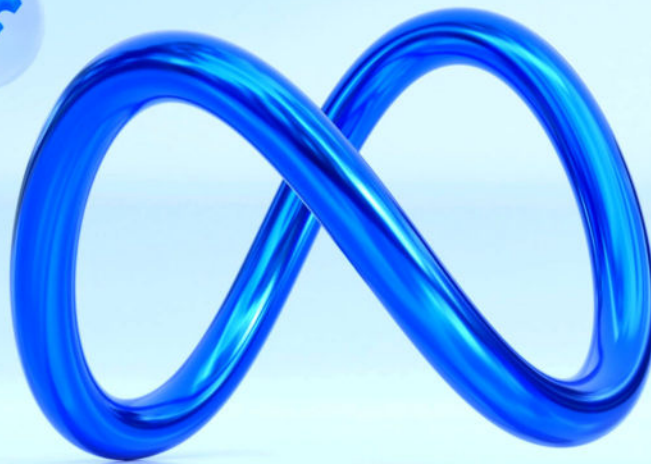## GOOGLE BUSINESS PROFILE

AI BASED
BUILDING SECURITY SYSTEM

Metaverse Marketing
EMERGENCE OF INDUSTRY 5.0

CONTENTS

ABOUT US

In 2008, we started our journey by launching the company's first office in Kochi with an operation team executing industrial automation projects and within one year we opened our first training centre in Kozhikode. By providing the finest service, in a short span we got students from various parts of India and Africa too. As a next step, we expanded our training centres to diverse locations in India, Nigeria, Qatar, UAE, Kenya, and the KSA and now in 2022, we have altogether 18+ branches. IPCS Global, one of the most renowned Core Technical Instruction Providers in the World, has been offering training on numerous programmes that are focused on the future.

The programmes that we choose for training segments are influenced by a variety of factors, including the stream's potential growth, the employability of our trainees, the accessibility of various employment markets, and many other aspects. Our current stream list includes Industrial Automation, Building Management and CCTV Systems, Embedded and Robotics, Internet of Things, Digital Marketing and IT and Software Development. 100% live and interactive classes, global certifications and placements are our major highlights.

Our next step is to expand IPCS to every single continent and to build a career oriented generation that stands with the future. We IPCS always focus on the upcoming trends and updates on every stream to make our students best and hold professional ethics and moral values tightly and never turns our clients un-satisfied. We firmly believe in the virtue of team spirit. All throughout, a culture of professionalism and mutual respect is upheld. Technology is the engine of business success and innovation. We believe that in the current digital world, it is important to understand how they affect our lives. As a part of our Corporate Social Responsibility, Team IPCS gave birth to "Iziar", a magazine that reflects technology trends and current trends in the market related to the same. The main goal is to raise awareness of available technologies and make them accessible wherever you are. It's about technology, inventions, startups, cyberpunk life & much more. Iziar was developed to give you insight into the latest innovations and keep you on top of the latest trends.

Technology is like air, You can't live without it. So we welcome you to the technological world of Iziar.

Google

BUSINESS PROFILE

Amal P K
Digital Marketing Analyst

DIVENTA SOCIO

Associarsi ad Agefis significa diventare parte di una collettività importante usufruendo, gratuitamente o a prezzi convenzionati, di una serie di servizi focalizzati sull'operatività e la professionalità del geometra esperto in materia fiscale e tributaria.
(Scopri di più)

Google Business Profile is a free online tool that allows business owners to manage and optimize their online presence across Google Search and Maps. It provides an easy and convenient way for businesses to display their information to potential customers, including their location, phone number, website, hours of operation, and customer reviews. In this article, we will discuss the various features of Google Business Profile and how it can benefit your business.

Firstly, creating a Google Business Profile listing is straightforward and can be done in just a few minutes. You need to provide basic information about your business, such as its name, address, phone number, and website. Once you've created a listing, Google will send you a postcard to verify your business's physical location. Once your listing is verified, it will appear on Google Maps and Google Search.

One of the most significant benefits of Google Business Profile is its ability to improve your business's visibility in search results. By creating a listing and optimizing it with relevant keywords, you can increase the chances of your business appearing at the top of Google Search results when people search for products or services related to your business. This can drive more traffic to your website and increase your chances of attracting new customers.

Another benefit of Google Business Profile is that it allows customers to leave reviews about your business. Positive reviews can help improve your business's reputation and attract new customers. It's important to respond to all reviews, whether positive or negative, to show that you value your customers' feedback and are committed to providing excellent service.

Google Business Profile also allows businesses to post updates, such as promotions or events, which can help attract new customers and keep existing ones engaged. These updates appear on your business's Google listing and can be seen by anyone searching for your business on Google Search or Maps.

Additionally, Google Business Profile provides businesses with valuable insights into how customers are finding and interacting with their listings. You can see how many people are viewing your listing, how many people are clicking on your website or directions, and even what keywords people are using to find your business. This information can help you make data-driven decisions about how to improve your online presence and attract more customers.

Finally, Google Business Profile provides a convenient way for businesses to manage their online presence across multiple Google services. You can use the tool to manage your business's information on Google Search, Maps, and even Google Ads. This can save you time and ensure that your business's information is accurate and up-to-date across all Google services.

In conclusion, Google Business Profile is a powerful tool for businesses looking to improve their online presence and attract new customers. By creating a listing and optimizing it with relevant keywords, businesses can increase their visibility in search results and drive more traffic to their website. The tool's ability to collect customer reviews, post updates, and provide valuable insights into how customers are finding and interacting with their listings make it an essential tool for any business looking to succeed online. If you haven't already, create a Google Business Profile listing today and start reaping the benefits of an optimized online presence.

Tips for optimizing my Google Business Profile listing

Optimizing your Google Business Profile listing is essential if you want to improve your business's online visibility and attract more customers. Here are some tips for optimizing your Google Business Profile listing:

1.   **Claim and verify your listing:** 1.Before you can optimize your listing, you need to claim it and verify that you are the business owner. This involves providing basic information about your business and verifying your physical location. Once your listing is verified, you can begin optimizing it.

2.   **Complete your profile:** Ensure that your profile is complete with accurate and up-to-date information, including your business name, address, phone number, website, hours of operation, and business description. Make sure that your business category is accurate and relevant to your business.

3.   **Add high-quality photos:** Photos are an essential component of your Google Business Profile listing. Add high-quality photos of your business, including your storefront, products, and services. Ensure that your photos are optimized for the web, and add relevant captions to each photo.

4.   **Encourage customer reviews:** Encourage your customers to leave reviews on your Google Business Profile listing. Respond to all reviews, whether positive or negative, and address any concerns or complaints that customers may have. Positive reviews can improve your business's online reputation and attract new customers.

5.   **Use relevant keywords:** Use relevant keywords in your business description and throughout your listing to improve your visibility in search results. However, avoid keyword stuffing, which can have a negative impact on your listing's ranking.

6.   **Post regular updates:** Use the Posts feature on your Google Business Profile listing to post regular updates, such as promotions, events, or new products or services. This can help keep your listing fresh and engaging for customers.

7.   **Monitor and respond to customer queries:** Monitor your listing for customer queries and respond to them promptly. This can help improve customer satisfaction and build trust with potential customers.

8.   **Use Google Business Profile Insights:** Use the Insights feature on your Google Business Profile listing to track how customers are finding and interacting with your listing. This can help you make data-driven decisions about how to improve your online presence and attract more customers.
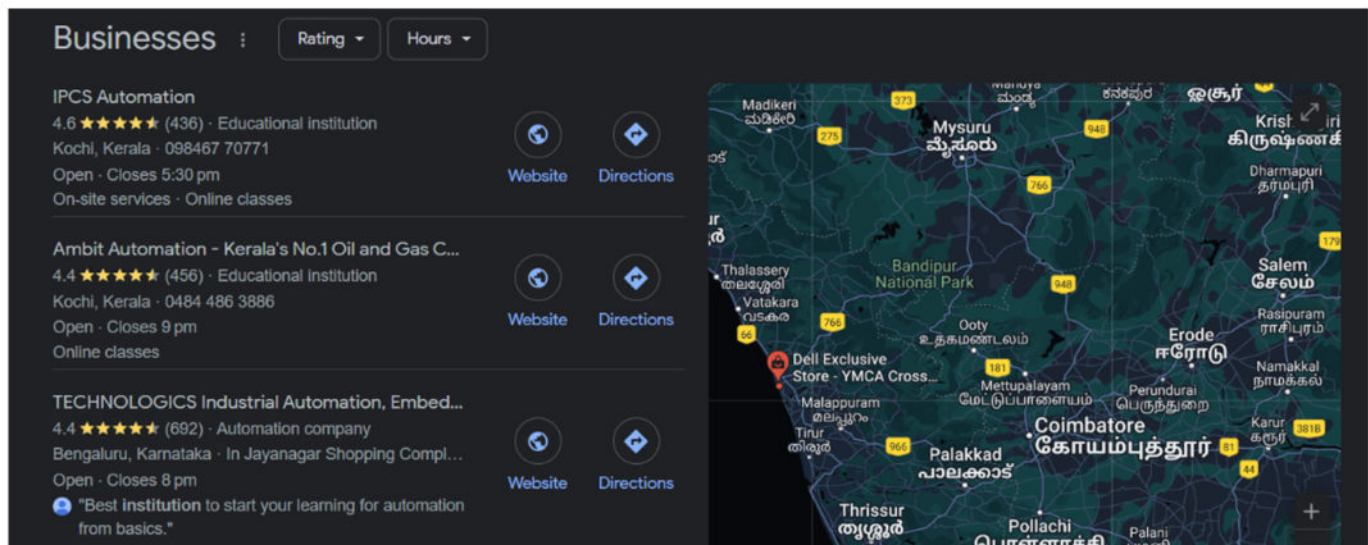
In conclusion, optimizing your Google Business Profile listing is crucial if you want to improve your business's online visibility and attract more customers. By following these tips, you can create a listing that is engaging, informative, and optimized for search engines.

CAN - BUS
PROTOCOL

Arafat Ali
Jr. Project Engineer

WHAT IS CAN ?

A Controller Area Network (CAN bus) is a vehicle bus standard designed to allow microcontrollers and devices to communicate with each other's applications without a host computer .A Controller Area Network (CAN) bus is a reliable serial bus system designed for networking intelligent devices in various industries, including automotive and industrial applications. . It is a message-based protocol, designed originally for multiplex electrical wiring within automobiles to save on copper, but it can also be used in many other contexts.

CAN BENEFITS

The Controller Area Network (CAN) protocol provides several benefits, including low-cost and lightweight network, broadcast communication, priority messaging, and error capabilities. CAN enables multiple devices to communicate through a single interface, reducing overall cost and weight in automobiles. Additionally, every message has a priority, ensuring that the highest priority message gets transmitted. The CAN specification includes error-checking capabilities, allowing individual nodes to disconnect from the network or stop transmitting errors if too many errors are detected. These benefits make CAN a reliable and efficient communication protocol for various industries

Without CAN   **With CAN**
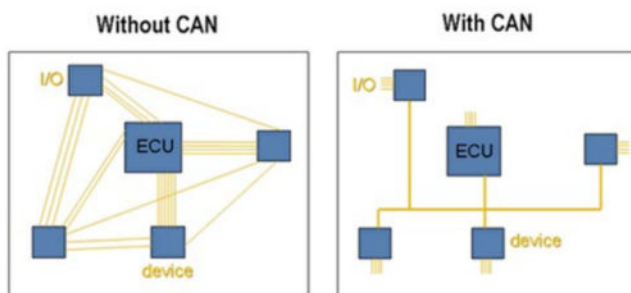
HOW CAN COMMUNICATION WORKS

Controller Area Network (CAN) operates as a peer-to-peer network without a master controlling individual nodes' access to read and write data. Each CAN node writes a unique arbitration ID on the network, and all nodes receive the CAN frame and decide whether to accept it based on the ID. If multiple nodes try to transmit a message simultaneously, the node with the highest priority gets bus access, ensuring deterministic communication among CAN nodes.
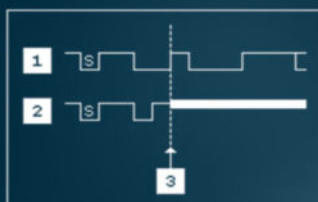
1 Device A: ID = 11001000111 (647 hex)
2 Device B: ID = 11011111111 (6FF hex)
3 Device B Loses Arbitration; Device A Wins Arbitration and Proceeds
S = Start Frame Bit

CAN-BUS

Robustness   Low Cost   Speed

Flexibility   Efficiency

CAN bus protocol in industrial automation

CAN (Controller Area Network) protocol is widely used in industrial automation for communication between various devices and systems. Here are some ways CAN bus protocol can be used in industrial automation:

Remote monitoring and control:

CAN bus protocol can be used for remote monitoring and control of industrial automation systems. This is particularly useful for large-scale manufacturing operations, where it may be difficult to monitor and control all aspects of the production process manually. With remote monitoring and control, operators can monitor the system from a central location and make adjustments as needed.

Integration with other protocols:

CAN bus protocol can be integrated with other communication protocols to create a comprehensive communication system for industrial automation. For example, it can be used along with Modbus or Profibus to provide a complete communication solution.

Remote firmware updates:

CAN bus protocol can be used to remotely update the firmware on devices in industrial automation systems. This allows for easier and more efficient management of firmware updates, which can be critical for maintaining system security and functionality.

Overall, CAN bus protocol is a versatile communication protocol that can be used in a wide variety of industrial automation applications. Its reliability, flexibility, and real-time capabilities make it an essential component of many modern industrial automation systems.

CAN BUS TYPES

CAN High Speed (CAN 2.0B)

- ◈ Speed: Up to 1Mbps
- ◈ Range: 40m
- ◈ 29bit Message Identifier
- ◈ Termination with 120 Ω Resistor

CAN Low Speed (CAN 2.0A)

- ◈ Speed: Up to 125Kbps
- ◈ Range: 500m
- ◈ 11bit Message Identifier
- ◈ overall termination resistance should be about 100 Ω

CAN FD (Flexible Data Rate)

- ◈ Speed: Up to 15Mbps
- ◈ Range 10m

ADVANTAGES

High reliability :
CAN bus is a highly reliable communication protocol that is capable of transmitting data over long distances without errors.

Real-time communication :
CAN bus provides real-time communication between devices, making it ideal for industrial automation systems where fast response times are required.

Low cost :
CAN bus is a low-cost solution for industrial automation communication needs, reducing overall system costs.

Scalability :
CAN bus can be easily expanded to accommodate additional devices, making it a scalable solution for industrial automation applications.

Error-checking capabilities :
CAN bus includes error-checking capabilities, which allow individual nodes to disconnect from the network or stop transmitting errors if too many errors are detected.

DISADVANTAGES

Limited bandwidth :
CAN bus has limited bandwidth and may not be suitable for applications that require high data rates.

Limited distance :
CAN bus is designed for short- to medium-distance communication and may not be suitable for long-distance applications.

Limited network size :
CAN bus is limited in the number of devices it can support in a single network.

Complexity :
CAN bus requires specialized hardware and software, which can increase the complexity of industrial automation systems.
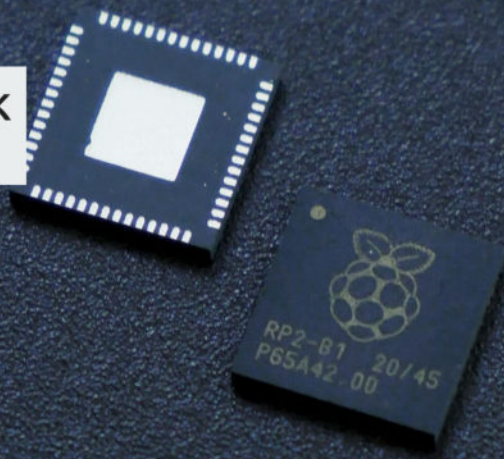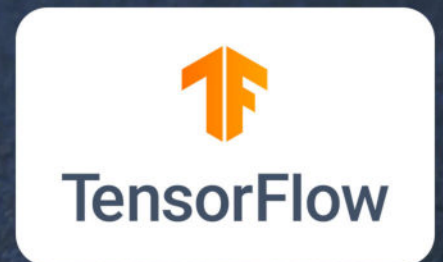
Interference :
CAN bus can be susceptible to electromagnetic interference, which can cause errors in data transmission.
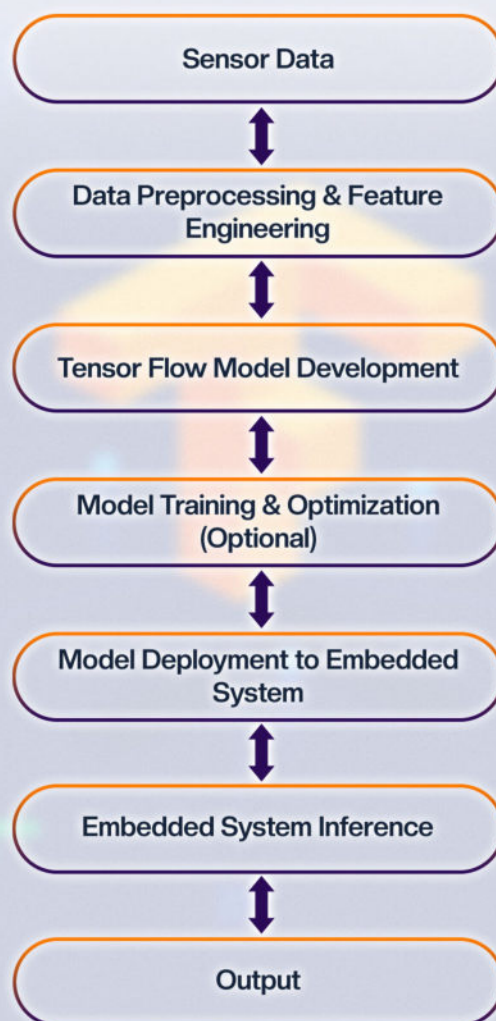
HOW TENSORFLOW ARE TRANSFORMING EMBEDDED SYSTEM

GNANASUNDARRAJ.K
Junior project Engineer

TensorFlow is an open-source machine learning framework. It allows developers to build and train machine learning models, including deep neural networks, using a variety of programming languages such as Python, C++, and Java. TensorFlow was first released in 2015 and has since become one of the most popular machine learning frameworks, with a large community of developers contributing to its development. TensorFlows allows developers to create models that can be trained on large data sets, and then used to make predictions on new data.

```
┌─────────────────────────────┐
│         Sensor Data         │
└─────────────────────────────┘
              ↕
┌─────────────────────────────┐
│ Data Preprocessing & Feature│
│         Engineering         │
└─────────────────────────────┘
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│ Tensor Flow Model Development│
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│  Model Training & Optimization│
│         (Optional)          │
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│ Model Deployment to Embedded│
│           System            │
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│  Embedded System Inference  │
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┌─────────────────────────────┐
│           Output            │
└─────────────────────────────┘
```

Why are we using TensorFlow in Embedded Systems ?

Improved performance : TensorFlow has been optimized to run efficiently on a wide range of devices, including embedded systems. This means that developers can train and run machine learning models on these devices without sacrificing performance.

Reduced latency : Running machine learning models on embedded systems can reduce latency, as data doesn't need to be sent to a remote server for processing. This is particularly important in real-time applications, such as autonomous vehicles or industrial automation.

Reduced power consumption : Running machine learning models on embedded systems can be more power-efficient than running them on a remote server. This is because the data doesn't need to be transmitted over a network, which can consume significant amounts of

Improved privacy and security : Running machine learning models on embedded system scan improve privacy and security, as data doesn't need to be sent to a remote server for processing. This is particularly important in applications where sensitive data is being processed, such as health care or finance.

Flexibility : Using TensorFlow in embedded systems allows for greater flexibility in the types of applications that can be developed. For example, machine learning models can be used to analyze data from sensors in real-time, allowing for new applications such as predictive maintenance or automated quality control.

SOME OF THE ADVANTAGES OF TENSORFLOW IN EMBEDDED SYSTEM INCLUDE :

Scalability :

TensorFlow supports distributed computing, which means that developers can scale their models to handle larger and more complex data sets.

Support for a wide range of hardware :

TensorFlow supports a wide range of hardware, including CPUs, GPUs, and custom ASICs. This means that developers can choose the hardware that best fits their application and budget.

HERE ARE SOME POTENTIAL ADVANTAGES OF TENSORFLOW IN THE FUTURE :

Advancements in hardware :

As hardware continues to evolve and become more powerful, TensorFlow can take advantage of these advancements to run more complex and advanced machine learning models.

Improved performance :

As TensorFlow continues to be optimized for different hardware platforms and use cases, it is expected to continue to improve performance and efficiency, making it even more attractive for use in embedded systems.

Increased automation :

TensorFlow and other machine learning platforms are expected to play a larger role in automation in the future. With advancements in robotics, autonomous vehicles, and other applications, TensorFlow can help power the intelligent decision-making processes required for these systems.
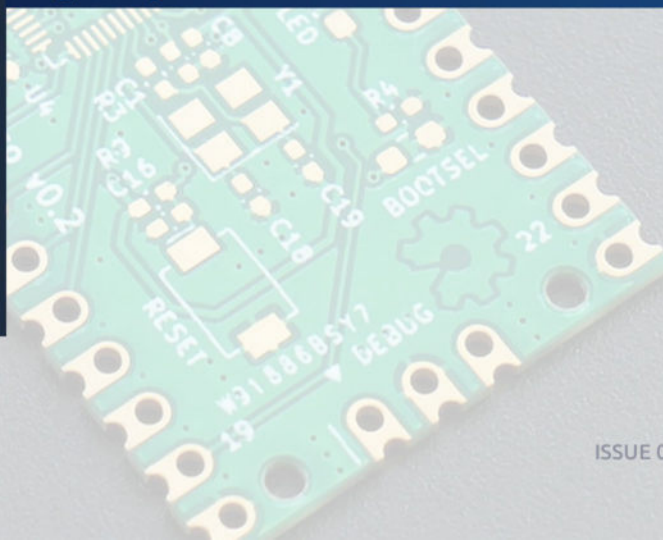
Application areas of Tensorflow

Build and train ML models easily using intuitive high-level APIs like Keras

Train and deploy models in the cloud, on-prem, in the browser, or on-device irrespective of the language you use

Powerful experimentation for research with a simple and flexible architecture

CODE :

```
#include<tensorflow/lite/micro/micro_error_reporter.h>
#include <tensorflow/lite/micro/micro_interpreter.h>
#include<tensorflow/lite/micro/kernels/micro_ops.h>
#include<tensorflow/lite/micro/all_ops_resolver.h>
#include<tensorflow/lite/micro/micro_mutable_op_resolver.h>
#include <tensorflow/lite/schema/schema_generated.h>
#include<tensorflow/lite/version.h>

// Define the input tensor shape
const int tensor_width = 28;
const int tensor_height = 28;
constinttensor_channels=1;

//Define the input tensor data
const float input_data[tensor_width*tensor_height*tensor_channels]={...};

//Define the TensorFlow model buffer
const unsigned char model[ ]={...};

int main()
{
//Initialize theTensorFlow interpreter
Statictflite::MicroErrorReporter micro_error_reporter;tflite::ErrorReporter*error_re-
porter=&micro_error_reporter;statictflite::MicroInterpreter static_interpreter(
model, tflite::GetModelSize(model),tflite::MicroMutableOpResolver<6>(micro_op_resolver),
tensor_arena, kTensorArenaSize, error_reporter);tflite::MicroInterpreter*interpret-
er=&static_interpreter;interpreter->AllocateTensors();

// Get pointers to the input and output tensors
TfLite Tensor* input = interpreter->input(0);
TfLiteTensor*output=interpreter->output(0);

//Set the input tensor data
memcpy(input->data.f,input_data,sizeof(input_data));

//RuntheTensorFlowmodelinterpreter->Invoke();

//Print the output tensor data
for (int i = 0; i < output->dims->data[0]; ++i)
 {
printf("Output[%d]:%f\n",i,output->data.f[i]);
}
return 0;
}
```

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Utilizing an embedded system and Tensor flow:

TensorFlow Lite for Microcontrollers: Recent Developments

Advait Jain
Staff Software Engineer
Google

David Davis
Senior Embedded Software Engineer
BDTI

John Withers
Automation and Systems Engineer
BDTI

With the help of TensorFlow in embedded systems, you can deploy machine learning models on low-power, resource-constrained devices, such as microcontrollers and edge devices. TensorFlow allows you to build, train, and optimize machine learning models using various neural network architectures, such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs), and deploy them on embedded systems. This enables you to perform tasks such as object detection, voice recognition, and anomaly detection on the edge, without the need for a cloud connection or a high-performance computer.
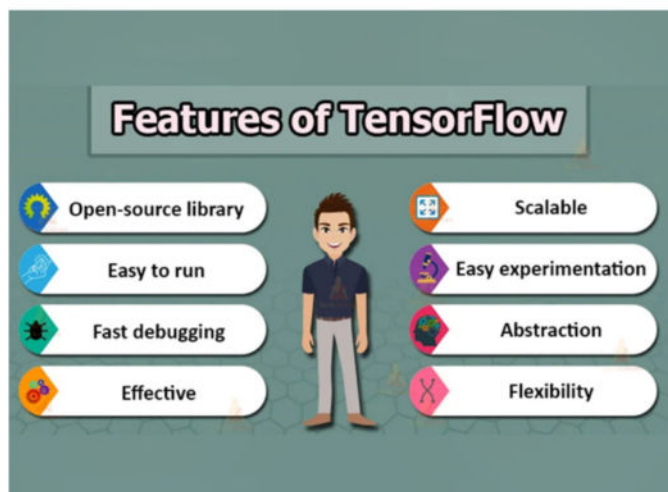
Privacy and security : By keeping sensitive data on the edge and not transmitting it to the cloud, you can improve privacy and security.

Energy efficiency : By performing machine learning tasks on low-power devices, you can reduce energy consumption and increase battery life, which is crucial for IoT devices.

Customization : By building and training your own machine learning models, you can customize them to your specific application requirements and improve their accuracy and performance.

Tensor Flow in embedded systems offers several advantages, such as:

Low latency: By running machine learning models on the edge, you can achieve low latency and real-time responsiveness, which is essential for applications such as robotics, autonomous vehicles, and industrial control systems.

Features of TensorFlow

Open-source library
Easy to run
Fast debugging
Effective

Scalable
Easy experimentation
Abstraction
Flexibility

CONCLUSION

In conclusion, TensorFlow is a powerful open-source platform for building and deploying machine learning models. It offers a wide range of features and tools, including data preprocessing, model building, training, and optimization. TensorFlow can be used for a variety of tasks, such as image and speech recognition, natural language processing, and anomaly detection. One of the key advantages of TensorFlow is its ability to scale from large-scale distributed training on powerful servers to running on resource-constrained embedded devices. This makes it an ideal tool for developing intelligent applications for the IoT and embedded systems domains. TensorFlow is constantly evolving, with new features and improvements being added all the time. As the field of machine learning. Continuing to advance, Tensor Flow is likely to remain at the forefront of innovation, enabling developers to create more intelligent and sophisticated applications.
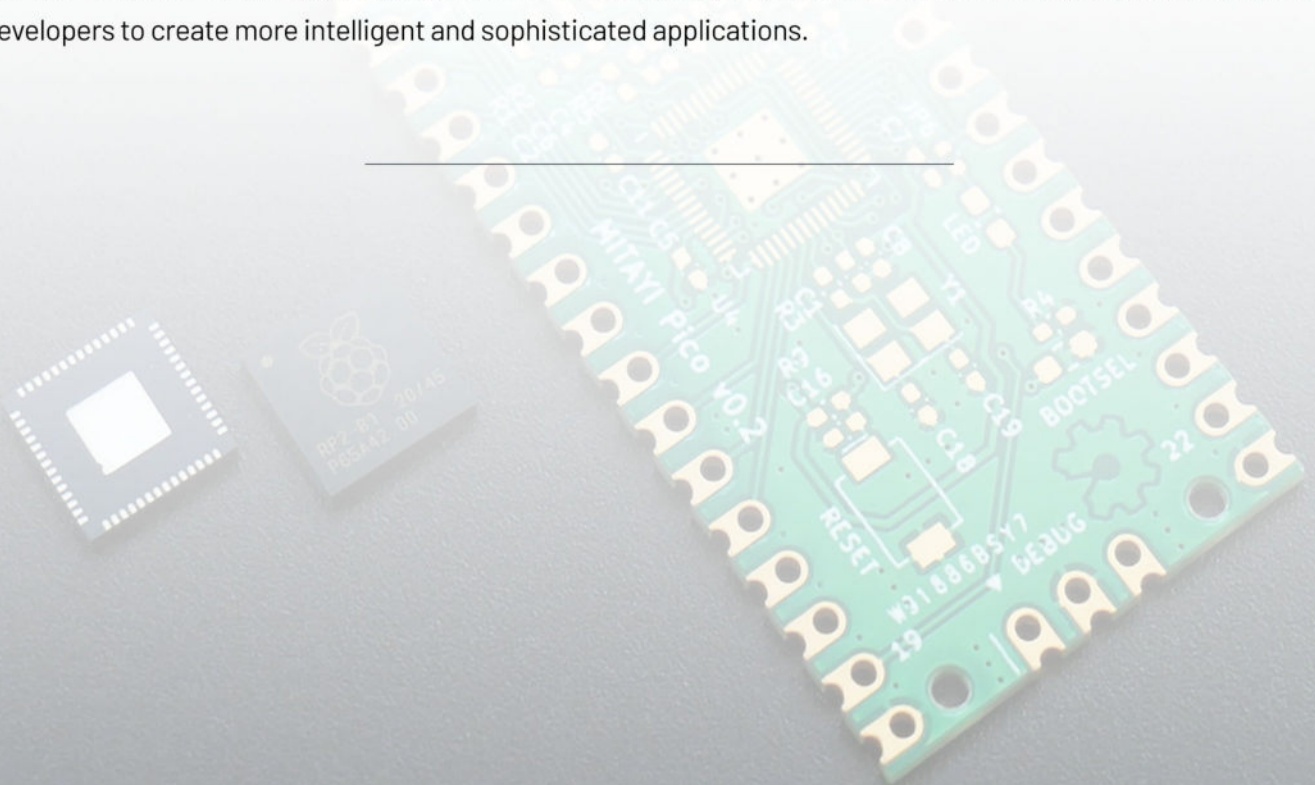
EMERGENCE OF
INDUSTRY 5.0

Vivek.T
Jr.Project Engineer

Industry 5.0, also known as the "Smart Factory" represents the fifth generation of industrial production and is characterized by the integration of advanced technologies such as artificial intelligence (AI), the Internet of Things (IoT), and automation. It is a significant evolution from previous industrial revolutions and has the potential to revolutionize the way we produce goods and services. It is characterized by the use of even more advanced technologies, such as quantum computing and biotechnology, to automate and optimize manufacturing processes. Industry 5.0 also involves the creation of a fully connected and integrated value chain, from raw materials to the end customer.

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Industry 5.0 ...

HUMAN-CENTRIC
... promotes talents, diversity and empowerment

RESILIENT
... is agile and resilient with flexible and adaptable technologies

SUSTAINABLE
... leads action on sustainability and respects planetary boundaries

One of the key features of Industry 5.0 is the use of AI and machine learning to optimize and automate manufacturing processes. With the ability to analyse vast amounts of data and make real-time decisions, AI can improve the efficiency and productivity of factories. These technologies can work alongside human workers or take over certain tasks entirely, freeing up workers to focus on more complex and creative tasks. For example, AI can be used to identify bottlenecks in the production process and suggest ways to resolve them, or to predict maintenance needs and schedule repairs before equipment breaks down. This can lead to cost savings and increased competitiveness for businesses.

The IoT is also an important aspect of Industry 5.0. By connecting machines, devices, and sensors to the internet, factories can collect and analyse data on everything from energy usage to the performance of individual machines

This information can be used to optimize production and identify opportunities for improvement. For example, if a machine is consistently underperforming, the data collected from the IoT can be used to identify the root cause and suggest solutions to improve its performance.

In addition to AI and the IoT, Industry 5.0 also involves the use of advanced automation technologies such as robotics, 3D printing, and autonomous vehicles. These technologies can help factories operate more efficiently by reducing the need for human labor and enabling faster, more precise production. For example, robots can be used to perform tasks that are dangerous or physically demanding for humans, such as welding or handling hazardous materials. They can also work around the clock without the need for breaks, further increasing efficiency.

The application of cutting-edge technologies like artificial intelligence and machine learning to enhance decision-making and enhance production processes is one of the fundamental aspects of Industry 5.0. AI may be used, for instance, to evaluate vast amounts of data and spot patterns and trends that can be leveraged to enhance productivity and optimize production schedules. The industrial process can be connected with the help of the internet of things (IoT), enabling real-time monitoring and management of the entire cycle.

In addition to improving efficiency and quality, Industry 5.0 technologies can also enhance flexibility and agility. For example, the use of AI and machine learning algorithms can enable factories to quickly adapt to changes in demand or the introduction of new products. This can help businesses to stay ahead of their competitors and respond quickly to changing market conditions.
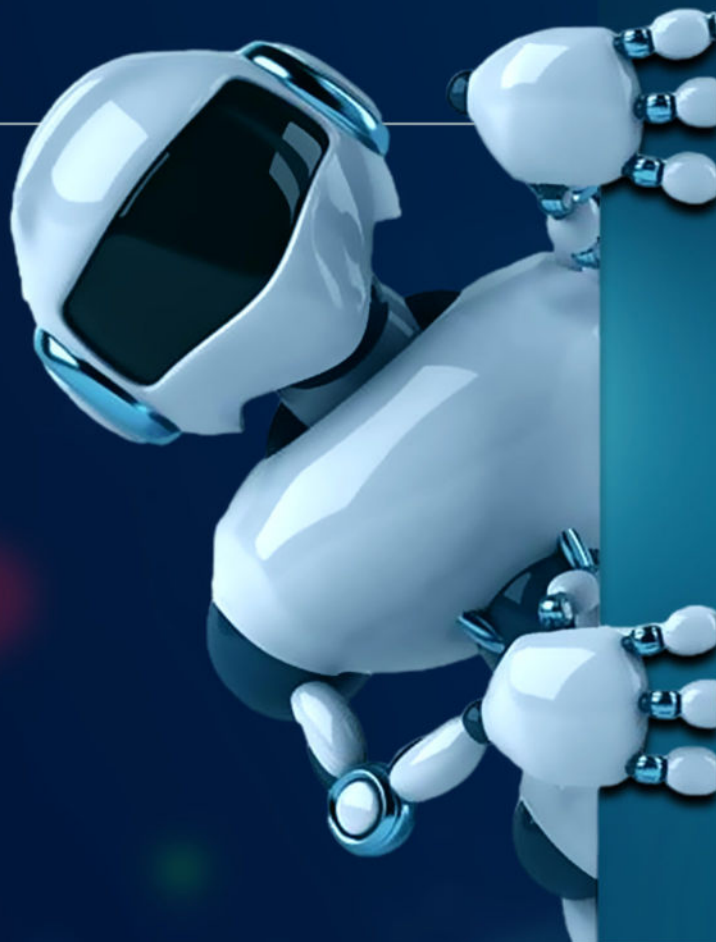
One of the main benefits of Industry 5.0 is the potential to increase productivity and competitiveness. By automating and optimizing processes, businesses can produce more goods in less time, leading to cost savings and increased profits. Additionally, the use of advanced technologies can help businesses differentiate themselves from competitors and gain a competitive advantage in their respective markets. This trend is expected to lead to significant improvements in efficiency, accuracy, and speed, as well as the creation of new products and services.

POTENTIAL BENEFITS OF INDUSTRY 5.0 ARE :

1. **Increased efficiency**
2. **Improved quality**
3. **Enhanced flexibility**
4. **Increased competitiveness**
5. **New business opportunities**

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Overall, Industry 5.0 is expected to bring about significant changes in the way industries operate, with the potential to drive economic growth and development through the adoption of advanced technologies and automation.

The emergence of Industry 5.0 represents a significant step forward in the evolution of industrial production. By integrating advanced technologies such as AI, the IoT, and automation, it has the potential to revolutionize the way we produce goods and services, leading to increased efficiency, productivity, and competitiveness. While there are concerns about job displacement, the benefits of Industry 5.0 far outweigh the risks, and it is important for businesses to embrace these technologies in order to stay competitive in an increasingly digital world.

AI BASED
Building Security systems

Githeesh S B
Project Engineer

If we look into the last one or two years we can see deep learning and Artificial intelligence are creating huge waves in all markets. This impact is also making changes in our physical security system also.

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DEEP LEARNING

Deep learning is a subset of machine learning that uses neural networks with multiple layers to learn from data and make predictions or decisions without human intervention. The neural networks are trained using large amounts of labelled data and are able to learn complex patterns and features from the data. Deep learning has been successful in many applications such as image recognition, speech recognition, natural language processing and many more.

Deep learning is one of the most powerful and successful approaches to AI, and it has been used to achieve state-of-the-art results in many applications such as image recognition, speech recognition, natural language processing, and more. It has also enabled the development of more advanced AI systems such as self-driving cars and machine translation.

Deep learning is a powerful and successful approach to AI, and it has been used to achieve state-of-the-art results in many applications.
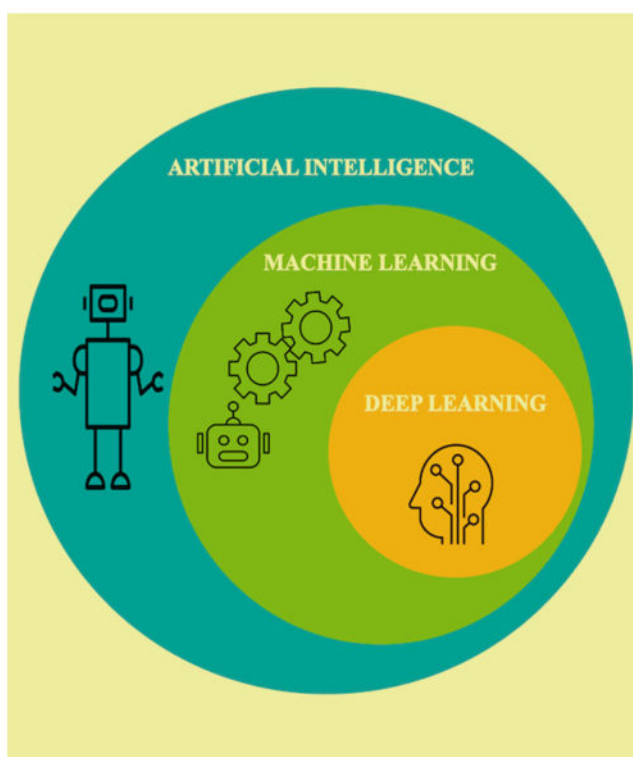
Artificial Intelligence Based Building Security System

Artificial intelligence (AI) has revolutionised many industries, and building security is no exception. AI-based security systems are becoming increasingly common in both residential and commercial buildings, and for good reason. These systems offer a number of benefits over traditional security measures, including increased efficiency, improved accuracy, and the ability to respond to threats in real time.

One of the primary advantages of AI-based security systems is their ability to analyse vast amounts of data and make decisions based on that analysis.

For example, an AI-based security system might be able to analyse footage from security cameras and identify patterns or anomalies that might indicate a potential threat. This ability to process and analyse large amounts of data allows AI-based security systems to identify potential threats much faster than a human security guard could.

AI-based security systems can also be programmed to respond to certain types of threats in real time. For example, an AI system might be able to detect the presence of an intruder and automatically lock all doors and windows, or alert the authorities. This ability to respond quickly and effectively to threats can greatly increase the security of a building.

Another benefit of AI-based security systems is their ability to learn and adapt over time. As the system processes more and more data, it can improve its accuracy and efficiency. This means that an AI-based security system will become more effective at identifying and responding to threats as it gains more experience.

AI-based security systems can also help to reduce the workload of human security personnel. With an AI system in place, security personnel can focus on more high-level tasks, such as interacting with building residents or visitors and responding to emergencies. This can lead to more efficient and effective security operations overall.

However, there are also some potential drawbacks to AI-based security systems. One concern is the risk of false positives, where the system incorrectly identifies a threat and takes inappropriate action. For example, an AI system might mistake a harmless animal for an intruder and lock all the doors and windows.

To minimise this risk, it is important to ensure that AI-based security systems are thoroughly tested and calibrated before they are put into use.

Another concern is the potential for AI-based security systems to be hacked or manipulated by malicious actors. To address this risk, it is important to ensure that the system is properly secured and that appropriate measures are in place to prevent unauthorised access.

Despite these potential drawbacks, the benefits of AI-based security systems far outweigh the risks. These systems offer a level of accuracy and efficiency that is simply not possible with traditional security measures. As a result, AI-based security systems are likely to become increasingly common in the coming years.

Types of AI based Security Systems

There are several types of AI-based building security systems that are currently in use or under development,

Facial recognition systems: These systems use AI to analyse video footage and match faces to a database of known individuals, such as employees or authorised visitors.

Behavioural analysis systems: These systems use AI to analyse video footage and detect abnormal behaviour, such as loitering or suspicious activity, in order to identify potential security threats.

Access control systems: These systems use AI to verify the identity of individuals and grant or deny access to a building or specific areas within a building, based on factors such as facial recognition or fingerprint recognition.

Intrusion detection systems: These systems use AI to analyse sensor data and detect potential security breaches, such as forced entry or movement in restricted areas.

Video analytics systems: These systems use AI to analyse video footage and extract useful information, such as the number of people in a specific area or the movement of vehicles in a parking lot.

Smart lock systems: These systems use AI to analyse sensor data and lock or unlock doors based on factors such as facial recognition, fingerprint recognition, or proximity detection.

Smart surveillance systems: These systems use AI to analyse video footage and detect potential security threats, and also have the ability to track and predict future security threats.

Future of AI Based security System

The future of artificial intelligence (AI) in the security industry is expected to bring significant advancements and improvements in the way security systems and processes are designed and implemented. Some of the key areas where AI is expected to have a major impact include:

Surveillance: AI-powered surveillance systems will be able to analyse video footage in real-time, detect potential security threats, and alert security personnel.

Intrusion detection: AI-based intrusion detection systems will be able to analyse network traffic, detect abnormal patterns, and identify potential security breaches.

Cybersecurity: AI-based cybersecurity systems will be able to detect and respond to cyberattacks in real-time, reducing the impact of security breaches.

Risk assessment: AI-based risk assessment systems will be able to analyse data from various sources, identify potential security risks, and provide recommendations for mitigation.

Automation: AI-based security systems will automate many of the routine tasks that are currently performed by security personnel, such as monitoring surveillance footage and analysing logs, allowing them to focus on more complex tasks.

Overall, AI is expected to play a key role in the future of the security industry, helping to improve the effectiveness and efficiency of security systems and processes and enabling organisations to better protect their assets, employees, and customers.

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METAVERSE
MARKETING

The metaverse is a 3 Dimensional , digital world where people interact with one another on multiple platforms. To make this experience more real, augmented reality and virtual reality are used. The metaverse mimics the real physical world and people can use these mimics to interact with others and purchase virtual goods. A metaverse will be an improved digital environment where shifting is possible between work, play, shopping, socialising and creativity in one digital landscape.

Laisu Saiju
Digital Marketing Analyst
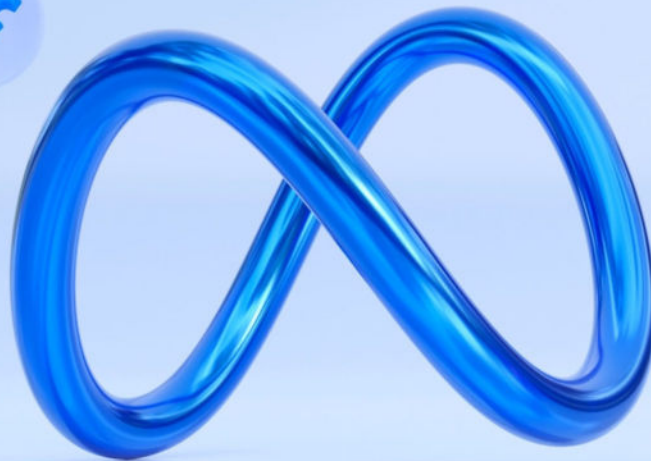
How does the Metaverse work?

Metaverse offers users with a digital identity, which provides access to an integrated digital ecosystem. The ecosystem would have its own currency, property and possessions which could be a digitally altered form of reality, a virtual world or some combination of the two.

Within this ecosystem, users are able to perform all the online tasks that are currently spread across separate digital environments like websites and apps, ideally without the need for the many passwords and user accounts that characterise current digital experiences.

How do you access the metaverse?

Currently users access the digital environment via graphical interface such as mobile or desktop devices. In the future metaverse will be accessed via easily portable and captivating hardware like headsets, gloves, watches and smart glasses. These mediums will allow users to view, hear and touch a digital landscape directly.

Metaverse marketing

Metaverse marketing refers to the promotion of products or services within virtual reality or augmented reality environments, such as those found in video games or social media platforms. This type of marketing can include virtual billboards, in-game product placements, and branded virtual experiences, among other tactics. It is a new and emerging field that is gaining popularity as technology advances and more people spend time in virtual environments. The metaverse allows companies to create their own digital avatar which can't be done with any of videos or ads. Each digital avatar can be unique and create a fully captivating experience for customers.

Difference between Digital marketing & Metaverse marketing

Digital marketing refers to the use of digital channels, such as the internet, social media, and mobile devices, to promote and market products or services. This can include tactics such as search engine optimization, content marketing, email marketing, and paid advertising on platforms like Google, Facebook, and Instagram

Metaverse marketing, on the other hand, is a relatively new concept that refers to the marketing and promotion of products or services within virtual worlds or virtual reality environments. This can include virtual reality experiences, augmented reality experiences, and other forms of immersive marketing in digital spaces.

The key difference between the two is that digital marketing is primarily focused on using digital channels to reach a target audience, whereas metaverse marketing is focused on using virtual worlds and virtual reality environments to create unique, immersive experiences that can engage audiences in new and exciting ways.

METAVERSE MARKETING STRATEGIES

1. **Creating engaging virtual experiences:** Brands can create virtual environments, such as virtual stores or showrooms, that allow users to interact with products and services in a fun and immersive way.
2. **Influencer marketing:** Partnering with popular virtual influencers can help brands reach a wider audience and increase brand awareness.
3. **Virtual events and collaborations:** Hosting virtual events, such as webinars or product launches, can help brands connect with their audience and build relationships. Brands can also collaborate with other brands or virtual influencers to create exciting and unique experiences.
4. **Virtual advertising:** Utilising virtual billboards, in-game ads, and other forms of virtual advertising can help brands reach a large audience in the metaverse.
5. **Building a virtual community:** Creating a virtual community around a brand can help build loyalty and engagement with users. Brands can use virtual platforms to host discussions, contests, and other interactive activities to keep their community engaged.
6. **Gamification:** Incorporating gaming elements into marketing strategies can increase engagement and make the brand more memorable.
7. **Personalization:** Using data to personalise virtual experiences and content can make the experience more engaging and relevant to the user.
8. **Virtual product placement:** Placing products in popular virtual environments, such as video games or virtual worlds, can give brands exposure to a large audience.
9. **Virtual customer service:** Providing virtual customer service can help brands build trust and loyalty with customers.
10. **Continuously tracking and measuring the success of virtual marketing campaigns:** Continuously tracking and measuring the success of virtual marketing campaigns can help brands refine their strategies and maximise their return on investment.

Marketing Steps in Metaverse

1. Understand the Metaverse: Before you start marketing in the metaverse, it's important to understand what it is and how it works. The metaverse is a virtual world that is created and inhabited by users. It is a place where users can interact with each other, create and share content, and engage in various activities.

2. Identify Your Target Audience: Determine who your target audience is and what their interests are. This will help you optimise your marketing efforts to reach the right people.

**3. Create a Strong Brand Presence:** Create a strong brand presence in the metaverse by developing a unique brand identity and creating engaging content that showcases your brand's values and message.

4. Use Influencers: Leverage the power of influencers to reach your target audience. Partner with influencers who have a large following in the metaverse and use them to promote your brand.

5. Utilise Virtual Events: Host virtual events in the metaverse to connect with your target audience and showcase your brand. These events can be used to launch new products, promote sales, and connect with customers.

6. Measure and Analyze: Measure and analyse the effectiveness of your marketing efforts in the metaverse. Use data and analytics to understand how your campaigns are performing and make necessary adjustments as per requirements.

7. Continuously Engage: Keep engaging with your audience and keep them updated about your brand and products. This will help to increase brand loyalty and keep your audience engaged.

DRIVES AND CONTROL

SILAMBARASAN
Jr. Project Engineer
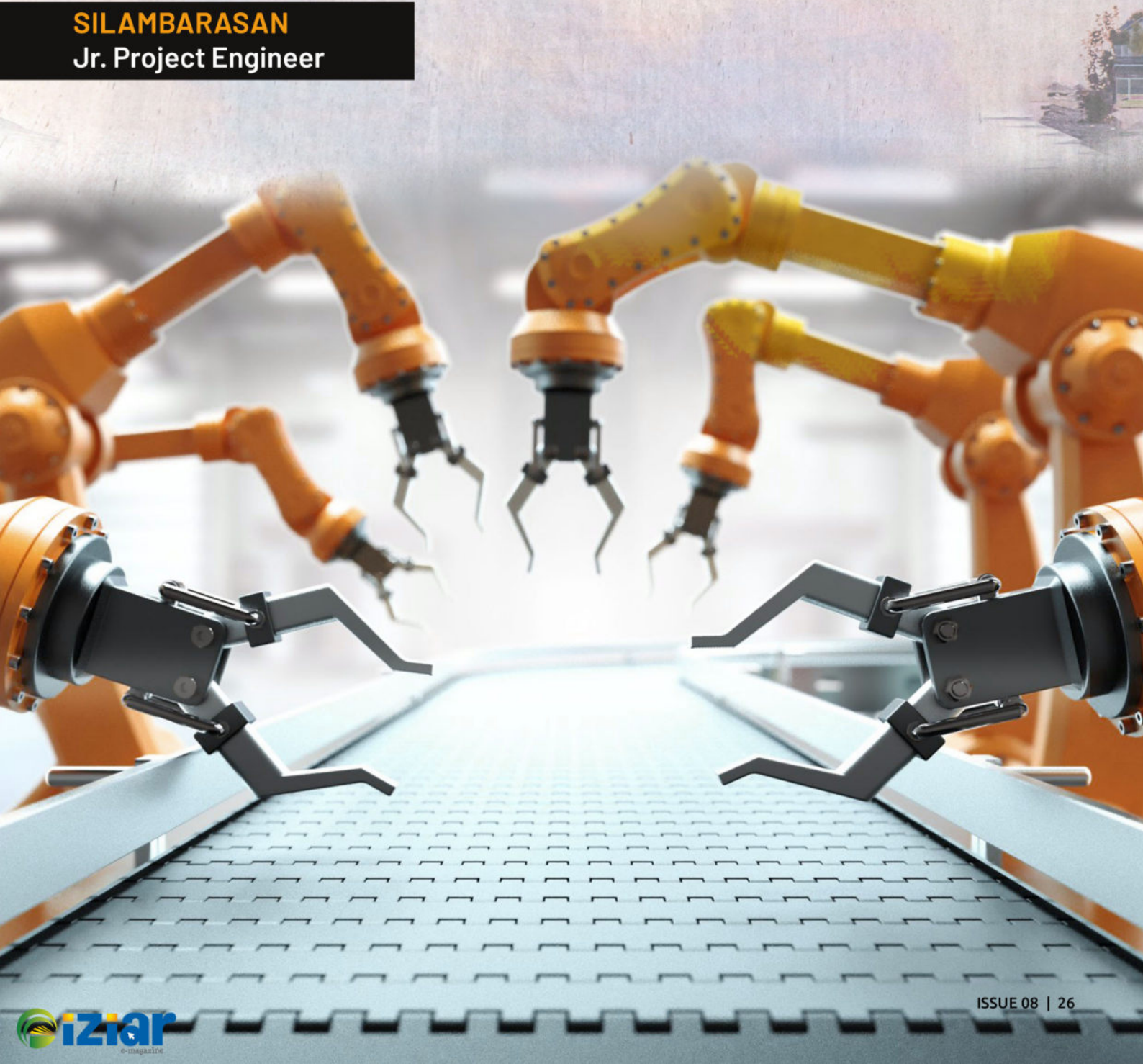
There are a wide variety of drives available that can be used in industrial automation, each with its own set of advantages and disadvantages. In this article, we will discuss the different types of drives used in industrial automation and their respective uses.

Drives and control is a key concept for any business to succeed. It requires a combination of the right strategies and methodology to ensure that the company is able to meet its objectives and goals. The use of Drives and control helps businesses to remain agile and efficient while also allowing them to stay on top of their competition.

Industrial automation is the use of sophisticated machines and systems to automate tasks that were previously done manually. Drives are an integral part of industrial automation as they provide the power and control needed for machines to perform their tasks. There are various types of drives used in industrial automation, each with its own set of advantages and disadvantages. These include AC drives, DC drives, servo drives, stepper drives, and linear motors. Each of these drives has its own unique performance and competence which make them appropriate for different applications in industrial automation.

The various Motor control are manual or automatic methods for starting, stopping, controlling speed, reversing, and protecting a motor. Drives are used to achieve this motor control in a variety of ways. There are four types of motor control using drives - open loop, closed loop, vector and servo motor control. Each type has its own merits and demerits depending on the application it is being used for.

Open loop control is simple to use but it doesn't provide precise results while closed loop offers higher accuracy but requires more complex setup. Vector and sensorless vector controls provide even better accuracy but require sophisticated controllers to achieve optimal performance.

Industrial robots have become an integral part of many industries, servo and stepper drive technology is one of the most important components in making them work. Industrial robotics provide manufacturing companies with the ability to improve safety while making products faster, at lower cost, and with higher quality. Industrial robots are becoming increasingly important in today's manufacturing industry. Stepper & servo drive technology is used in a wide range of industrial robots, from small desktop models to large-scale industrial production robots. This technology helps to ensure that the robot's movements are precise and accurate, allowing it to perform complex tasks with minimal human intervention.

This technology has been used in a variety of applications, from manufacturing to medical robotics. It is essential for ensuring that industrial robots can carry out their tasks with precision and speed. With the help of stepper drive technology, industrial robots can be programmed to perform complex tasks with accuracy and precision.

Servo drives and stepper drives are two types of motor control systems that are used to control the movement of motors. Both have their own advantages and disadvantages, but they serve different purposes. Servo drives are used in applications where precise positioning is required, while stepper drives are used in applications where speed is more important than accuracy. Understanding the differences between servo drive and stepper drive can help you choose the right type of motor control system for your application.

A servo motor uses a closed loop system; it is accomplished by employing encoder feedback in order to control the motor's position, speed, or torque. On the other hand, the stepper motor is controlled to move to a specific location without need of any such feedback, but could lose synchronism due to overload.

Stepper motors use a current chopper driver technology, which provides a constant current flow to the motor coils irrespective of load conditions. Temperature rise is directly proportional to load current, so a stepper motor's duty cycle needs to be curtailed within 50% rated. Servo motors offers more efficient control because it only draws the current which is needed. Stepper motor is better at its ability to generate holding torque at zero speed when compared with a Servo motor that uses more power to generate holding torque.

PYTHON LIBRARIES
FOR DATA SCIENCE IN 2023

SHILPA PATIL
Project Engineer

Python has become the most widely used programming languages in the world. Apart from the simplicity of use and Extensive applications, there is an e exceptionally helpful community around Python with millions of practical solutions for any of the issues you face.

Python programming language can be used for many applications right from simple mathematic calculation to web application including backend, frontend, middleware, data science, machine learning, artificial intelligence, deep-learning and so on.

Below we have listed some of the python modules ranging from Mathematics, data exploration and visualization, machine learning, data mining & data scraping, and natural language processing

Python Libraries for Math

NumPy

Numerical Python (NumPy) is generally used as an alternative to arrays and lists in Python while working well for multi-dimensional arrays.

SciPy is generally used to perform tasks related with research and scientific computation which is related to mathematical functions.

SciPy

theano

Theano is generally used for computer vision, such as recognizing handwriting and sparse coding.

Python Libraries for Data Exploration and Visualization

Pandas

It is a one of the fast, powerful, flexible and easy module which is used for open source data analysis and manipulation tool.

It is used to make a huge number of preparatory plots for large datasets; matplotlib is helpful in envisage data.

matplotlib

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This module will permit the user to build low-code applications which are scalable and deployed data apps in Python.

It is built on top of Matplotlib with a high-level interface for informative statistical graphs, attractive visualizations

A prominent package which can generate quick visuals, irrespective of how layered the base data is.

It is used to automatic visualize in a number of w graphs for data frames t preferably have less than 5,000 rows.

Allow the user with Automatic visualizations of a dataset. It is used to analyze the dataset and make suggestions on how to filter your variables.

A visualization tool which is an interface to Graphviz, used to manipulate dot files from Graphviz.

Python Libraries for Machine Learning

Keras allows an interface for Artificial Neural Networks (ANNs) and serve as an interface to the Tensorflow library.

The most popular machine learning library for modelling, Scikit learn is a machine learning library used for predictive data analysis.

PyTorch is a machine learning framework that is based on the torch library by Meta that expedites the path from illustration & researching to production & deployment

PyCaret is a low-code machine-learning library which is used to automate machine learning system.

Tensorflow is a universally distinguished module with a pivotal on the training and inference of deep neural networks. It is an opens source module for machine learning and Data Science

REQUEST is an HTTP library which allows the user to transmit and receive HTTP requests easily. The Requests package is used to make requests and test out various URLs for performance, security, etc.

Python Libraries for Data Mining and Data Scrapping

It is open source and collaborative for acquiring the information which we wish from websites. It is used for data mining, monitoring, automated testing, Web Scraping.

Python's Beautiful Soup package is basically used for extracting data from HTML and XML files which is mainly used for web scraping purposes.
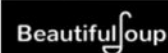
SQL Alchemy facilitates the communication between Python and databases. A user can create python code which has a ability to interact with the databases.

PYTHON LIBRARIES
FOR NATURAL
LANGUAGE PROCESSING

NLTK

One of the most important NLP libraries, it incorporate tools which allow computers to comprehend human language and respond whenever required Chatbots can be built using the nltk.chat module.

Bonus Python Libraries!

OpenCV is a dedicated module for applications like computer vision, machine learning, and image processing. It is used for various jobs like object identification and facial recognition.

It is designed in such a way that, they operate along with deep learning frameworks like TensorFlow or PyTorch and it is a performance-oriented module. Search, Autocomplete, Autocorrect are the task which can be done with SpaCy.

spaCy

Mahotas is a Python module which is specifically used for computer vision and image processing.
Specifically used for image processing which include cropping images, finding eccentricity and roundness, etc.

Mahotas

It is used for various operations which include creation of thumbnails, merging images, cropping, blurring, and resizing images. It can also be used for creating watermarks for images.

GENSIM

Gensim, which is short for Generate Similar, is an open-source, popular NLP language library used for topic modelling. Genism deploys a modern statistical ML for executing complex tasks, including corpora, topic identification, etc

Python web browser interaction can be automated, for tasks relating to executing automated tests. It permits the user to undoubtedly define and detect the tests on a pre-decided browser.

Se

pytest

It is a plugin-based, fully featured environment for testing your Python code. Common activities can be completed with PyTest with less code, and more complex jobs can be completed using a range of time-saving commands and plug-ins
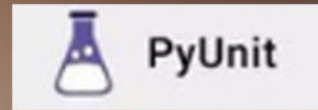
PyUnit

It is used to indentify defects in early stage of application development process; hence fixing them will be easier and less expensive. For the automated testing of the code, PyUnit includes fixtures, test cases, test suites, and a test runner.

Conclusion

Packages and modules are the main pillars of Python, which is why it is considered as the best programming language in the world today, and having this knowledge in your toolkit will make you stand apart as an accomplished data scientist. Python, which is why it is considered as the best programming language in the world today, and having this knowledge in your toolkit will make you stand apart as an accomplished data scientist.

SAHAYABESKI
Project Engineer

EXPLOSIVE INK TECHNOLOGY

FOR EMERGING ARMAMENT APPLICATIONS

Explosive ink (Xink) is a developing technology that promises a breakthrough for designing energetic materials in the form of explosive charges smaller than one millimetre in diameter for miniature weaponry systems. The technique includes new formulations for flow able explosives and its printing process.

The explosive inks are dispensed using a special direct printing technique, a versatile additive manufacturing tool. In sub-millimetre explosive tracks, where conventional methods for filling these explosive materials are not practicable because to their intrinsic constraints, it enables precise deposition of an energetic fill in small volumes.

The future of armament systems will be determined by explosive inks and their printing techniques. Examples include miniaturised detonators, explosive lenses, plane wave generators, self-destructing electronic circuits, and Micro-scale Explosive Fire (MSF) trains of MEMS-based safety arming mechanisms. For armament applications, HEMRL has created primary and secondary explosive inks as well as their printing technique.

Explosive Ink Technology for Future MEMS based S&A Devices

Smart weapon systems use Safety-and-Arming (S&A) devices based on Micro Electromechanical Mechanisms (MEMS). These MEMS S&A devices often employ a combination of mechanical mechanisms, which only when subjected to the most rigorous physical demands of firing or launch can align a firing train made up of additional explosive components and very small explosive charges. The manufacturing of MEMS S&A devices is typically done on a die with a surface area of one square centimetre or less, and the firing train is made up of a series of holes and channels into which very small explosive charges (micro-liter volumes) must be accurately deposited. These systems do not work with the usual techniques for adding explosives to ordnance. The only practical technology for such microscale fire trains (MSF) is explosive ink technology. HEMRL has evaluated the capacity to fill Xinks in such small channels and the dependability of a small initiating

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Explosive Inks for the Development of Miniaturized Detonators

The primary explosive is essentially what the initiating devices use; when it is exposed to heat, flame, impact, friction, or an electric spark, it produces a detonation shock wave that ignites the secondary or booster explosive. Lead azide/styphnate is the principal explosive most frequently utilised. In order to provide confinement and achieve the necessary shock levels, the devices rely on these primary explosives compaction of spot charge, transfer charge, and output charge over the heating element. This compaction procedure is risky and leads to an inherently greater arrangement of initiators and detonators. Compact and secure detonator development, and specifically micro detonators are crucial in MEMS fuses, is necessary for the production of miniaturised military systems. Based on main explosive ink that is safe for the environment and free of lead, HEMRL has created miniature detonators.

The two separate variations, a novel flexible tape type detonator and a small cup type detonator, were made with only a few milligrammes of primary explosive ink, which is a comparatively safe explosive. It has been demonstrated that both of these detonators start the secondary explosive ink tracks (Xink 1 & 2). Additionally, the detonator's flexibility opened the door for sandwich-style explosive devices, which allow for the stacking of a heating element, a primary explosive ink layer, and a secondary explosive ink.

Explosive Ink Technology for Self-destruction of Electronic Memory Devices

It's crucial to preserve secret material for national security from unauthorised access and enemy use when captured. Electronic storage media and memory chips can be destroyed with explosive devices based on Xink up to the point where the data can no longer be recovered. Complete destruction of the IC chip structure requires an explosive device with the right composition. For use in this application, a metallic substrate was patterned with secondary explosive ink, and initiation was demonstrated using an initiator based on a thin layer of primary explosive ink.
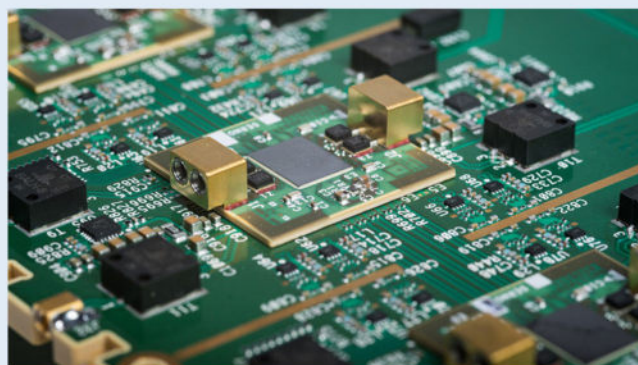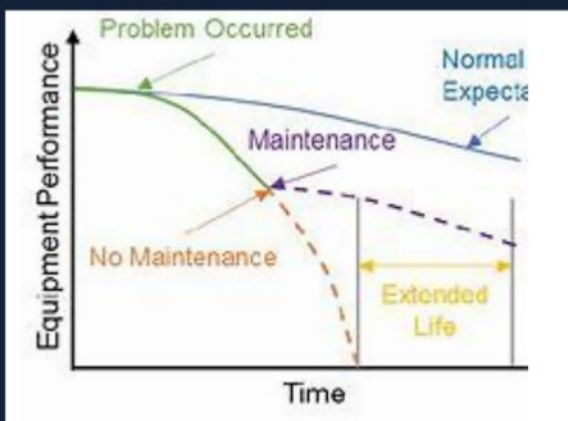
PREDICTIVE MAINTENANCE

Nital Sarap
Senior Project Engineer

Global pandemic could not hit the evolution of Industry. A new need, new goal, and new trends have emerged. The Industrial automation sector has been transformed by incorporating digital and physical aspects of manufacturing to increase the performance. Industrial automation marks the third step after mechanization and electrification in the direction of industrialization.

TYPES OF MAINTENANCE

Sensors are amalgamated into an automated system, by doing this; the machines can evaluate their status and provide instantaneous feedback. Due to the consequence of a malfunction, a maintenance request is automatically triggered before the problem reaches a critical state. For example, we know exactly the state of a machine or system, when and how it could fail and, therefore, when it will be necessary to intervene or order a spare part. Today we have technology in place where the machines themselves carry out their own maintenance.

Reactive maintenance

Reactive maintenance is the traditional approach to maintenance. It is also called "run-to-failure," reactive maintenance generally refers to maintenance activity which is carried out after an asset or machine has broken down. The focus is mainly on resuming the faulty machine or assets into operating conditions as soon as possible.

The main objective of Reactive maintenance is to address problems when they arise. Maintenance activities are initiated whenever there are equipment malfunctions, setbacks, and failures. Most of the Broken-down machines are either repaired or replaced with new ones.
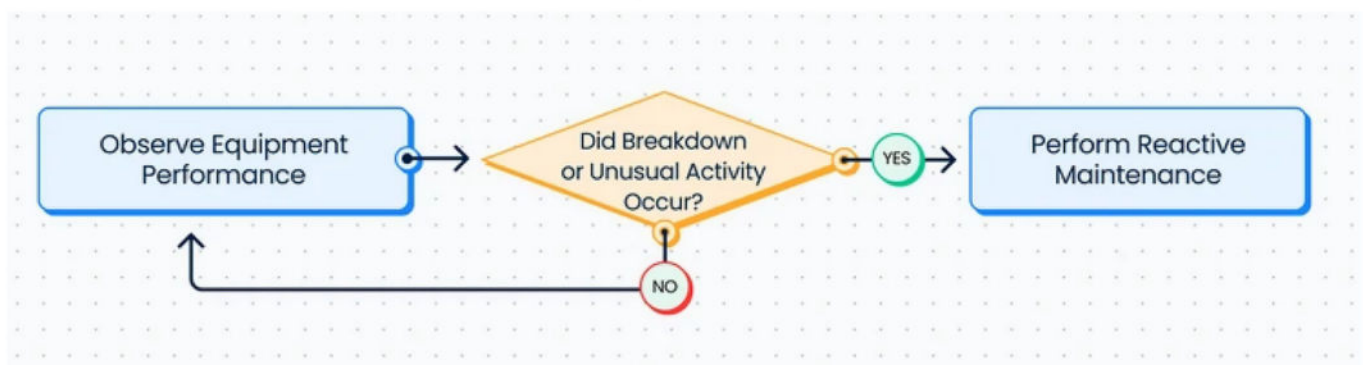
Planned maintenance

Planned maintenance generally refers to any maintenance activity that has a systematic approach which is executed by a well planned, documented, and scheduled. The main objective of planned maintenance is to minimize downtime by cogitating all necessary resources available with us such as manpower and spare parts, and a well established strategy to use these resources.

There are two main types of planned maintenance. The first is planned scheduled maintenance, which is mainly aimed at repairing assets before they fail. The second is planned unscheduled maintenance, which is keeping a backup solution in case when an asset is down either repairing or replacing the asset as quickly as possible.
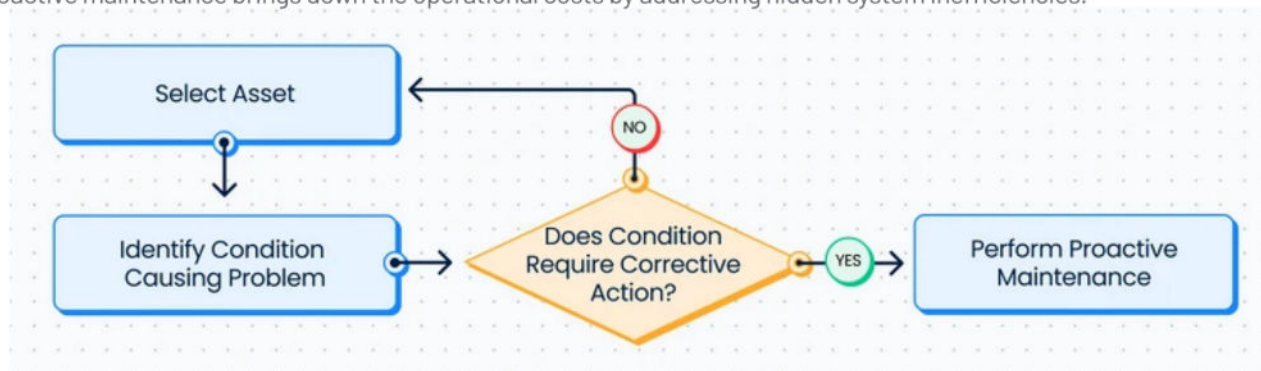
PROACTIVE MAINTENANCE

Proactive maintenance is another strategy that aims to identify and figure out the reasons for equipment failure and fix it before it happens. The aim of proactive maintenance is to increase asset reliability and eliminate the risk of downtime.

Wear and tear is a normal aspect of any equipment life cycle. Nevertheless, a strong proactive maintenance strategy will definitely extend the lifespan of assets and improve performance.

Proactive maintenance brings down the operational costs by addressing hidden system inefficiencies.

WHAT IS PREDICTIVE MAINTENANCE?

Predictive maintenance, which is generally referred to as condition-based maintenance, which integrates performance monitoring and equipment condition monitoring during normal operations so as to reduce the chances of a breakdown. Predictive maintenance's main objective is to predict asset failures based on analyzing certain parameters and factors. Once a abnormality is predicted, stakeholders will take needed steps to prevent this failure with corrective or scheduled maintenance.
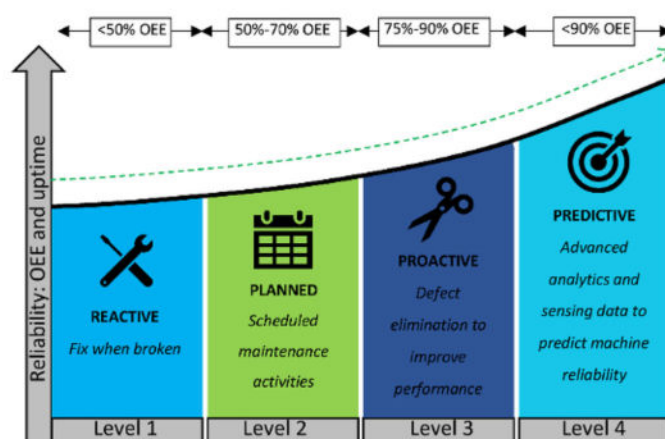
Predictive maintenance won't prevail without condition tracking and monitoring.

The main objective of predictive maintenance is to decrease the breakdown occurrence and optimize the asset uptime, improving asset reliability, and maximizing operational costs by reducing maintenance work.

PREDICTIVE MAINTENANCE TECHNOLOGIES

There is no singular technology which can consolidate all of the predictive maintenance strategies. Although there are numerous condition-monitoring devices and techniques that the stakeholders will use to effectively predict failures and raise red flags when maintenance is needed. The commonly used technologies are

> Infrared Thermography
> Acoustic Monitoring
> Vibration Analysis
> Oil Analysis
> Eddy current analysis

INFRARED THERMOGRAPHY

Infrared thermography is a non-intrusive diagnostic technology that is widely used in predictive maintenance. By infusing infrared cameras, maintenance workers can identify the abnormality of normal temperatures in equipment. Components that are fatigue will malfunction, that tend to heat up, and this is displayed as a heat spot on a thermal image.

ACOUSTIC MONITORING

In acoustic monitoring, maintenance staff can detect the sounds of gas emission, liquid, or vacuum leaks in equipment at the sonic and ultrasonic level.

VIBRATION ANALYSIS

Vibration analysis is used in places with high-speed rotating equipment. Maintenance staff use handheld devices or real-time sensors connected along the equipment to monitor equipment functioning. Whenever components begin to wear down, the vibration changes and a new pattern of vibration from the normal pattern emerges. Through regular monitoring, a trained staff can match vibration pattern readings against known failure possibilities and fix a problem earlier. Vibration analysis can be used for identifying misalignment, out-of-shape shafts, unbalanced elements, loose mechanical components, and motor issues.

OIL ANALYSIS

Oil analysis is an effective tool in predictive maintenance. By checking oil conditions in the machines, we can establish the presence of contaminants. By identifying the contamination we can fix the root cause of the issue.

EDDY CURRENT ANALYSIS

Eddy current analysis marks the changes in tube wall thickness.
Other technologies that support predictive maintenance are borescope inspections, computerized maintenance management systems, data integration, and condition monitoring. Choosing the right one will be the critical decision for organization to succeed.

THANKS

Articles

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