Cutting-edge Applications of Artificial Intelligence and Implications for National Development

Prof. Abiodun Musa **Aibinu,**
Vice-Chancellor/Chief Executive and Academic Officer,
Summit University Offa,
Kwara State, Nigeria.

www.summituniversity.edu.ng

Abiodun Musa Aibinu

The Vice-Chancellor,
The Chief Executive and Academic Officer,
Summit University, Offa, Kwara State, Nigeria.
vc@summituniversity.edu.ng,
maibinu@gmail.com,
+2348029494164

www.summituniversity.edu.ng

Mogaji Aikulola-Aibinuomo Family,

Ita Abigbo, Oranyan,

Ibadan, Oyo State.

What I Do

Mechanism + Electronics =
Mechatronics

Academics + Entreprenuership =
Acadopreneurship

Artificial + Intelligence =
Artificial Intelligence

Spiritual + Intelligence =
Spiritual Intelligence

Distance + Virtual + Online + Learning =
Borderless Learning

Prof. A. M. Aibinu

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My Vision

"At Summit University, Offa, we shall be developing innovations and inventions that will be changing the way we live in our communities, we defend our nations and work in Africa"

Prof Abiodun Musa Aibinu,
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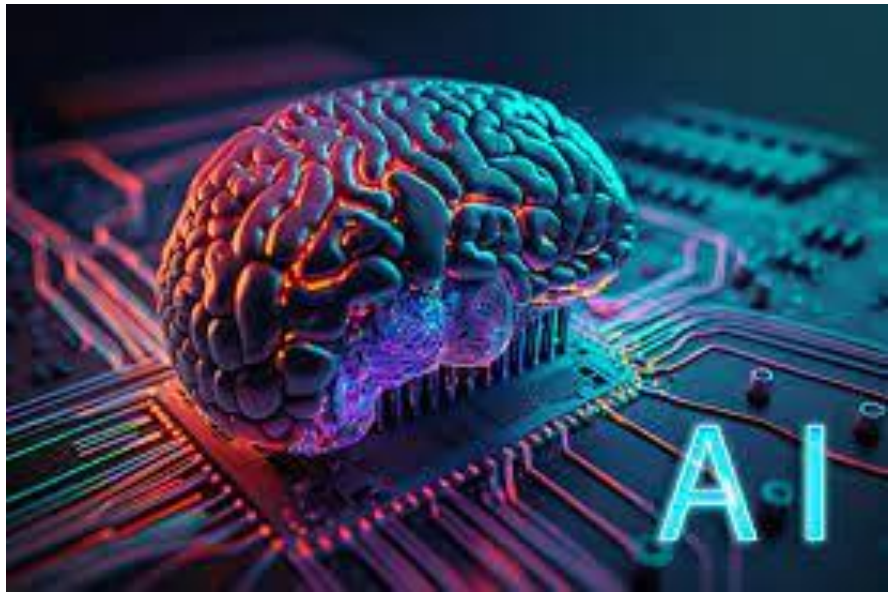
Kwara State, Nigeria.
vc@summituniversity.edu.ng

Overview

- In this presentation, we will explore the cutting-edge applications of Artificial Intelligence (AI) and their potential implications for national development.
- We will delve into various sectors where AI is making significant strides and discuss how these advancements can contribute to the progress of nations.



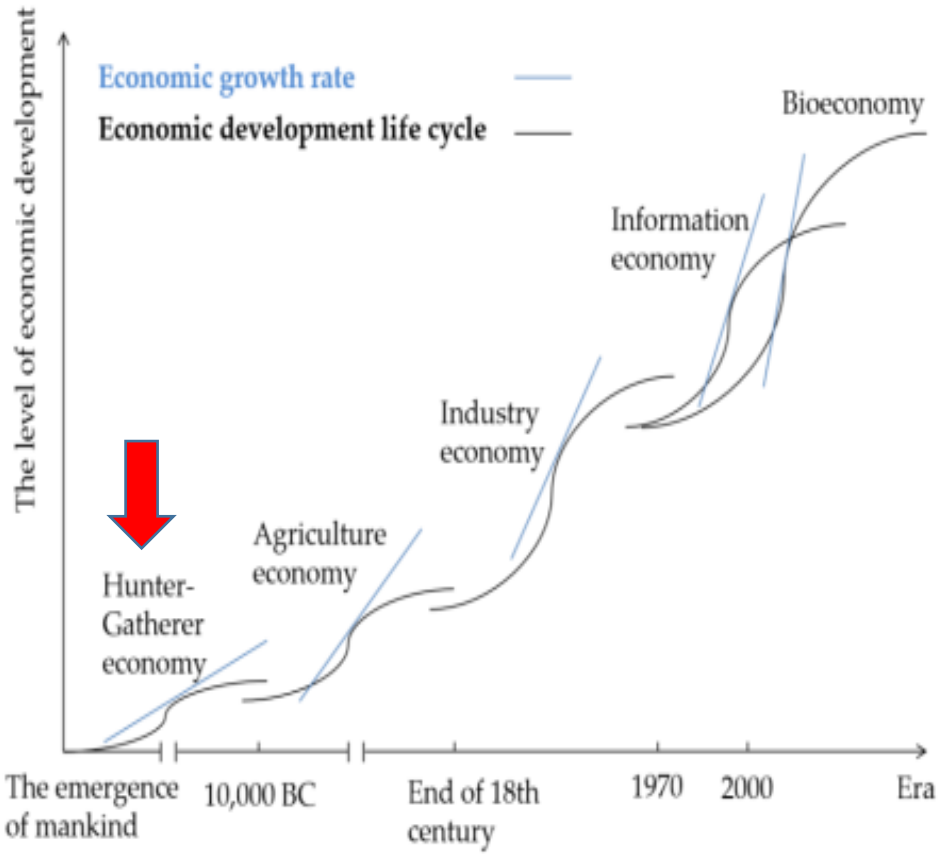
Outline

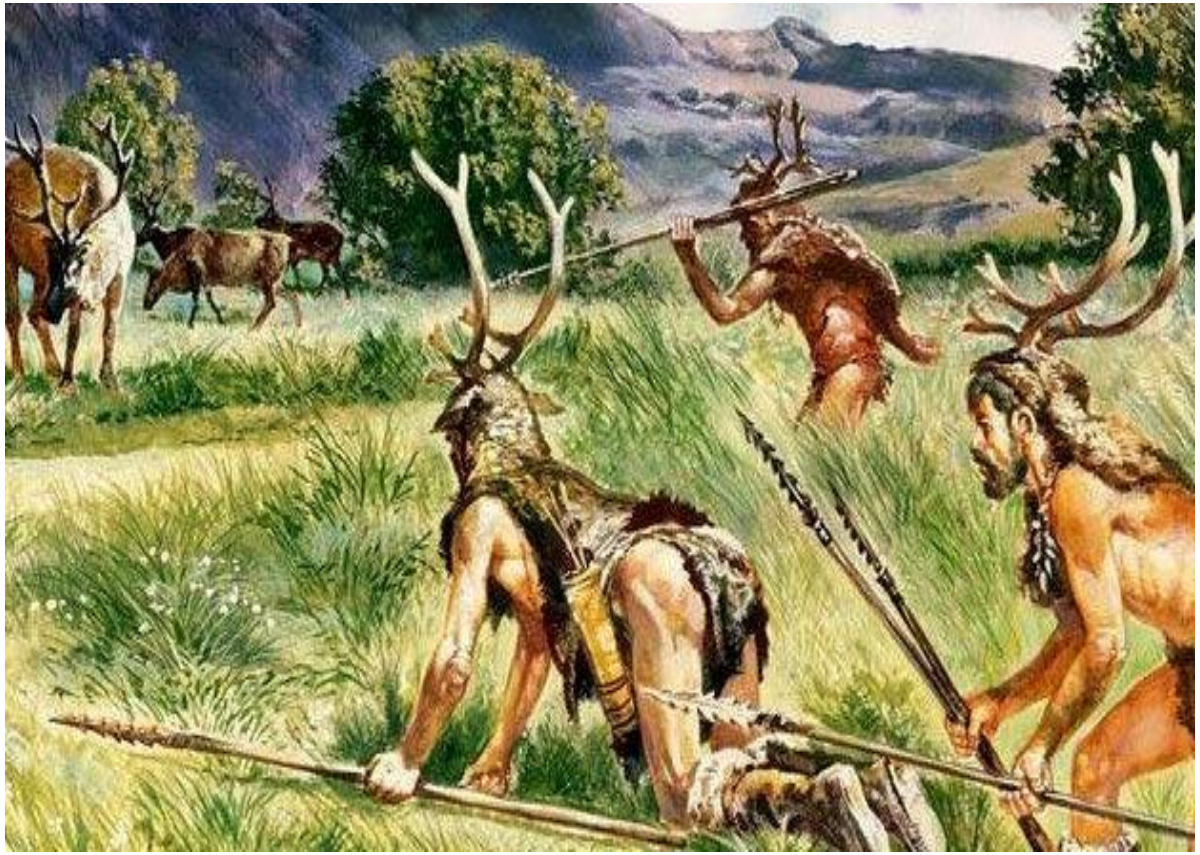
- Industry 4.0
- Understanding Artificial Intelligence
- Cutting-Edge Applications of AI
- Artificial Intelligence and National Development
- Limitations and Challenges
- Opportunities
- Case Studies
- Conclusion

Humans Evolved from a Garden: Myth or Reality?

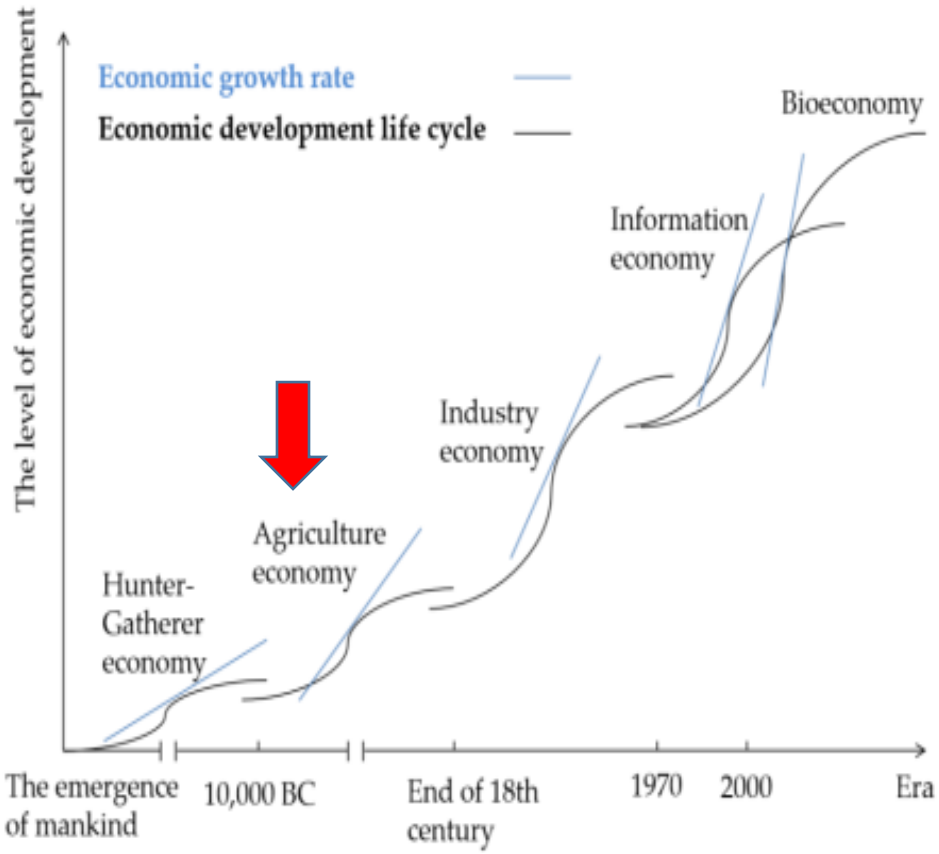
Then, humans were in harmony with nature

Pre-Industrial Revolution: Hunter Gatherer Economy

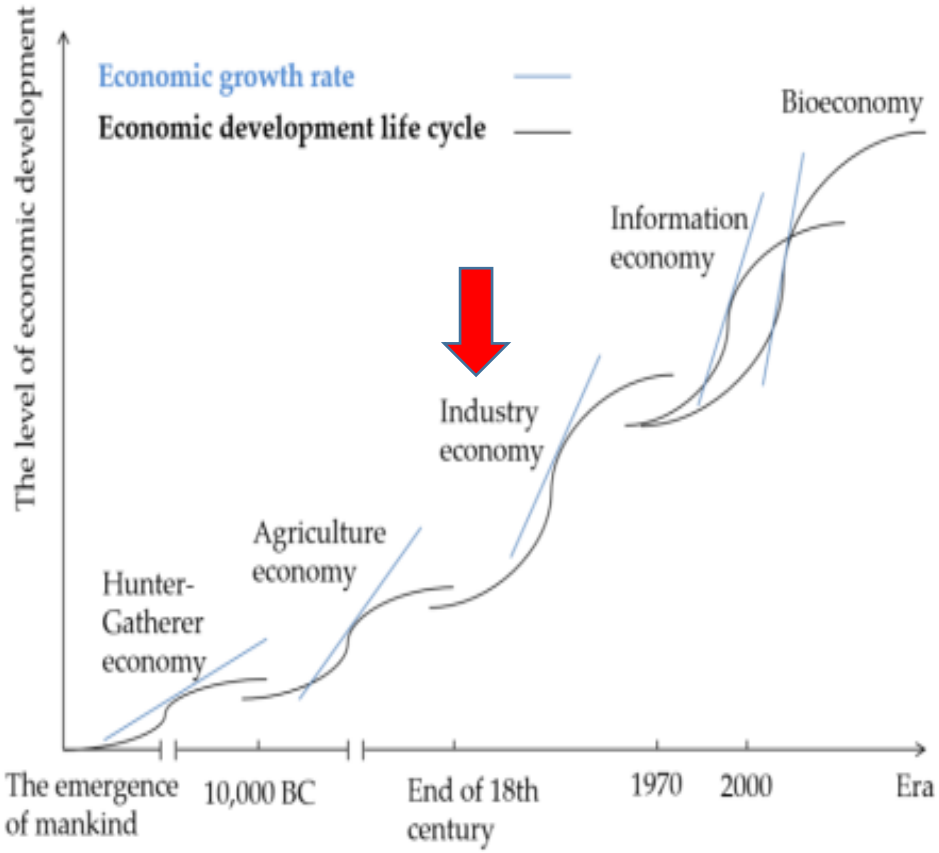




Pre-Industrial Revolution: 2-Agricultural Economy



Industrial Revolution



The Fourth Industrial Revolution (Industry 4.0 or 4IR)

Where are the Big Boys ?

At a time in Nigeria, this was a vehicle owned by a Nigerian big man

What is the big question?

Digital Transformation. How prepared are we for 2030?

What is the big question?

VS

How prepared are we for 2030?

Evolution of Technology-Cont'd

Can you see the timely change in each of this gadget?

Landlines: you call people from them. Usually one per household, maybe two but use the same line.

First mobiles: VERY expensive and VERY big. You can cell from them on the go.

Text messaging: you can keep in touch by sending text.

Picture Message: You can now send black and white pixelated images.

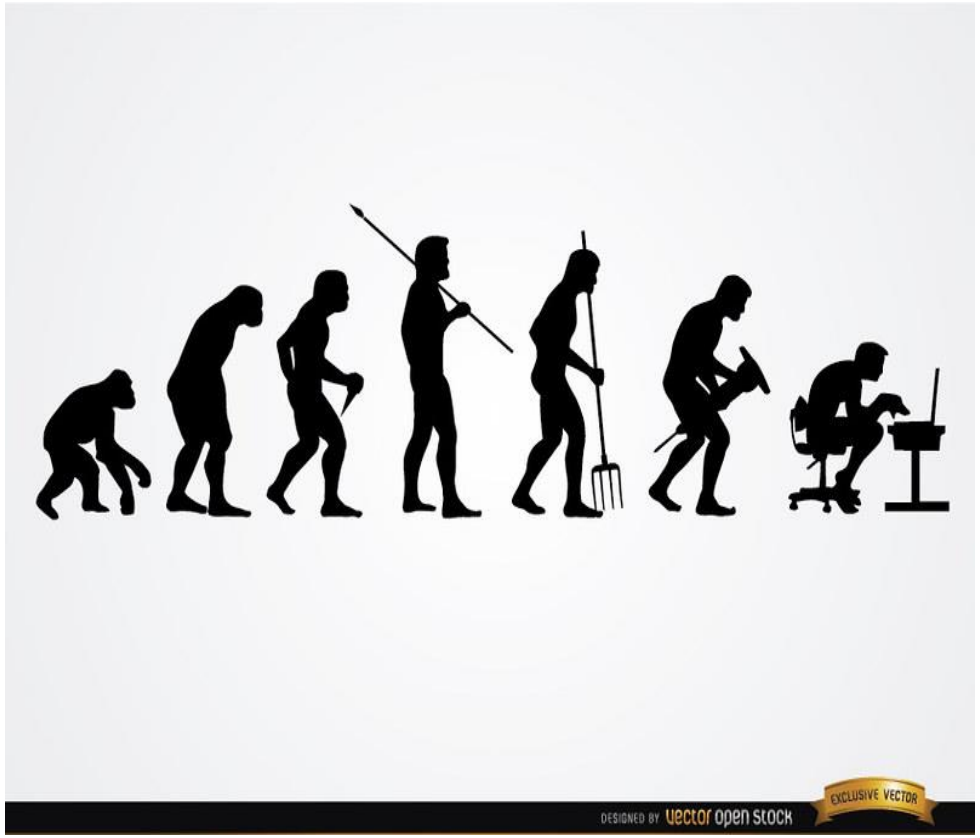
Colour: you have a tiny colour screen and cameras are starting to be used.

Cameras develop: Better quality images and you can send them to each other.

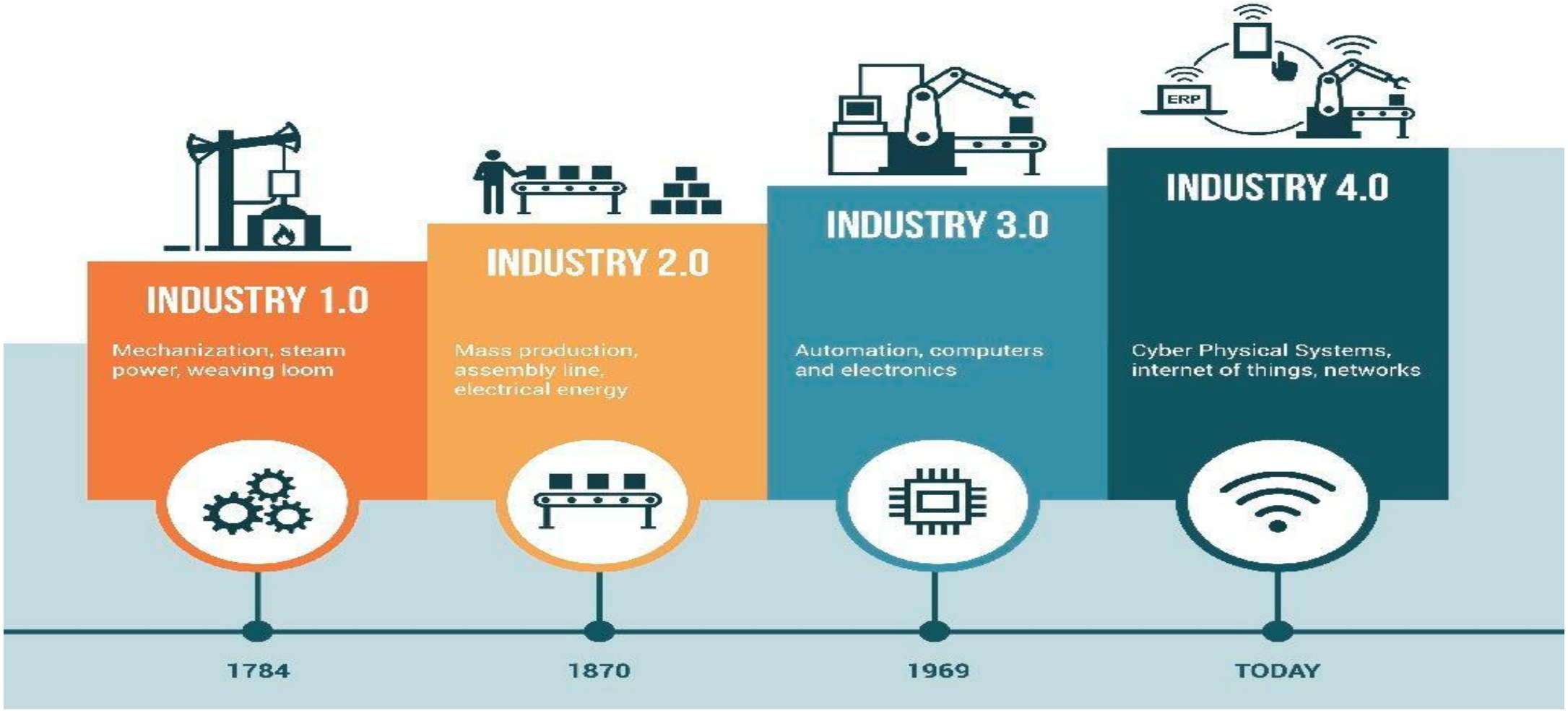
Everything: photos, music, internet, video calling, endless possibilies!

Evolution of Technology-Cont'd

Evolution is about a change in the manner and styles of doing things….



The Fourth Industrial Revolution - How It Differs



Fourth Industrial Revolution

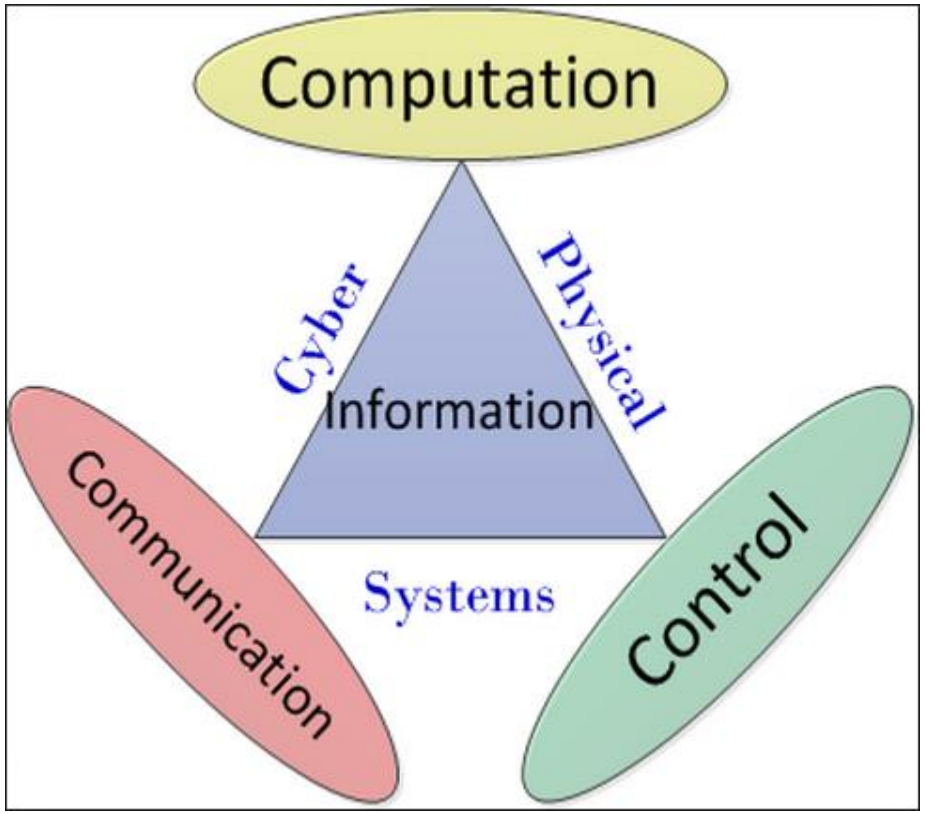
- The Fourth Industrial Revolution, often called **Industry 4.0**, is marked by the convergence of digital, physical, and biological technologies.

- It is characterized by the integration of cutting-edge technologies such as artificial intelligence (AI), the Internet of Things (IoT), blockchain, and robotics.

Industry 4.0: Principle and Definition

Cyber-Physical Systems (CPS)

- CPS is a system of collaborating computational elements controlling physical entities.
- CPS are physical and engineered systems whose operations are monitored, coordinated, controlled and integrated by a computing and communication core.
- They allow us to add capabilities to physical systems by merging computing and communication with physical processes.



Industry 4.0: Principle and Definition

A non-exhaustive list of transformative technologies within the Industry 4.0

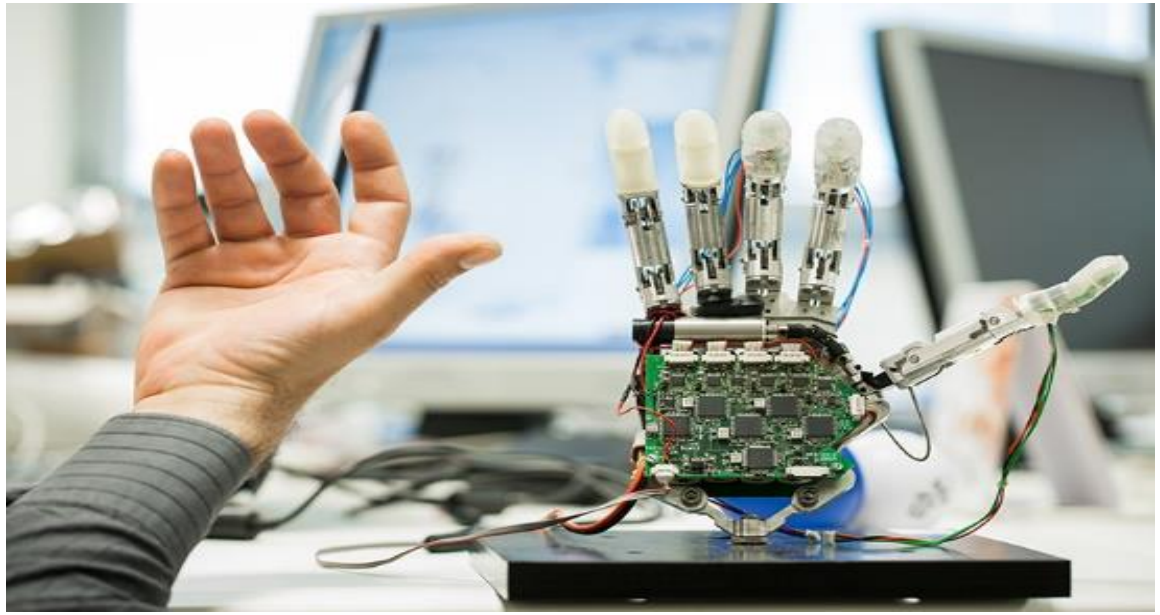
1. **Artificial Intelligence**
2. Big Data
3. Robotics/Mechatronics
4. Renewable/Clean Energy
5. Smart Cities
6. Blockchain
7. 3D Printing
8. Virtual/Augmented Reality
9. FinTech
10. E-Commerce
11. Shared Economies
12. IoT
13. Nanotechnology/2D Materials
14. Biotechnology/Genetics & Agricultural Innovation
15. Enhanced Waste Management

Artificial Intelligence

Artificial Intelligence Definition

Simply put:

Artificial + Intelligence = Artificial Intelligence

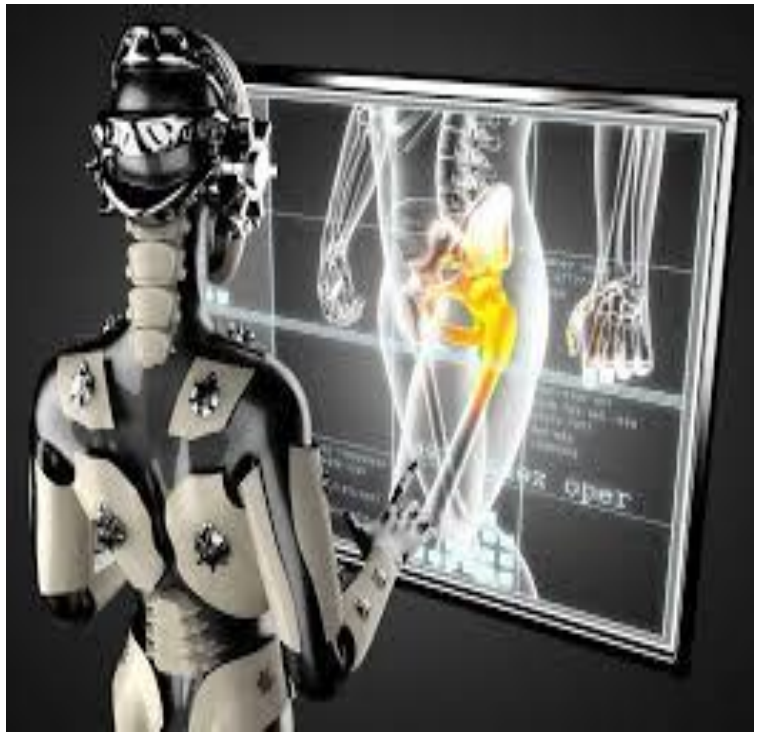


What is Artificial Intelligence (AI)?

- **Artificial Intelligence (AI)** is the transfer of intelligence in man to machine.
- It is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.
- The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience (Encyclopedia Britannica).

What is Artificial Intelligence?

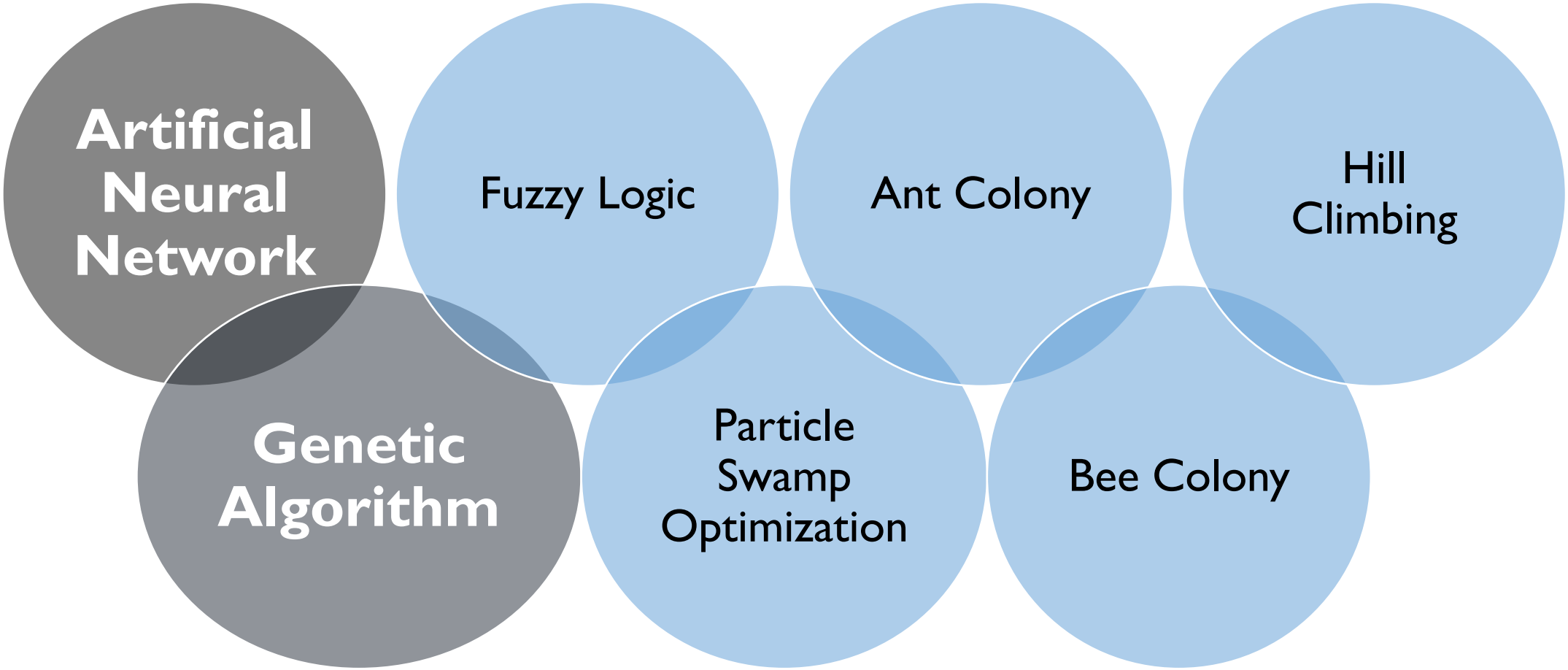
- **"A way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think"**



- "The art of creating machines that perform functions that require intelligence when performed by people."

- "The study of how to make computers do things at which, at the moment, people are better at."

Artificial Intelligence: Some of the Known Techniques



Can Machines Think?

Cutting-Edge Applications of Artificial Intelligence

AI in Security Sector

AI in Security: Real-World Examples

1 – Cyber Attacks (Defense Against Hackers) and Software Errors/Failures

- The software that powers our computers and smart devices is subject to errors in code, as well as security vulnerabilities that can be exploited by human hackers.

2 – Security & Crime Prevention

- Predictive analytics and other AI-powered crime analysis tools have made significant strides since those "pioneering" times.

3 – Privacy Protection

- Privacy issues sit at the forefront of online activity, business actions, and government decisions.
- This is largely in response to the breaches, scandals, and personal data leaks that have eroded confidence in technology and information systems.

4. Privacy Considerations for AI

- **Data accuracy:** For AI to produce accurate outputs, algorithms must contain large and representative data sets.

AI in Education Sector

Application of AI in Education

- AI brings the ability to have 24hr access to teachers and lessons anytime, anywhere.
- AI can be used as an educational tool that guides students towards their goals by providing personalized feedback on homework, quizzes etc., based on AI algorithms.

1. Personalized learning

- AI can ensure that educational software is personalized for individuals. There are already adaptive learning software, games, and programs for students.

2. Universal access

- Educational classrooms can become globally available to all students through AI tools, even those that have hearing or visual impairment or speak different languages.
- This opens up new possibilities

AI in Agriculture Sector

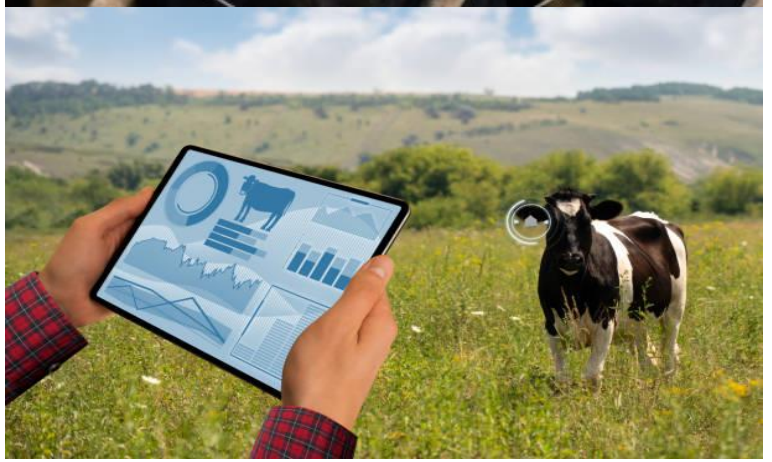
A case Study: AI in Farming

Smart livestock farming allows the farming industry to leverage digitalization.

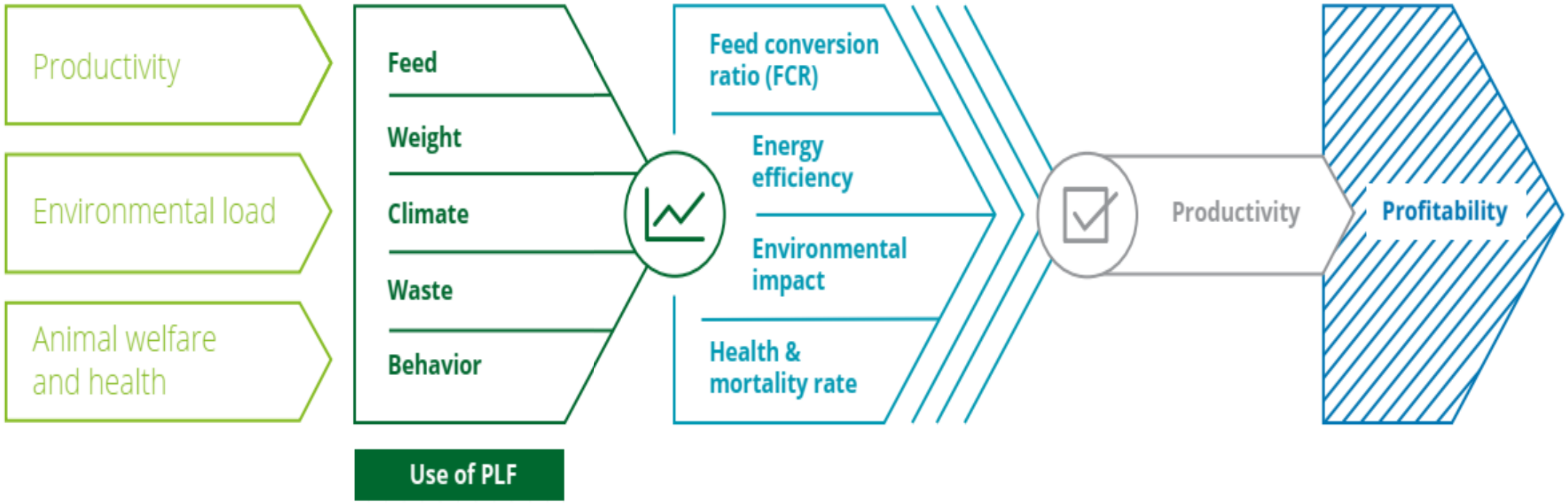
- Smart livestock farming aims to achieve more productive, efficient, and sustainable farm operations based on the effective use of digital technologies.

- The largest potential lies in individual animal monitoring and analysis, which is referred to as precision livestock farming (PLF).

- In PLF, tools and sensors are used to continuously and automatically monitor key performance indicators of livestock in the areas of animal health, productivity, and environmental load



A case Study: AI in Farming



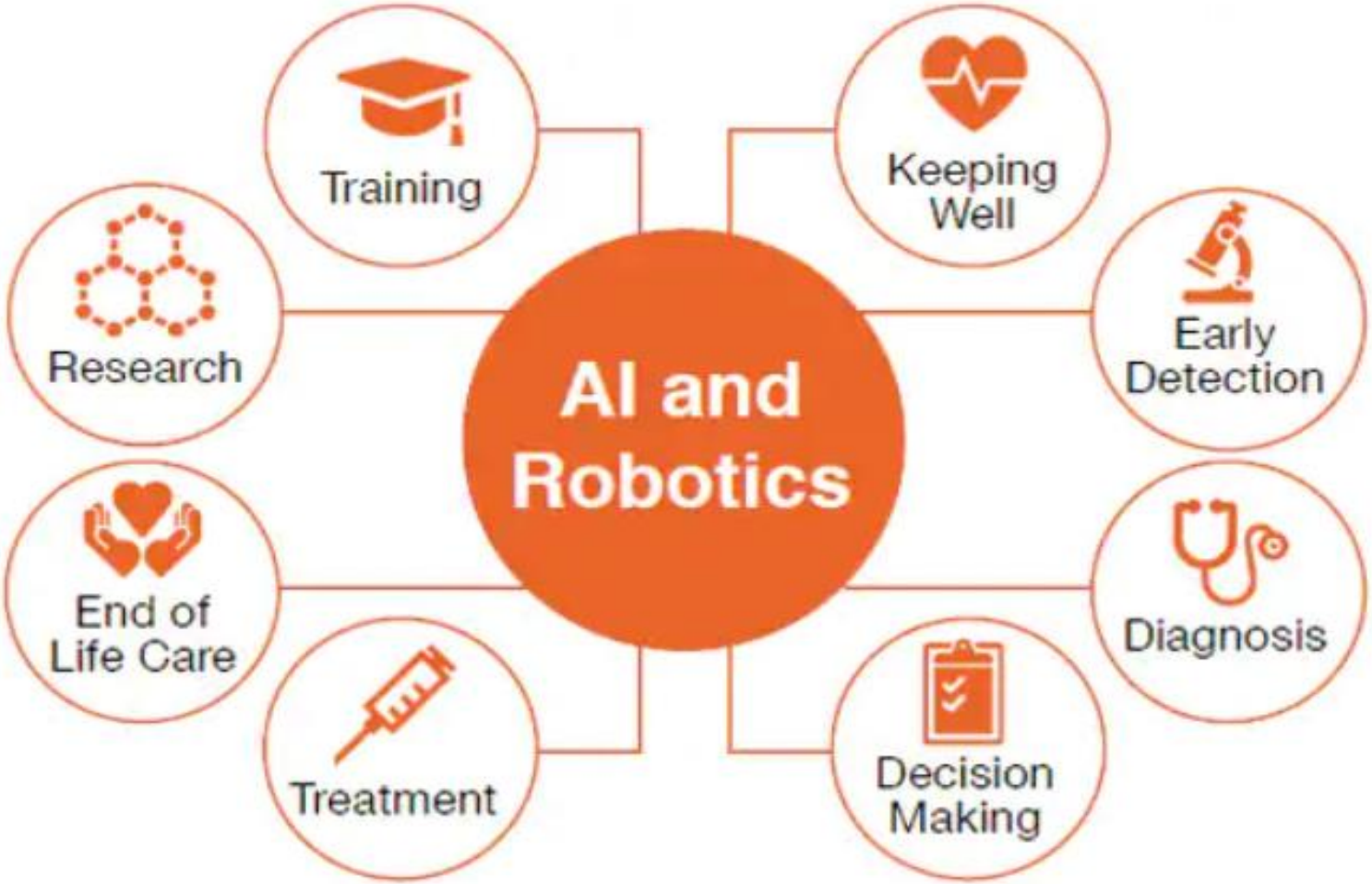
Operations can be improved further when farmers also share the information collected across the supply chain with relevant stakeholders, such as veterinarians, slaughterhouses, meat processors, and animal feed producers.

AI in Health Sector

AI in Health

- Artificial Intelligence (AI) has made a major impact across a myriad of industries, especially in healthcare.
- Rather, this evolving technology has become a part of our daily lives in ways we never have imagined.
- The use of AI in the healthcare industry is radically changing the face of the IT industry.
- The primary aim of AI applications in health care is to analyze links between prevention or treatment approaches and patient outcomes.

AI in Health – Use cases



AI IN HEALTHCARE

AI in Transportation: Local Example

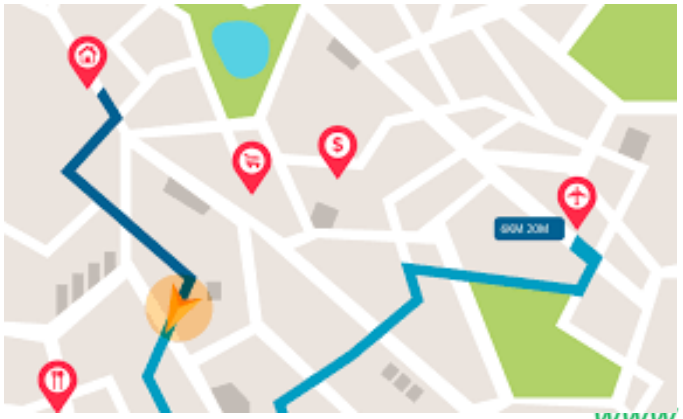
Applications of AI - Ride-Hailing Services as a Case Study

We will illustrate the impact of **AI** on ride-hailing services such as **Uber** and **Bolt** as a case study.

- **Demand Prediction:** AI analyzes historical data, traffic patterns, and even external factors like weather and events to predict when and where passengers will need a ride. This ensures that drivers are in the right place at the right time, reducing wait times for riders.

Applications of AI - Ride-Hailing Services as a Case Study

- **Route Optimization:** AI algorithms calculate the fastest and most efficient routes for drivers. It considers real-time traffic conditions, road closures, and even learns from drivers' behavior to suggest optimal routes.



- **Dynamic Pricing Algorithms:** Ever noticed how ride prices can change during peak times or in heavy traffic? AI-driven pricing algorithms adjust fares based on supply and demand, ensuring fair pricing for riders while incentivizing drivers to meet increased demand.

Artificial Intelligence and National Development

Economic Growth Engine

- **Increased Productivity:**
- AI automates tasks, analyzes data for better decision-making, and optimizes processes, leading to significant productivity gains across industries.

- **Creation of New Job Markets:**
- While some jobs might be automated, AI creates new opportunities in areas like AI development, data science, cybersecurity, and human-machine collaboration.

Economic Growth Engine

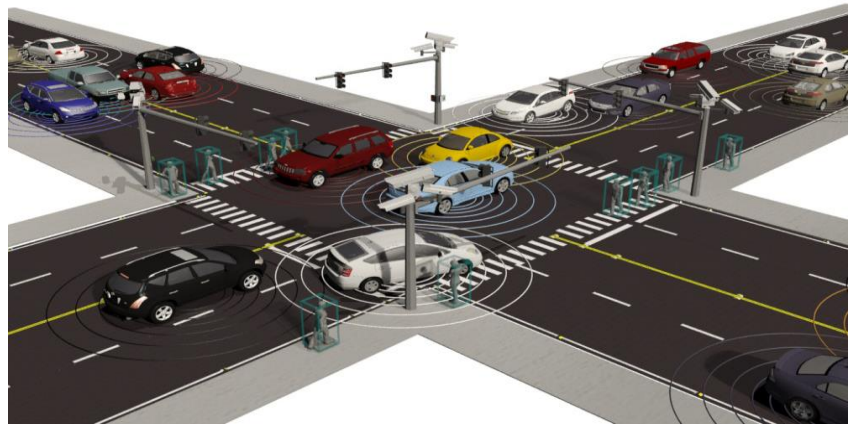
- **Enhanced Global Competitiveness:**
- AI-powered innovations can give nations a competitive edge in the global marketplace, attracting investments and fostering economic growth.

- **Improved Resource Management:**
- AI can optimize resource allocation in sectors like energy, agriculture, and transportation, leading to cost savings and environmental sustainability.

Infrastructure Improvements

- **Predictive Maintenance:**
- AI analyzes sensor data to predict equipment failures in power grids, transportation networks, and buildings, enabling proactive maintenance and minimizing downtime.

- **Traffic Flow Optimization:**
- AI-powered systems analyze real-time traffic data to dynamically adjust traffic signals, reducing congestion and improving travel times.



Infrastructure Improvements

- **Smart City Development:**
- AI plays a crucial role in developing smart cities, optimizing energy use, waste management, and resource allocation for improved sustainability and citizen well-being.

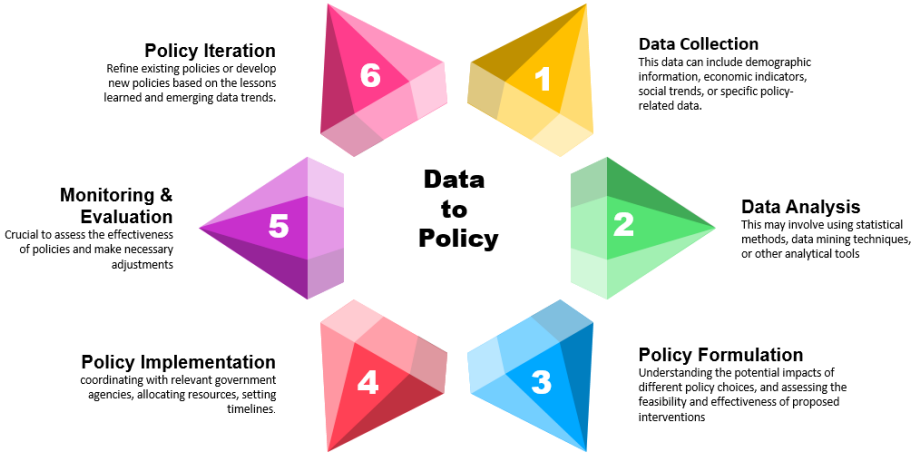
- **Disaster Risk Reduction:**
- AI analyzes data to predict and prepare for natural disasters, optimizing resource allocation for mitigation, response, and recovery efforts.

DRR
DISASTER RISK REDUCTION

Public Service Enhancements

- **Personalized Citizen Services:**
- AI-powered chatbots and virtual assistants provide 24/7 support, answer frequently asked questions, and automate routine tasks, freeing up human agents for complex inquiries.

- **Data-Driven Policymaking:**
- AI analyzes data to identify trends, predict outcomes, and inform evidence-based policy decisions, leading to more effective and targeted interventions.



Public Service Enhancements

- **Fraud Detection and Prevention:**
- AI algorithms can analyze financial transactions and identify suspicious patterns in real-time, helping to prevent fraud and ensure the integrity of government services.

- **Improved Public Service Delivery:**
- Automating administrative tasks and data analysis with AI streamlines processes, reduces wait times, and enhances transparency in public service delivery.

Considerations for Responsible AI Development

- **Ethical Considerations:**
- Addressing bias in data and algorithms is crucial to ensure fair and equitable outcomes in AI-powered systems.

- **Transparency and Explainability:**
- Ensuring transparency in AI decision-making processes is essential for building trust and understanding the rationale behind AI outputs.

Considerations for Responsible AI Development

- **Job Market Adaptation:**
- Investing in reskilling and upskilling initiatives is critical to prepare the workforce for the changing job landscape brought about by AI.

- **Data Privacy and Security:**
- Robust regulations and data protection measures are necessary to safeguard individual privacy and ensure the secure use of data in AI development and deployment.

Case Studies

Precision Agriculture with AI

- **Challenge:** Low crop yields due to inefficient farming practices and limited resources.
- **Solution:** The International Institute of Tropical Agriculture (IITA) and partners developed an AI-powered tool called "TROPICS." TROPICS uses satellite imagery, weather data, and soil sensors to provide farmers with personalized recommendations on planting dates, fertilizer application, and pest control.
- **Impact:** Increased crop yields, improved resource management, and potential for boosting food security in Nigeria.

IITA
Transforming African Agriculture

AI-powered healthcare in Lagos

- **Challenge:** Limited access to healthcare professionals and specialists in rural areas.
- **Solution:** Babyl, a digital health company, launched a pilot program in Lagos offering AI-powered chatbots for symptom checking and triage.
- **Impact:** Improved access to basic healthcare services, reduced pressure on overwhelmed hospitals, and potential for earlier disease detection.

Flood Risk Prediction with AI

- **Challenge:** Recurring and devastating floods displacing communities and causing infrastructural damage.
- **Solution:** IBM partnered with the Nigerian government to develop an AI-powered flood prediction system that analyzes weather data, river levels, and historical patterns.
- **Impact:** Improved preparedness for floods, allowing for early evacuation and resource allocation for mitigation efforts.

Fighting Financial Crime with AI

- **Challenge:** High prevalence of financial fraud impacting the economy and hindering financial inclusion.
- **Solution:** Nigerian banks are implementing AI-powered fraud detection systems that analyze financial transactions in real-time to identify suspicious patterns.
- **Impact:** Reduced financial fraud, increased security in financial transactions, and potential for promoting financial inclusion by mitigating risks.

Limitations and Challenges

Limitations and Challenges

- **Data Dependence:**
- Artificial Intelligence systems are heavily reliant on data for training and operation.
- The quality, quantity, and diversity of data significantly impact their performance.

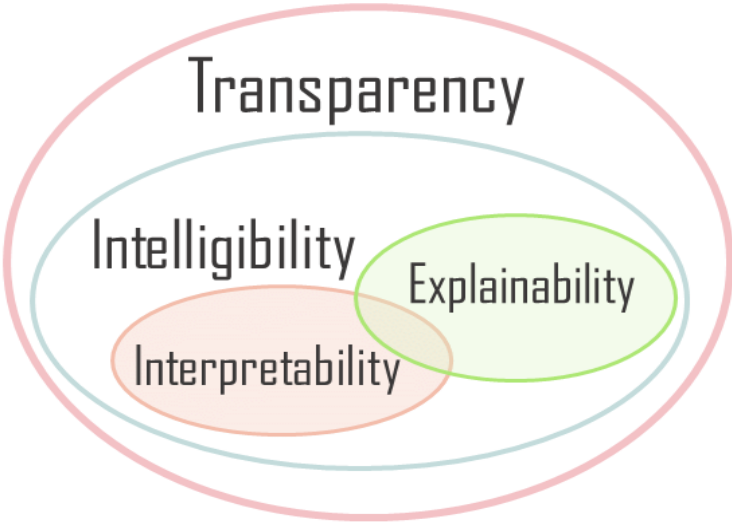
- **Lack of Creativity and Common Sense:**
- Artificial Intelligence struggles with tasks requiring genuine creativity and out-of-the-box thinking.

"Common sense is not so common."

Limitations and Challenges

- **Ethical Concerns:**
- Artificial Intelligence raises numerous ethical concerns, including data privacy, algorithmic bias, and the potential misuse of the technology.

- **Explainability and Transparency:**
- Understanding how Artificial Intelligence systems reach their conclusions can be difficult, raising concerns about accountability and fairness.



Limitations and Challenges

- **Security and Robustness:**
- Artificial Intelligence systems are vulnerable to adversarial attacks, where malicious actors manipulate input data to deceive the system.

- **Long-Term Impacts:**
- The long-term societal, economic, and geopolitical impacts of Artificial Intelligence are uncertain and subject to speculation.

Opportunities in Artificial Intelligence

Opportunities

- **Enhanced Decision-Making:**
- AI can analyze vast amounts of data to inform evidence-based decision-making across various sectors, leading to more effective policies and resource allocation.

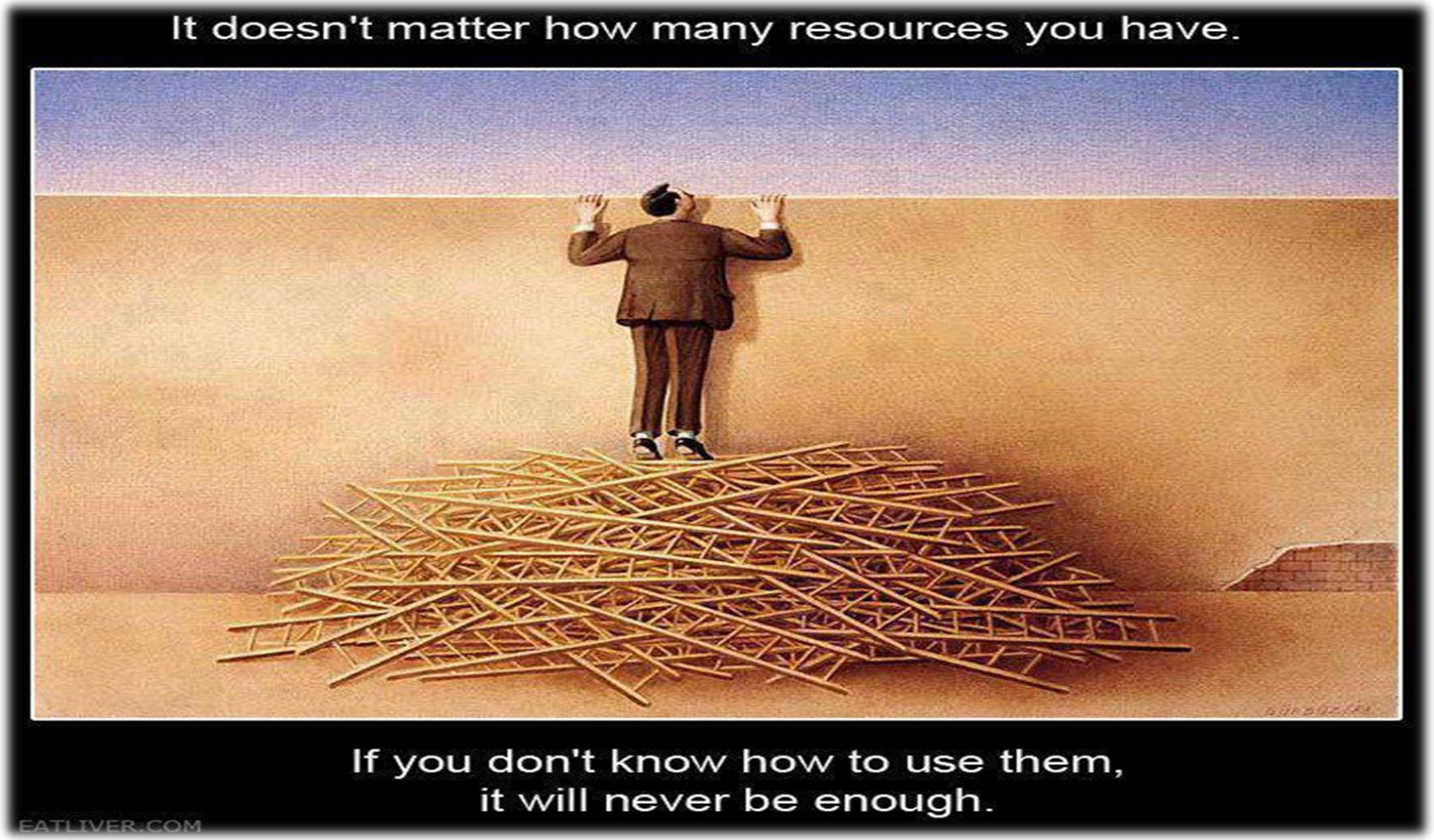
- **Boosting Economic Growth:**
- AI can create new job opportunities, increase productivity, and foster innovation, contributing to economic growth and development.

Opportunities

- **Addressing Social Challenges:**
- AI-powered solutions can address social challenges like healthcare access, education quality, and environmental sustainability, contributing to a more equitable and prosperous society.

- **Leapfrogging Development Stages:**
- Nigeria, like other developing nations, has the opportunity to leapfrog traditional development stages and adopt cutting-edge AI solutions, potentially narrowing the gap with developed nations.

Conclusion


It doesn't matter how many resources you have.
If you don't know how to use them,
it will never be enough.
EATLIVER.COM

Conclusion

- Artificial Intelligence represents a transformative force with vast potential for national development.
- From cutting-edge applications across sectors to the implications for economic growth and societal advancement, AI offers immense opportunities.
- However, addressing challenges such as ethical concerns and workforce displacement is crucial.
- Embracing AI responsibly, with robust governance and innovation, will shape a brighter future for all.

Thank you for listening.

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