

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ “

In the name of Allah, the Most Gracious, the Most Merciful

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## Contemporary Learning Session

# 4<sup>th</sup> IR and It's Implication in Research



**Md. Imam Sohel Hossain**

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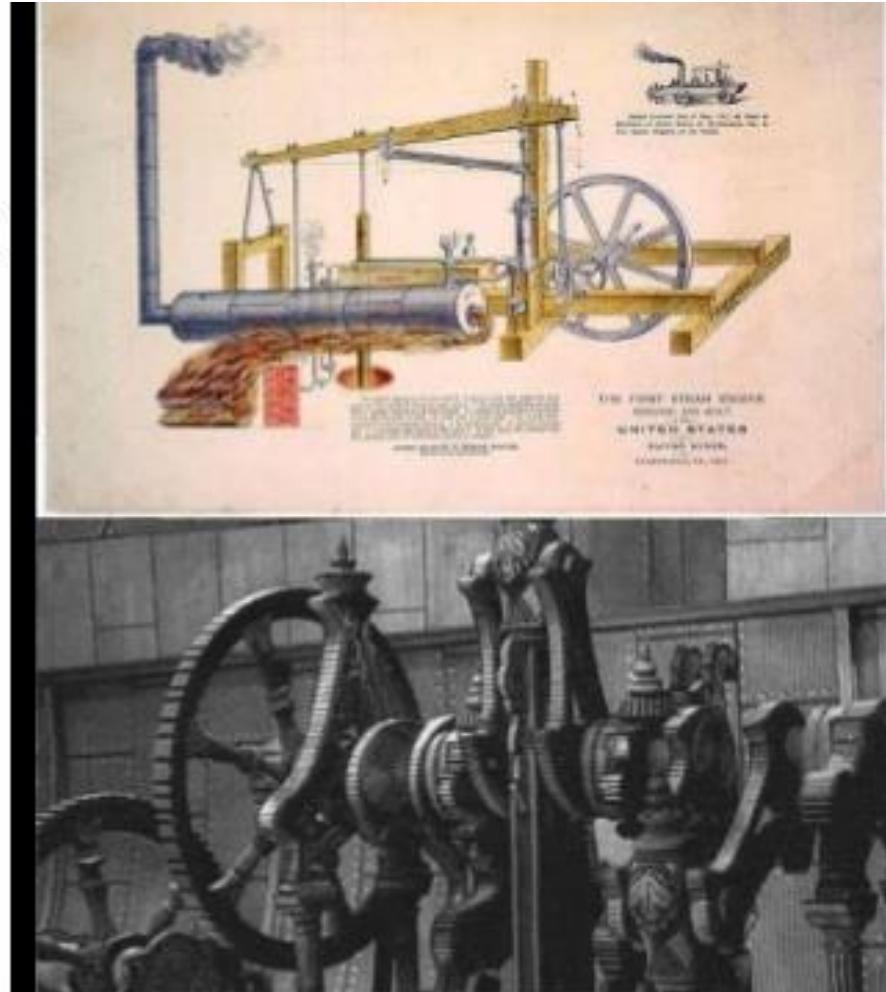
# First IR



1765

1<sup>st</sup> INDUSTRIAL REVOLUTION

- The first industrial revolution, which REALLY was a revolution, and,
- invention of steam machines,
- the usage of water and steam power and all sorts of other machines,
- industrial transformation of society with trains,
- mechanization of manufacturing and loads of smog.

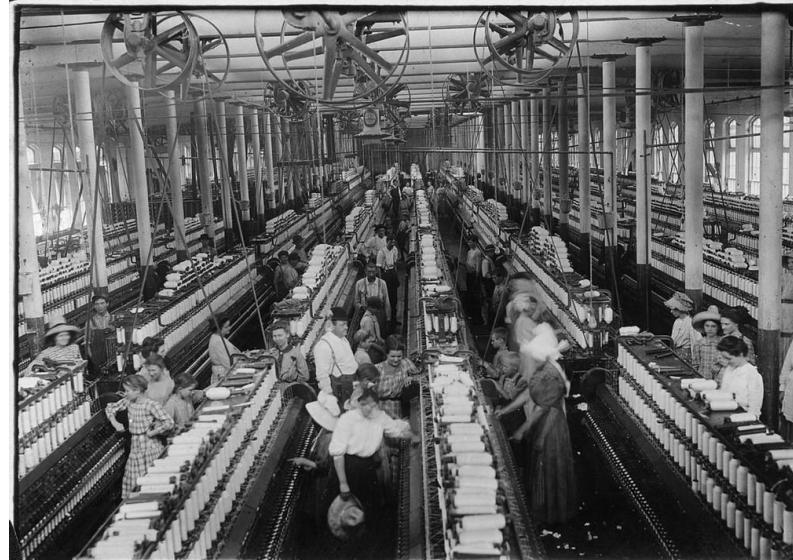




# Second IR

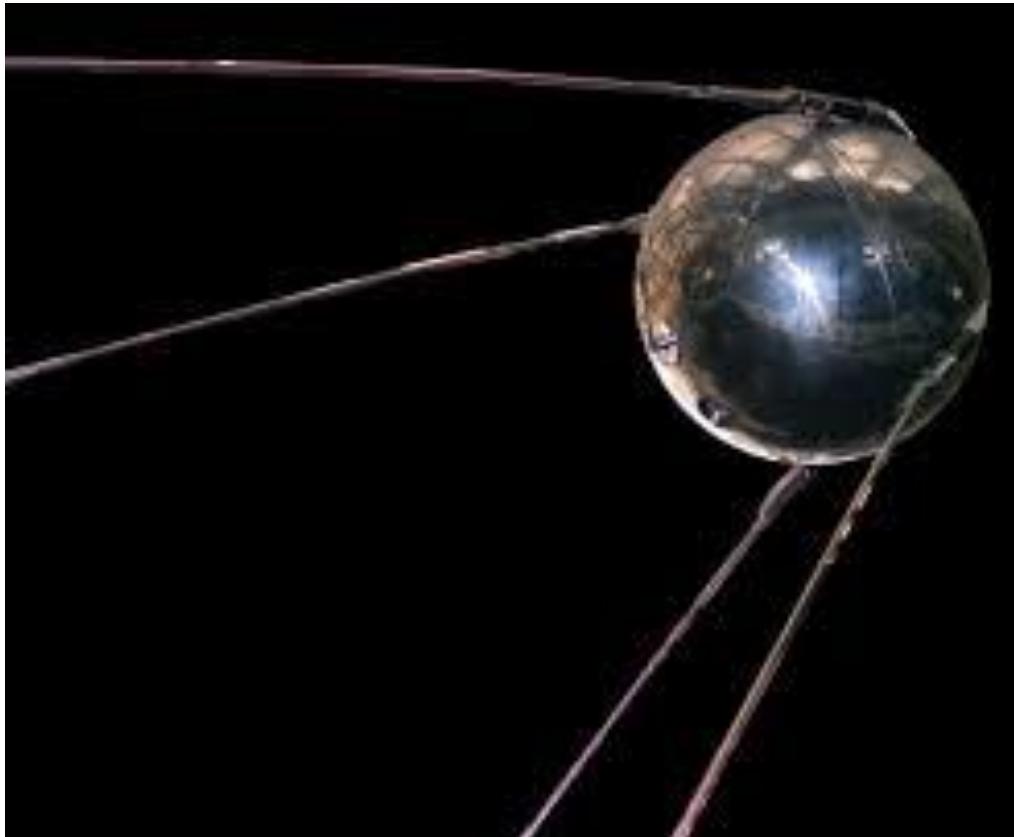


**36 sec to assemble a car**



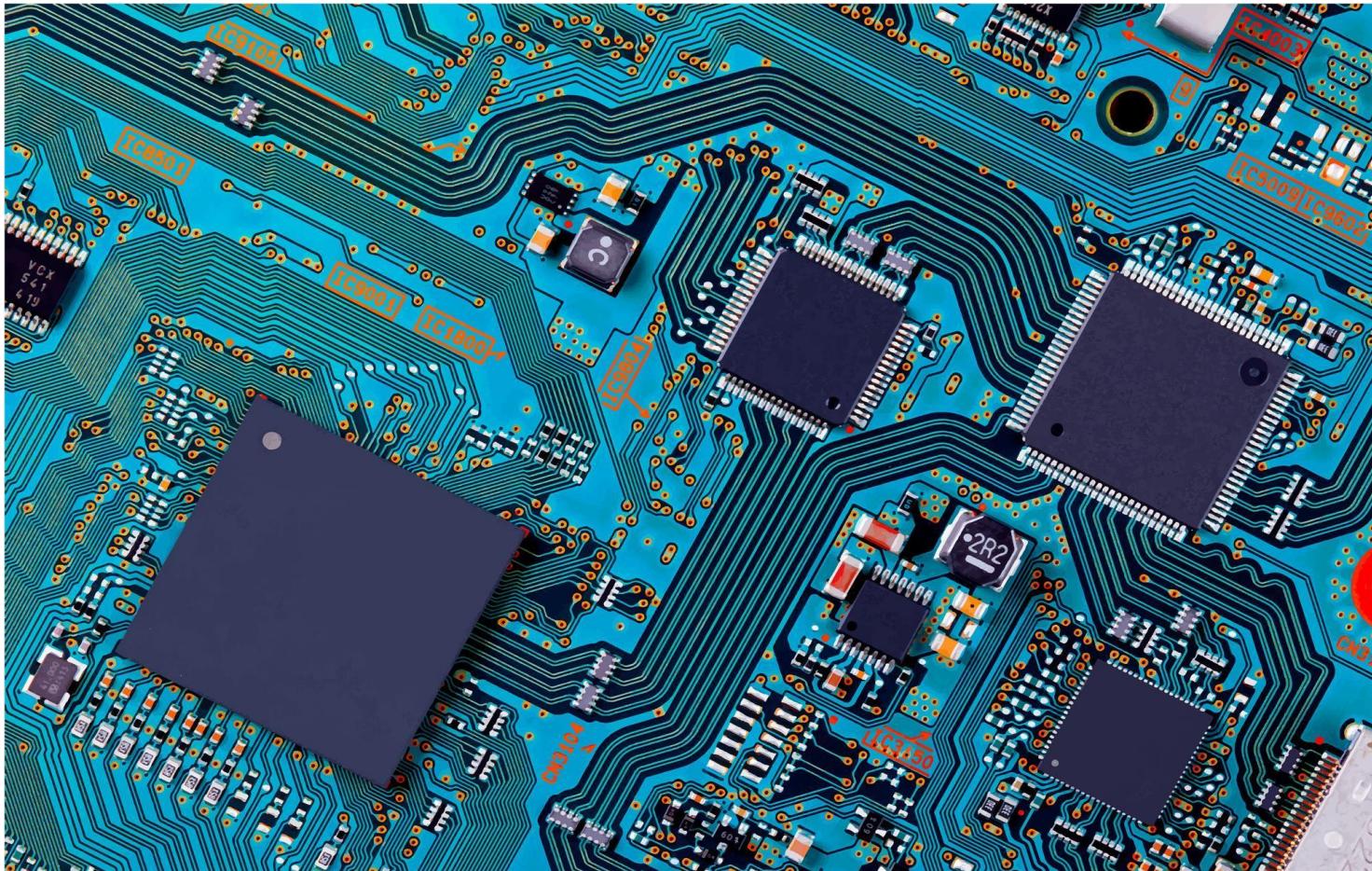


# Spinoff of Cold/Space War





# 3<sup>rd</sup> IR- Microcomputer/Microchip





# Space Age

There are two events in human history that drive technology and medicine forward. War, and the Space Race. The Space Race was a diversion of wartime technology during the Cold War between the United States and the Soviet Union.

Both were smart enough to not want to prove their capability of accurately launching nuclear missiles toward each other by actually launching nuclear missiles.

Instead both sides set out to prove that our rocket technology (which “wink wink” could also be used to deliver nuclear bombs if we wanted to) was bigger and better than the other.

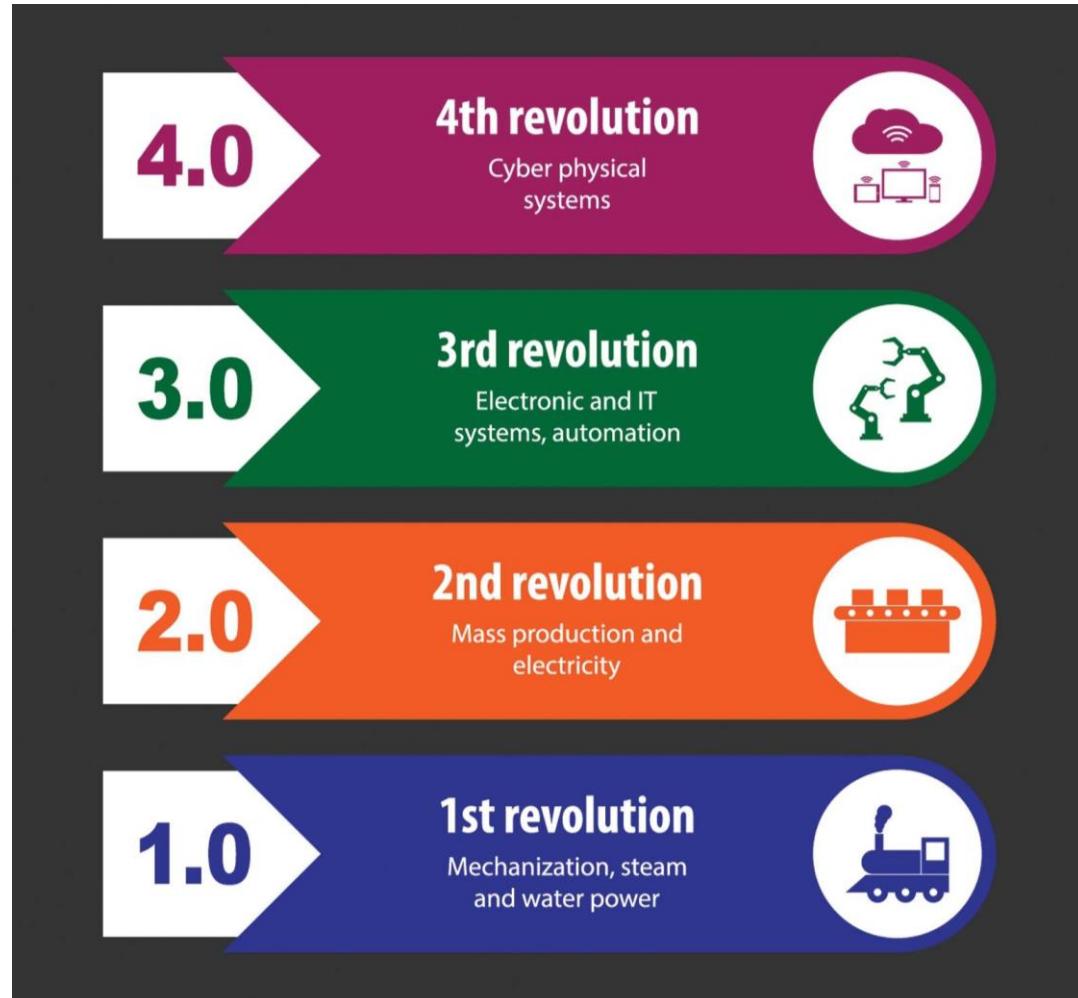
The race to the moon drove forward tremendous advances in solid state electronics and micro circuitry, materials, communications, computer science, solar energy, robotics, artificial intelligence medicine. There is hardly a science, technology or industry that was not involved in some way by the space race.

You can type in “Spin offs of space exploration” for a list of the thousands of products we use today traceable directly back to the space program. This is why space exploration continues today.



# Incredible adventure story

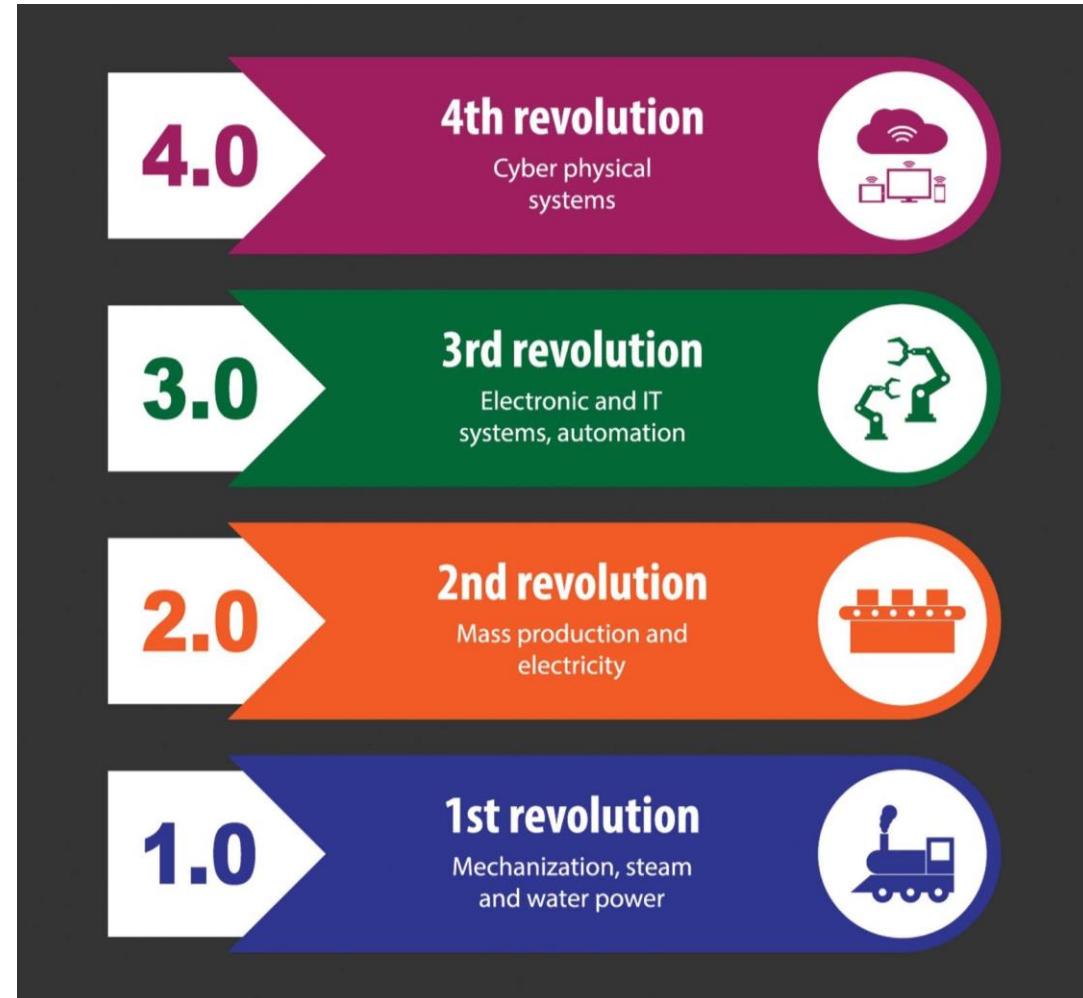
Imagine it's the late 1700s, and people mostly work on farms or in small workshops. Then, something amazing happens: inventors create machines that can do work faster and easier than people ever could. This is the First Industrial Revolution, and it starts with machines powered by water and steam. Factories pop up, and people move to cities to work.





# Incredible adventure story continues to 2<sup>nd</sup> IR

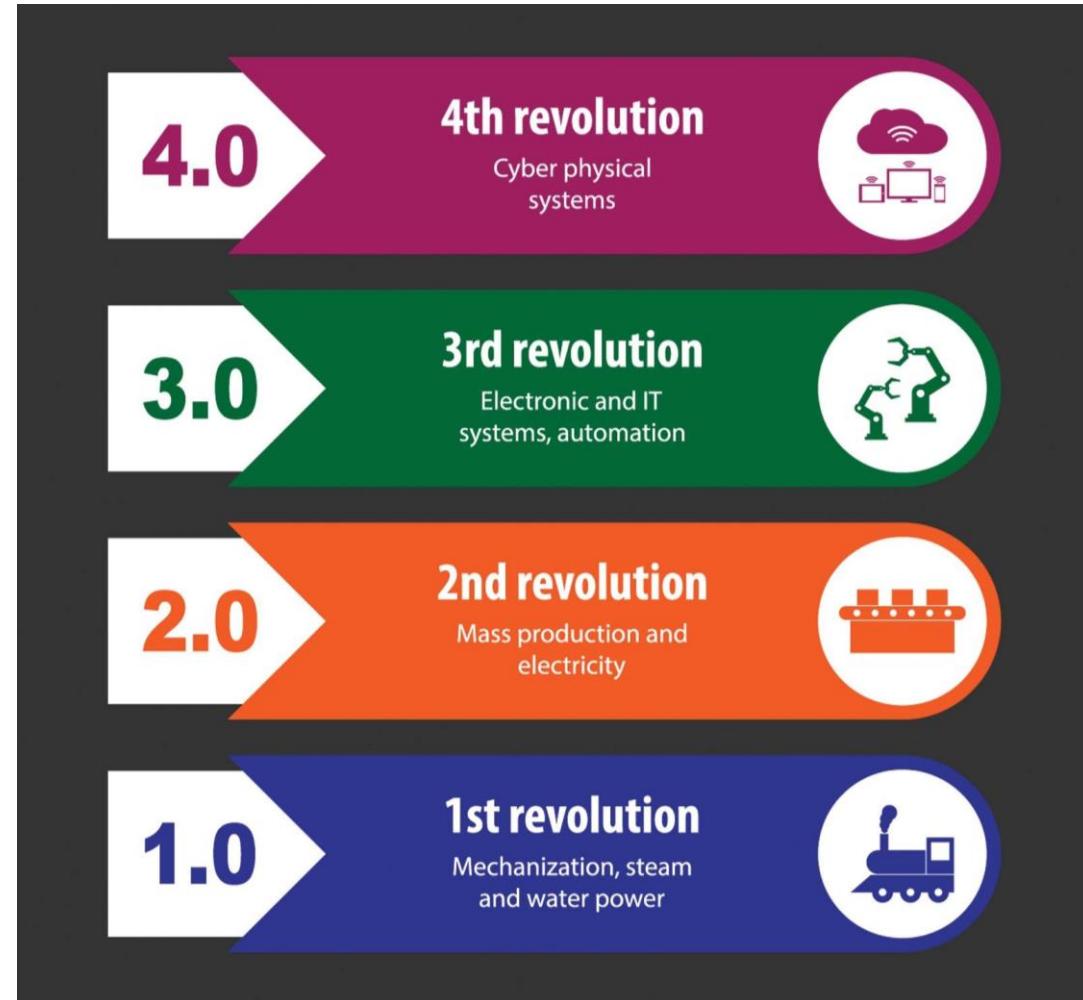
⦿ Fast forward to the late 1800s and early 1900s, and we enter the Second Industrial Revolution. Now, electricity powers machines, and new inventions like the telephone and the automobile change how we live and connect with each other.





# Incredible adventure story continues to 3<sup>rd</sup> IR

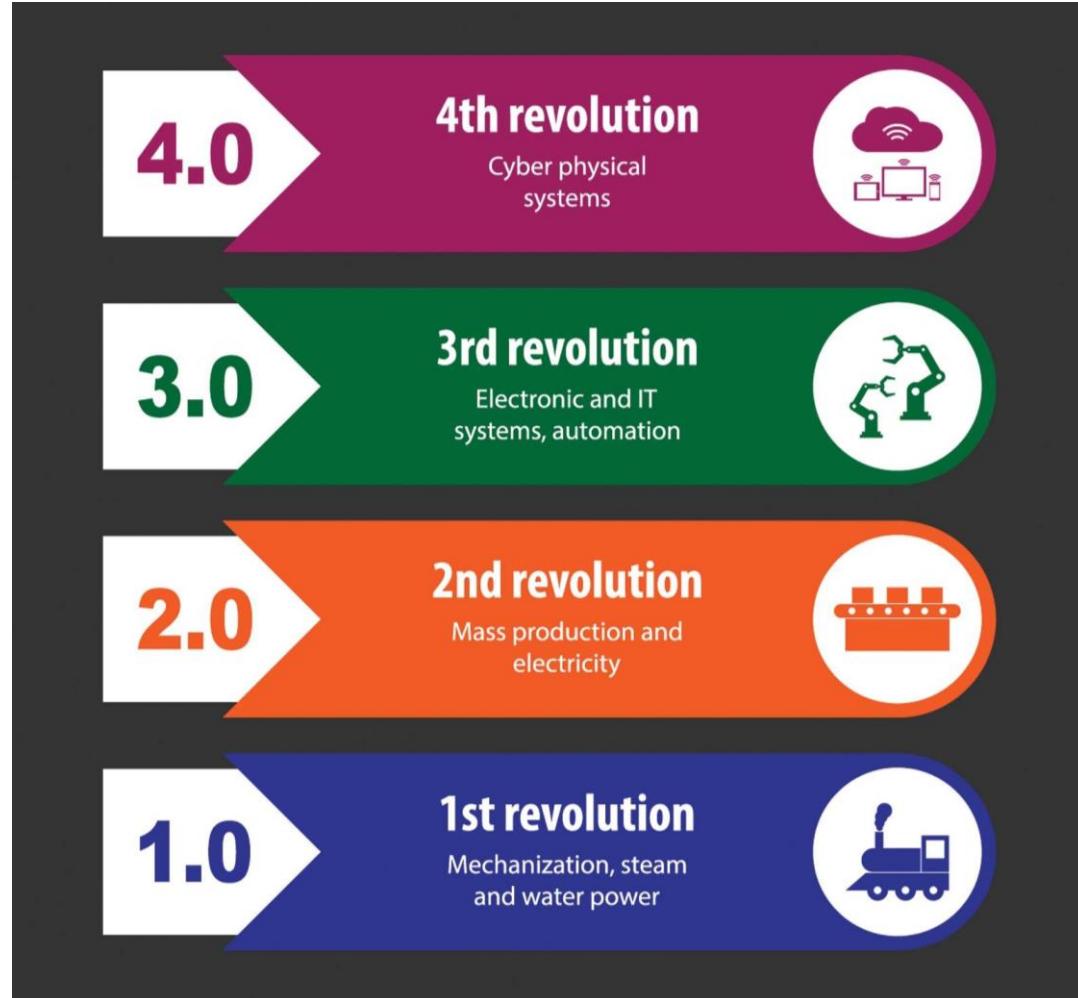
○ Next, we jump to the mid-20th century for the Third Industrial Revolution, where computers and electronics come into play. Factories become more advanced with robots, and the internet starts to link people around the world.



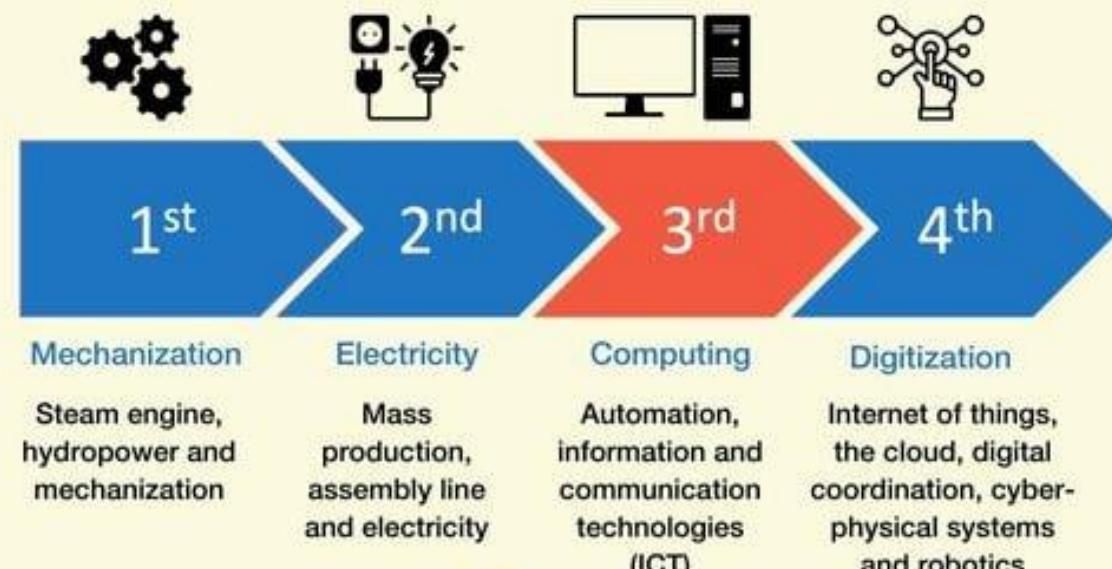


# Incredible adventure story continues to 4th IR

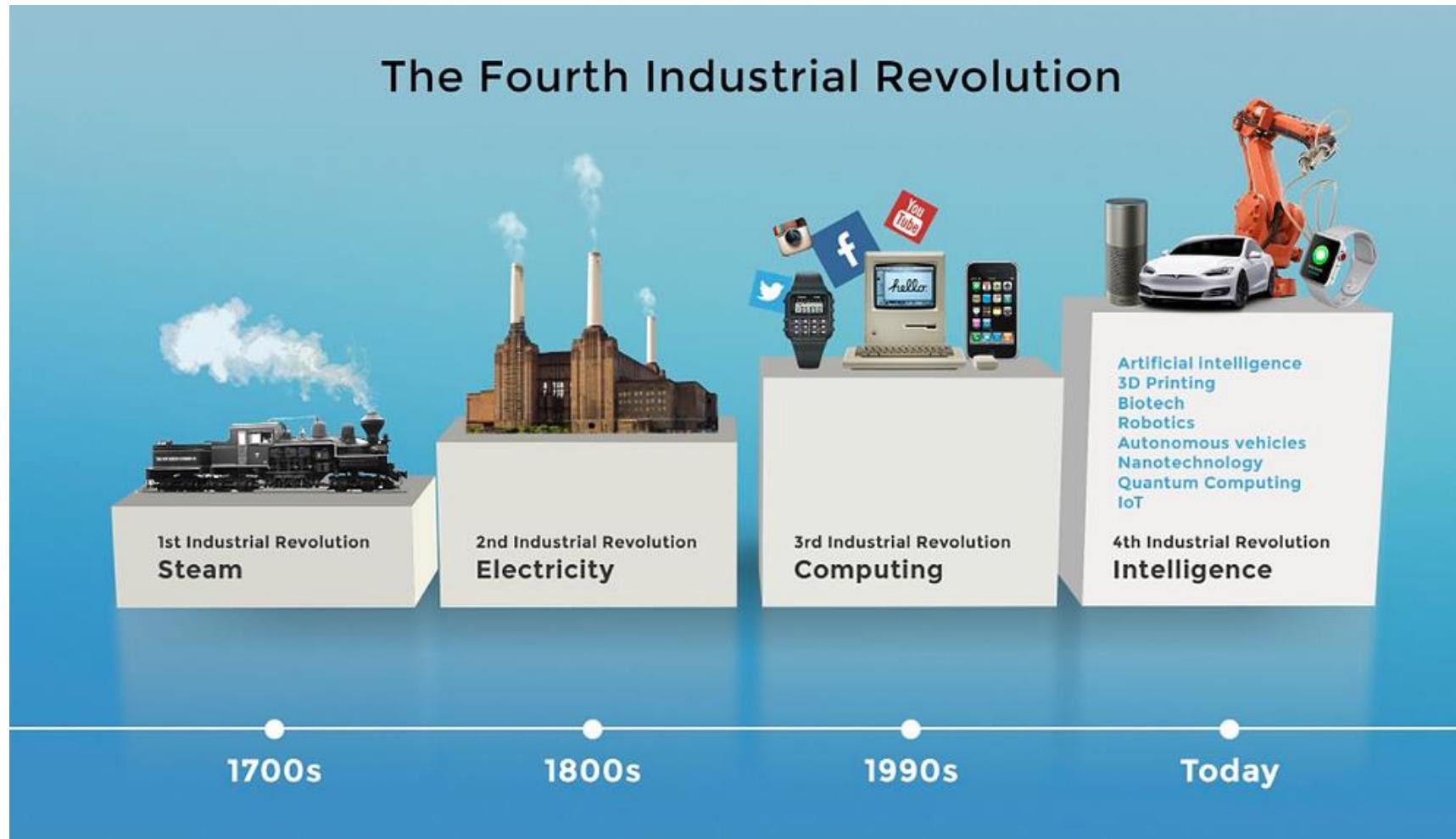
Finally, we reach the Fourth Industrial Revolution, where things get even more futuristic. Imagine robots that think, cars that drive themselves, and smart devices that can talk to each other. This revolution is all about blending digital technology with the physical world, using artificial intelligence, big data, and the Internet of Things to create a world that's more connected and efficient than ever before. Each revolution builds on the previous one, making our world more advanced and exciting.



## STAGES OF THE INDUSTRIAL REVOLUTION

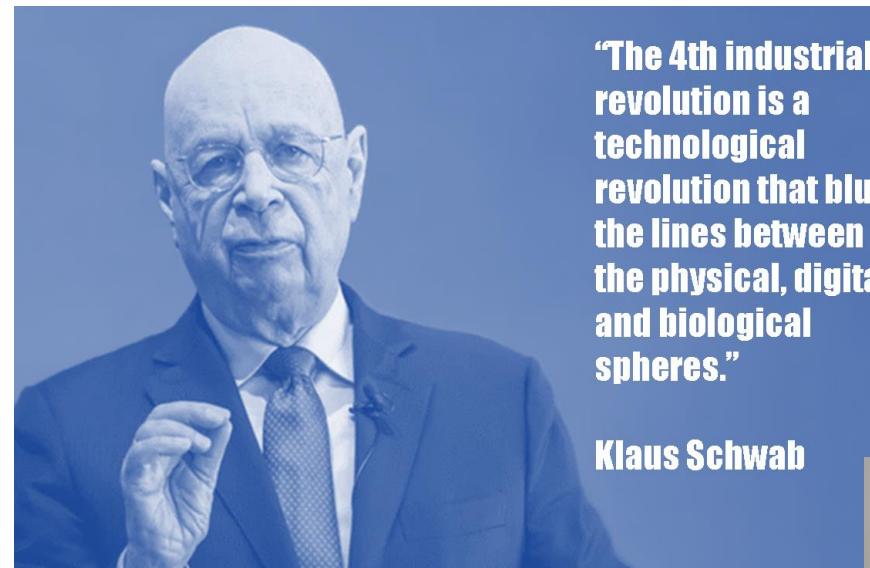


 [economipedia.](#)





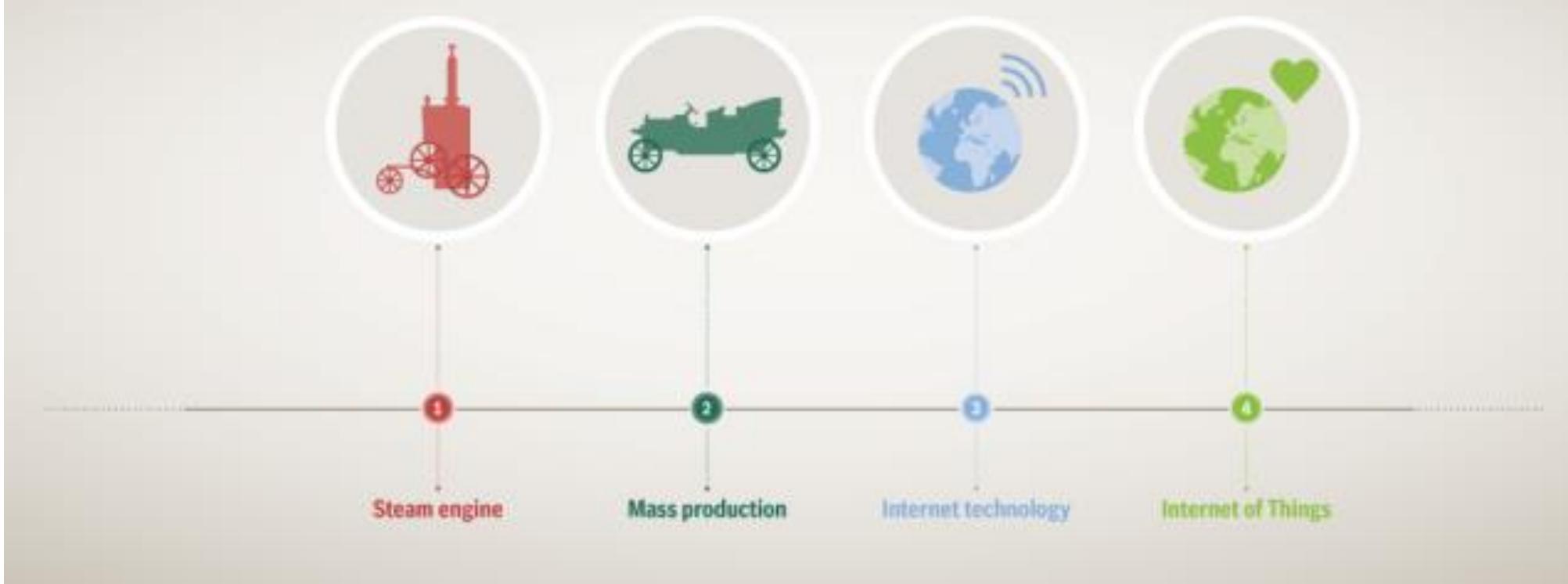
Professor Klaus Schwab  
Founder and Executive Chairman  
of the World Economic Forum



Klaus Schwab

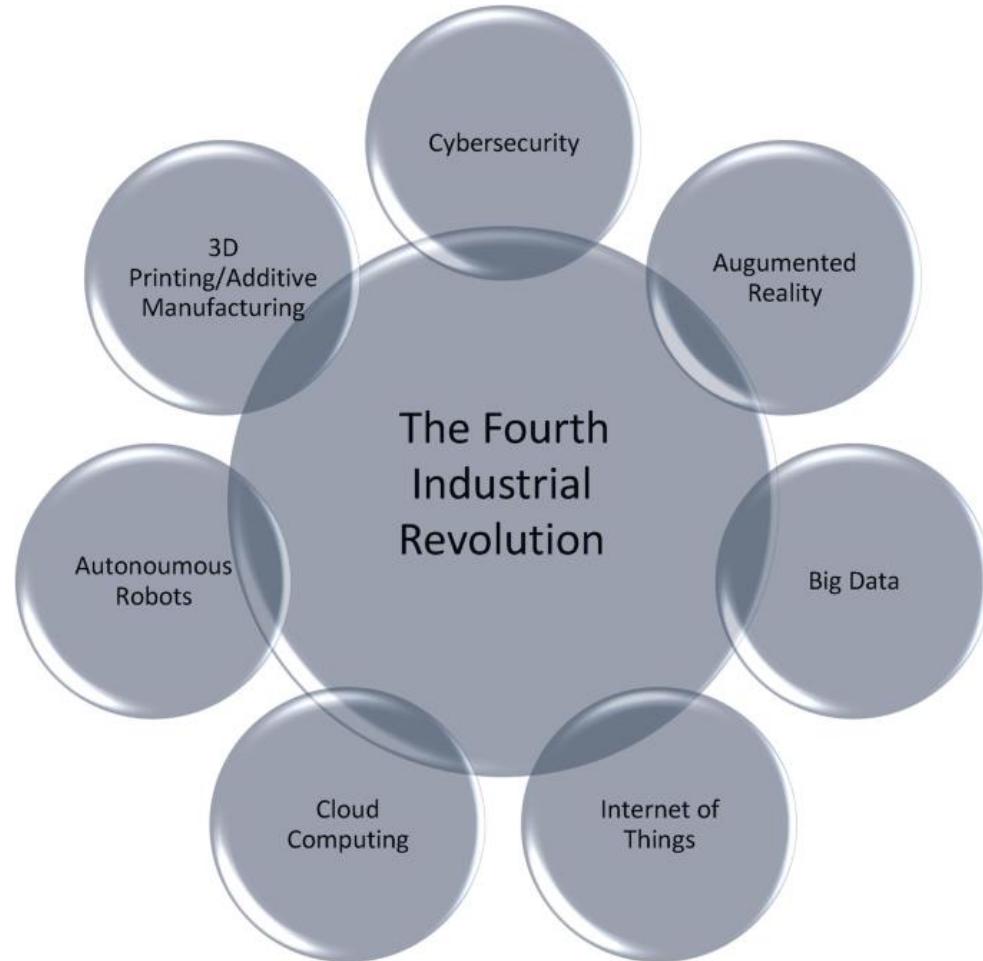


## FOURTH INDUSTRIAL REVOLUTION

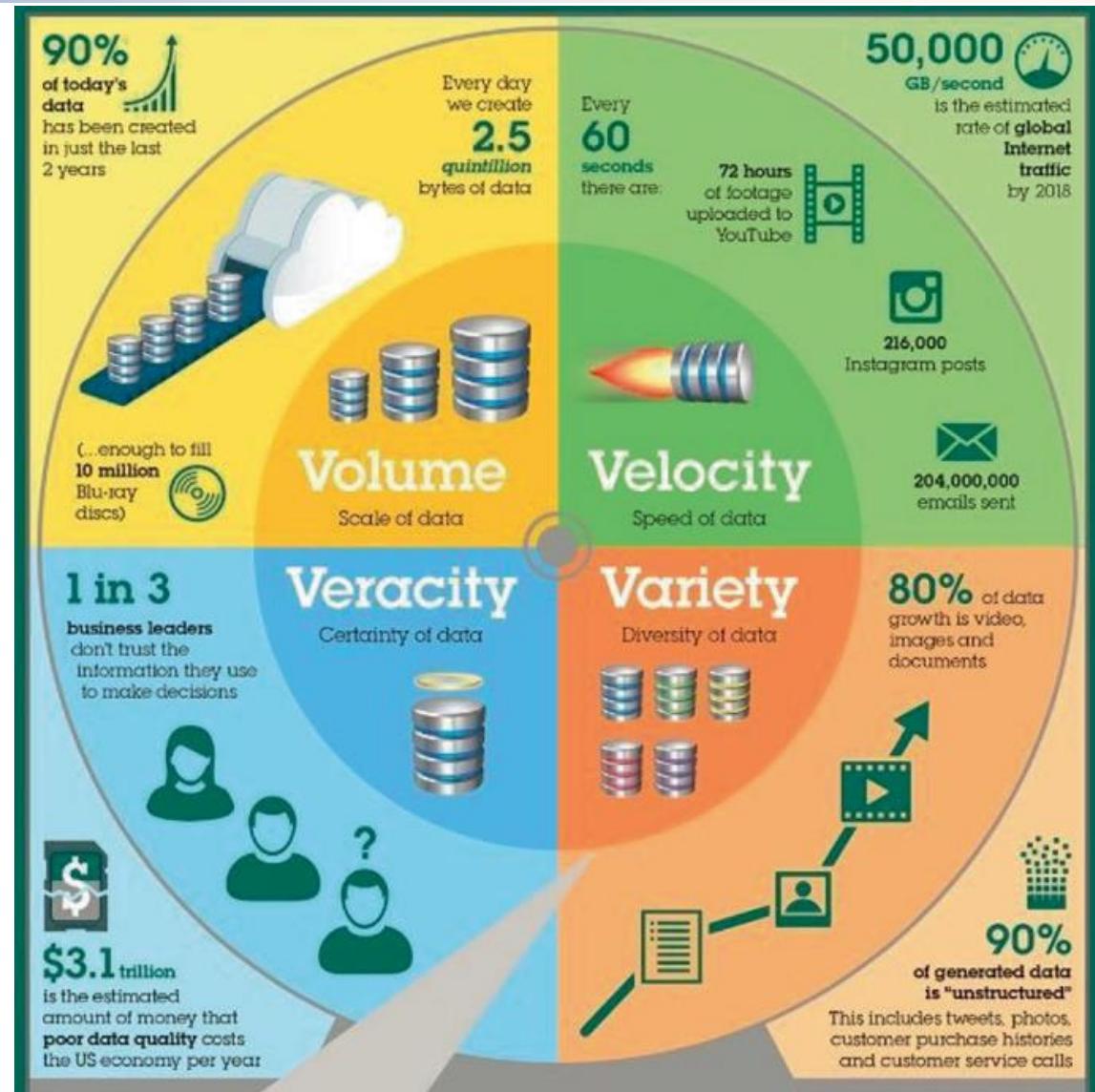
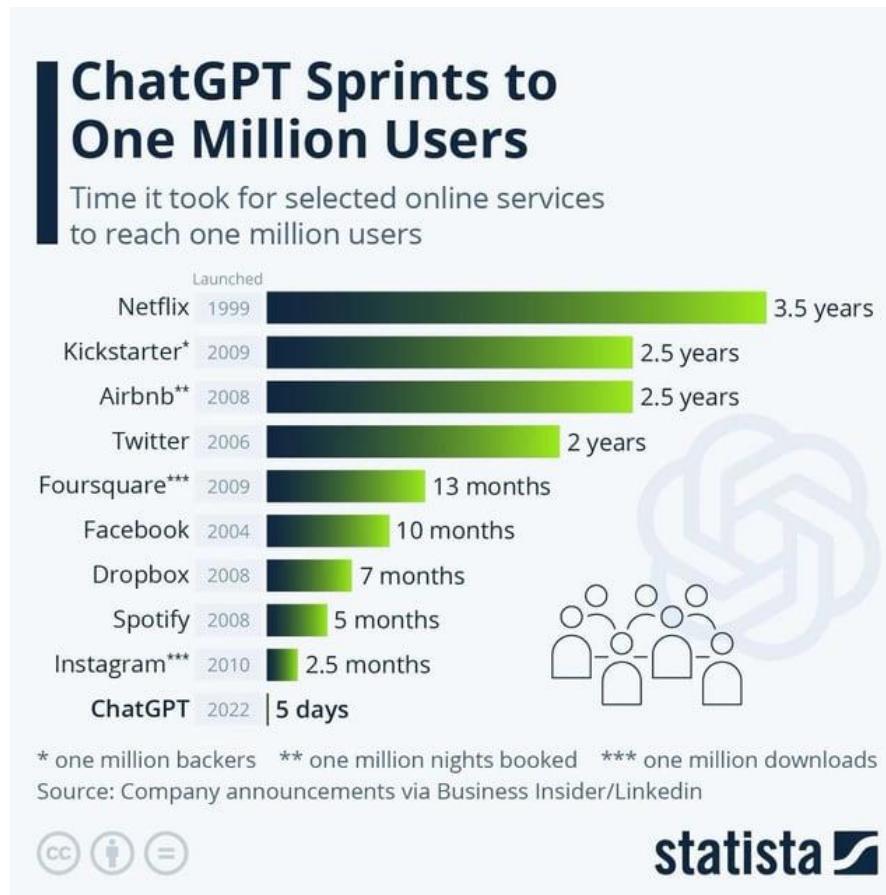




# Components of 4<sup>th</sup> IR

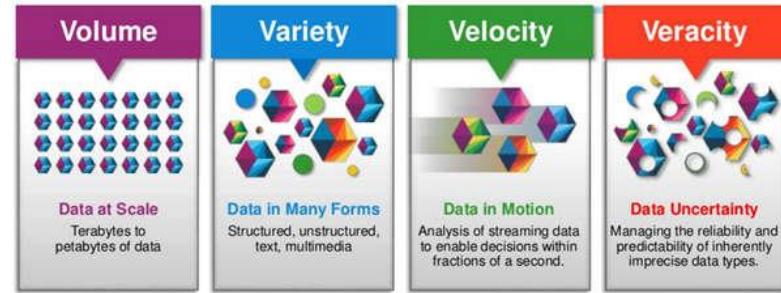


# Characteristics of 4<sup>th</sup> IR



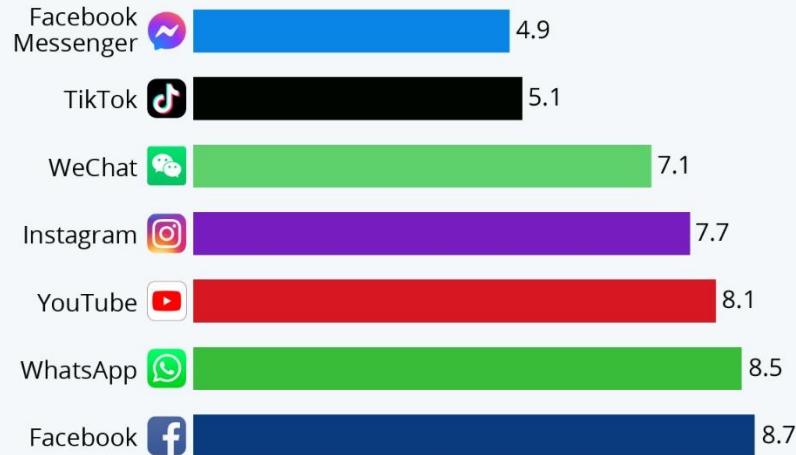


# Characteristics of 4<sup>th</sup> IR



## The Road to One Billion Users

Time it took for selected social media services to reach one billion monthly active users (in years)



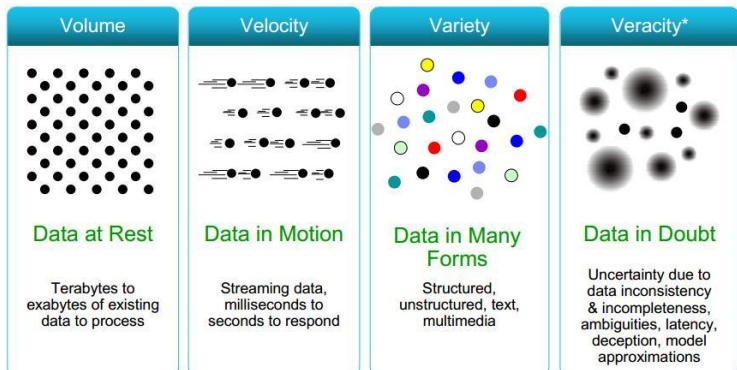
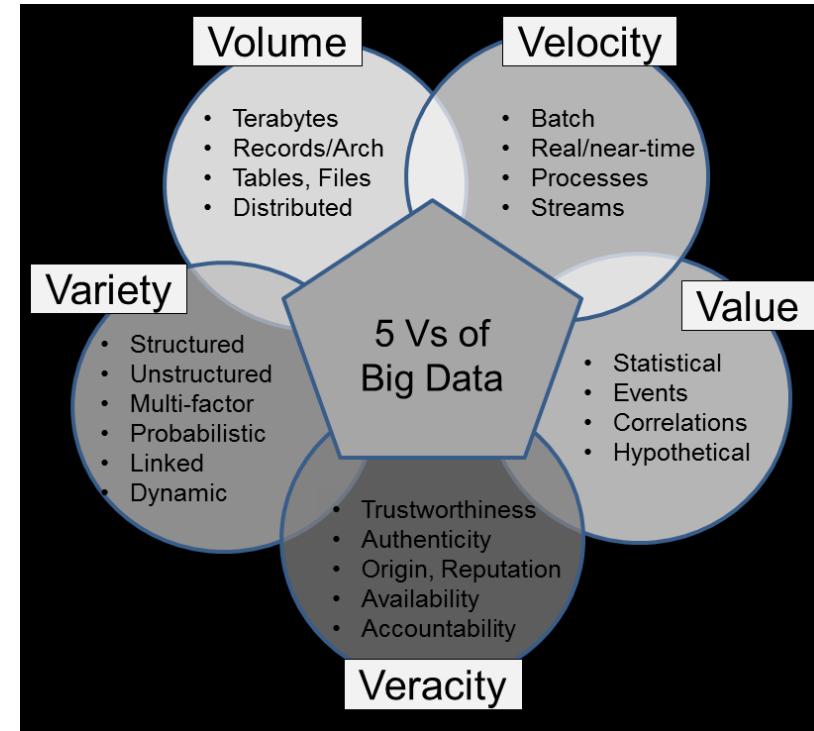
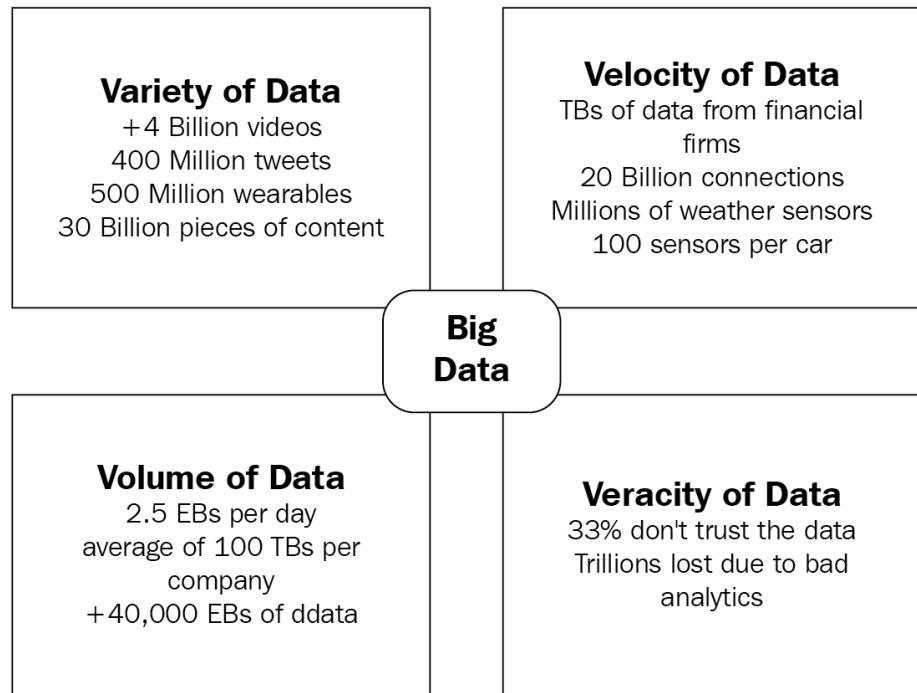
As of Sept 2021  
Source: Axios

## TIME IT TOOK FOR PLATFORMS TO REACH 1 MILLION USERS

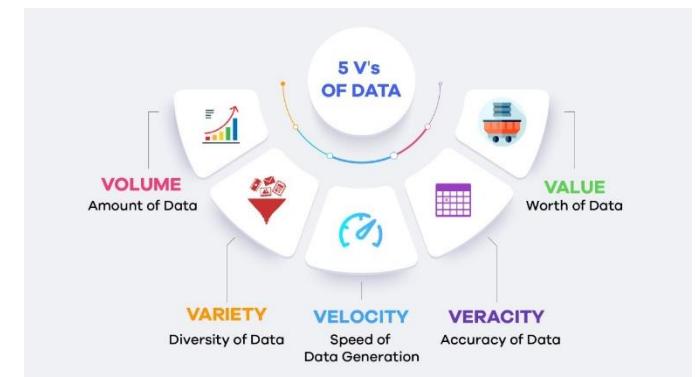




# Characteristics of 4<sup>th</sup> IR



- VOLUME** How much data?
- VARIETY** What kind of data?
- VELOCITY** How frequent or real-time is the data?
- VERACITY** How accurate & applicable is the data?

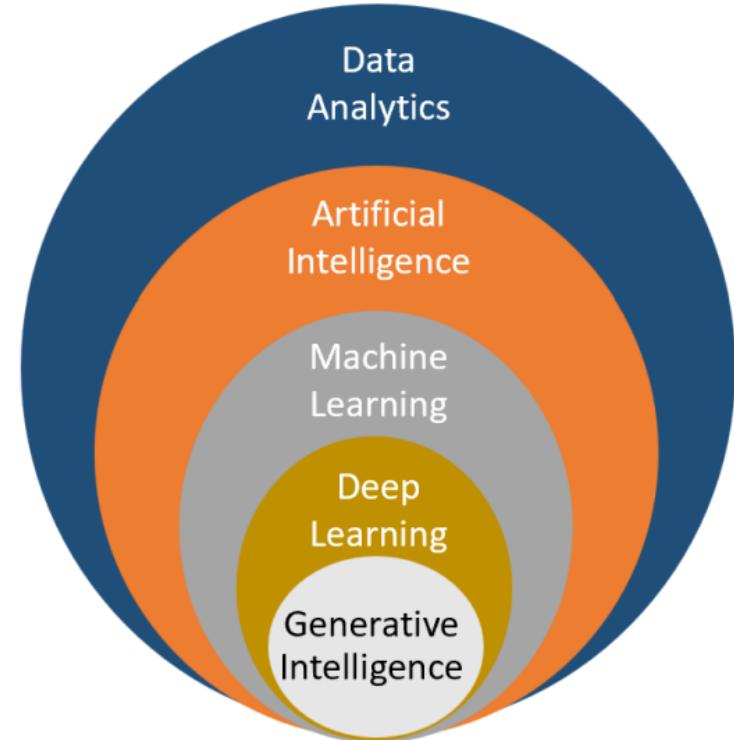




# Artificial Intelligence and Machine Learning

- These technologies enable machines to learn from data, make decisions, and improve over time. They are used in a wide range of applications from autonomous vehicles to personalized medicine.

DL and GI – How it all fits together

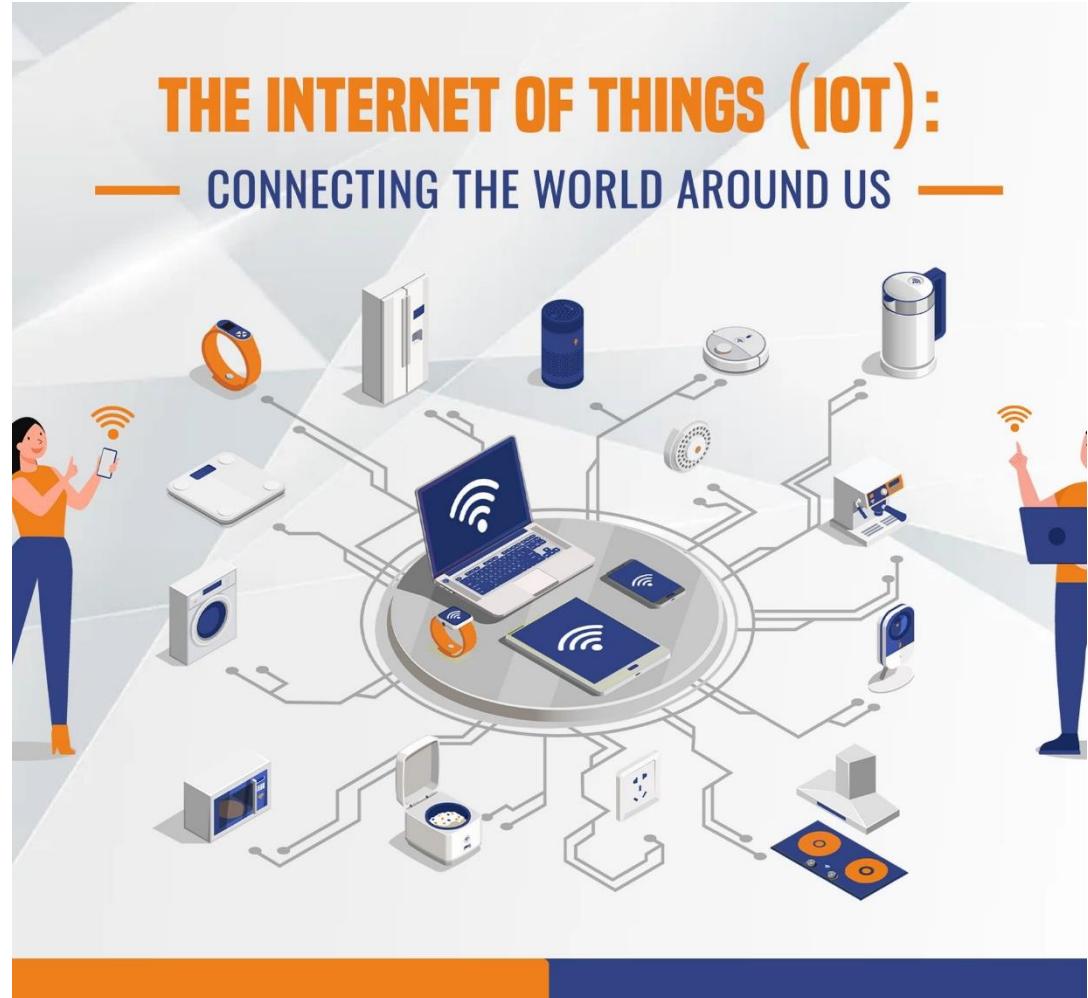
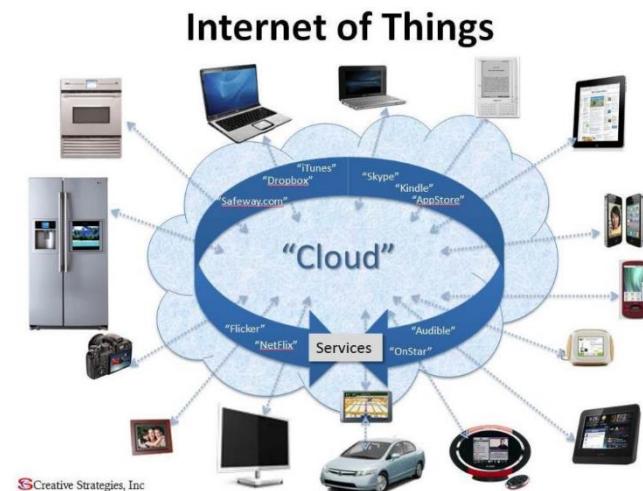


<https://www.linkedin.com/pulse/how-does-ai-ml-dl-gi-fit-together-anang-b-singh>

0231010

# Internet of Things (IoT):

- This refers to the network of interconnected devices that can communicate and exchange data with each other. IoT is used in smart homes, wearable devices, industrial automation, and more.



# Big Data and Analytics:

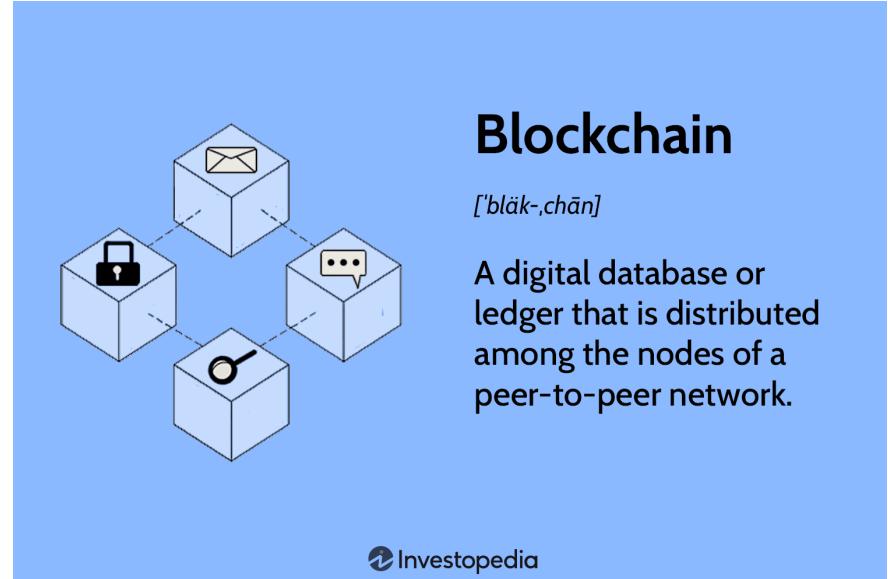
- The vast amounts of data generated by digital devices are analyzed to uncover patterns, trends, and insights that can inform decision-making and drive innovation.



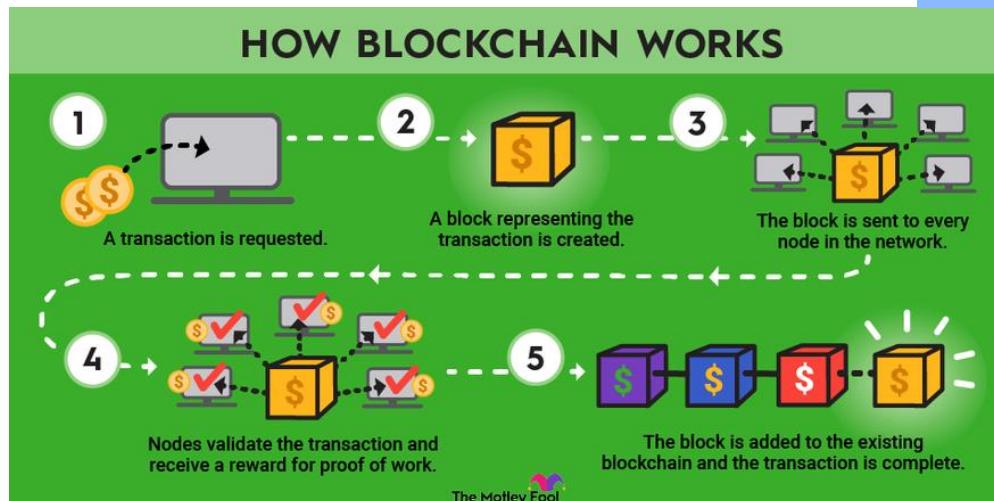


# Blockchain

○ A decentralized and secure way of recording transactions and managing data, blockchain is used in cryptocurrencies, supply chain management, and secure voting systems.



Investopedia



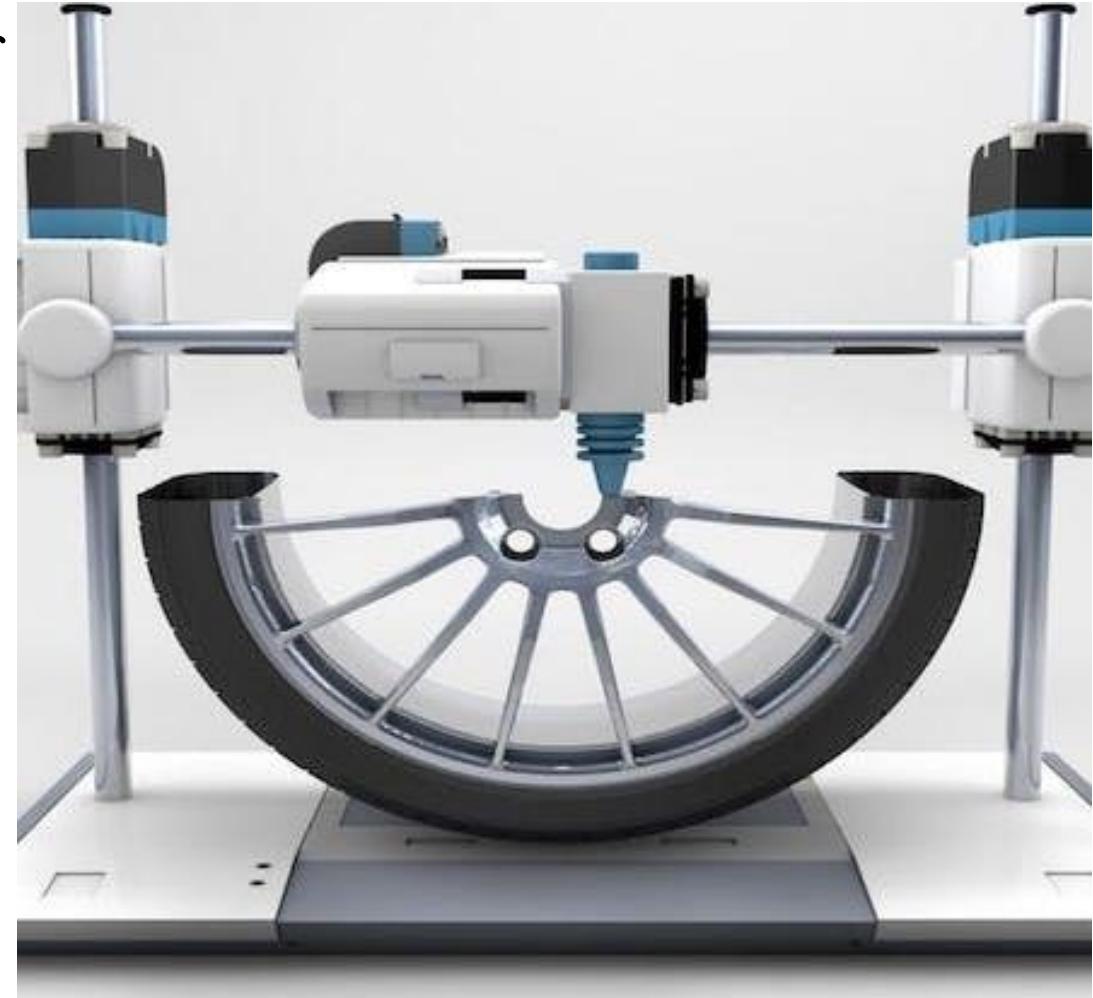
# Robotics

- Advances in robotics are leading to more sophisticated and capable robots that can perform complex tasks in manufacturing, healthcare, and other sectors.



# 3D Printing (Additive Manufacturing)

- This technology allows for the creation of complex objects by layering materials, which is used in industries like aerospace, automotive, and healthcare for customized manufacturing.





# Augmented Reality (AR) and Virtual Reality (VR)

⦿ These immersive technologies are used for training, simulation, entertainment, and enhancing user experiences in various fields.



Extended Reality (XR)				
	Reality	Augmented Reality (AR)	Mixed Reality (MR)	Virtual Reality (VR)
Display	Naked eye/optical glasses	Translucent display	Translucent display	Occlusion display
Display example				
Example				
	Real view of a trail	Augmented virtual map and direction	Interactive virtual contents	Virtual gaming



# Quantum Computing

- Though still in early stages, quantum computing promises to solve complex problems much faster than classical computers by leveraging the principles of quantum mechanics. Let's say you're on a treasure hunt. There are 8 treasure chests, and only one has the treasure. A regular computer would check each chest one by one until it finds the treasure. This could take a while.
- A quantum computer, with its qubits in superposition, can check all the chests at once! Because of this, it can find the treasure much faster.

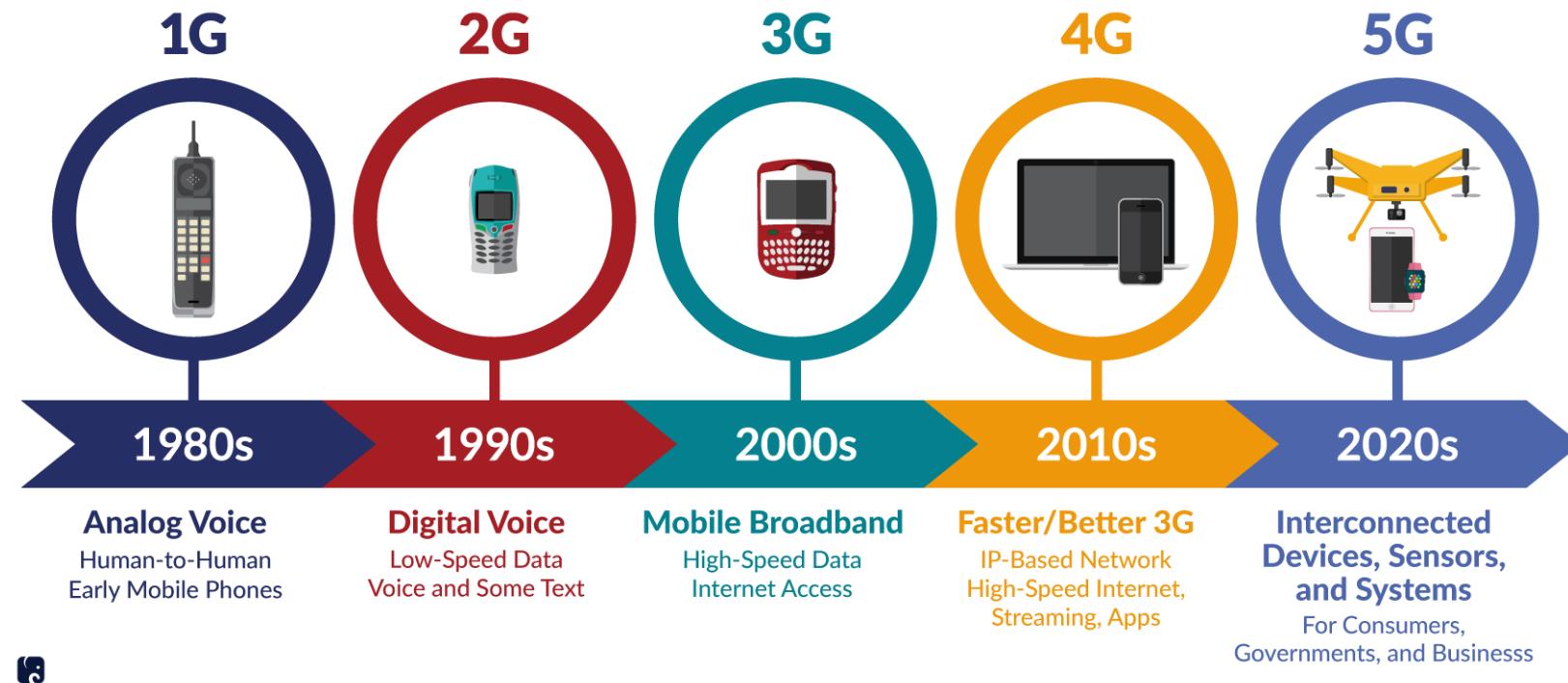


- Classical Computer:** Uses bits (0 or 1), like regular coins (heads or tails).
- Quantum Computer:** Uses qubits (0, 1, or both at the same time), like magic coins (heads, tails, or both).
- Superposition:** A qubit can be in multiple states at once.
- Entanglement:** Qubits can be connected in a special way, so the state of one affects the other, no matter the distance.



# Advanced Wireless Technologies (5G and Beyond)

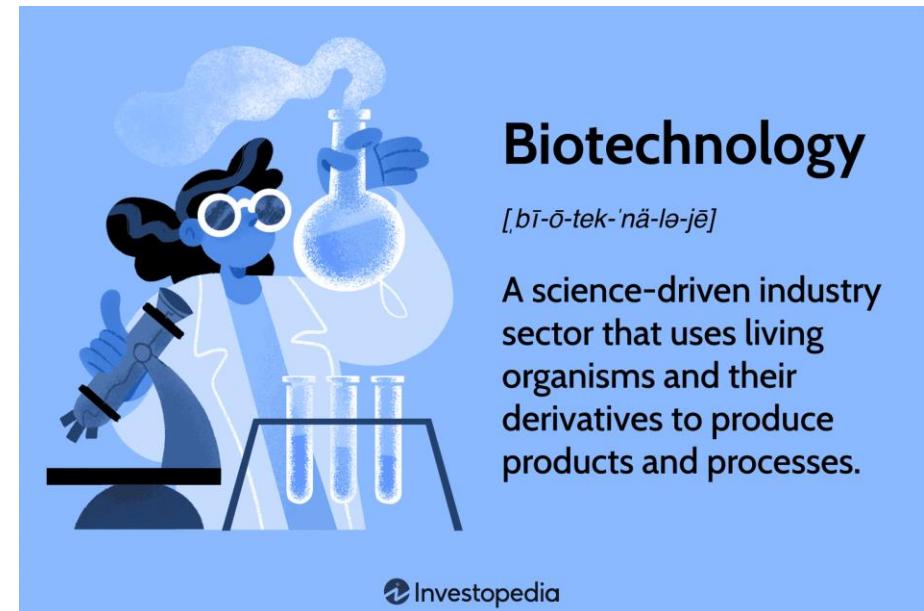
- The next generation of wireless communication technologies provides faster, more reliable connections, enabling advancements in IoT, smart cities, and autonomous vehicles.





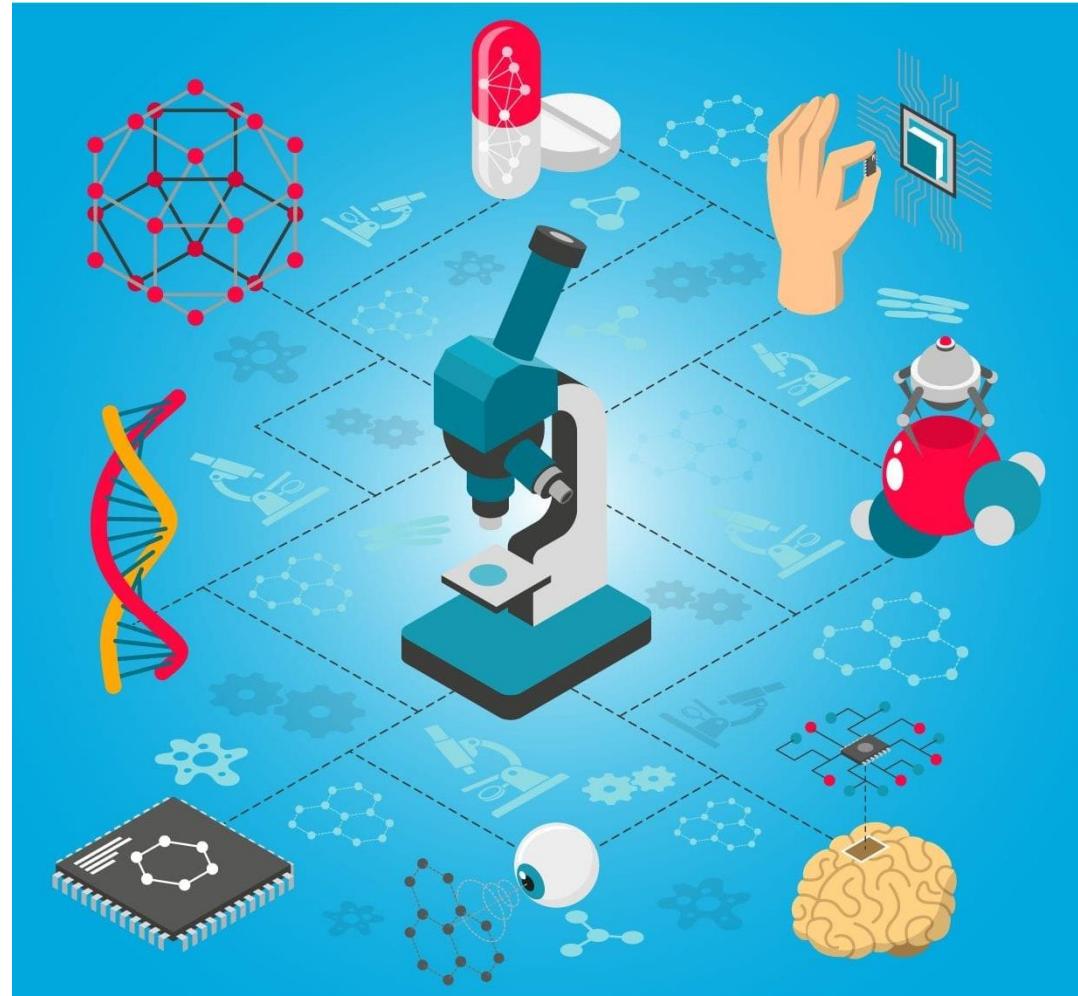
# Biotechnology

● Innovations in genetic engineering, CRISPR, and personalized medicine are transforming healthcare, agriculture, and other fields



# Nanotechnology

- The manipulation of matter at the atomic and molecular scale is leading to breakthroughs in materials science, medicine, and electronics





# Cybersecurity

- ⦿ As digital systems become more integral to all aspects of life, protecting data and infrastructure from cyber threats is increasingly critical





⦿ From self-driving cars to drone-delivered online shopping, the Fourth Industrial Revolution is changing how we live, work, and communicate. But with more and more jobs being taken over by artificial intelligence, what do researchers/students today need to do to stay relevant for future challenges?



Chapter PDF Available

## A Deep Learning-Based Approach for Automatic Leather Classification in Industry 4.0

March 2021

March 2021

DOI:[10.1007/978-3-030-68799-1\\_48](https://doi.org/10.1007/978-3-030-68799-1_48)

In book: Pattern Recognition. ICPR International Workshops and Challenges (pp.662-674)

### Authors:



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**Riccardo Rosati**

Università Politecnica delle Marche



**Luca Romeo**

University of Macerata



ResearchGate

<https://www.researchgate.net/publication/37009554...>

### Automatic Leather Defect Detection Using Deep Learning

Apr 18, 2023 — In this paper, we are going to introduce an **automatic defect detection technique** by employing a deep learning method for leather defect ...



The Science and Information (SAI) Organization

[https://thesai.org/Downloads/Paper\\_55-Leather...](https://thesai.org/Downloads/Paper_55-Leather...)

### Leather Image Quality Classification and Defect Detection ...

The proposed leather defect detection system using **advanced deep learning algorithms** holds great potential to transform the leather industry. It can ...

11 pages



aimlprogramming.com

<https://aimlprogramming.com/services/ai-driven-leath...>

### Ai Driven Leather Production Optimization

By leveraging AI and machine learning, businesses can transform their leather production operations, driving efficiency, profitability, and sustainability.



ScienceDirect.com

<https://www.sciencedirect.com/science/article/pii...>

### Leather Defect Detection Using Semantic Segmentation

by SR Khanal · 2022 · Cited by 7 — Then, a series of image processing will be carried out to detect defect detection which consist image pre-processing, training the **deep learning** model...



Open Access Review

## A Systematic Review of Machine-Vision-Based Leather Surface Defect Inspection

by Zhiqiang Chen <sup>1</sup>✉, Jiehang Deng <sup>2</sup>✉, Qiuqin Zhu <sup>1</sup>✉, Hailun Wang <sup>1</sup>✉ and Yi Chen <sup>1,3,\*</sup>✉

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<sup>2</sup> School of Computers, Guangdong University of Technology, Guangzhou 510006, China

<sup>3</sup> School of Engineering, Newcastle University, Newcastle upon Tyne NE1 7RU, UK

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*Electronics* 2022, 11(15), 2383; <https://doi.org/10.3390/electronics11152383>

Submission received: 7 July 2022 / Revised: 24 July 2022 / Accepted: 25 July 2022 / Published: 30 July 2022

(This article belongs to the Section Computer Science & Engineering)



ELSEVIER

Journal of Cleaner Production

Volume 457, 10 June 2024, 142464



## Energy-saving and low-carbon leather production: AI-assisted chrome tanning process optimization

Long Zhang <sup>c</sup>, Qingsu Cheng <sup>b</sup>, Chunhua Wang <sup>a,c</sup>, Changping Huang <sup>c</sup>, Wei Lin <sup>a,c</sup>

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<https://doi.org/10.1016/j.jclepro.2024.142464>

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ “

In the name of Allah, the Most Gracious, the Most Merciful

# Revolutionizing Flood Monitoring: A Web-Based Application for Near-Real-Time Observation Using Satellite Imagery



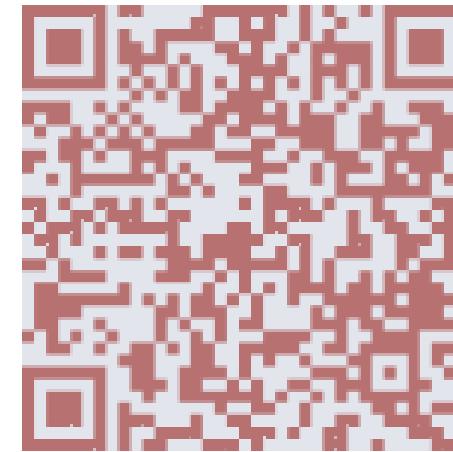
Slide Link



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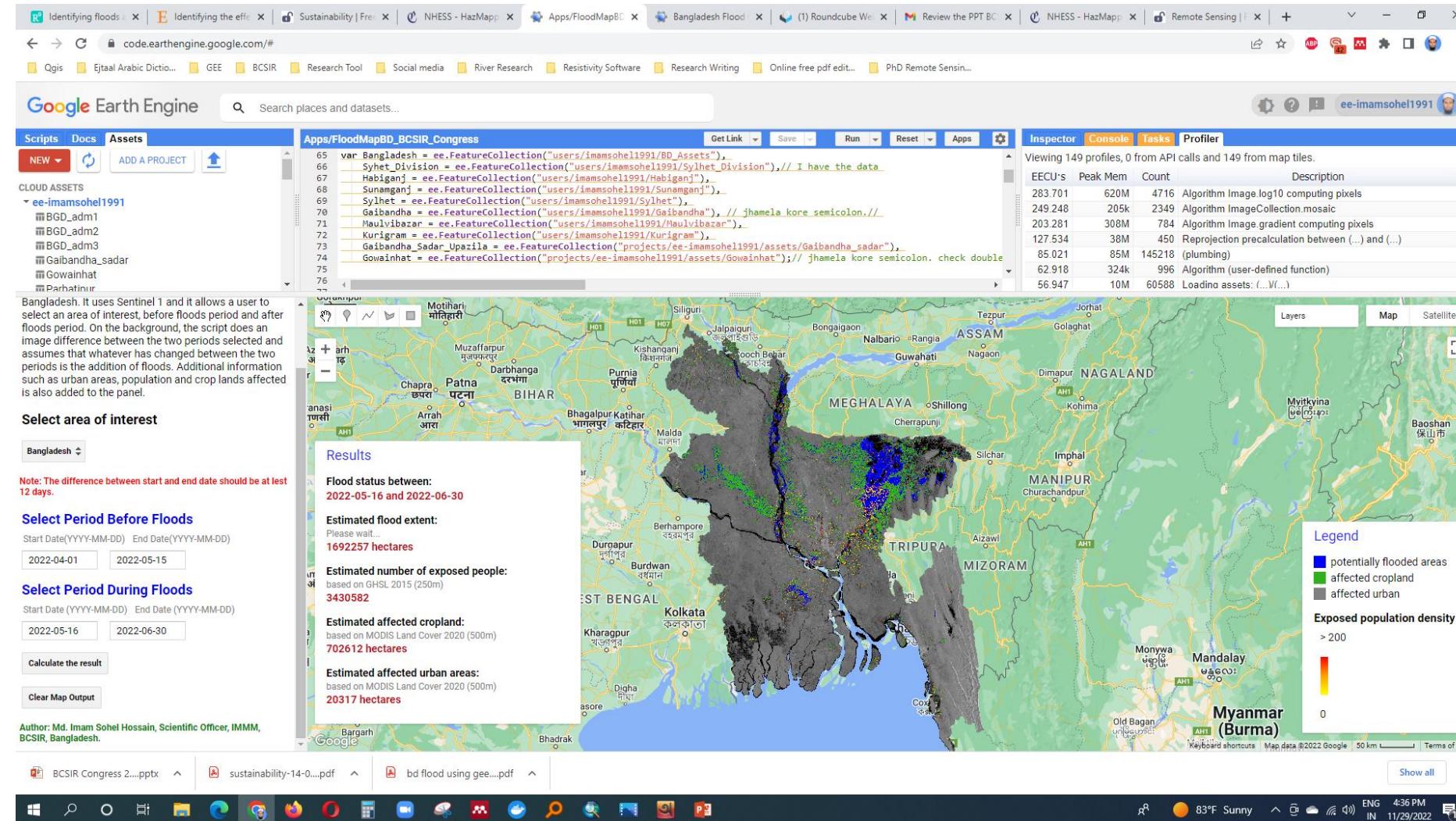


App Link

Bangladesh Council of Scientific and industrial Research (BCSIR)

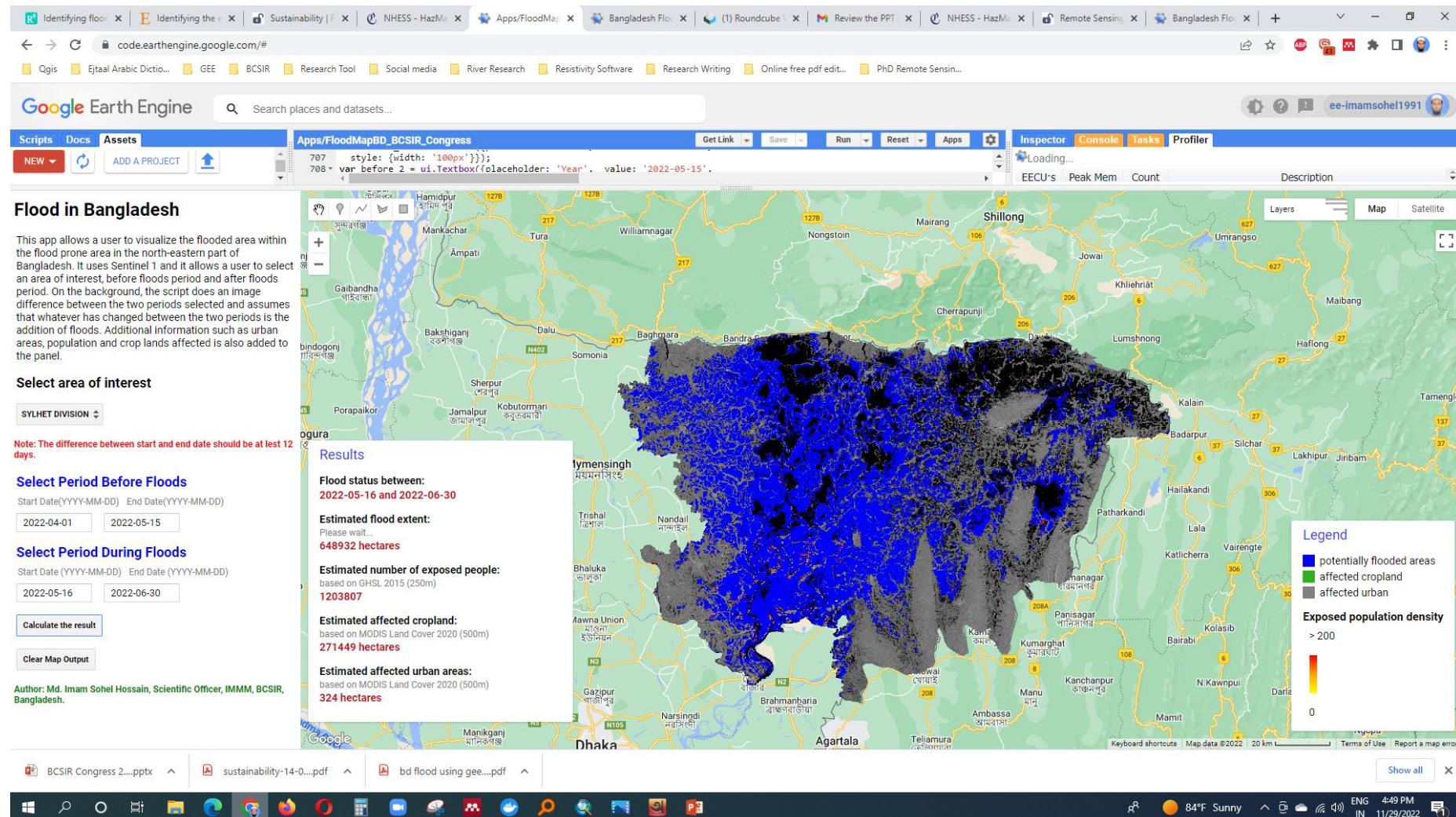


# Findings-Regional Scale Flood Mapping and Estimation



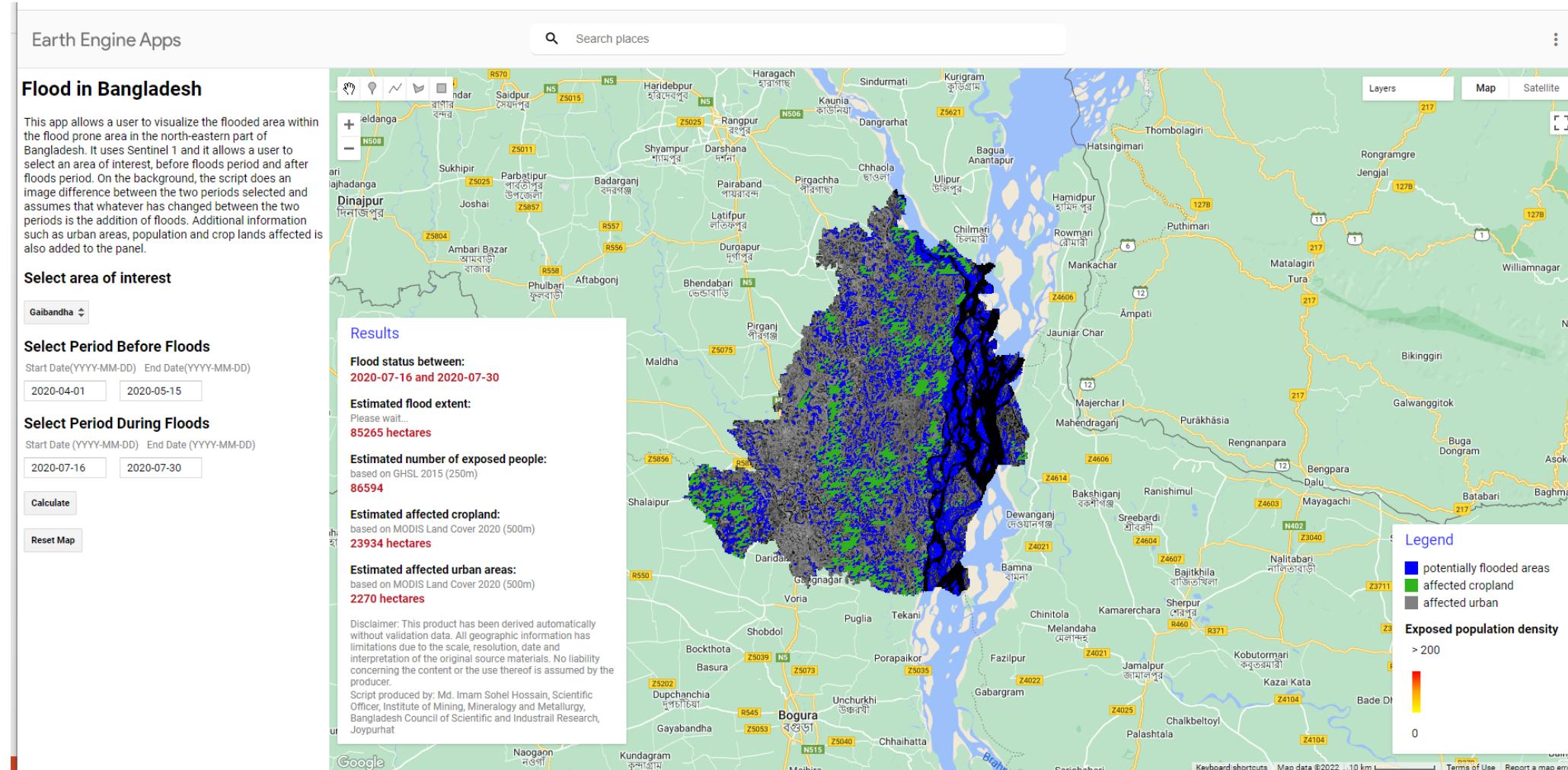


# Findings-Divisional Scale



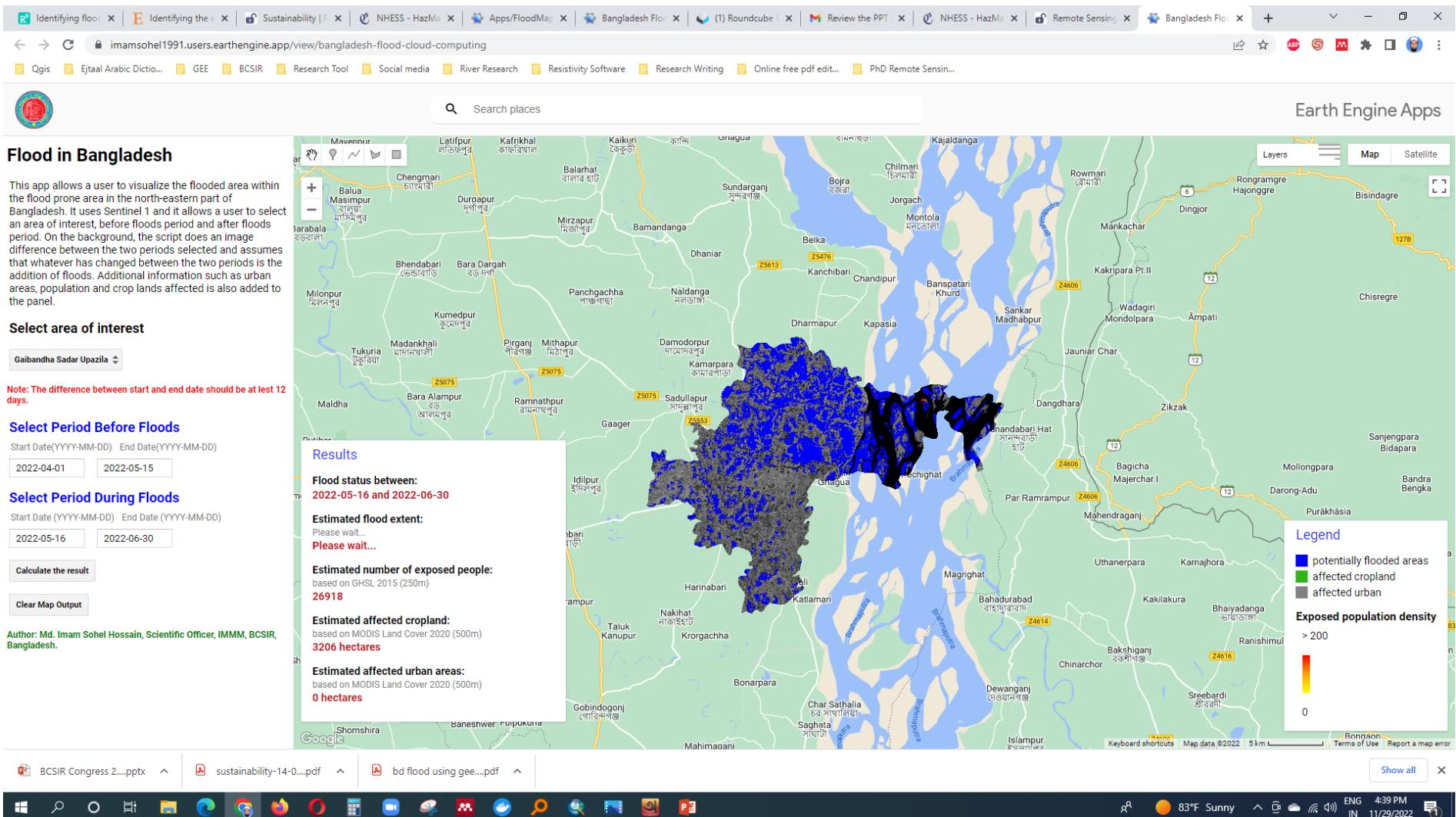


# Findings-District Scale



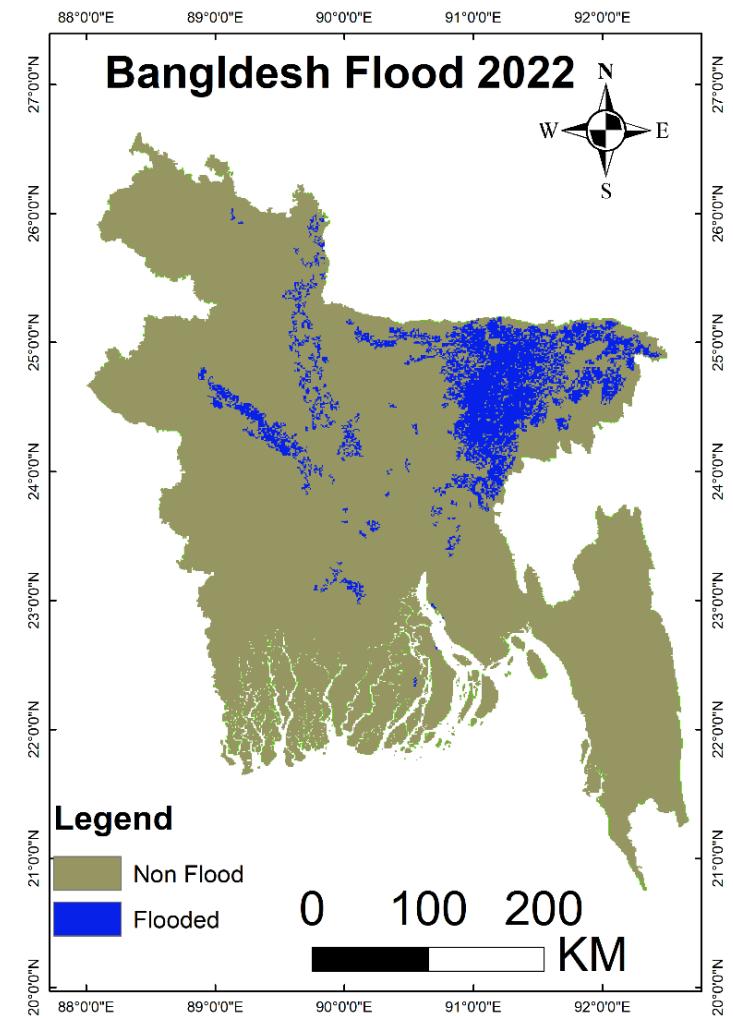
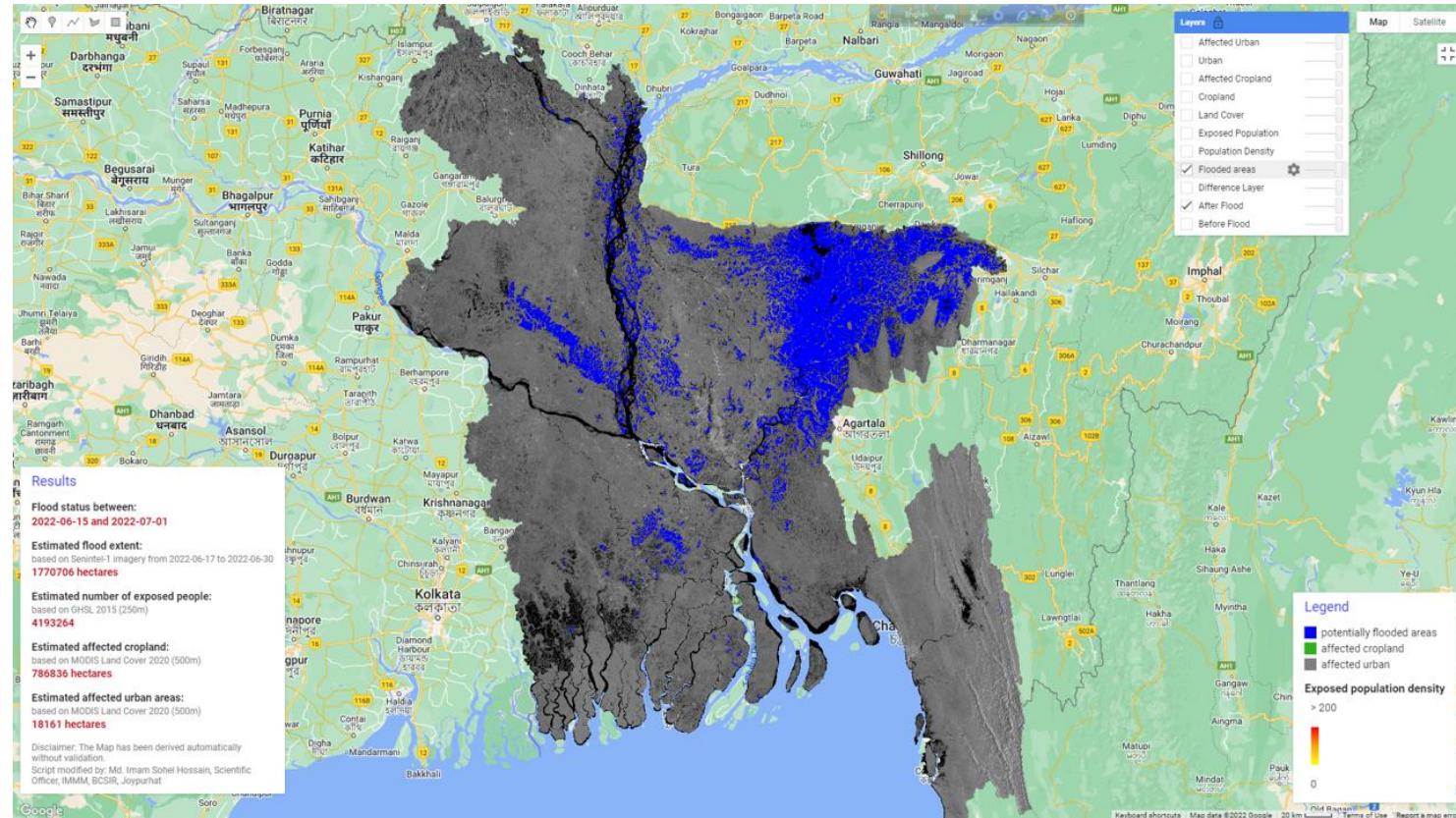


# Findings-Subdistrict/Upazila Scale





# Findings-Future Flood Mapping and Modelling





# Conclusion

**Revolutionizing Flood  
Monitoring using Cloud  
Computing**

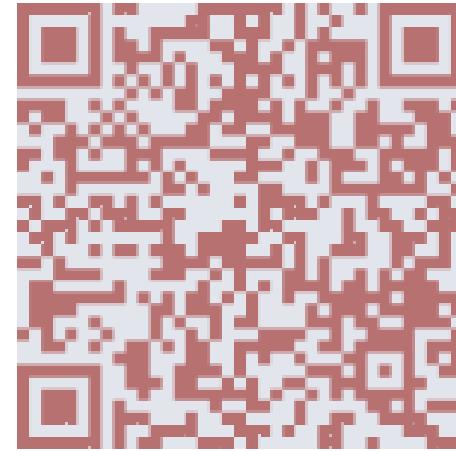
Md. Imam Sohel Hossain  
Senior Scientific Officer, BCSIR



# Thank You



**Slide Link**



**App Link**



# Skill Development

https://github.com/ImamSohelHosaain

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**Hello-World** Public  
A new journey begins

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Config files for my GitHub profile.

**Machine-Learning-Linear-Regression** Public  
Prediction of weight based on height  
Jupyter Notebook

**Python-Crash-Course-for-Beginners** Public  
Beginners friendly  
Jupyter Notebook

**Decision-Tree-Practice** Public  
Jupyter Notebook

Md. Imam Sohel Hossain  
ImamSohelHosaain

A geoscientist from the Bangladesh Council of Scientific and Industrial Research (BCSIR), Dhaka, Bangladesh.

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# Python

Python-Crash-Course-for-Beginners / Python\_Crash\_Course\_Beginners\_ipynb\_txt.ipynb [🔗](#)

ImamSohelHosaain Update Python\_Crash\_Course\_Beginners\_ipynb\_txt.ipynb

[Preview](#) [Code](#) [Blame](#) 1528 lines (1528 loc) · 402 KB Code 55% faster with GitHub Copilot

## Python Scripting for Beginners

Credit to Kevin Nebiolo, PhD and Digital Sreeni.

### Contents

- 1. What is Python?
- 2. Where to go for help
- 3. Easiest Way to Start
- 4. Data Types and Structures
- 5. Program Flow
- 6. Modules Useful for Water Resources
- 7. Example

### Part 1: Introduction to Python



# Python

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## Thank You

### Questions?

Md. Imam Sohel Hossain, Scientific Officer, IMMM, BCSIR.  
imamsohel1991@gmail.com

The diagram is a tree structure representing the layers of Python knowledge:

- Foundation:** Command Prompt, IDE, Installing libraries, 'Hello World'
- Essentials:** Dictionaries, Functions & Classes, Loops & conditions, Lists & Arrays
- Core Libraries:** Numpy, Pandas, Matplotlib
- Technique Specific:** opencv, Scikit-image
- Domain Specific:** Microscopy, MRI, Biology, Natural Language Processing, Sentiment analysis, Text Translation
- Application Specific:** Cell counting, Assays, Neuron segmentation