



IIT KHARAGPUR



NPTEL ONLINE
CERTIFICATION COURSES

Industry 4.0: Artificial Intelligence

Dr. Sudip Misra

Professor

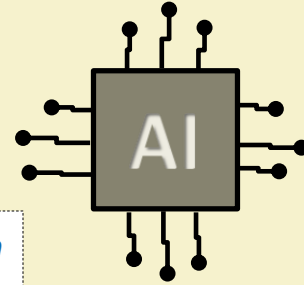
**Department of Computer Science and Engineering
Indian Institute of Technology Kharagpur**

Email: smisra@sit.iitkgp.ernet.in

Website: <http://cse.iitkgp.ac.in/~smisra/>

Research Lab: cse.iitkgp.ac.in/~smisra/swan/

What is Artificial Intelligence (AI)?



“AI is a branch of computer science that deals with the study and the creation of computer systems that exhibit some form of intelligence.”

- Patterson

“AI is the study of mental faculties through the use of computational models.”

- Eugene Charniak and Drew McDermott

Source: Artificial Intelligence by David L. Poole, Alan K. Macworth, Artificial Intelligence by Rajiv Chopra

What is Artificial Intelligence (AI)? (Contd..)



Artificial + Intelligence = Artificial Intelligence

↓
Manmade

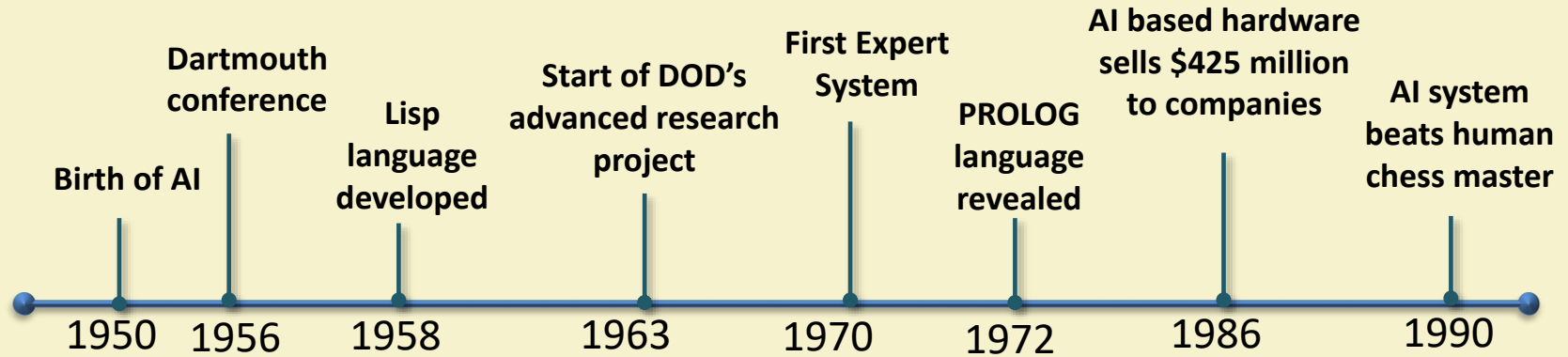
↓
Thinking power

↓
*Creation of manmade
thinking power*

In simple way, *Artificial Intelligence* is a creation of software having intuitive decision making ability.

Source: Artificial Intelligence by David L. Poole, Alan K. Macworth, Artificial Intelligence by Rajiv Chopra

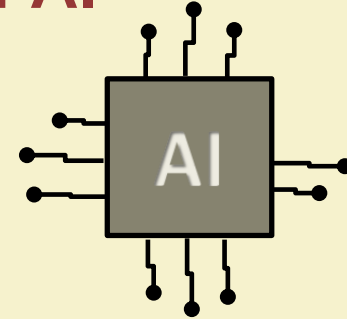
History of AI



The first use of phrase Artificial Intelligence was proposed by **John McCarthy** in 1956 in the article *A Proposal for Dartmouth Summer Research Project on Artificial Intelligence*

Source: Artificial Intelligence by David L. Poole, Alan K. Macworth, Artificial Intelligence by Rajiv Chopra

Difference between program with and without AI

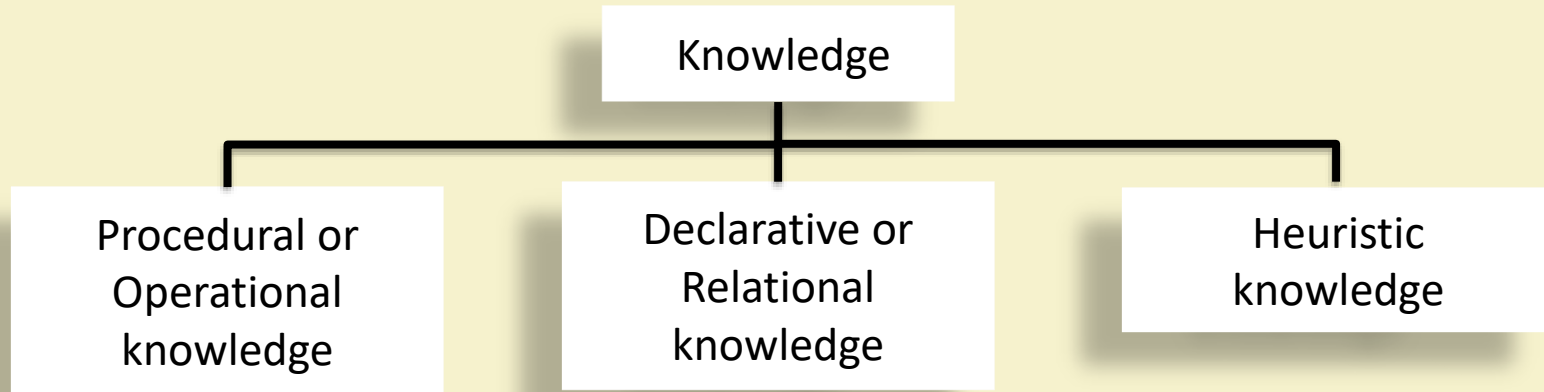


A computer program without AI uses large database and uses algorithmic search method whereas computer program with AI uses large knowledge base and heuristic search method

Source: Artificial Intelligence by Rajiv Chopra

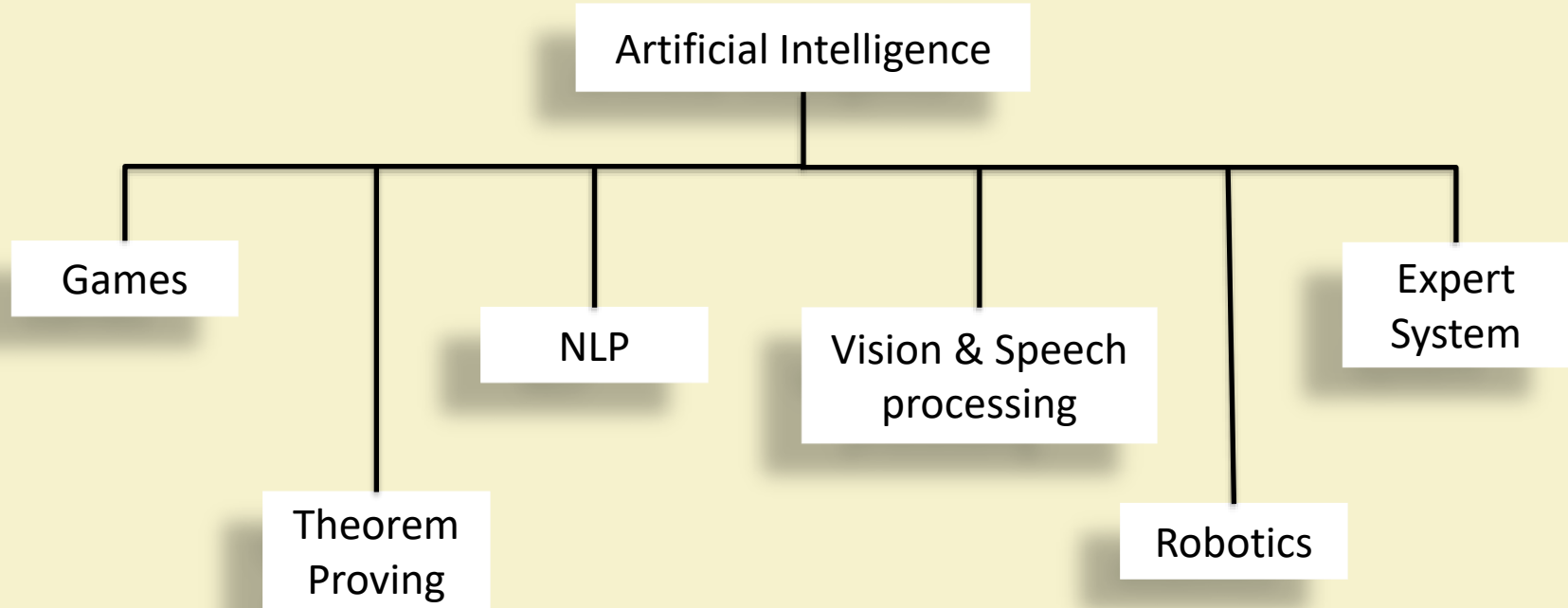
AI Techniques

Knowledge is the information that can be used to perform a particular task



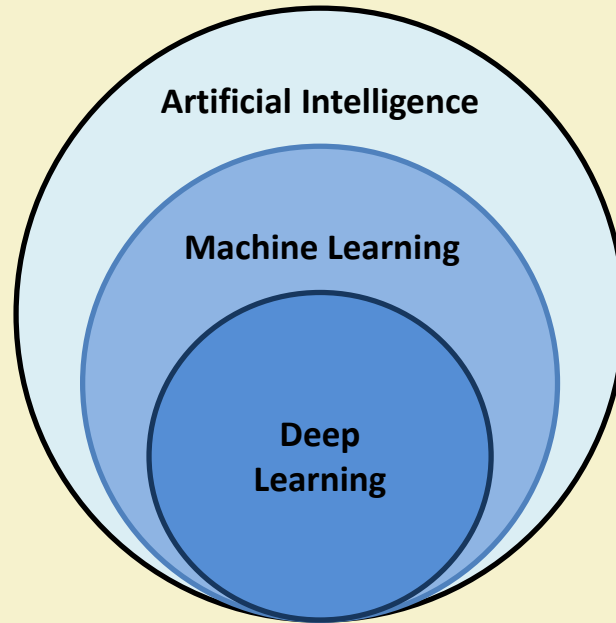
Source: Artificial Intelligence by David L. Poole, Alan K. Macworth, Artificial Intelligence by Rajiv Chopra

Scopes of AI



Source: Artificial Intelligence by Rajiv Chopra

AI vs Machine learning vs Deep learning



Source: Artificial Intelligence by David L. Poole, Alan K. Macworth, Artificial Intelligence by Rajiv Chopra

Machine learning

Machine learning is a part of Artificial Intelligence which empower machines to make decisions based on their experience rather than being explicitly programmed.

Source: Artificial Intelligence by David L. Poole, Alan K. Macworth, Artificial Intelligence by Rajiv Chopra

Deep learning

Deep learning is a subset of machine learning which can learn automatically by finding the features of the object by own.

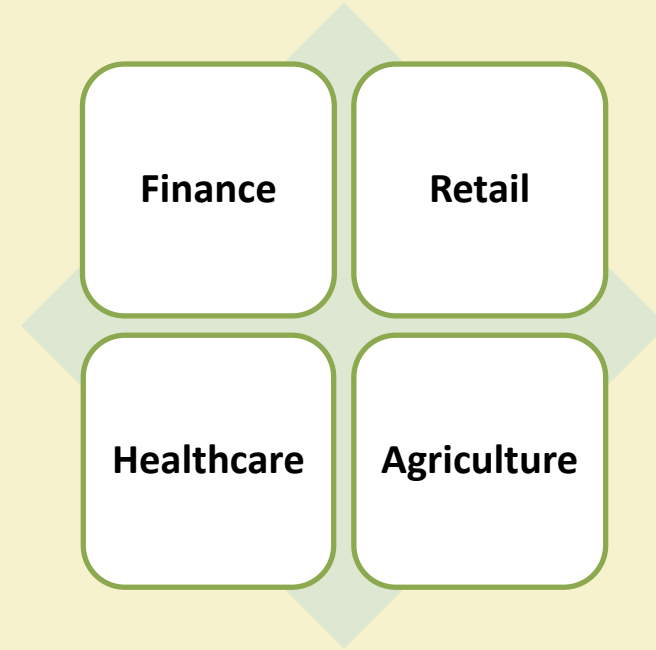
Source: Artificial Intelligence by David L. Poole, Alan K. Macworth, Artificial Intelligence by Rajiv Chopra

Role of AI in Industry 4.0

- ✓ **Industry 4.0:** Human-machine interaction, CPS, cloud computing, cognitive computing, IoT/IIoT, etc – in Manufacturing
- ✓ **Smart Factory:** Virtualized instances of physical objects in a factory interacting with one another.
- ✓ **Role of AI:** Machine safety, efficient product lifecycle, efficient manufacturing processes, etc.

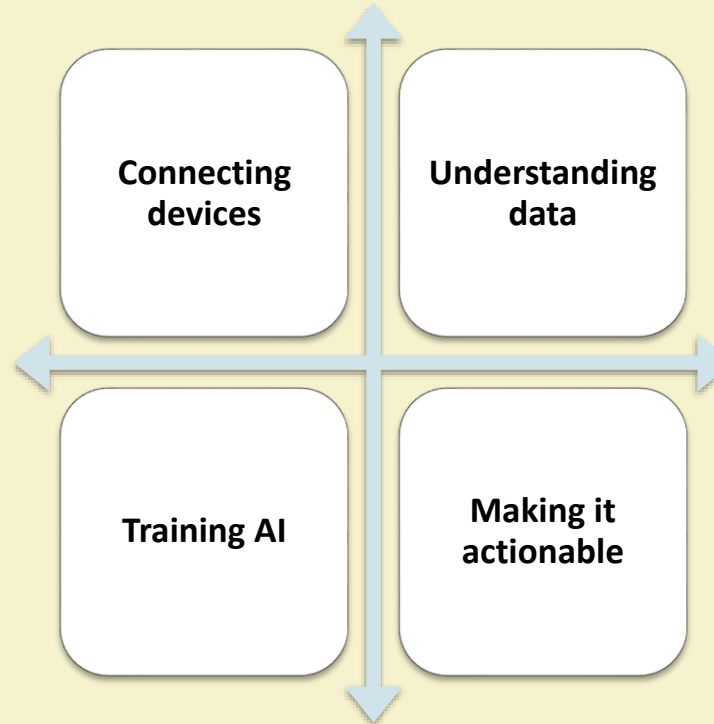
AI in IIoT

- Use of AI helps machines and equipment to communicate and relay information with one another
 - Examples: Computer Vision, Robotics, NLP, ML, DL, RL, etc.
- With the help of AI industries are capable of taking the advantage of large amount generated data by machines
 - Example: Prediction of yield, quality of yield etc in Manufacturing



Source: The Significance of AI and Machine Learning in IIoT, Inc42

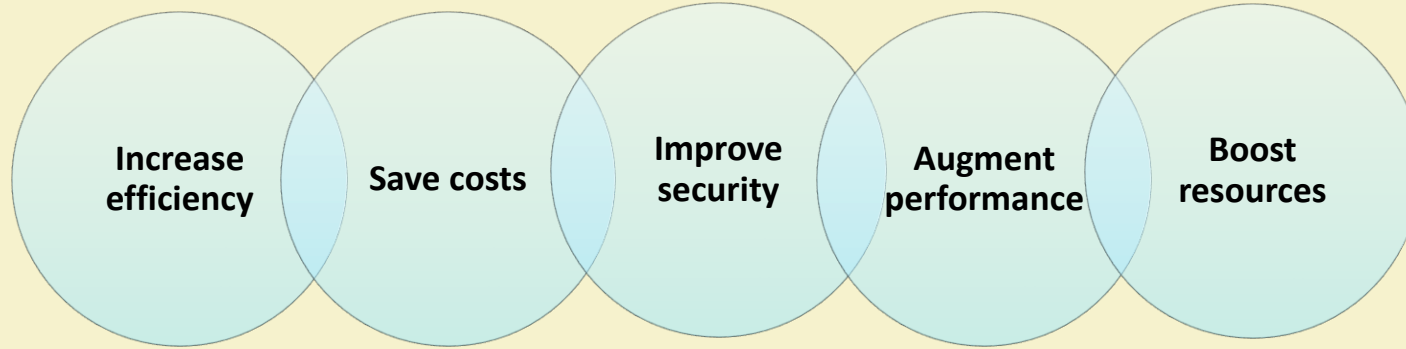
Challenges of AI in IIOT



Source: Four Artificial Intelligence challenges in facing the Industrial IoT, Clearblade

Advantages of AI in IIoT

The usefulness of AI in industrial scale are,



Source: The Significance of AI and Machine Learning in IIoT, Inc42

Significance of AI in Agriculture industry



Crop and
soil
monitoring

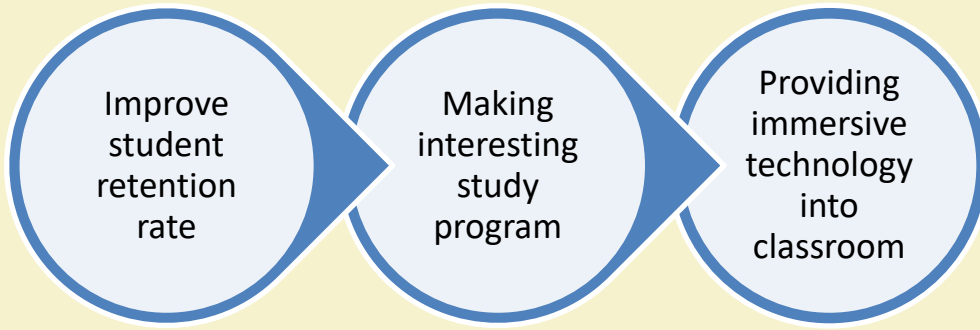
Precision
agriculture

Supply
chain
efficiency

- **CropIn's** smart farm solution
- **Intello lab** using AI based solution for crop health monitoring
- **Microsoft India AI** based sowing app
- **Gobasco AI** based Agri supply chain

Source: Artificial Intelligence in Indian Agriculture – An Industry and Startup Overview

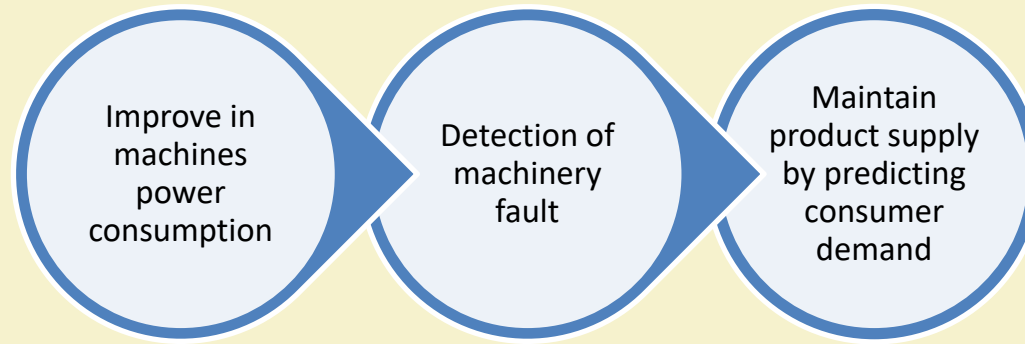
Significance of AI in Education industry



- Smart learning systems by **Carnegie Learning**
- **Querium Corporation** AI based education system

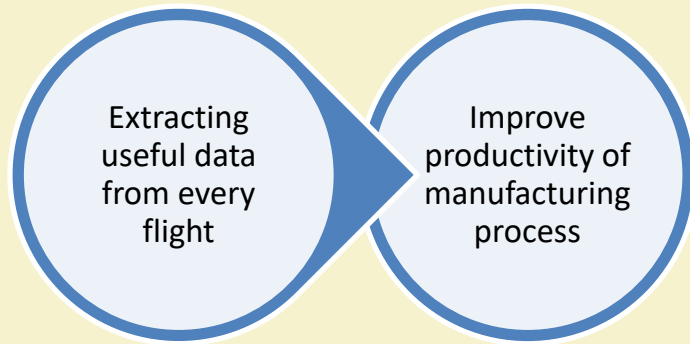
Source: AI in Education: 3 Industry Defining Trends in 2018

Significance of AI in Manufacturing factories



Source: The Significance of AI and Machine Learning in IIoT, Inc42

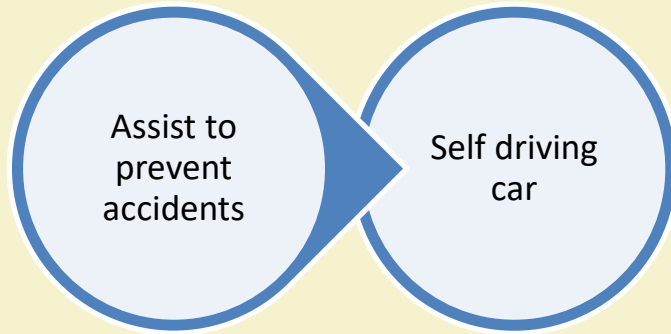
Significance of AI in Aerospace industry



- **Boeing 787** generates large amount of data at each flight where AI is used to extract useful information
- **Airbus** is moving on with “Factory of Future”, to improve the productivity of manufacturing process.

Source: The Significance of AI and Machine Learning in IIoT, Inc42
<https://inc42.com/resources/the-significance-of-ai-and-machine-learning-in-iiot/>

Significance of AI in Transportation industry



- **Indian railways** utilizes AI to secure safety of trains
- **Tesla** first automotive brand to launch self driving car

Source: The Significance of AI and Machine Learning in IIoT, Inc42

References

- [1] D. L. Poole, A. K. Macworth (2017). “Artificial Intelligence”. Cambridge University Press
- [2] R. Chopra (2012). “Artificial Intelligence”. S. Chand & Company Pvt. Ltd.
- [3] E. Kumar (2008). “Artificial Intelligence”. L.K. International Publishing House
- [4] The Significance of AI and Machine Learning in IIoT. Inc42
URL: <https://inc42.com/resources/the-significance-of-ai-and-machine-learning-in-iiot/>
- [5] Four Artificial Intelligence challenges in facing the Industrial IoT, Clearblade
URL: <https://www.clearblade.com/blog/four-artificial-intelligence-challenges-facing-the-industrial-iiot/>
- [6] Artificial Intelligence in Indian Agriculture – An Industry and Startup Overview
URL: <https://www.techemergence.com/artificial-intelligence-in-indian-agriculture-an-industry-and-startup-overview/>
- [7] AI in Education: 3 Industry Defining Trends in 2018
URL: <https://www.technavio.com/blog/ai-education-industry-trends-2018>

Thank You

