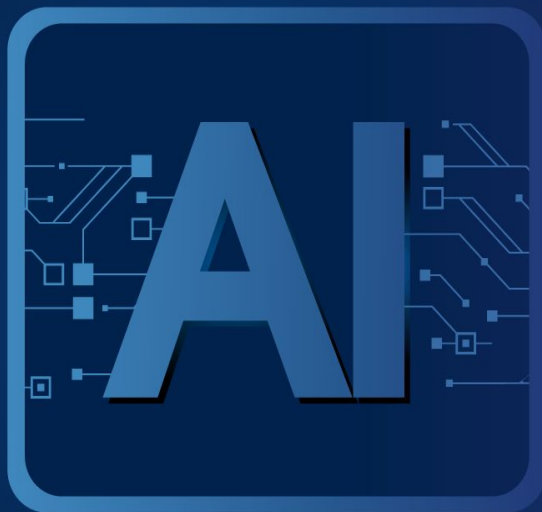


Navigating the Complexities of AI and ML: Key Challenges and Insights for Educators and Researchers



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01 Envision the Future

02 Challenges

03 LLMs

04 Education & Research



Mark enters the ED with shortness of breath.

WITHOUT AI



+55 minutes
Mark is taken to the CT scanner.



+104 minutes
Due to extensive list of "STAT" images, Mark's CTPA reading is delayed.



+40 minutes
Radiologist calls ED physicians caring for Mark.



+10 minutes
ED physician consults with on-call interventional radiologist.



+28 minutes
Mark is admitted for appropriate clinical management.

MARK'S ADMISSION TIME IS 237 MINUTES

WITH AI



+40 minutes
Mark is taken to the CT scanner.



+7 minutes
AI prioritizes Mark's case on radiologist worklist.



+5 minutes
Mark's CTPA is read as positive for PE with right heart strain.

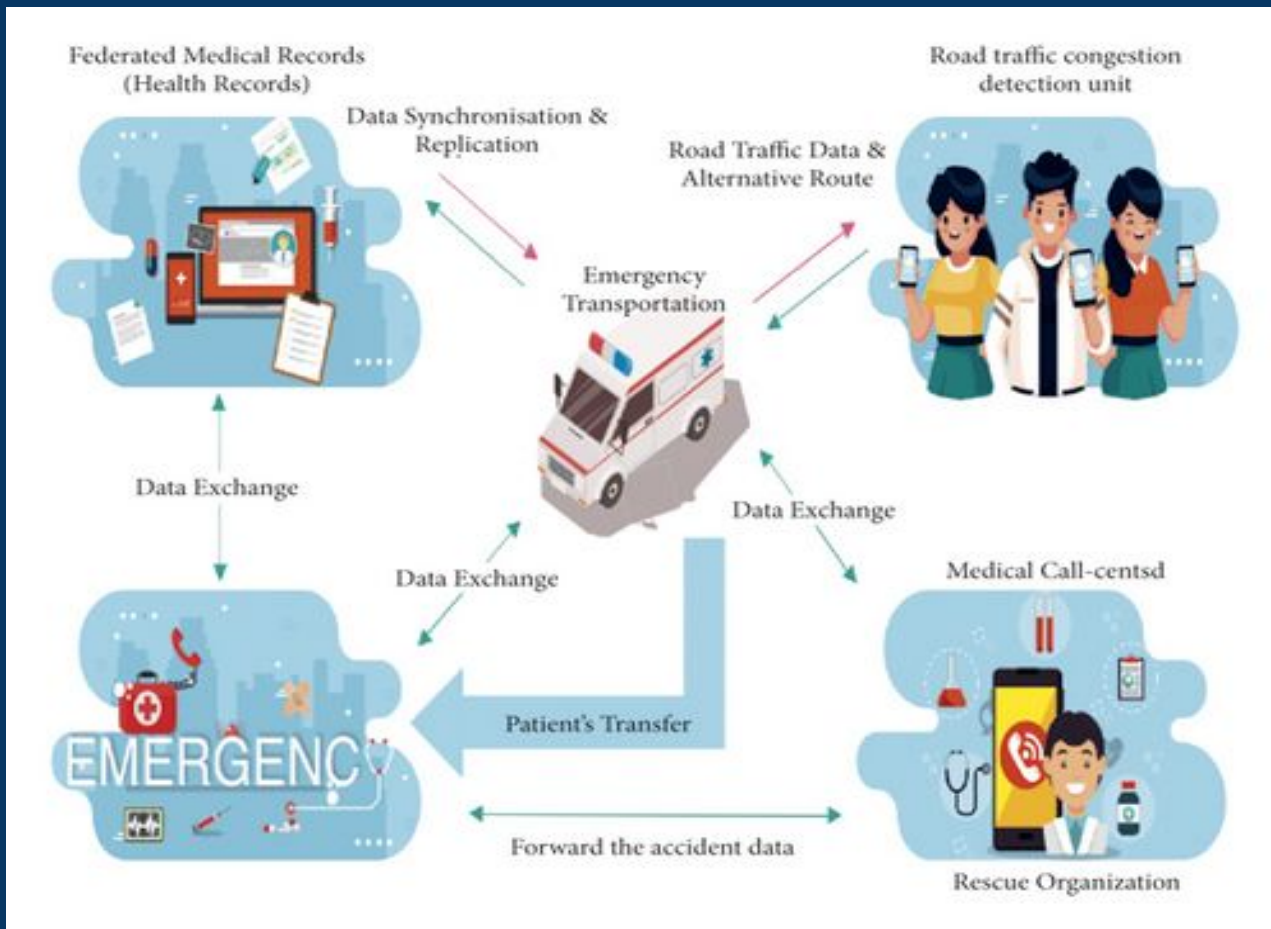


+2 minutes
ED physician, diagnostic radiologist, and on-call interventional cardiologist are connected.

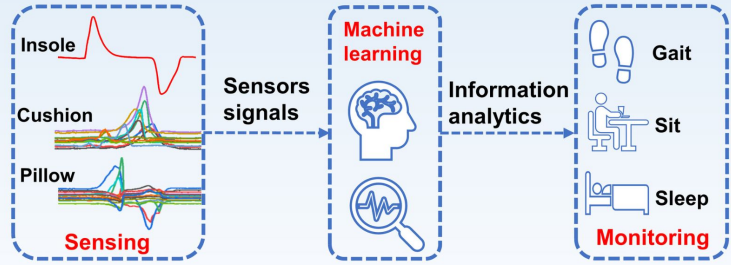


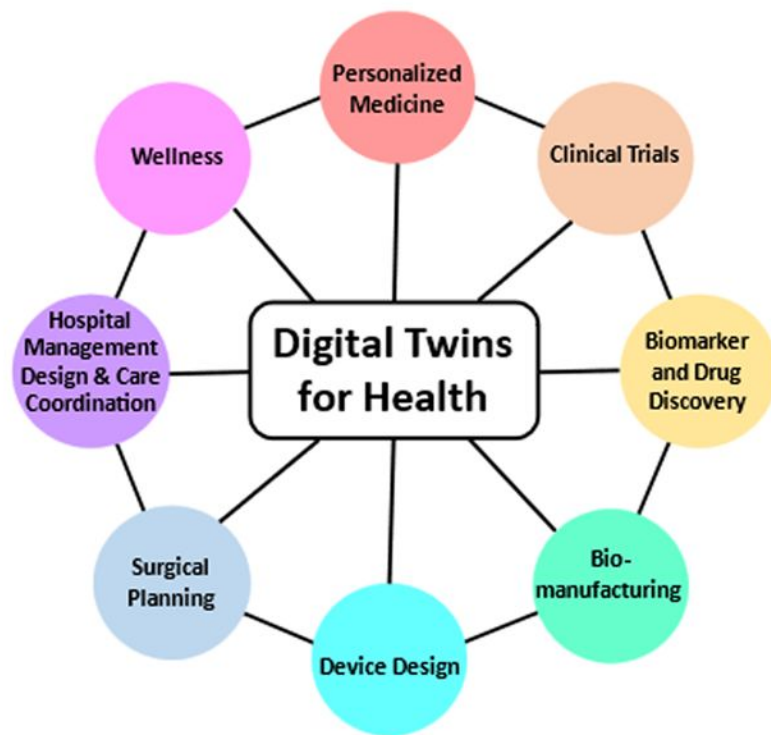
+10 minutes
Mark is admitted under care of interventional radiology.

MARK'S ADMISSION TIME IS 54 MINUTES

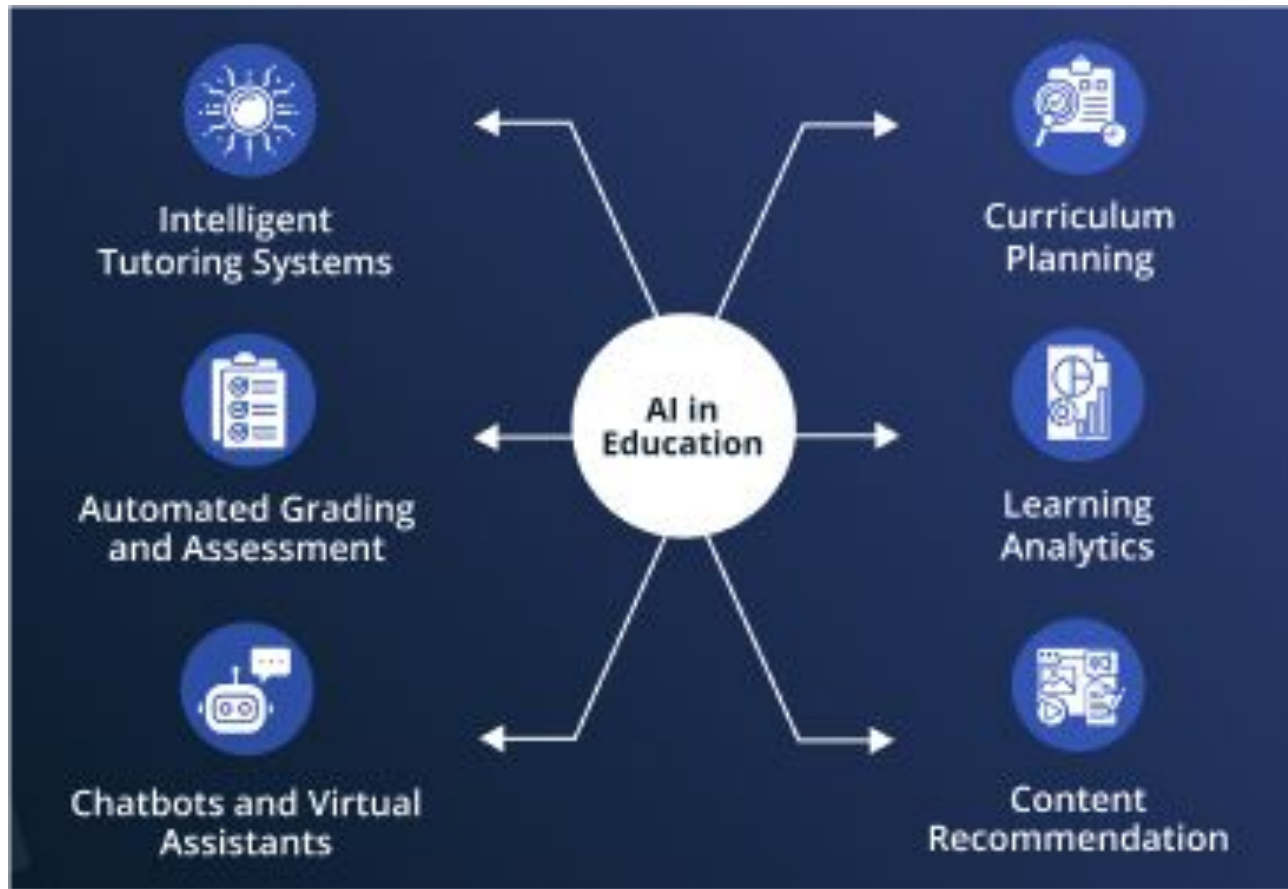


All-day AIoT-based intelligent health management

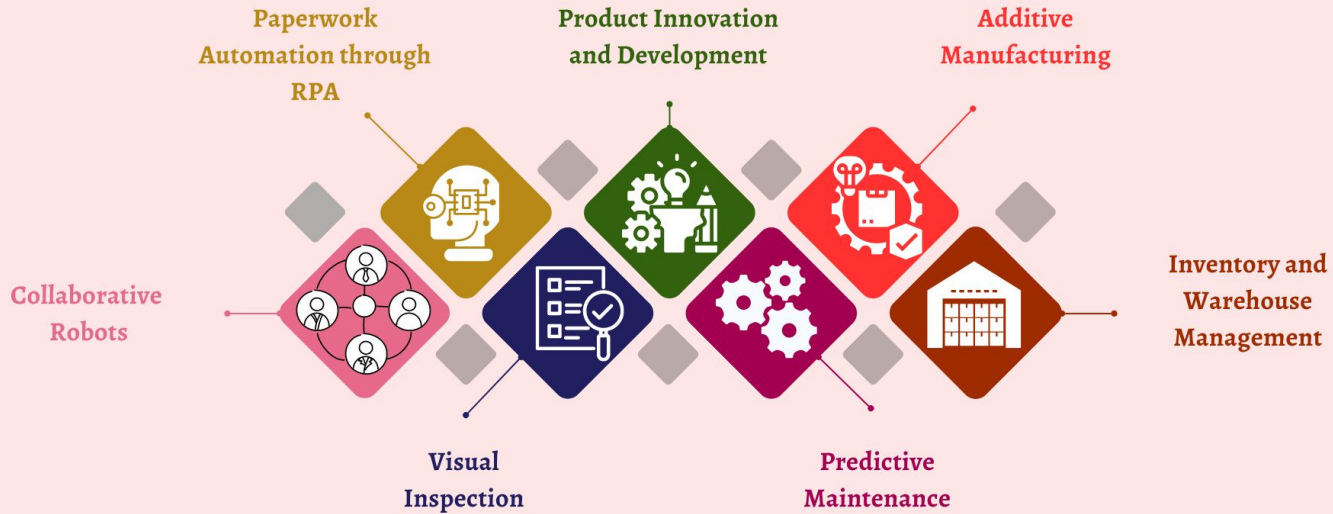


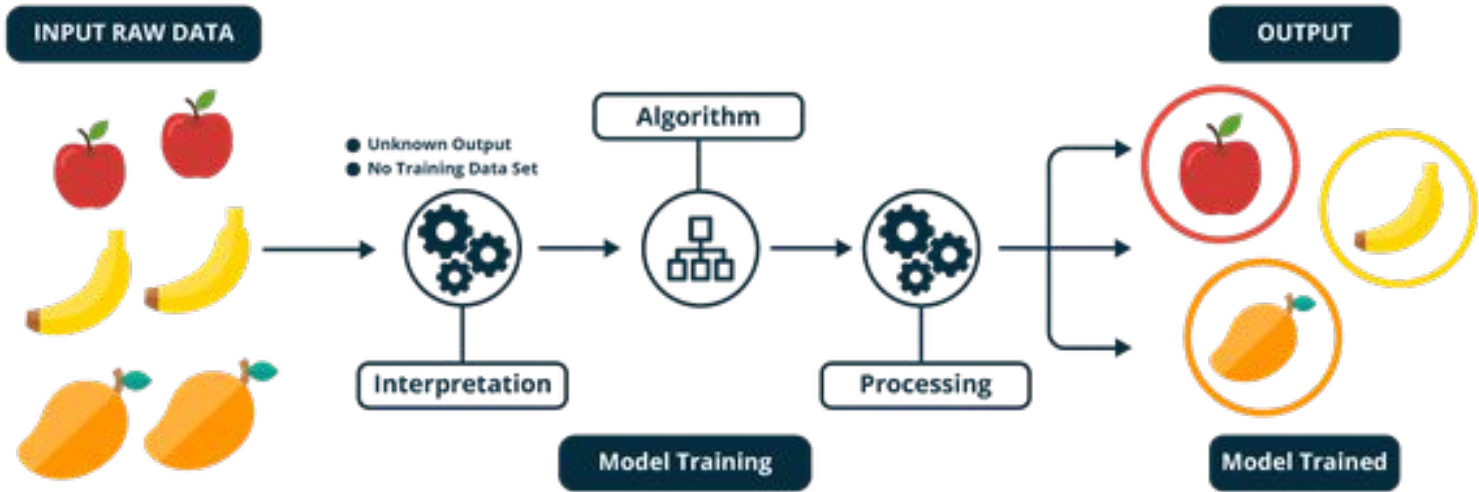


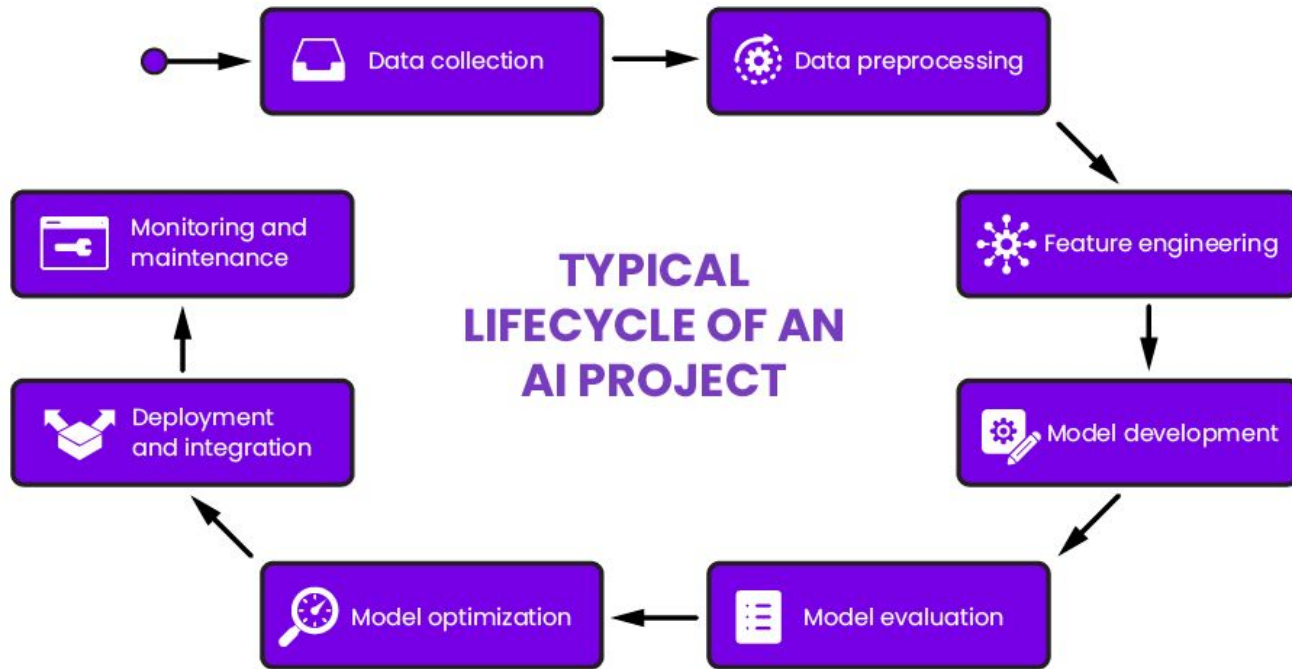
Digital Twin Technology Relies on Data

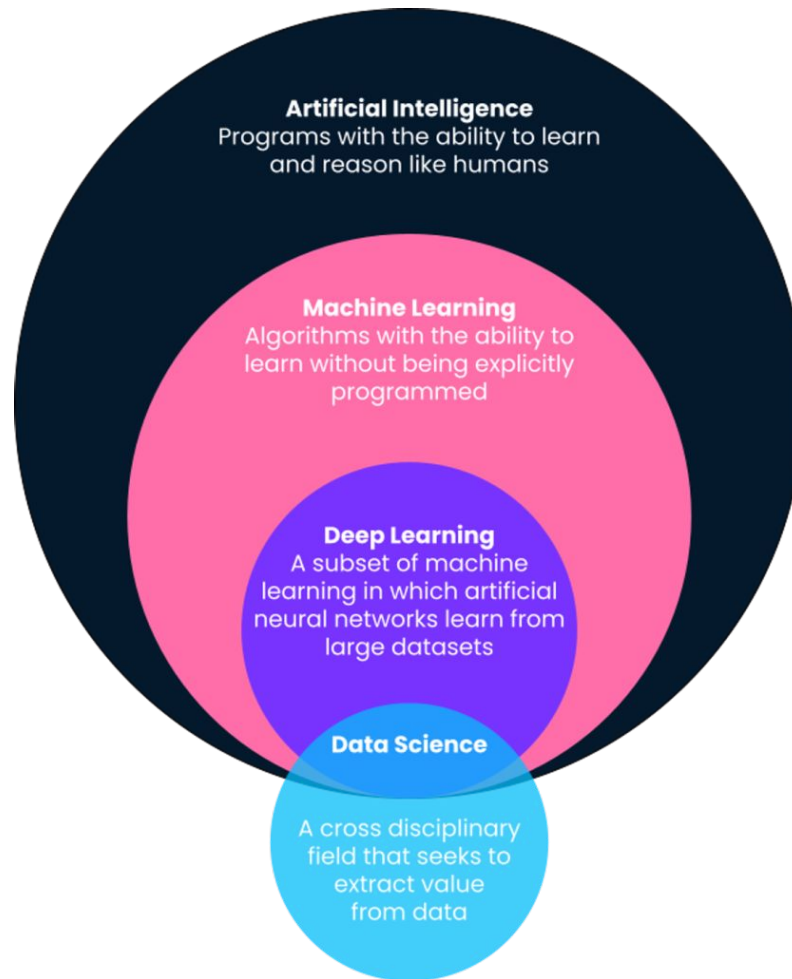


Use Cases of AI in the Manufacturing Industry









<https://www.clicdata.com/blog/ai-ml-data-science-deep-learning/>

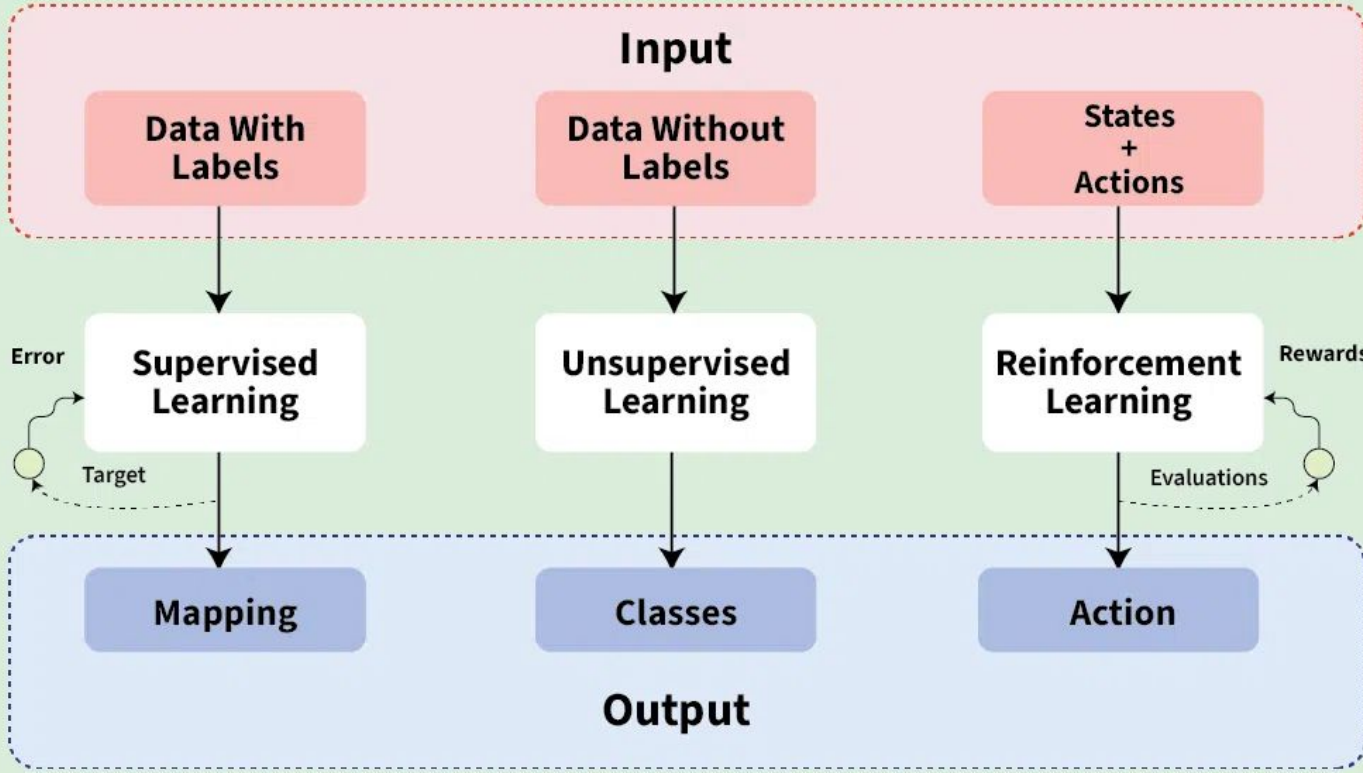
Supervised

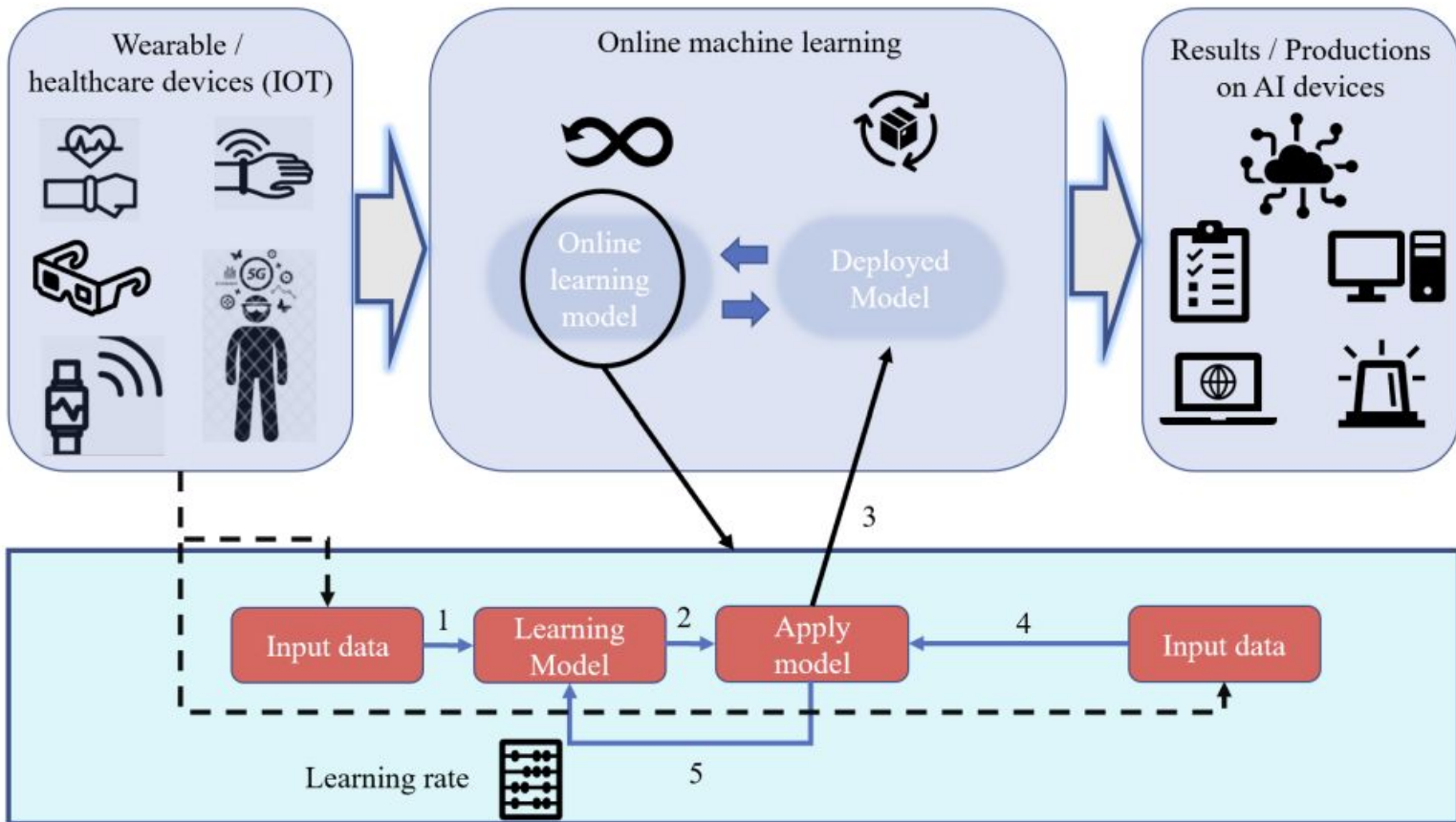
VS

Unsupervised

VS

Reinforcement





CHALLENGES



Challenges in Development



Challenges in Adoption



Challenges in Deployment



Challenges in Implementation



Challenges in Development



Data

- High quality
- Large quantity

Bias

- Disparate Impact
- Skewed Learning

Robustness

- Model Drift
- False Positives and Negatives



Challenges in Adoption



Data Privacy and Security

- Data security
- Privacy crucial

Ethical and Legal Concerns

- Ethical dilemmas
- Inequitable care.
- Liability and accountability

Resistance to Change

- Job displacement
- Lack of trust in technology
- Complexity of integrating



Challenges in Deployment



Scalability

- High computational power
- Secure data storage
- Reliable network access

Compliance with Regulations

- FDA (U.S.) and EMA (Europe) require evidence of safety and efficacy for AI-driven applications

Monitoring and Maintenance

- Evolving knowledge, protocols
- Continuous retraining



Challenges in Implementation

Integration with Existing Systems

- Legacy Systems

Interoperability

- Diverse and fragmented data sources
- EHR systems, medical devices and imaging platforms

Training and Usability

- Training to use AI tools
- Lack of user-friendly interfaces

DATA CHALLENGES



- **Insufficient Data Quantity**
- **Imbalanced Data**
- **Missing Data**
- **Lack of Diversity in Data**
- **Label Noise and Mislabeling**
- **Data Distribution**
- **Data Bias**
- **Data Privacy**

BIAS CHALLENGES

DATA BIAS

Training data is not representative of the real-world population or task the model is expected to perform on.

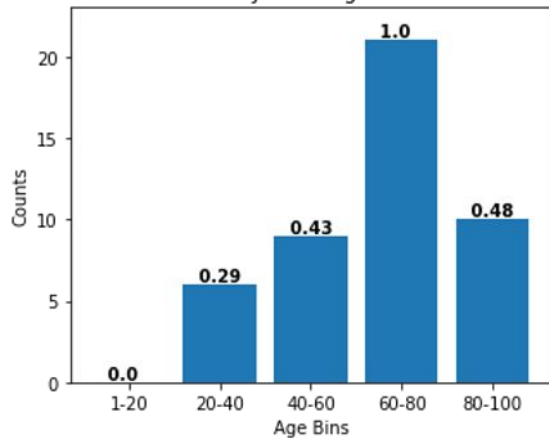
ALGORITHMIC BIAS

Arise from how the algorithm weighs certain features, optimizes objectives, or handles fairness constraints.

MODEL BIAS

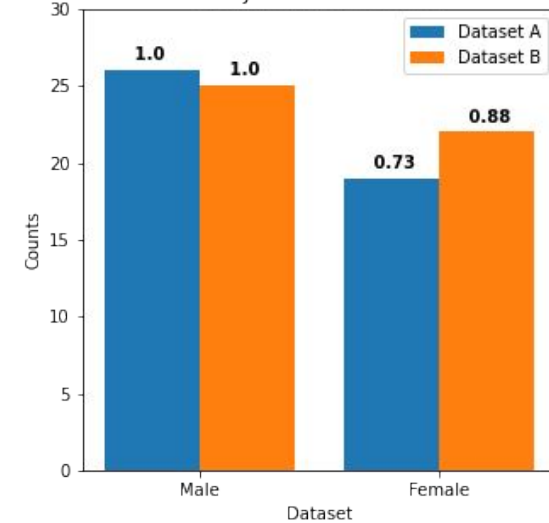
Errors or limitations from assumptions of the learning algorithm leading to underfitting.

Arrhythmia Age Plot



Class Ratio for the protected variable "Age" for Dataset B.

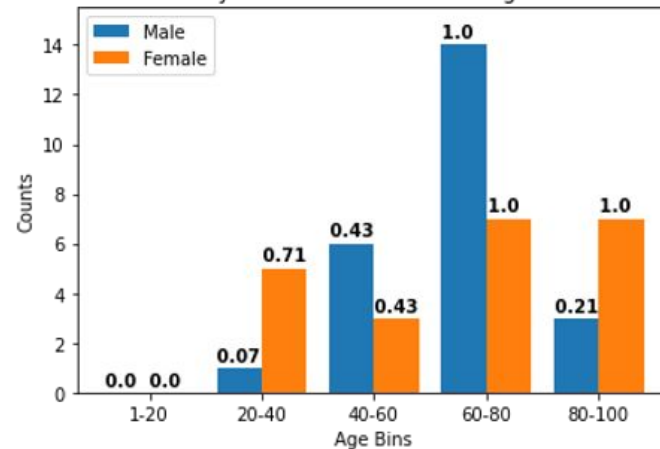
Arrhythmia Gender Plot



Class Ratio for the protected variable "Gender" for Dataset A and Dataset B.

Class Ratio for the Combined Protected Group "Female Age" and "Male Age" for Dataset B.

Arrhythmia Male and Female Age Plot





- **Explanations vs Interpretability**
 - **Are the explanations interpretable?**
- **Evaluating Explanations**
- **Reliability of Explanations**
- **Insufficiency of human judgment to validate XAI**

Human Bias

In mammographic data analysis, a radiologist would likely trust a cancer diagnosis made by an AI if told that the decision was based on a patch of tissue they themselves identify as cancerous.

Conversely, if the XAI method assigns high “importance” to features that are known not to be associated with cancer, this might lead to the dismissal of the model itself as being wrong (Saporta et al., 2022)

ETHICAL

Regulation

Privacy

Mitigation of Bias

Transparency

Relevance



LEGAL

Governance

Confidentiality

Liability

Accuracy

Decision Making

September 18, 2024 | Press Release

Attorney General Ken Paxton Reaches Settlement in First-of-its-Kind Healthcare Generative AI Investigation

MONEYWATCH

UnitedHealth uses faulty AI to deny elderly patients medically necessary coverage, lawsuit claims

Can I sue an hospital for not using AI and thus preventing me from getting the best access to healthcare service

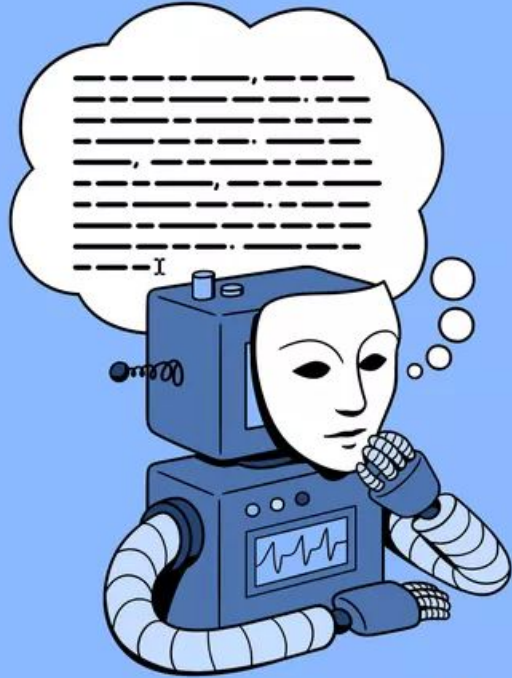
Suing a hospital for not using AI in its healthcare services would be a complex legal case and would depend on several factors, including the jurisdiction, the hospital's duty of care, and whether the lack of AI directly caused harm to you or violated any established standards of care. Here's a breakdown:

1. Duty of Care and Standard of Care

Hospitals and healthcare providers have a legal duty to provide care that meets the accepted standard within the medical community. If AI has become a recognized standard of care for diagnosing or treating specific conditions, failing to use it could potentially be grounds for negligence. However:

- **LLMs cannot Reason, Plan**
- **Inability to plan**
- **LLMs have their Bias**
- **LLMs hallucinate**





Large Language Model (LLM)

[ˈlɑːrj ˈlɑŋ-gwɪj ˈmɑːdəl]

A deep learning algorithm that's equipped to summarize, translate, predict, and generate human-sounding text to convey ideas and concepts.

ChatGPT ▾

How many r's are there in strawberry?



There are **2 r's** in the word "strawberry."



What happens if I hold a piece of paper horizontally with two hands and I let go of one hand?



If you were holding a piece of paper horizontally with two hands and let go of one hand, the paper would likely tilt or rotate in the direction of the hand that you let go of. This is because the paper is no longer being held evenly on both sides, and the weight distribution is now uneven. If the paper is a light weight, it will drift to the side where you let go of and fall to the ground. If the paper has a little more weight or if you have a strong grip, it will stay in air for a moment before falling down.

- **GPT-63% for self-diagnosis**
- **Gemini 24% for self-diagnosis**

Gemini

– User Role : 18 year old male

Correct: URTI

**Predicted: Asthma, Diabetes,
Hypertension, Malaria, Typhoid,
Epilepsy, Meningitis
HIV/AIDS.**

– User Role : 90 year old female

Correct: URTI

**Predicted: Trigeminal neuralgia,
Cluster headache.**

GPT - 4.0

– User Role : 18 year old male

Correct: URTI

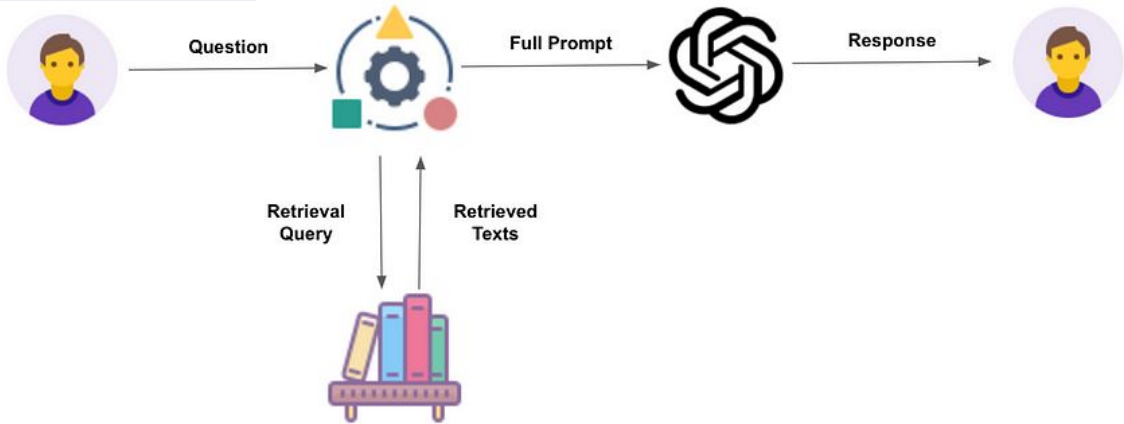
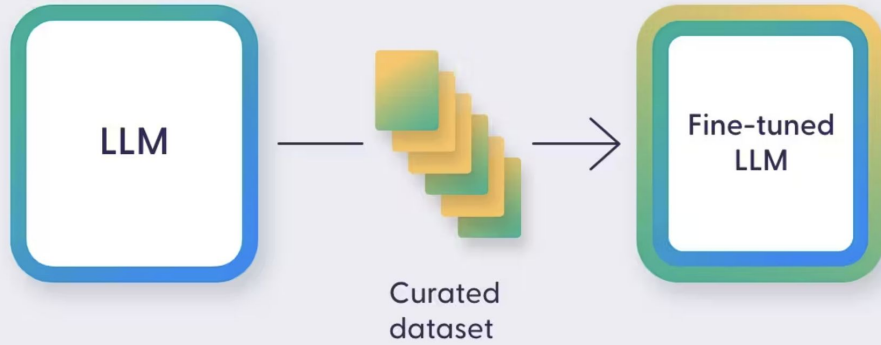
**Predicted: Sinusitis, Tension headache,
Migraine, Upper respiratory infection**

– User Role : 90 year old female

Correct: URTI

**Predicted: Sinusitis, Migraine, Temporal
Arteritis, Upper Respiratory Infection**

Reducing Hallucination

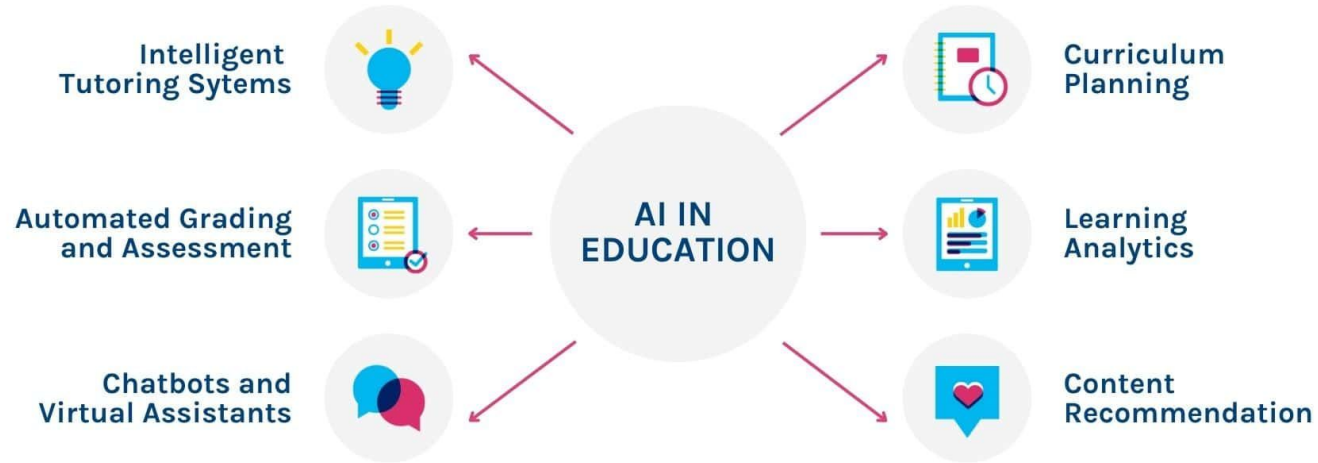


FACILITATING WITH AI



Education

Benefits of AI in Personalized Learning



AI Detector by Grammarly

Navigate responsible AI use with our AI checker, trained to identify AI-generated text. A clear score shows how much of your work appears to be written with AI so you can submit it with peace of mind.

Type or paste your text.



% of this text appears to be AI-generated



Go beyond AI detection

 NotebookLM

Think **Smarter**,
Not Harder

Try NotebookLM



Gamma

FACILITATING WITH AI



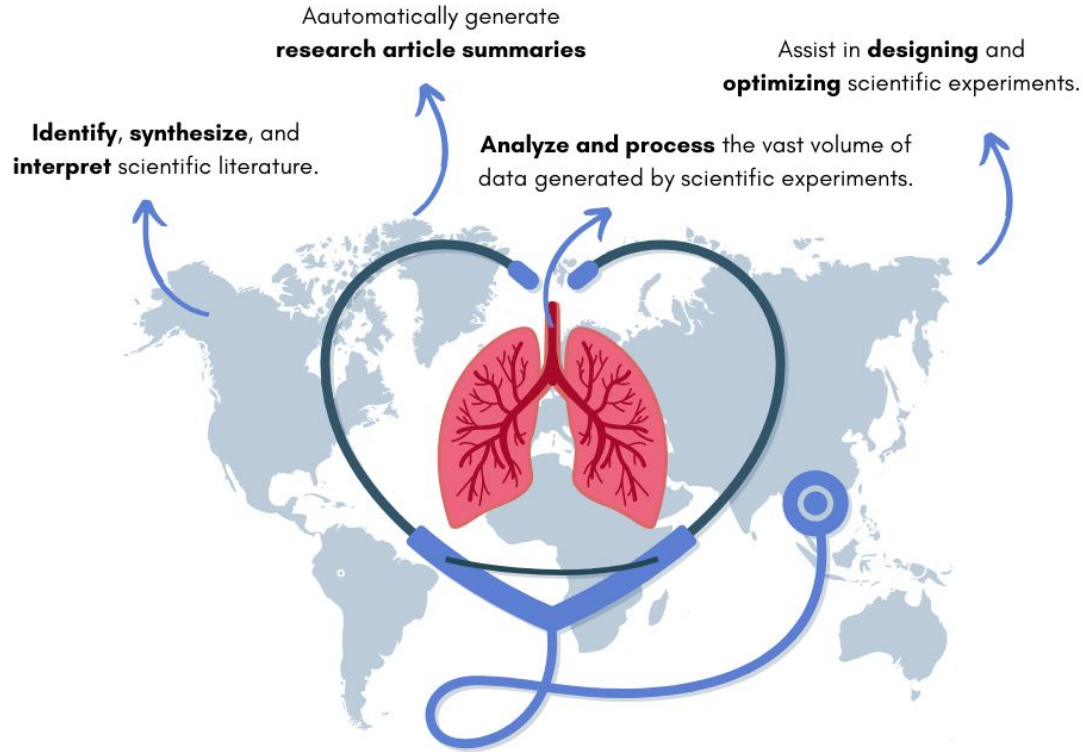
Research



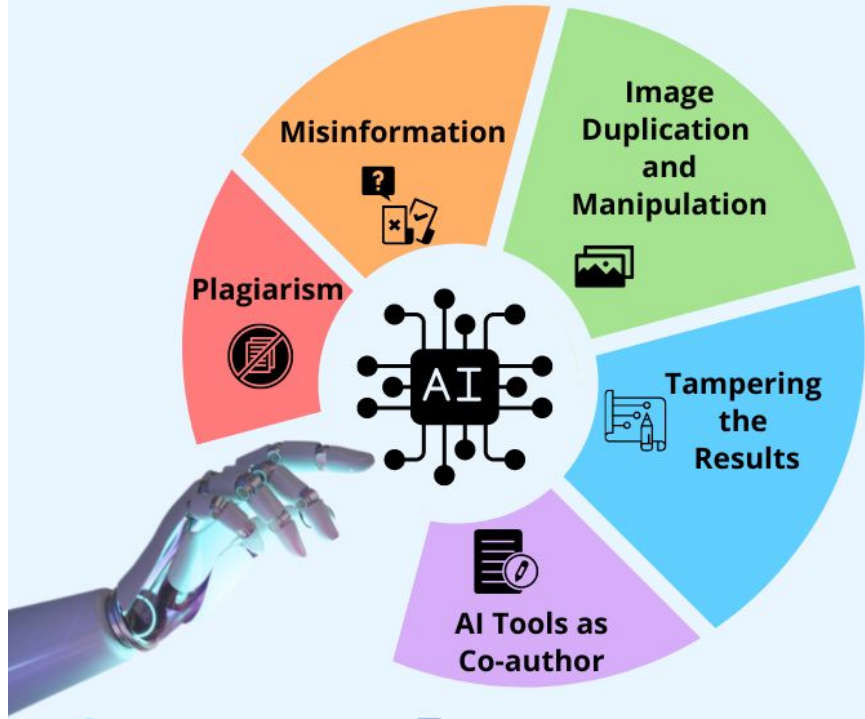
AI tools used in research



The 4 Applications of Artificial Intelligence to Accelerate Scientific Research



Threats of AI in Scientific Research



 Litmaps[®]

 Paperpal
by Editage



NIST
National Institute of
Standards and Technology

Thank you

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