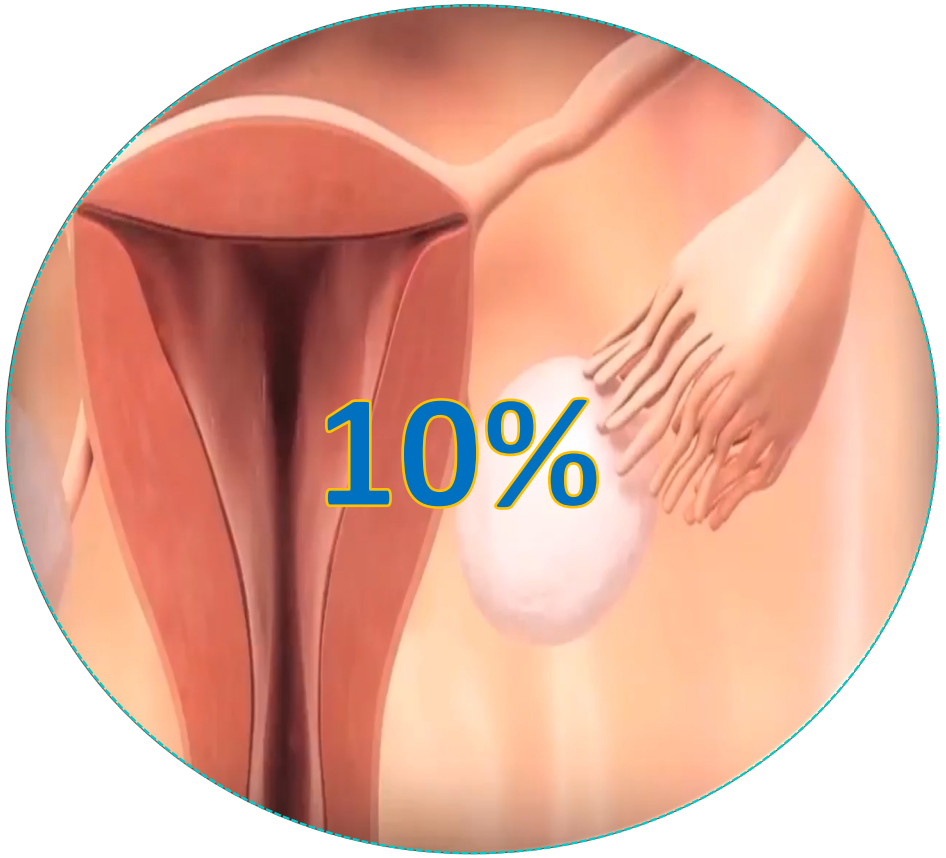
Management of endometriosis

Artificial Intelligence & Robotic surgery

Dr Ouzaher Hamza
Gynecologist
Endoscopic Surgeon
Robotic surgery
Oujda Morocco

Endometriosis a Chronic pathology



Management of endometriosis

Artificial Intelligence & Robotic surgery

Delay in Diagnosis

Ethiopathogenie ?

Difficult Surgery

Management of endometriosis

Artificial Intelligence & Robotic surgery

Management of endometriosis

Artificial Intelligence & Robotic surgery

History & Basics understanding

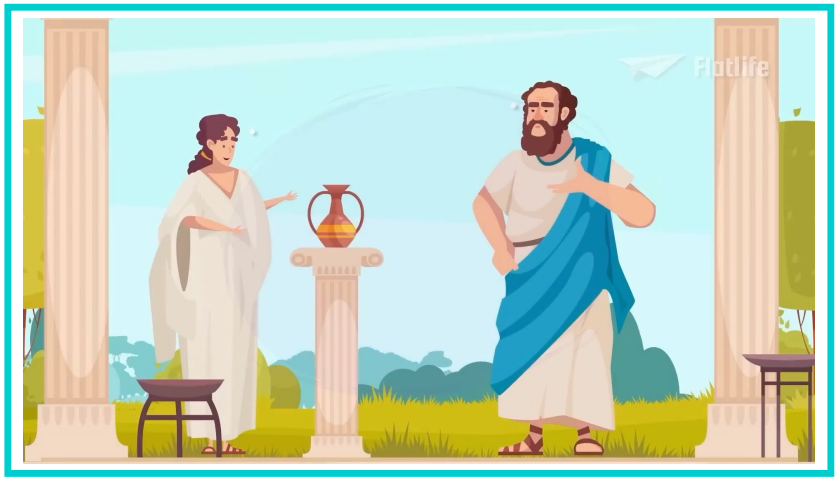
Preoperative planning

Intraoperative Guidance

AI IN Future implications

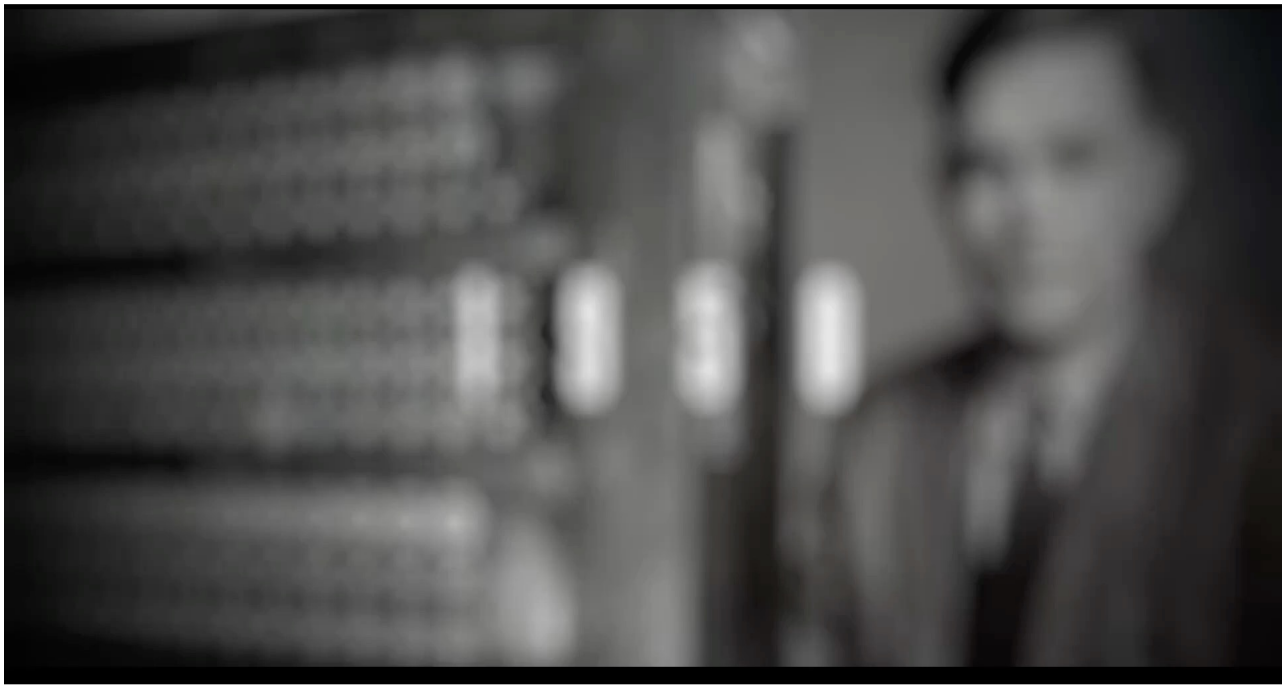

THE HISTORY OF ARTIFICIAL INTELLIGENCE

The Beginning of AI

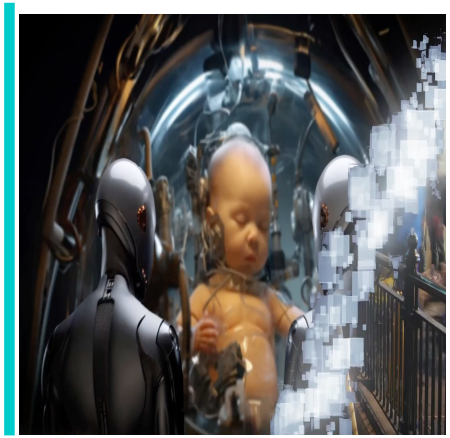


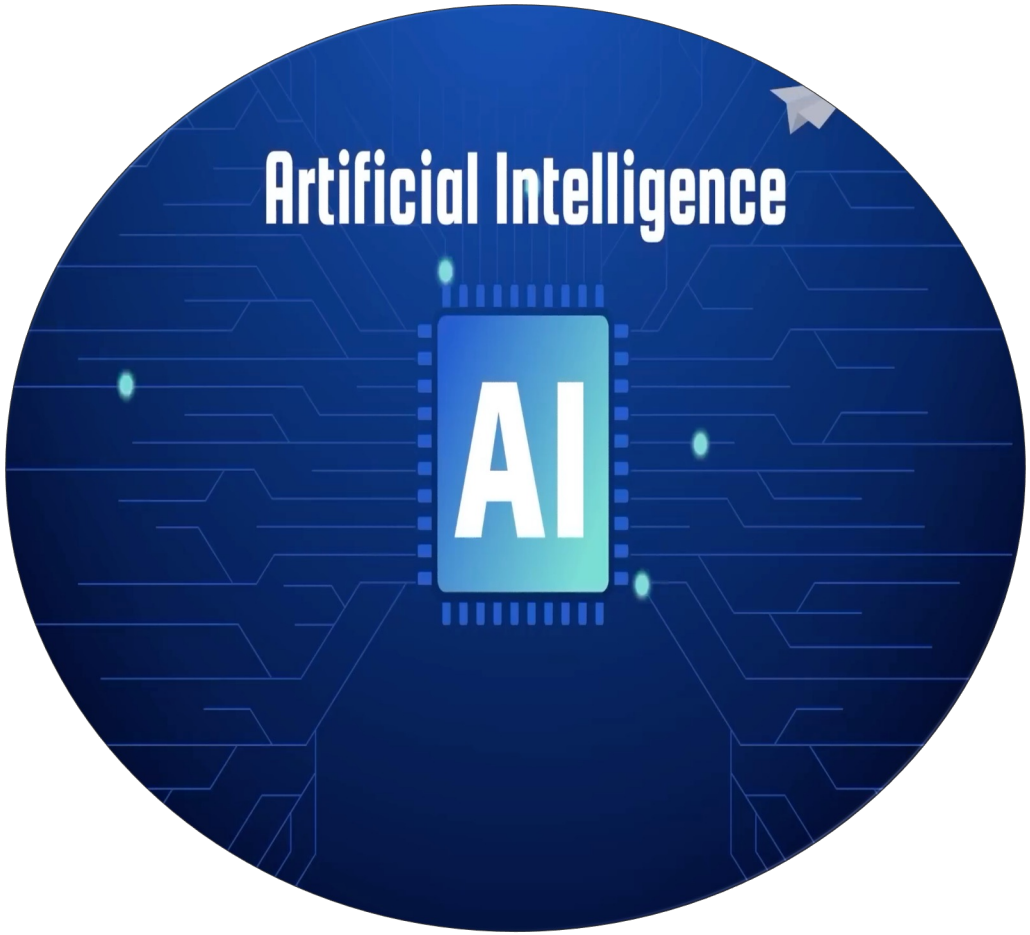

The
Pascaline

ALAN TURING



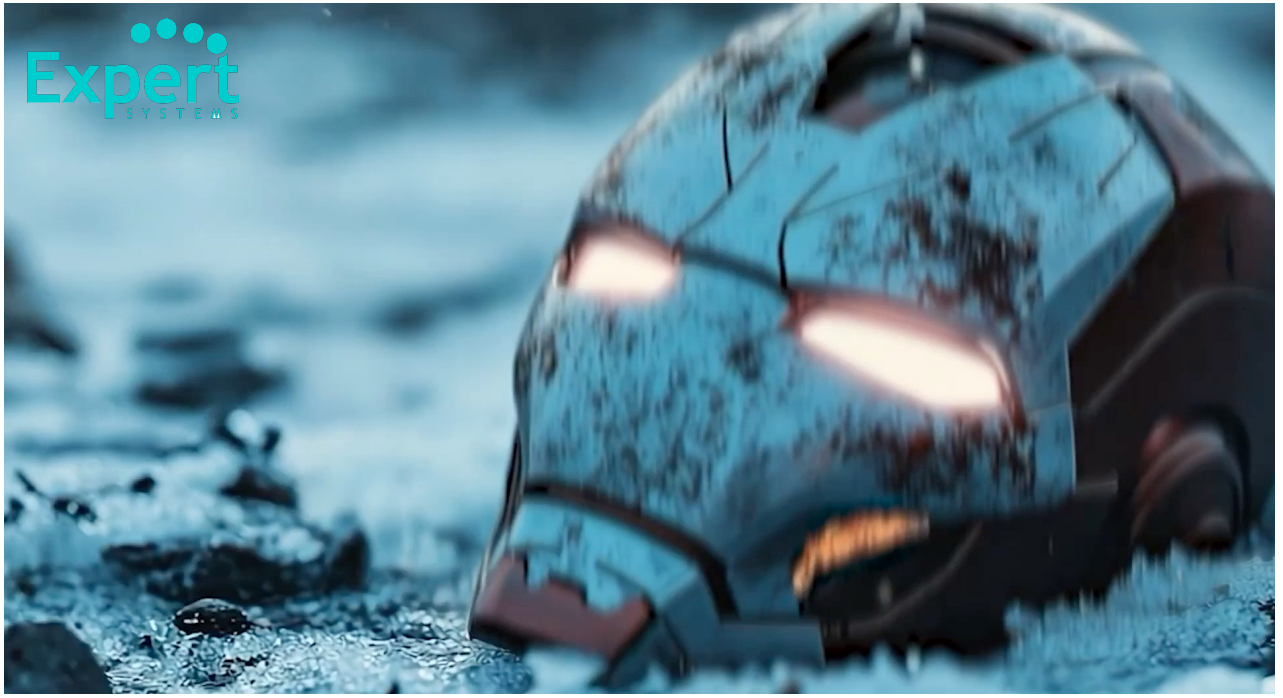
The Birth of AI



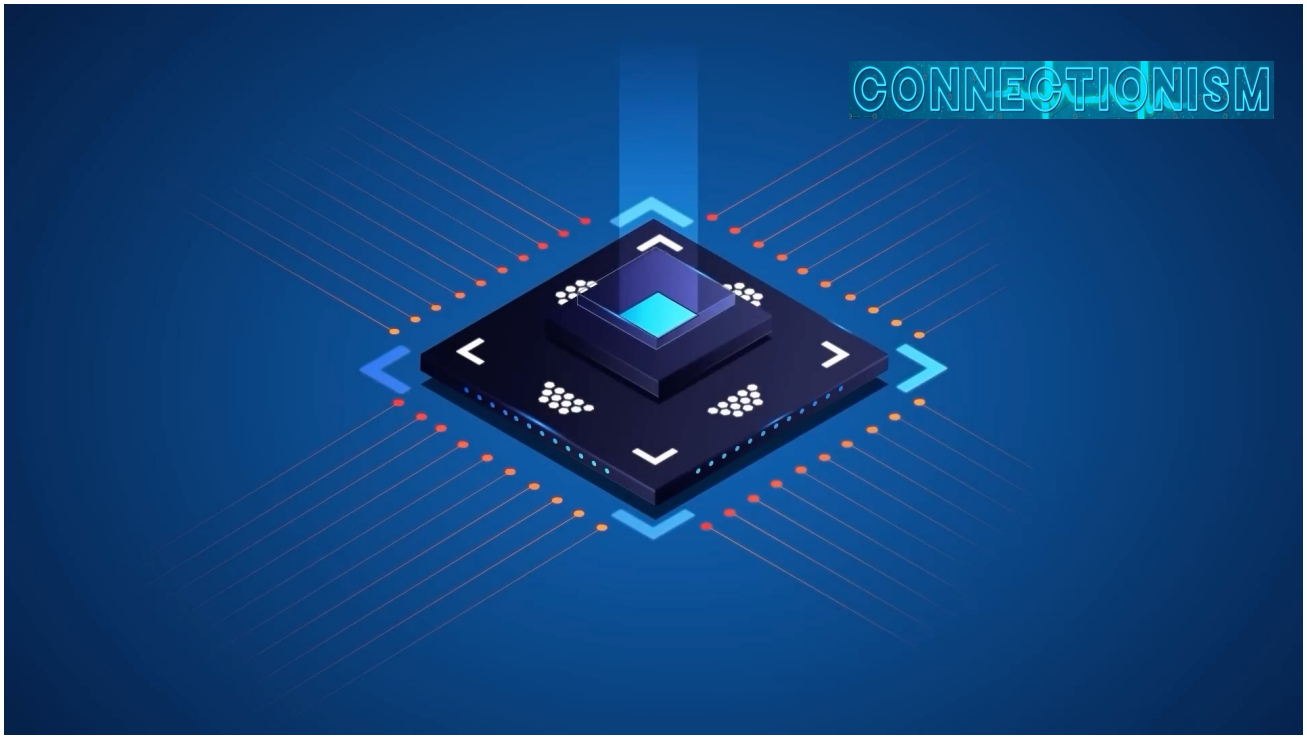



EXPERT SYSTEM
Règles prédéfinies 1980

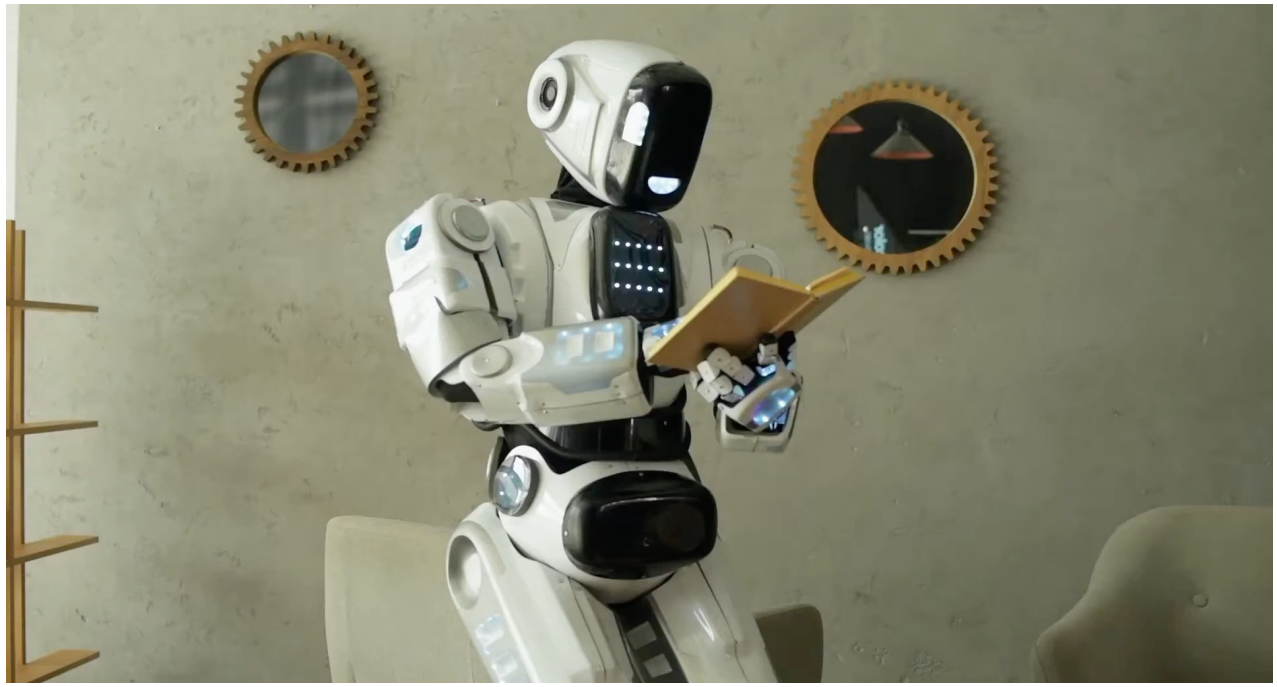
1974-1980
AI WINTER
1987-1993



FROM SYMBOLOIC TO COMMECTIONISM IA

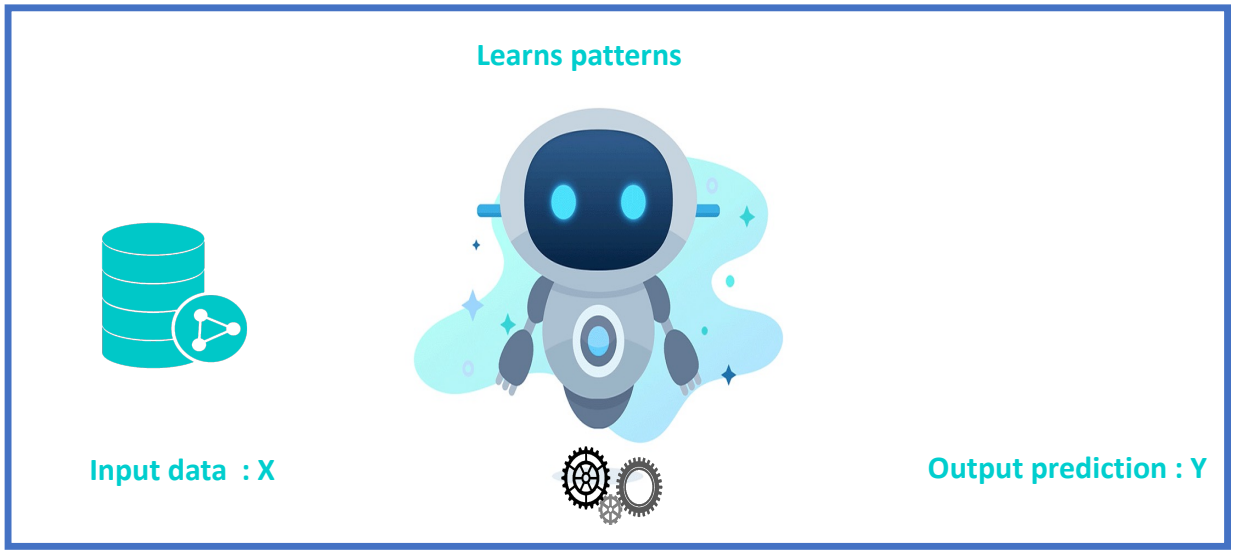


2010
AI BOOM



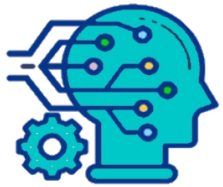
MACHINE LEARNING

How to learn (ML) ?

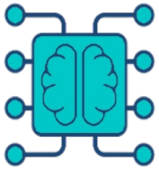


Supervised Learning

Unsupervised Learning

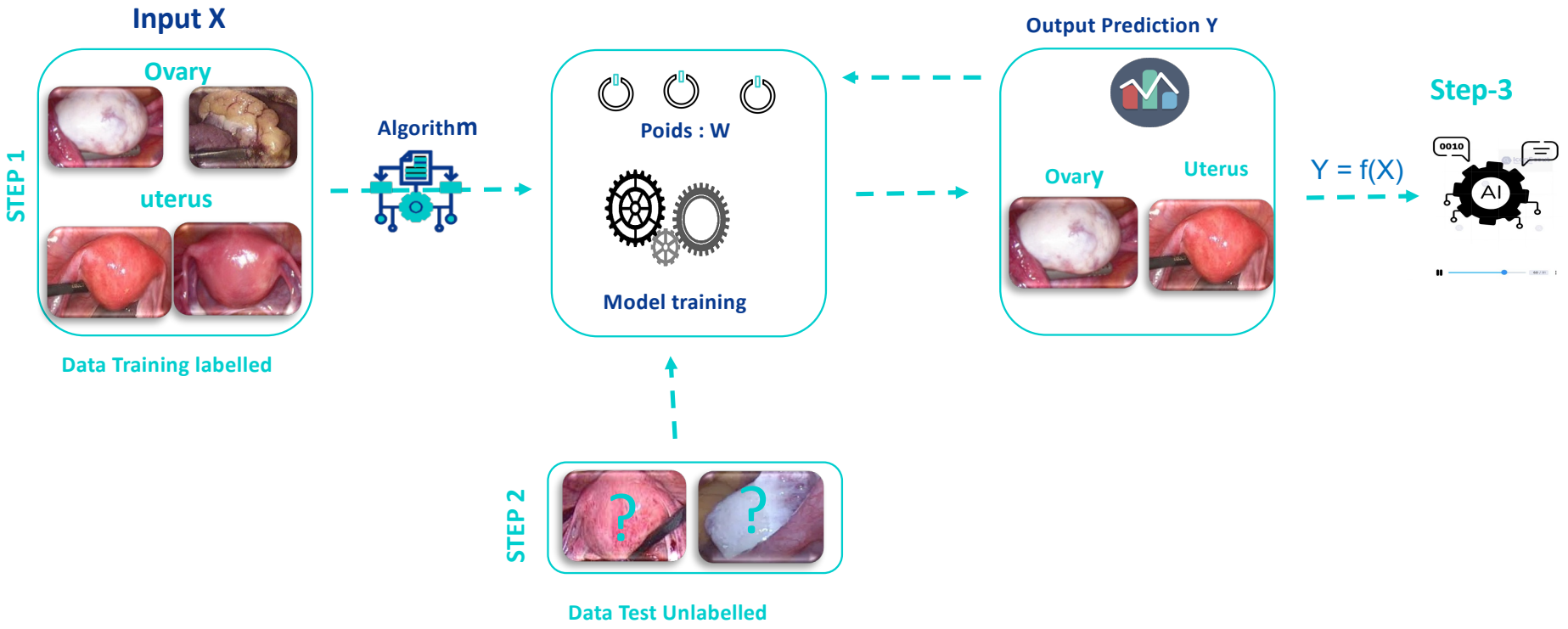


Reinforcement Learning

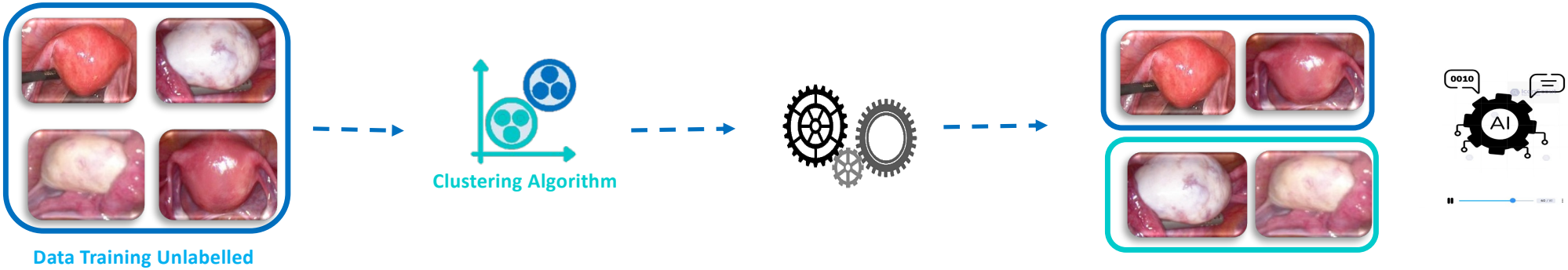


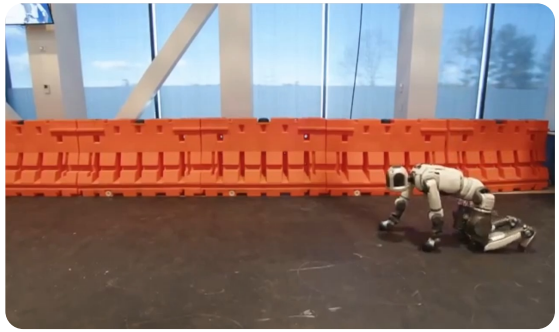
Machine learning
Supervised Learning

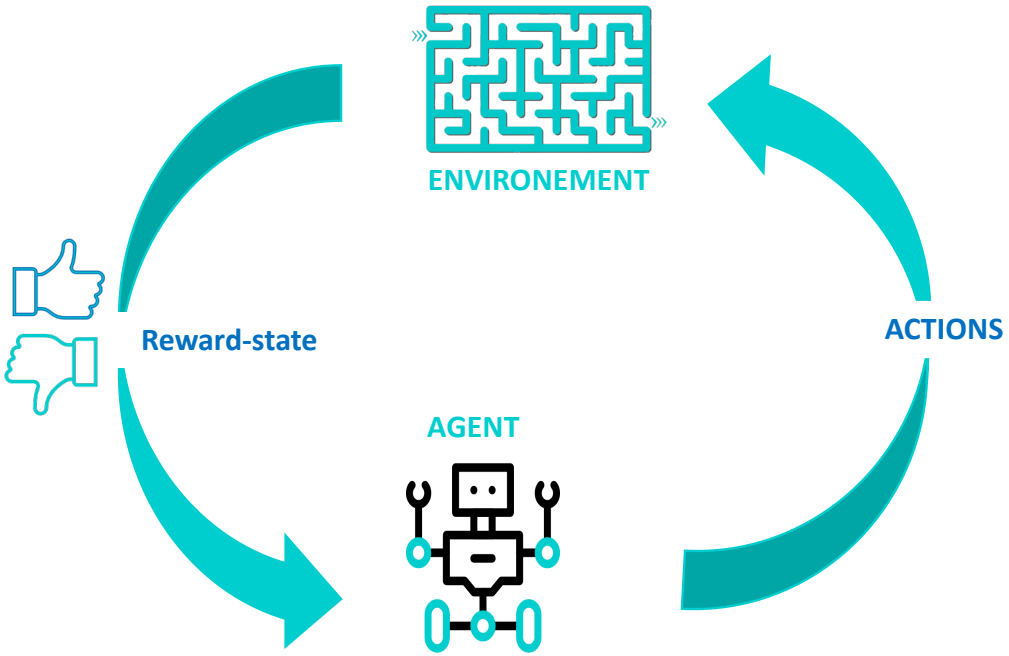
Relation entre une entrée X et un label Y:F(X)=Y



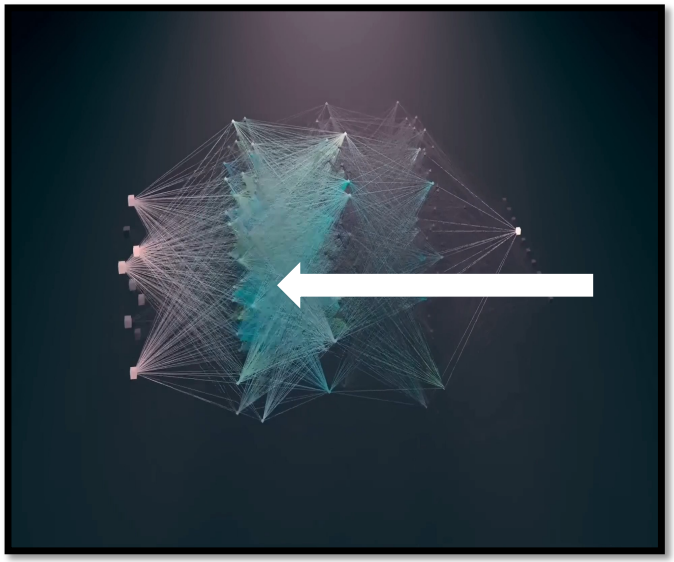
Machine learning
Unsupervised Learning

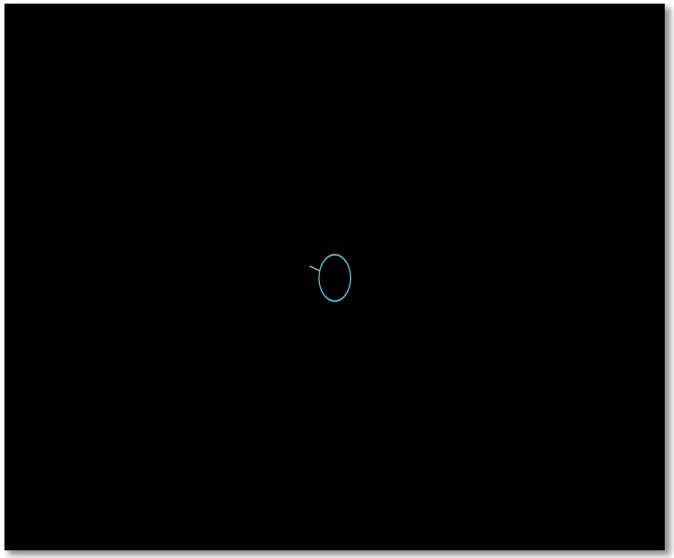


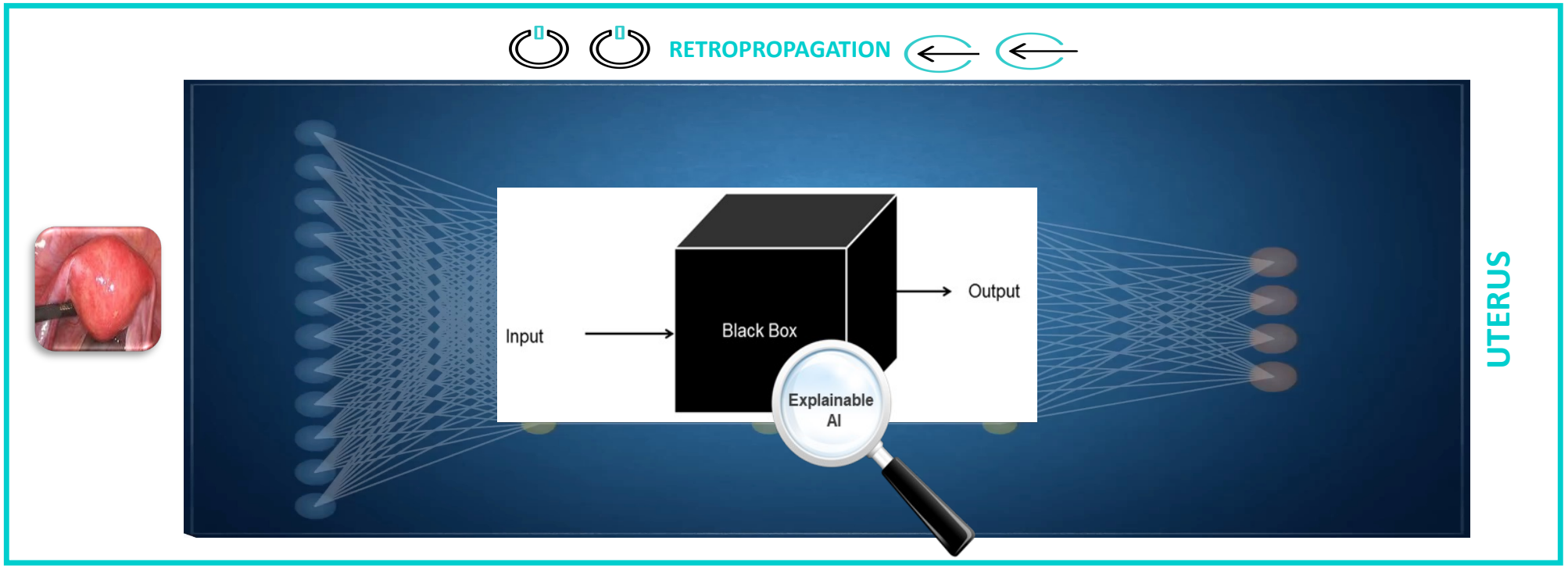



ENVIRONEMENT
Reward-state
ACTIONS
AGENT

Deep Learning is an advanced form of Machine Learning that uses **Artificial Neural Networks.**





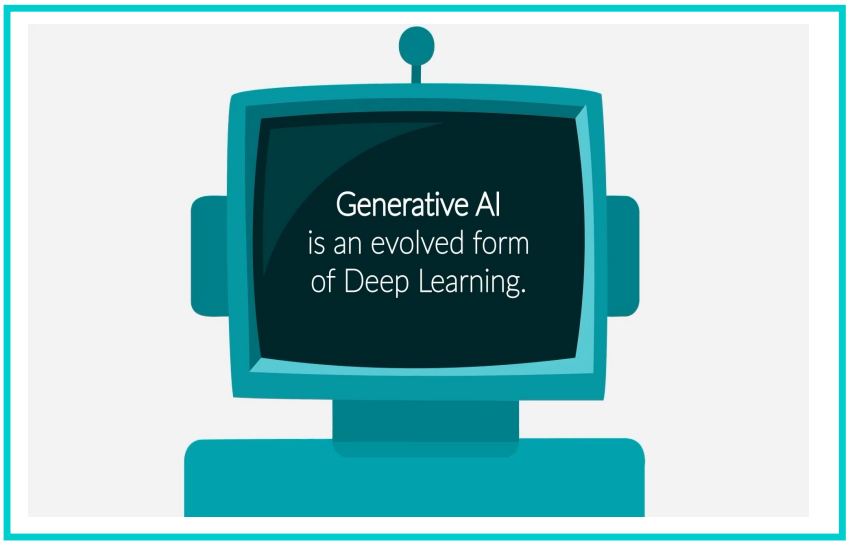

RETROPROPAGATION
Input
Black Box
Output
Explainable AI
UTERUS

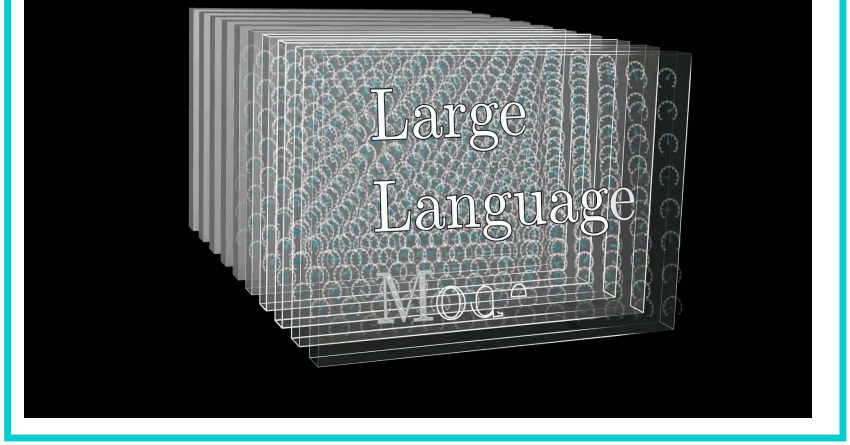
2017-2024

The Era of Modern IA

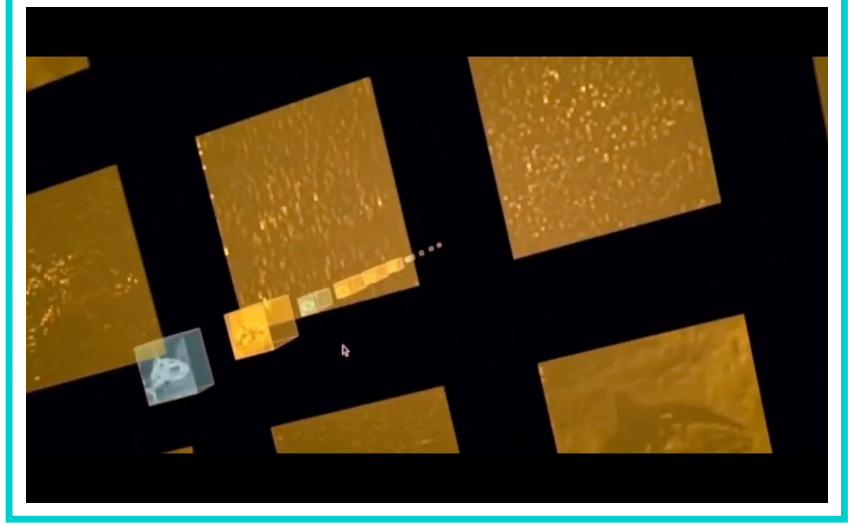
From Traditional to Modern & Generative IA

Human Language Understanding?

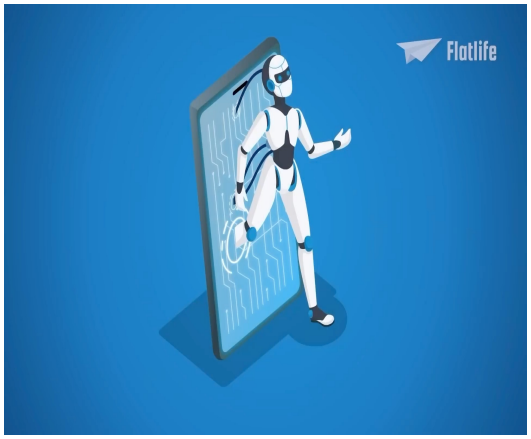

Generative AI
is an evolved form
of Deep Learning.


Large
Language
Model

Computer Vision : CV



Ai in everyday life & healthcare



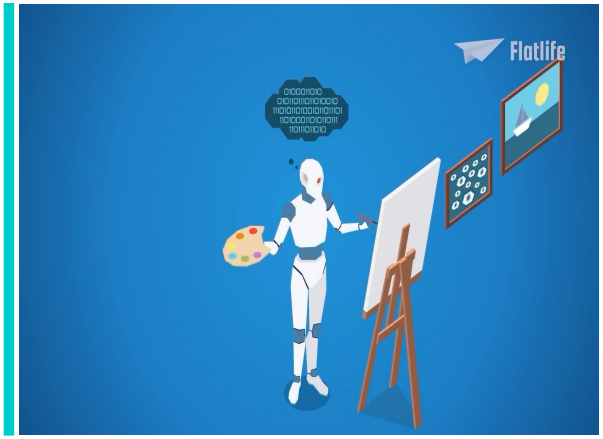
2025-????

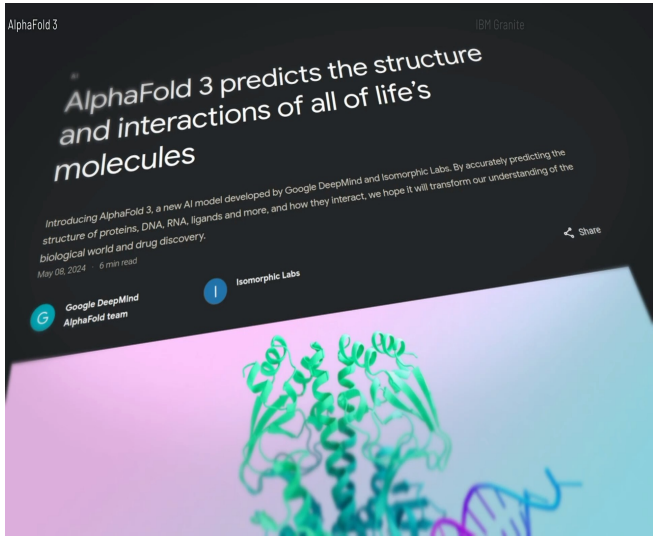
The futur of IA

Acceleration drastique vers une nouvelle renaissance

RAISONEMENT, DECISION ,CREATION?

IA creative ?


Flatlife

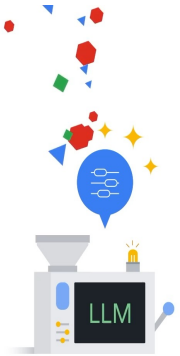

AlphaFold 3
IBM Granite
AlphaFold 3 predicts the structure and interactions of all of life's molecules
Introducing AlphaFold 3, a new AI model developed by Google DeepMind and Isomorphic Labs. By accurately predicting the structure of proteins, DNA, RNA, ligands and more, and how they interact, we hope it will transform our understanding of the biological world and drug discovery.
May 08, 2024 · 6 min read
Share
Google DeepMind
AlphaFold team
Isomorphic Labs

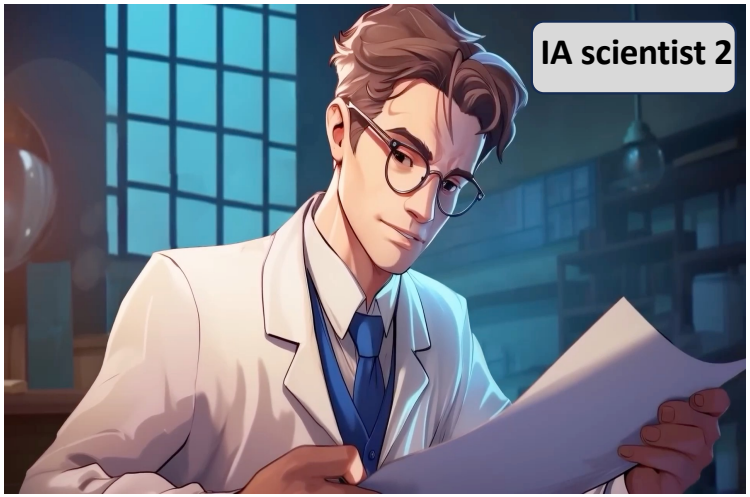
IA & MEDICAL KNOWLEDGE

Pathophysiology of endometriosis?

IA & MEDICAL KNOWLEDGE

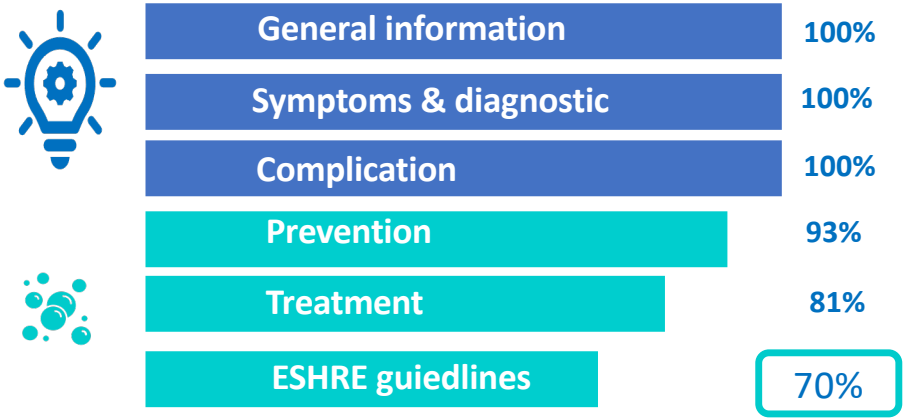
Pathophysiology of endometriosis?





AI IN MEDICAL KNOWLEDGE

Chat GPT



Foundation Modal

DATA

Taining

Foundation Modal

Fin-Tuning

TASKS

MEDICAL KNOWLEDGE

ENDOMETRIOSIS ?

How can IA improve Preoperative planning ?

1-Reduction of diagnosis delay
2-Personalize management
3-Image Analysis

AI IN PREOPERATIVE PLANNING

1-Reduction of diagnosis delay

Symptoms and biomarkers

LUNA

NoEndo

National Observatory for Endometriosis

Ziwig

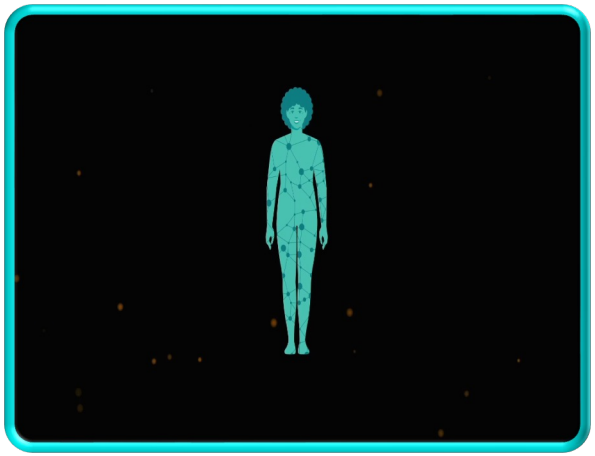
AI IN PREOPERATIVE PLANNING
1-Reduction of diagnosis delay

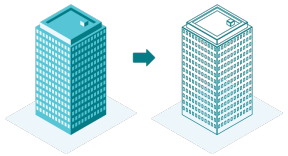
Large language models : LLM

AI IN PREOPERATIVE PLANNING

2-Personalize management

"Precision medicine : 4P"

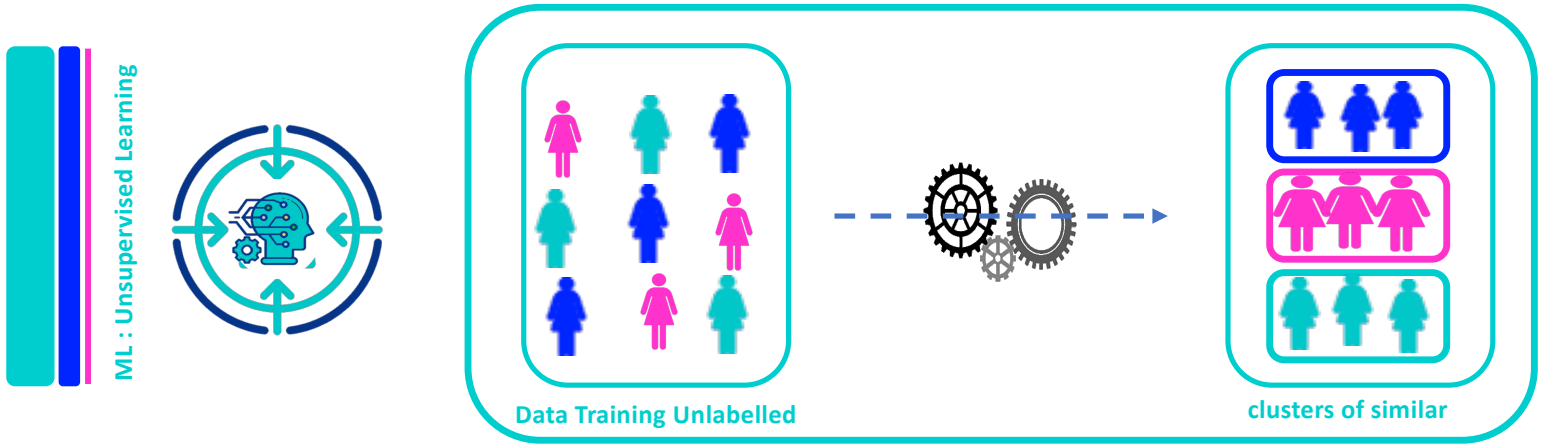




DIGITAL TWIN

AI IN PREOPERATIVE PLANNING

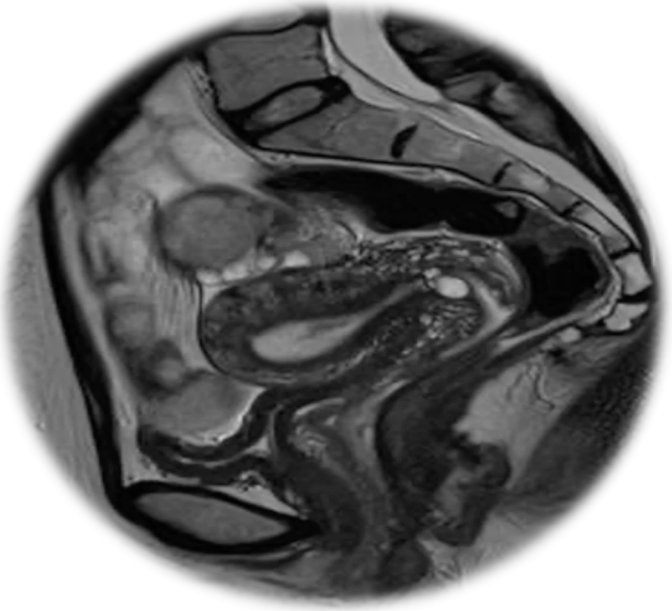
2-Personalize management



AI IN PREOPERATIVE PLANNING

3-Image Analysis

TVUS

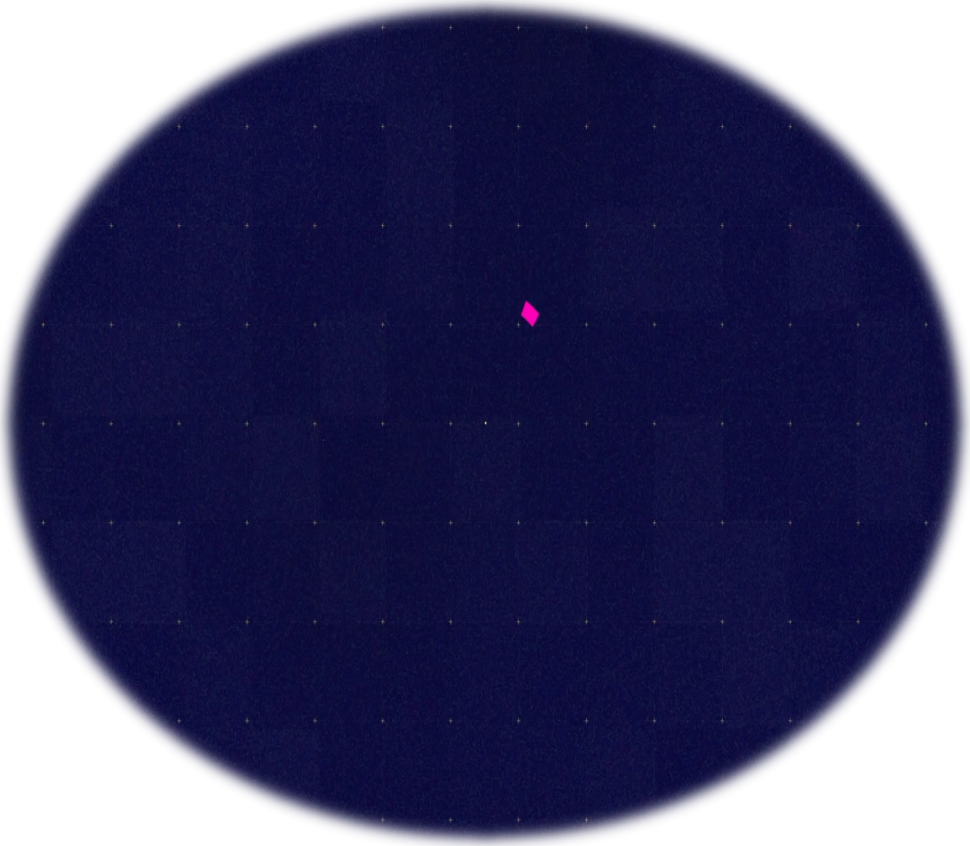


2D MRI Model

AI IN PREOPERATIVE PLANNING

3-Image Analysis : 3D concept

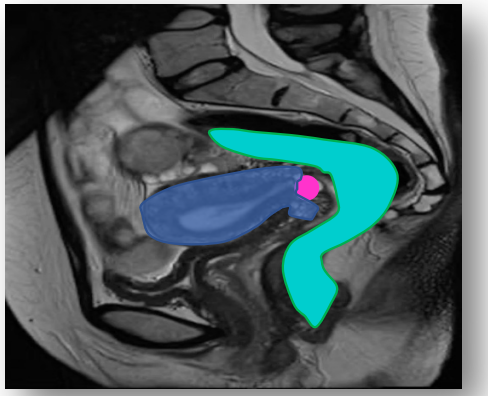
From imaging 2D To Better visualization 3D



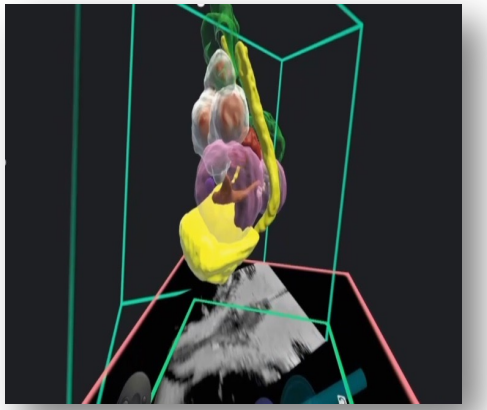
AI IN PREOPERATIVE PLANNING

3-Image Analysis : 3D concept

2D MRI Model



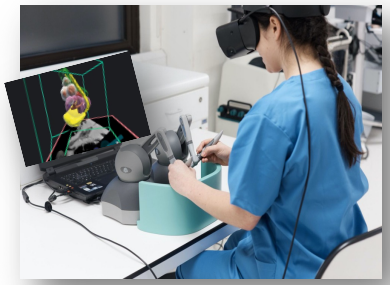
3D virtual model :digital twin



Virtual surgical plan

3D printed model

Training



AI IN PREOPERATIVE PLANNING

- Risk prediction

AI IN INTRAOPERATIVE GUIDANCE

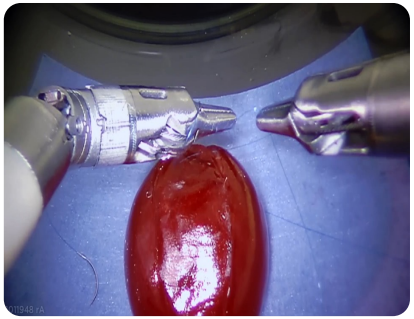
LIMITED STUDIES

INSPIRATIONS

How can IA & robotic surgery improve intraoperative planning ?

AI IN INTRAOPERATIVE GUIDANCE

Robotic Surgery systems



AI IN INTRAOPERATIVE GUIDANCE

Robotic Surgery systems & IA

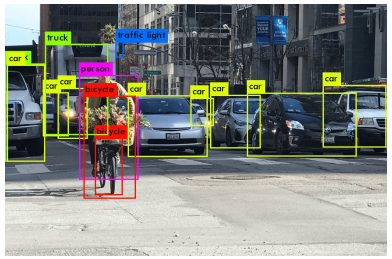
- -Interpretation of anatomy
- -identification of endometriosis
- -Identification risk areas
- - Detection of complications

Augmented reality

Robotic surgery

Computer Vision

Computer Vision : CV



Object detection

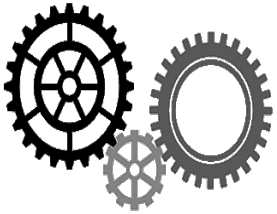
Robotic surgery

Object tracking

COMPUTER VISION : CV

Input 4000 images

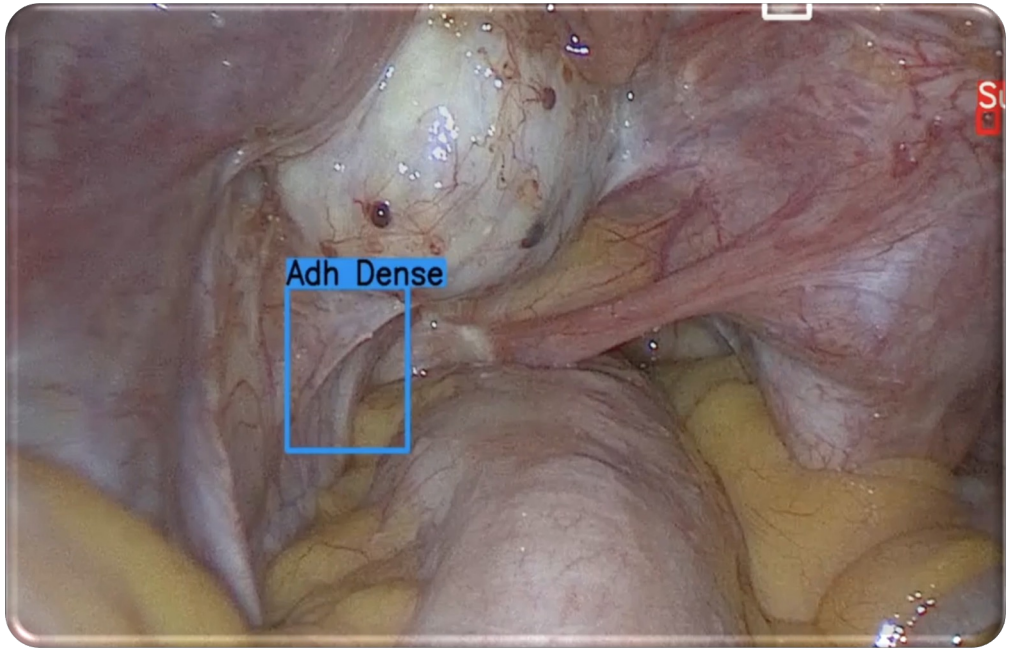
INTERPRETATION OF ANATOMIE



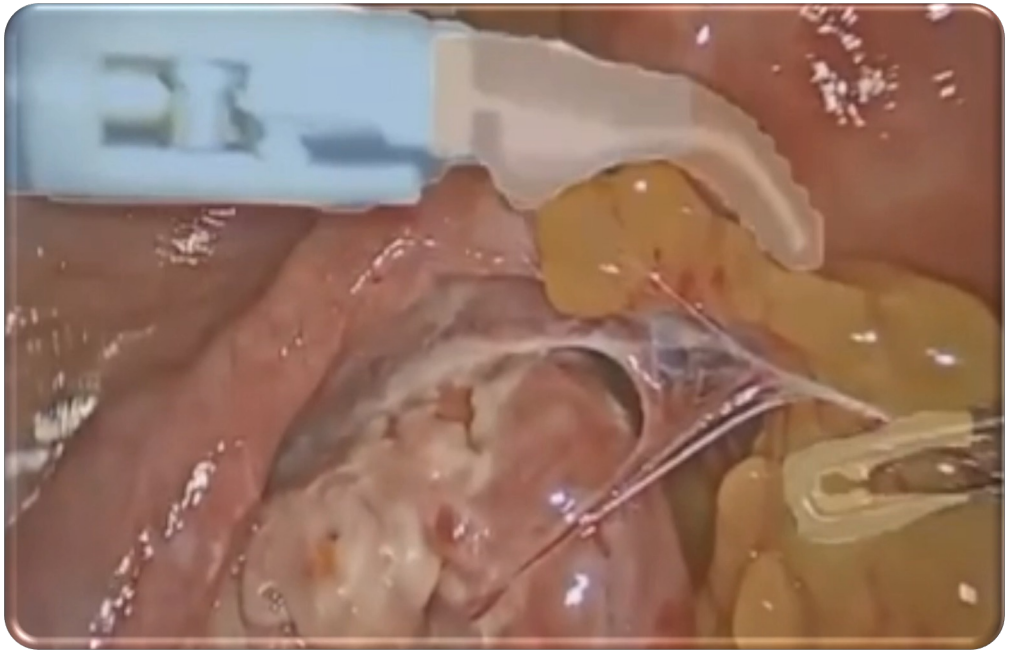
Output Prediction

COMPUTER VISION : CV

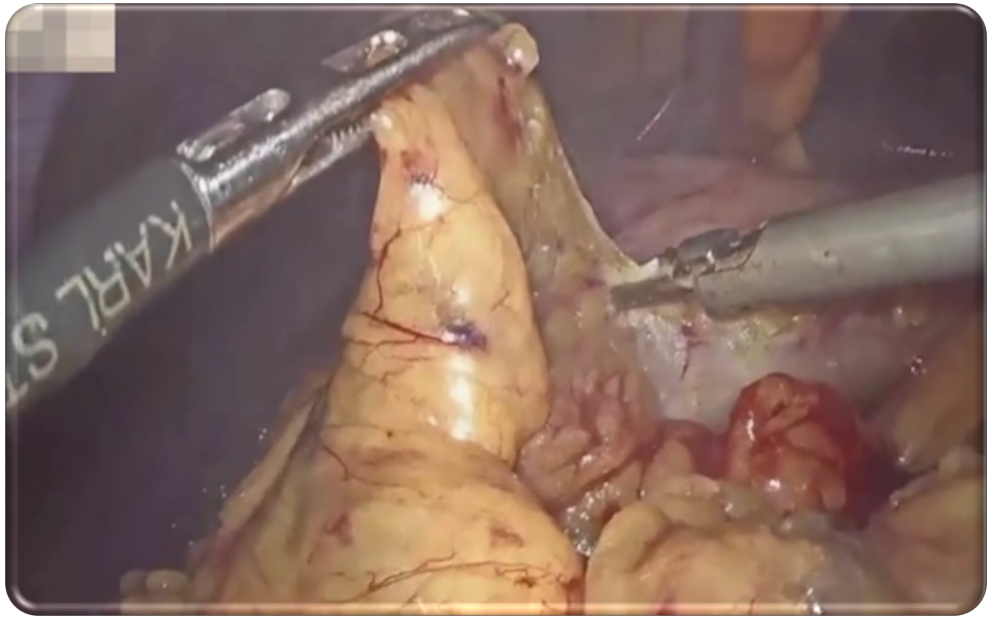
IDENTIFIER OF ENDOMETRIOSIS



REAL TIME TOOL DETECTION



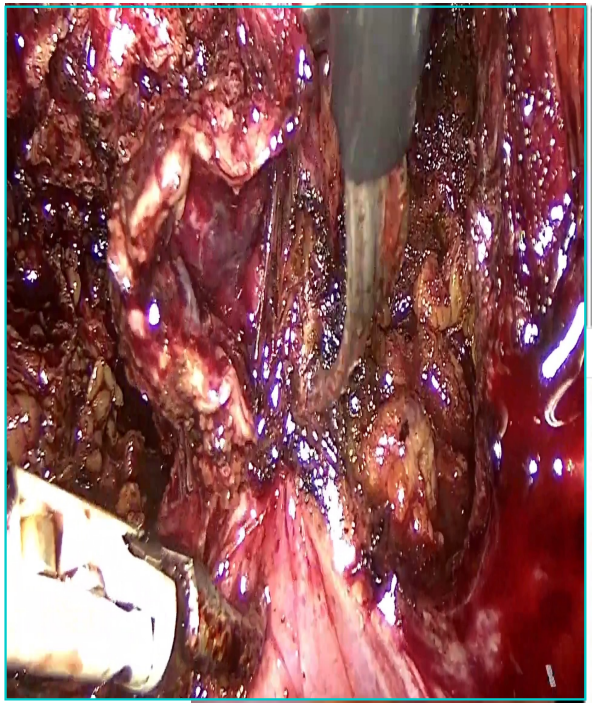
DETECTION OF COMPLICATIONS



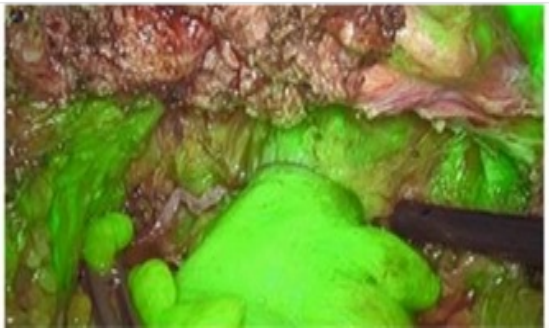
Flaxman et al.

Nicola Bordel and all

DETECTION OF COMPLICATIONS

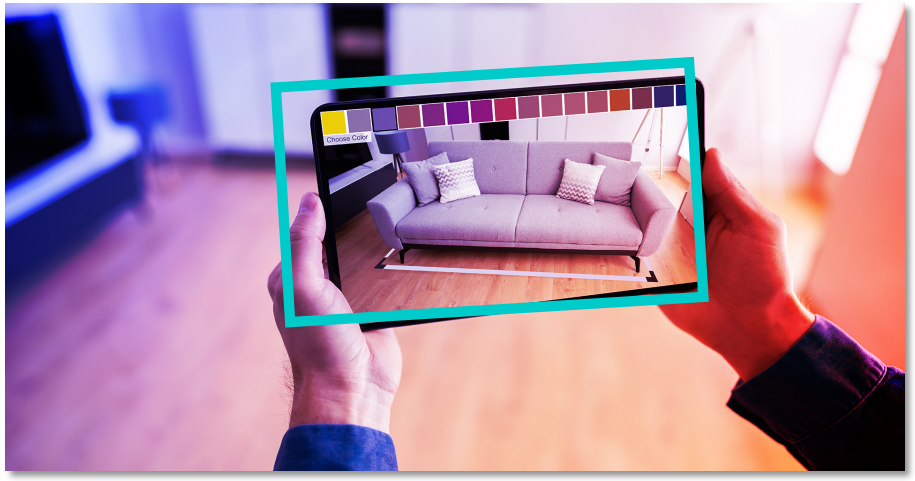


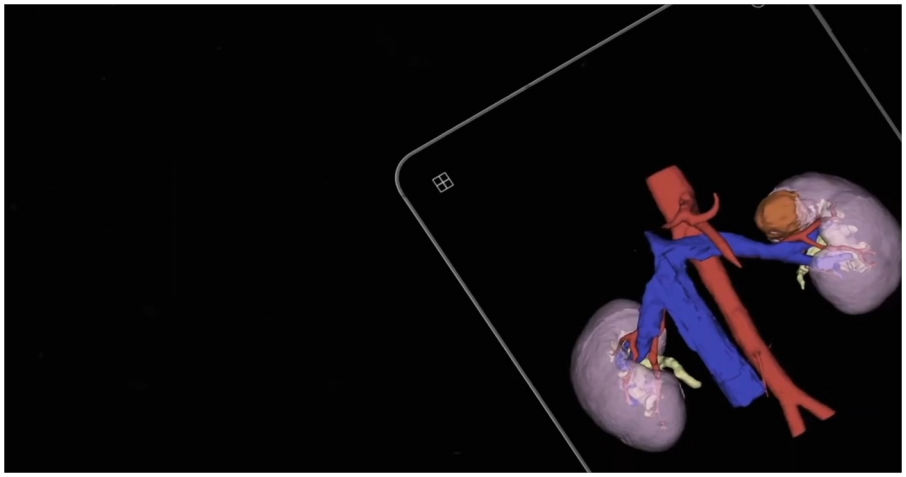
Deep learning & Automatic bowel segmentation



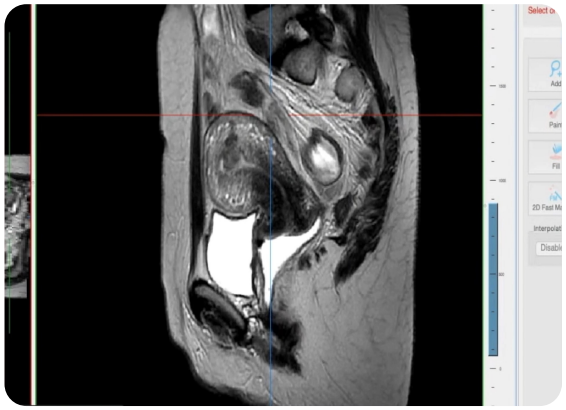
Hernández and colleagues' 2022

AUGMENTED REALITY : AR

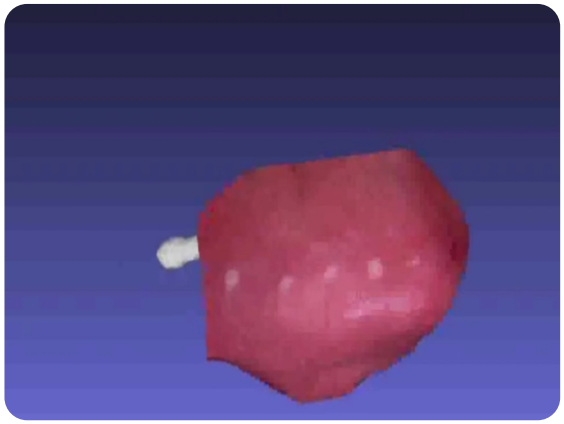




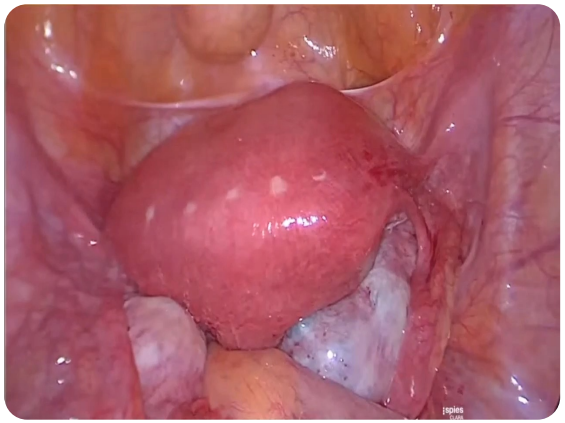
AUGMENTED REALITY : AR



MRI :segmented uterus and myomas

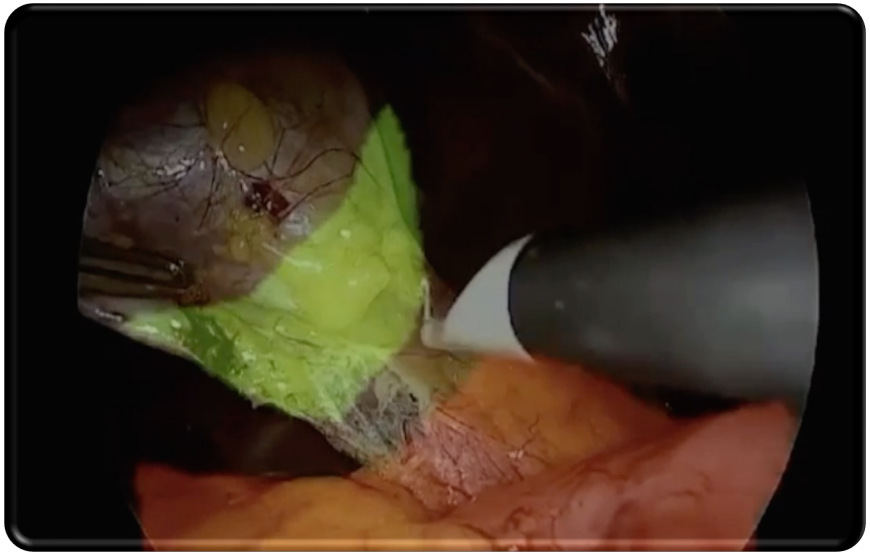


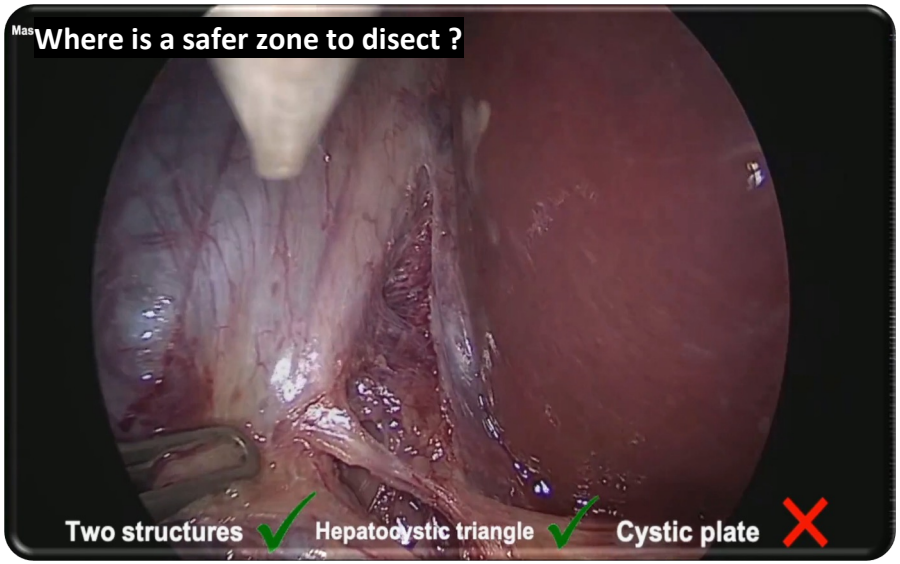
Uterus with myomas 3D virtual model



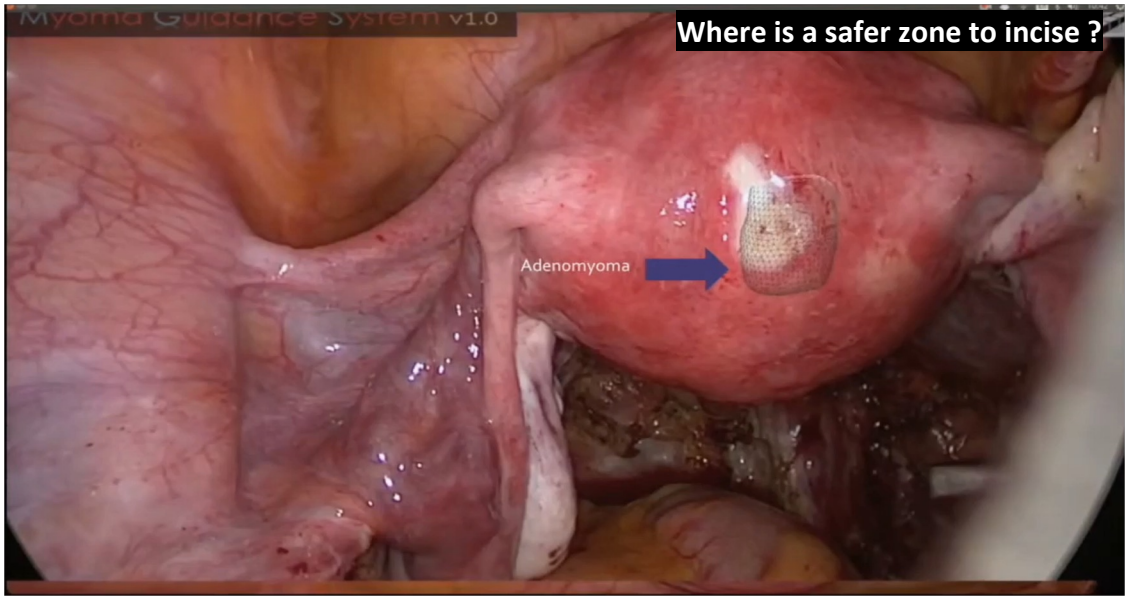
Visualisation of the myoma

DETECTION OF RISK AREAS

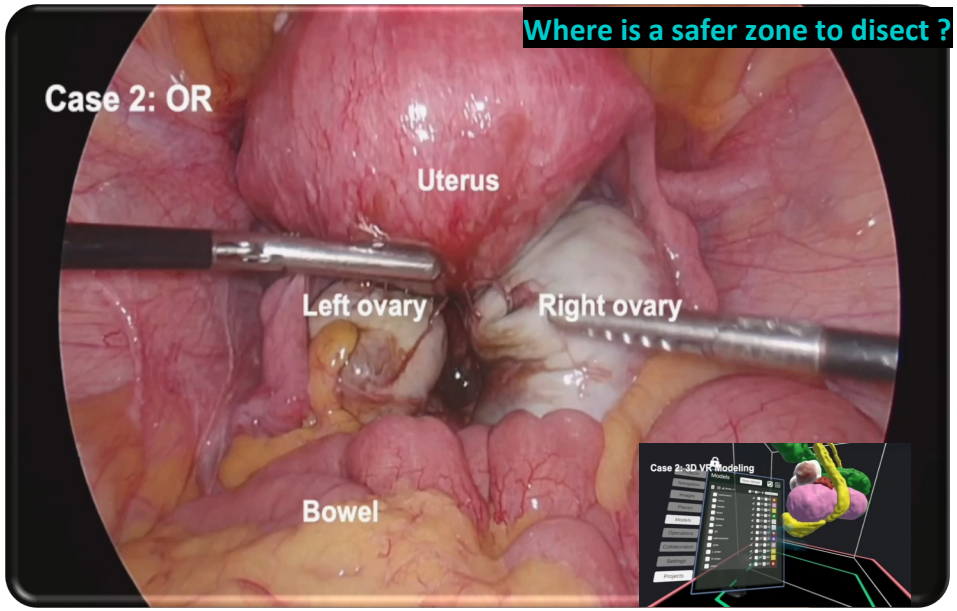


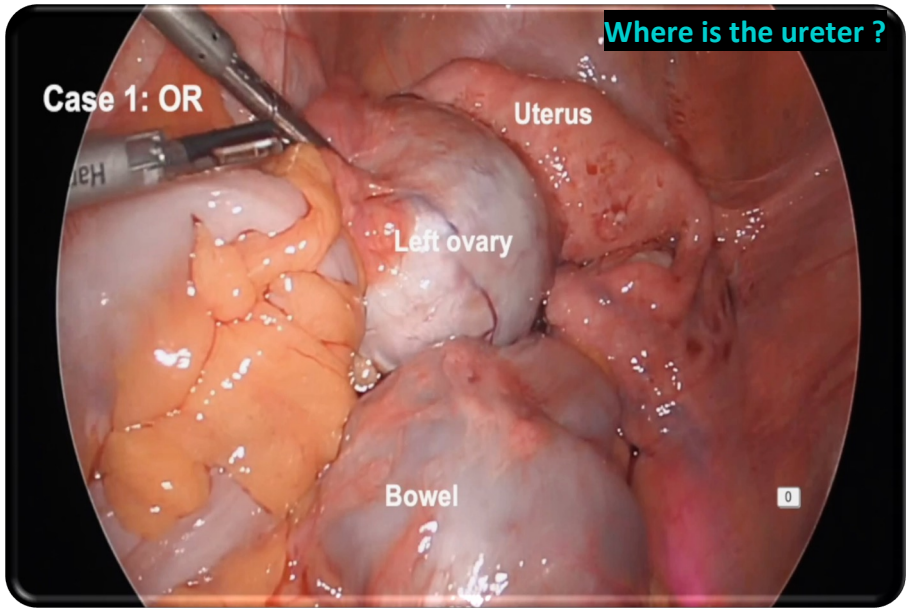


DETECTION OF RISK AREAS



DETECTION OF RISK AREAS





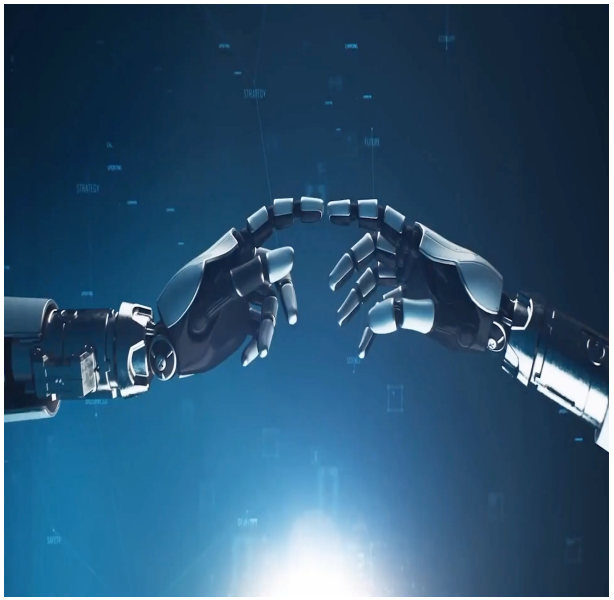
Flaxman et al

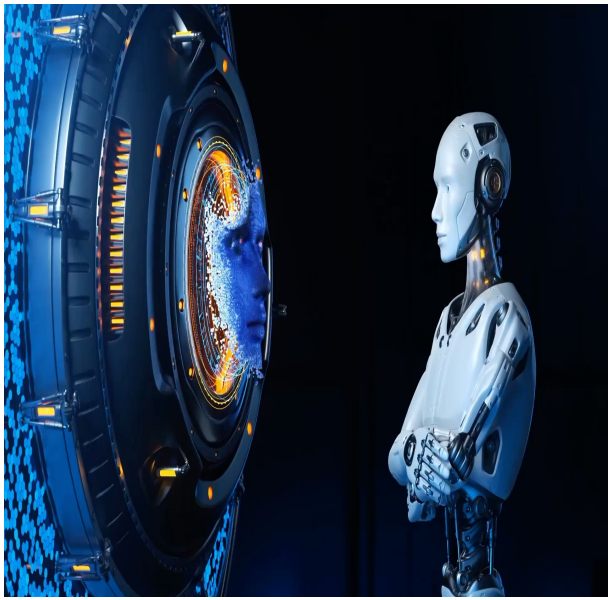
AI IN POSTOPERATIVE

Risk prediction

AI IN Future implications

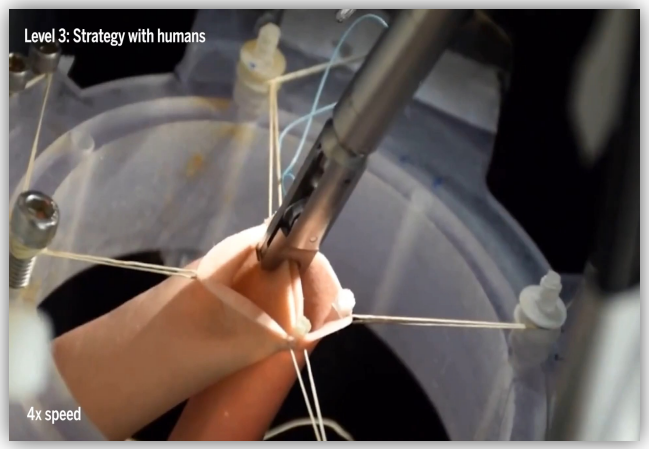
Autonomous operative robots



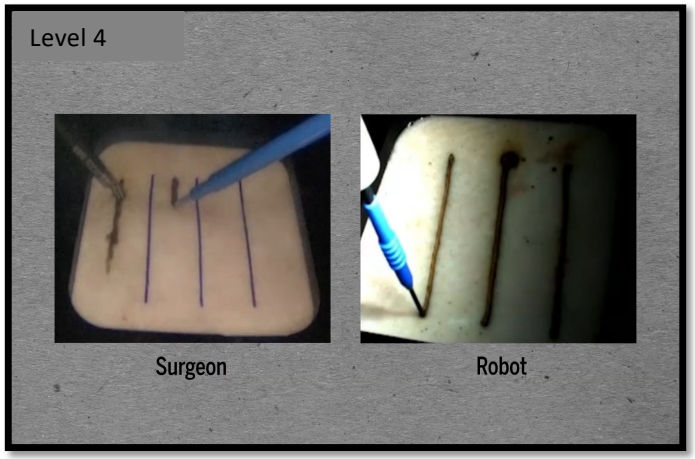


Autonomous operative robots

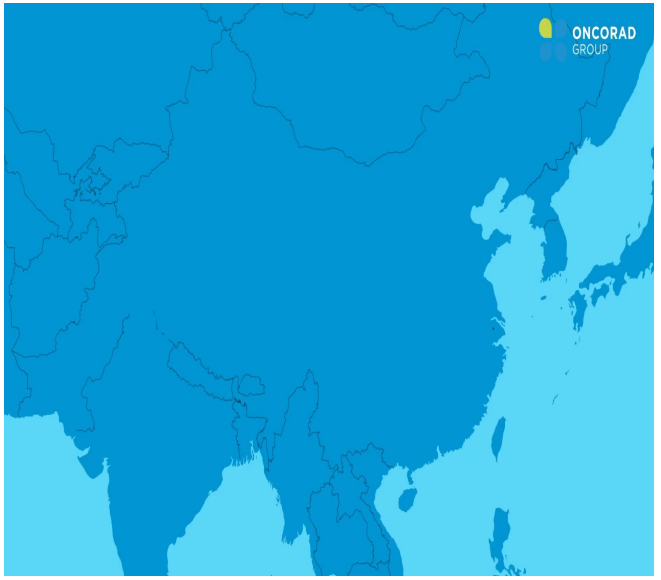
CURRENTLY



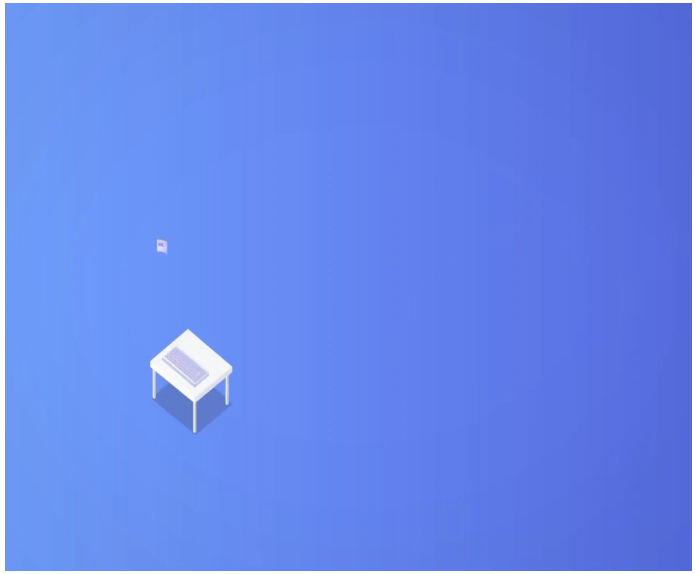
IN Future



Robotic telesurgical system

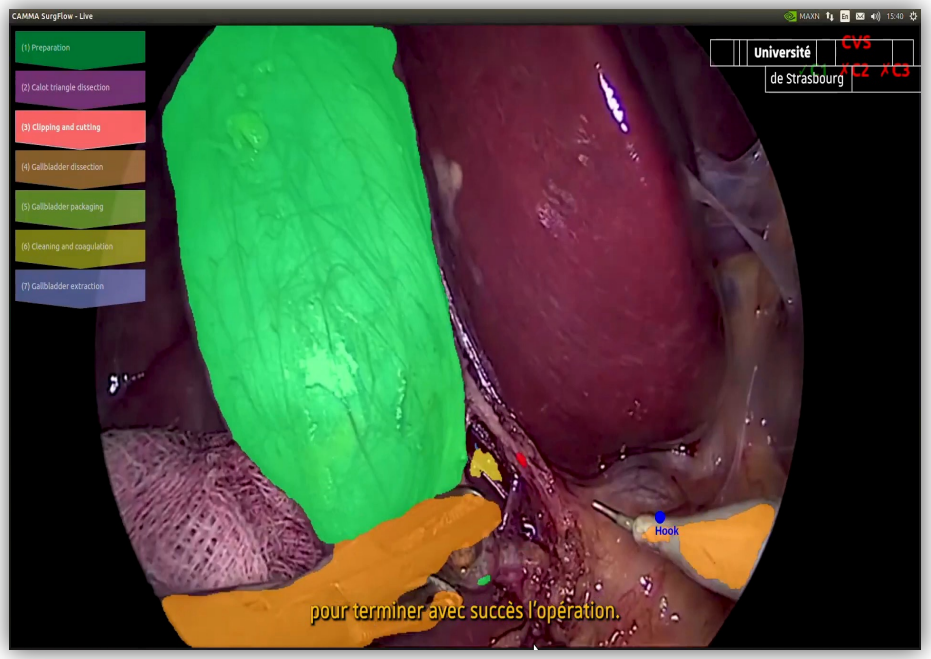


Operating room “Black box”



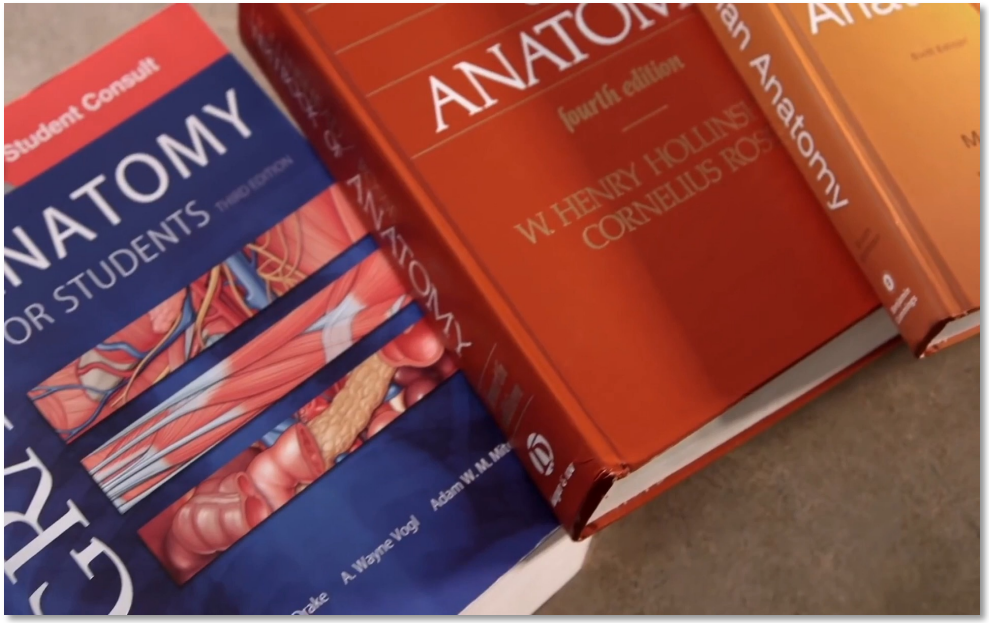
Black Box and Surgical Control Tower

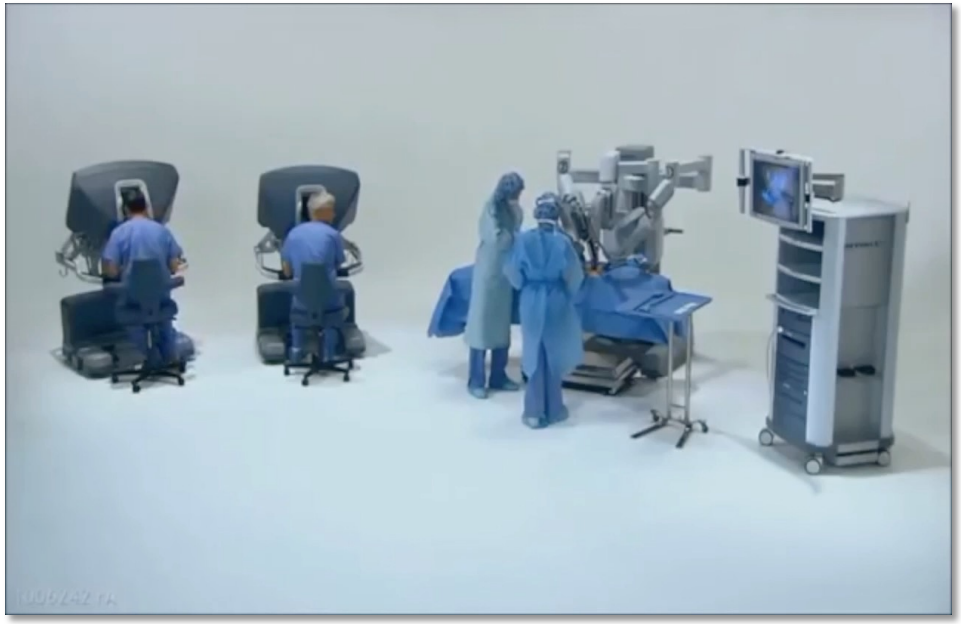
ASSIST SURGEON IN REAL TIME



PREDICT SURGEON PERFORMANCE

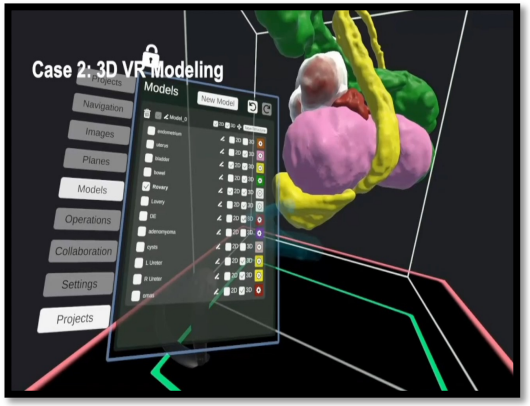
EDUCATION & TRINING





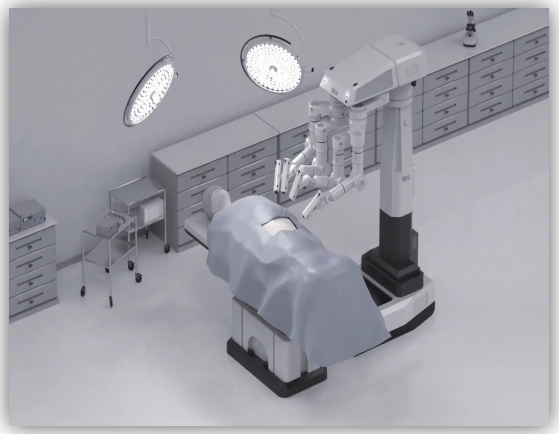
In summary

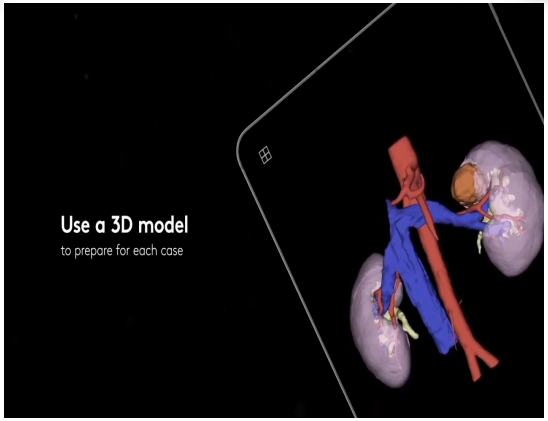
AI IN PREOPERATIVE PLANNING



In summary

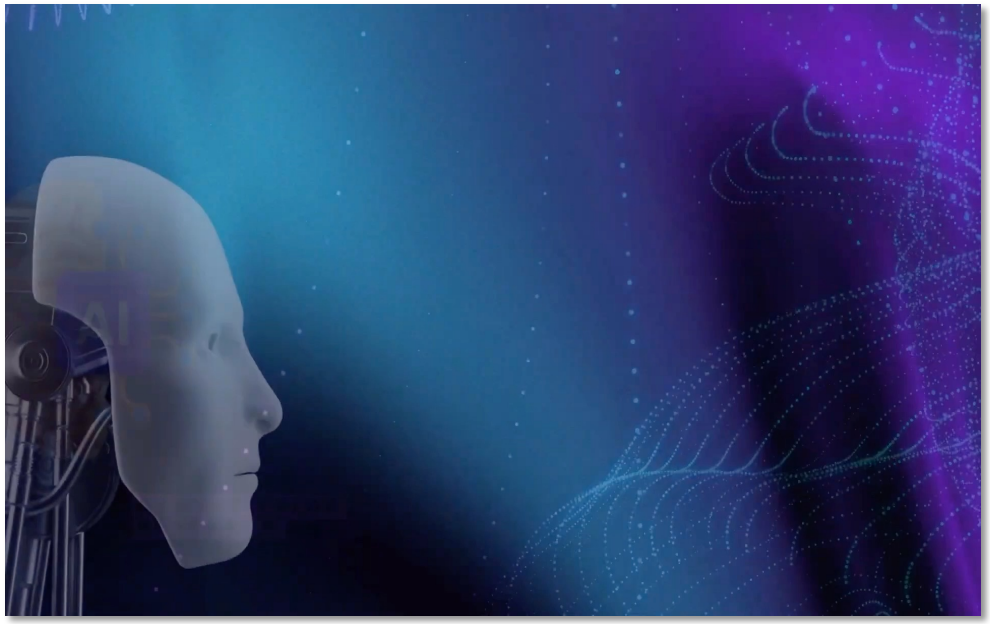
AI IN PEROPERATIVE GUIDANCE





In summary

HUMAN MACHINE SYMBIOSE



In summary

ETHICAL & LEGAL CONSIDERATIONS

In summary