Η νέα Ιατρική στην εποχή της Τεχνητής Νοημοσύνης

ΓΕΩΡΓΙΟΣ ΦΛΕΓΚΑΣ

ΜΗΧΑΝΙΚΟΣ ΑΥΤΟΜΑΤΙΣΜΩΝ & ΤΕΧΝΗΤΗΣ ΝΟΗΜΟΣΥΝΗΣ

Δεν υπάρχει καμία σύγκρουση συμφερόντων

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Artificial Intelligence

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Introduction

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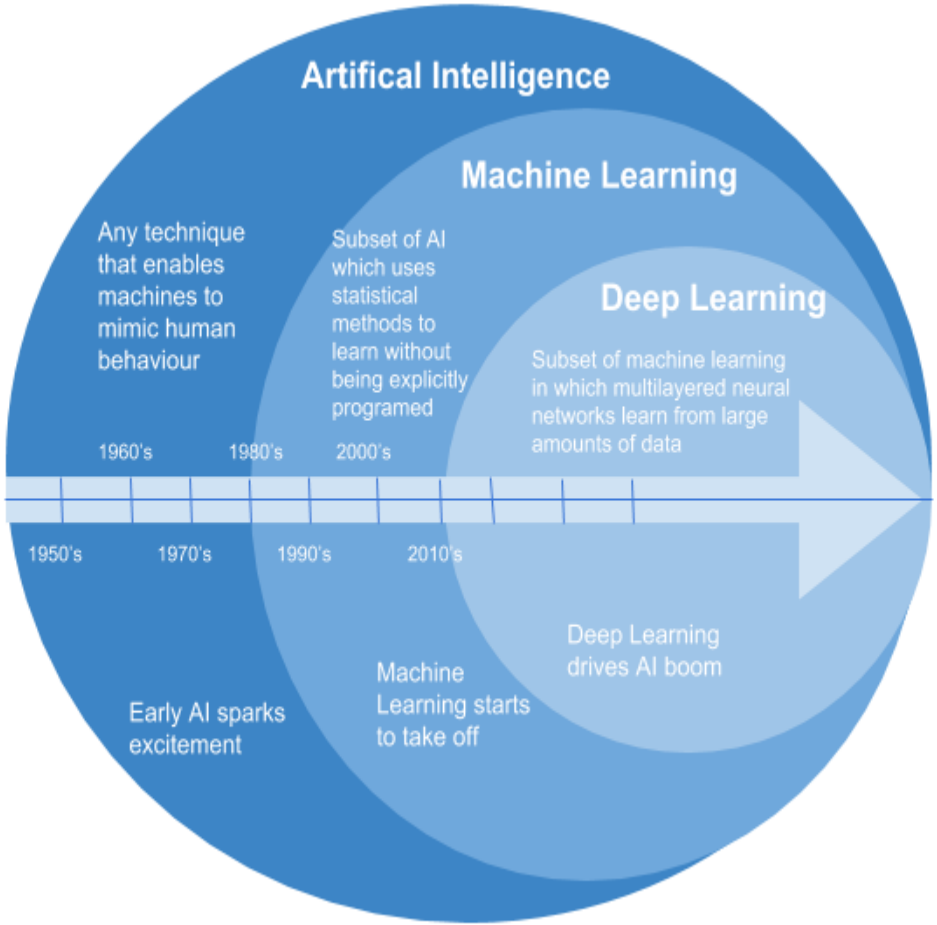
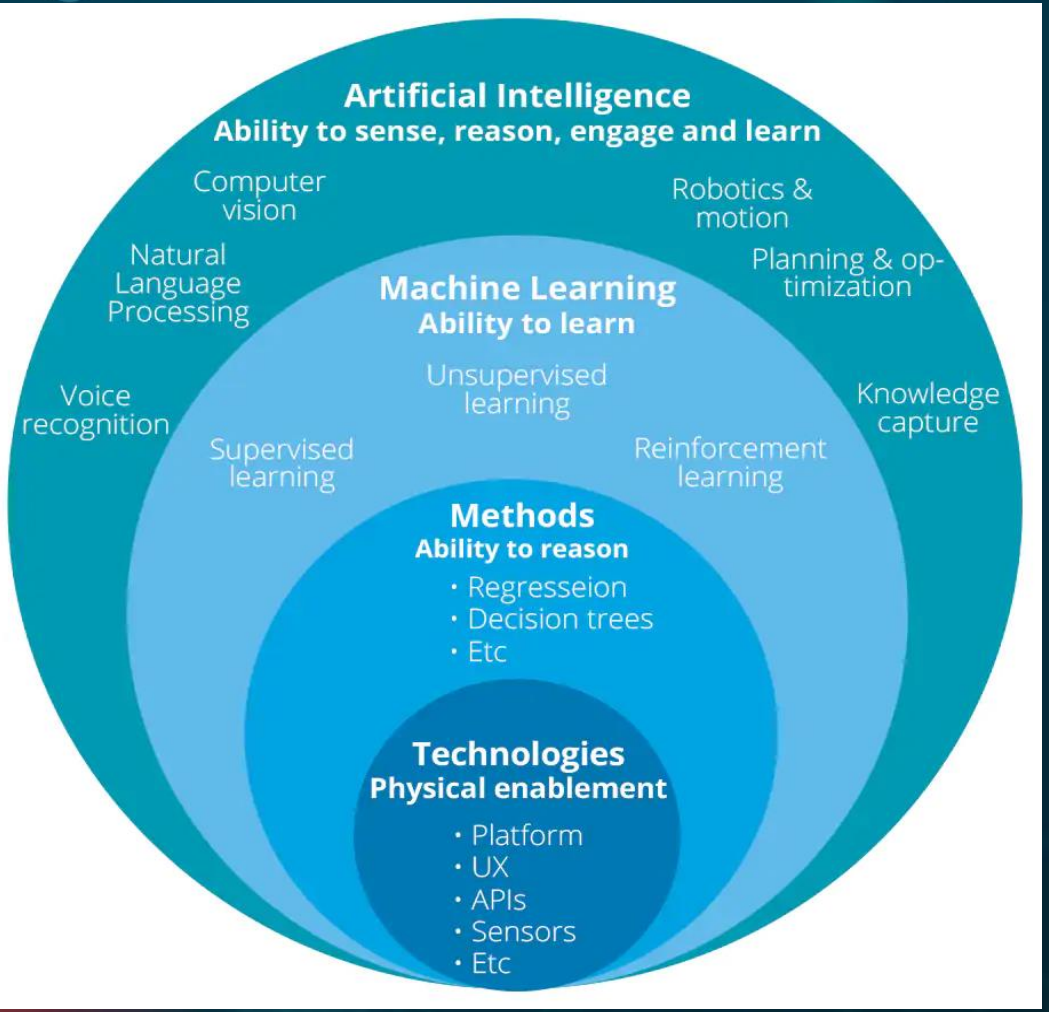


Artficial Intelligence — 1950

1980 — Machine Learning

Deep Learning — 2010

2020 — Adopted in all sectors



Artificial Intelligence Capabilities

The Three Types of AI

- Google Search
- Siri , Alexa, Cortana
- Image / facial recognition software
- Health Disease prediction tools
- Manufacturing and drone robots
- Email spam filters / social media monitoring tools for dangerous content
- Marketing content recommendations
- Self-driving cars

Artificial Narrow Intelligence (ANI)

We would need to find a way to make machines conscious, programming a full set of cognitive abilities. Machines would have to take experiential learning to the next level, not just improving efficiency on singular tasks, but gaining the ability to apply experiential knowledge to a wider range of different problems.

Artificial General Intelligence (AGI)

The concept of artificial superintelligence sees AI evolve to be so akin to human emotions and experiences, that it doesn't just understand them, it evokes emotions, needs, beliefs and desires of its own. ASI would theoretically be exceedingly better at everything we do.

Artificial Superintelligence (ASI)

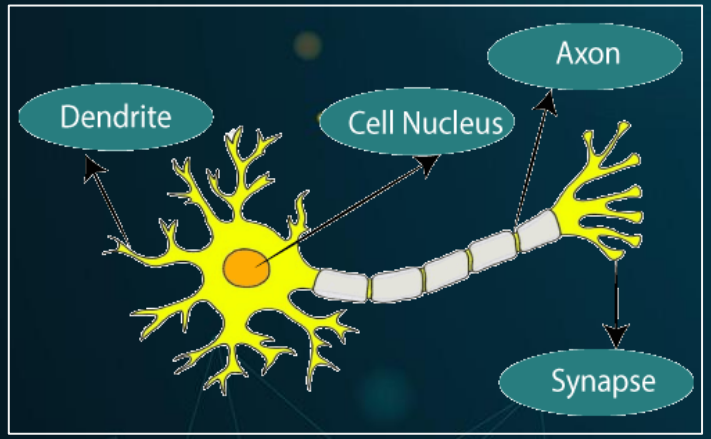
Autonomous Driving

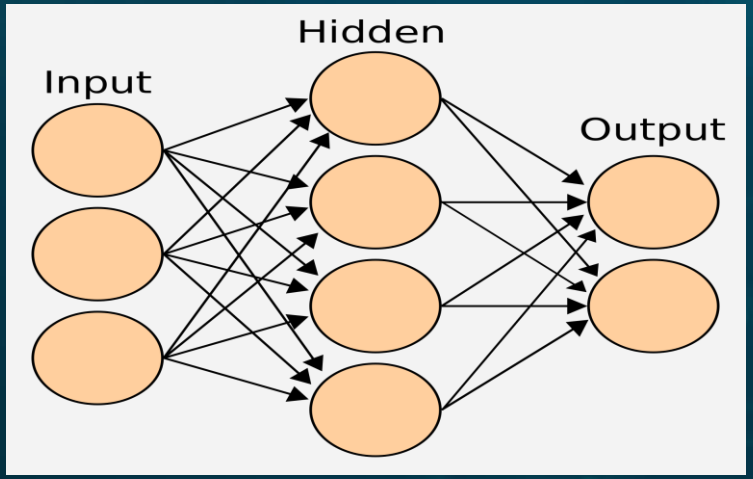
Machine Learning Deep Learning

02

Definition for **M**achine **L**earning(**ML**) and **D**eep **L**earning(**DL**)

Artificial Neural Networks(ANN)

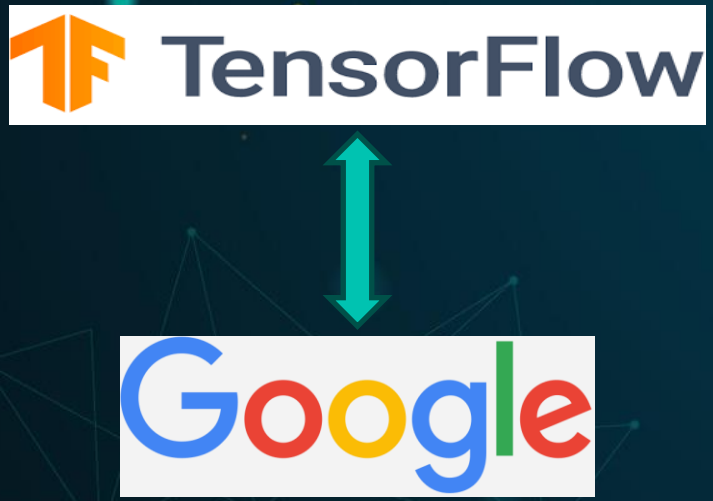


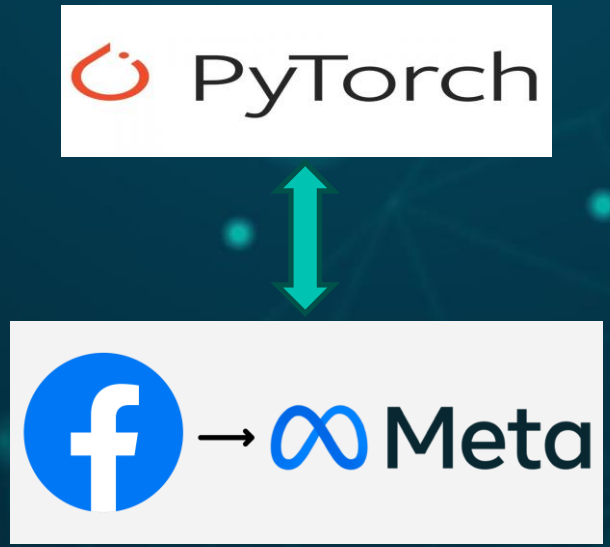


A neural network is composed of 3 types of layers:

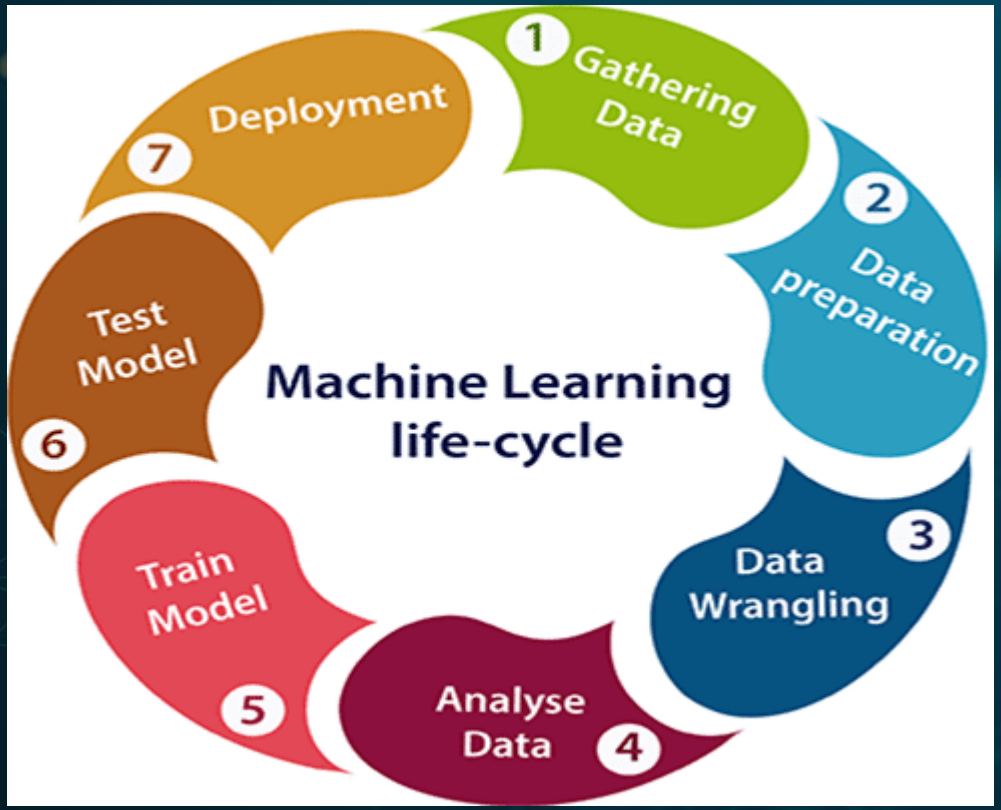
1. ***Input layer*** — It is used to pass in our input(an image, text or any suitable type of data for ANN).
2. ***Hidden Layer*** — These are the layers in between the input and output layers. These layers are responsible for learning the mapping between input and output and it does this through a series of matrix multiplications and mathematical transformations to learn these mappings.
3. ***Output Layer*** — This layer is responsible for giving us the output of the ANN given our inputs.

Major Deep Learning Frameworks

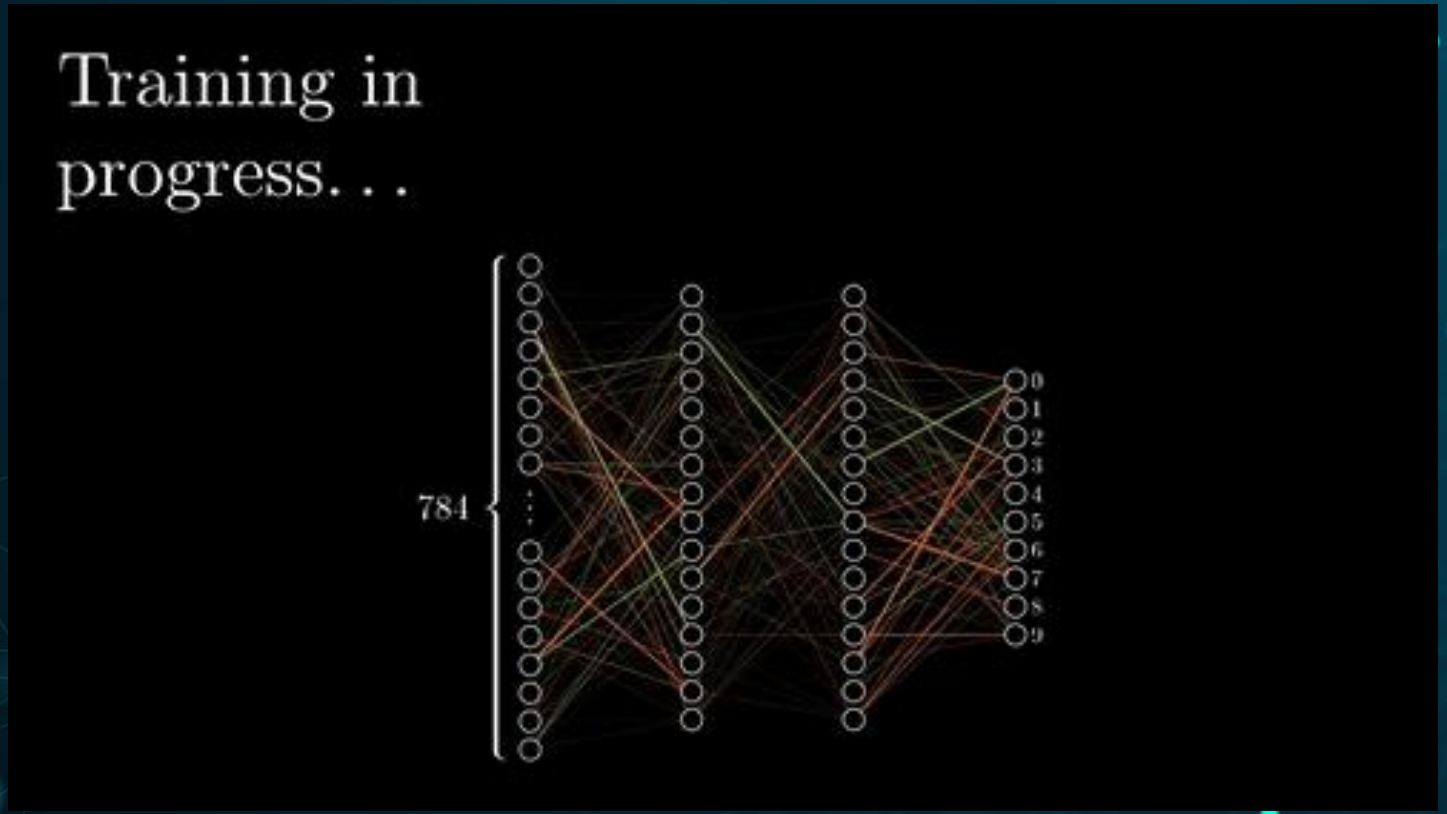




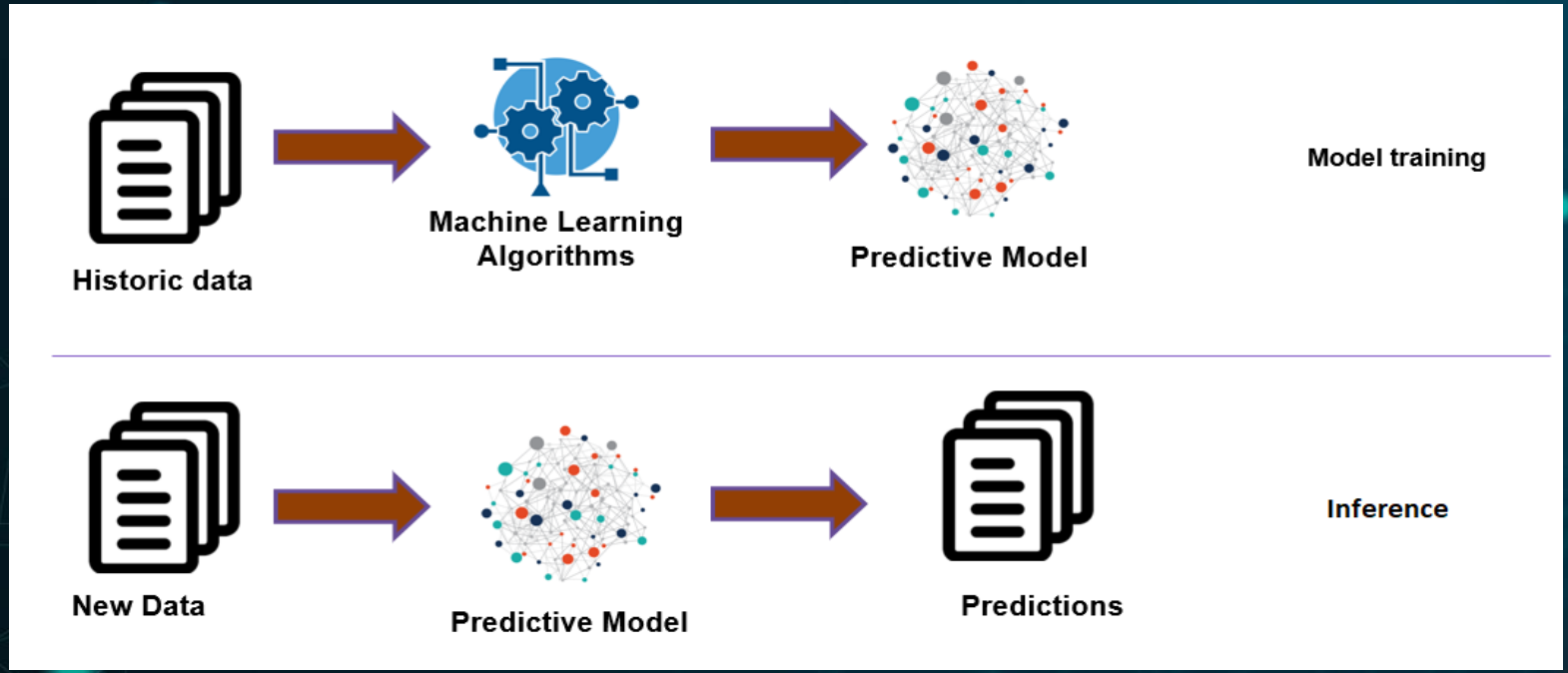
Machine Learning Life Cycle



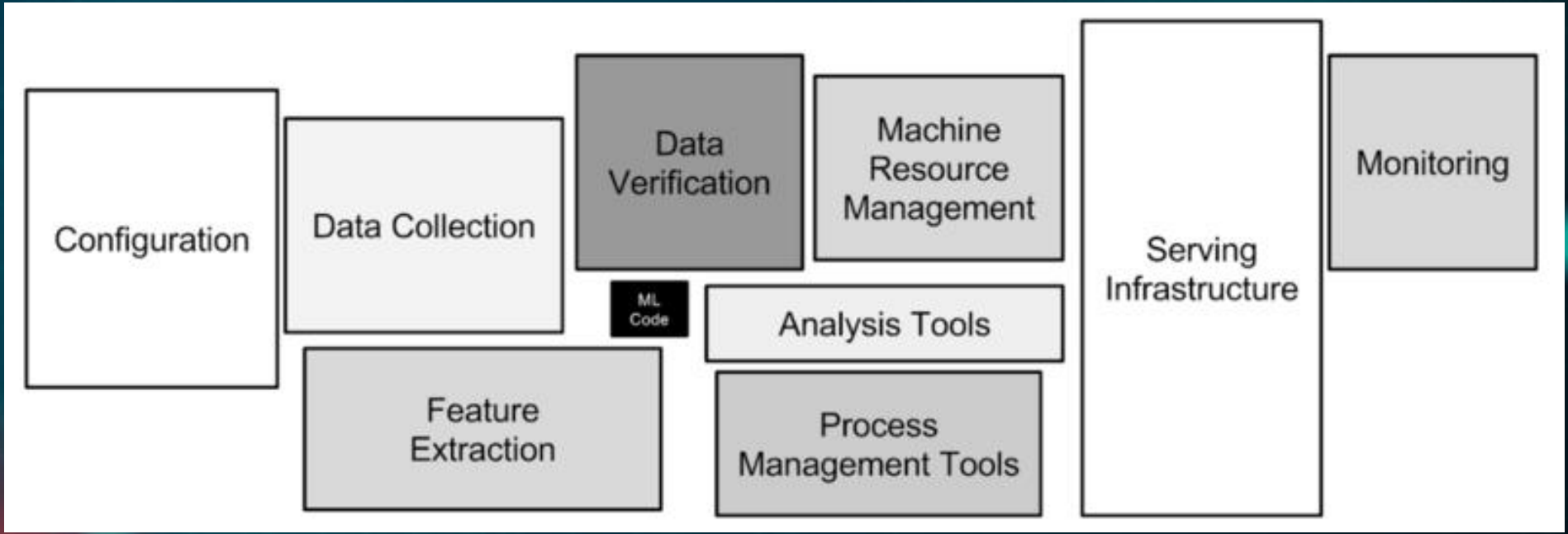
ML Model Training



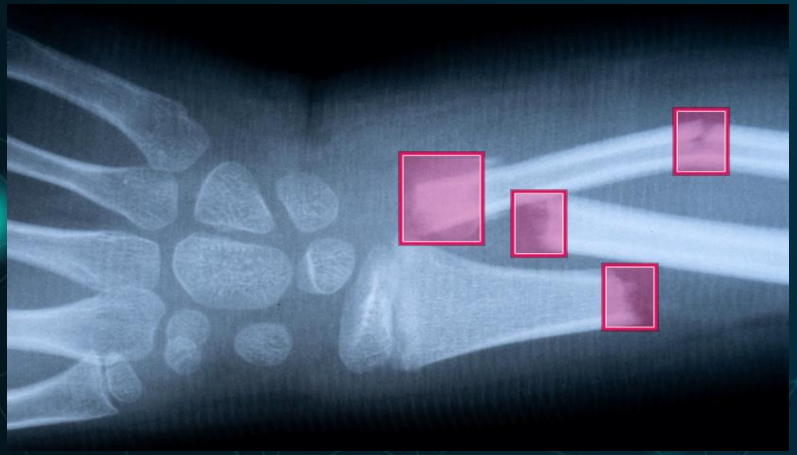
Machine Learning Model Training & Inference

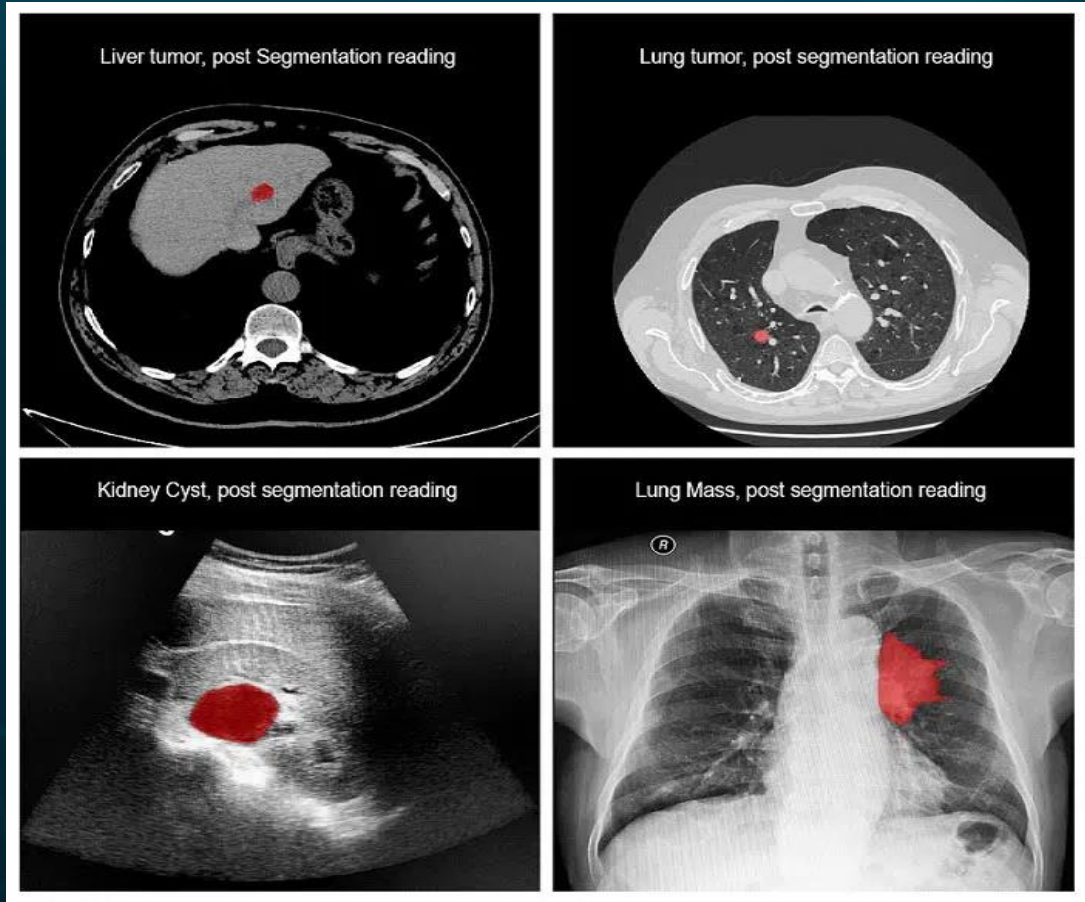


Time to ML Project



Computer Vision use cases





Time Series Use Cases

- Anomaly detection: Identification of rare events/observations which deviate from the normal/expected. Example: detecting critical health episodes such as arrhythmia from electro-cardiogram (ECG) signals.
- Forecasting: Predicting future values for a time series with respect to its past values (and other external variables). Example: predicting the number of hospital patients to optimize resource allocation and staffing levels.
- Classification: Mapping time series to a class label. Example: predict patient risk categories based on historic time series data during COVID-19 pandemic.
- Clustering: Assigning time series to groups (clusters) without prior knowledge of the groups. Example: detect gene expression changes across single-cell RNA sequences.
- Motif Discovery: Finding time series subsequences that are representatives of a data set or a class. Example: differentiation between types of motifs in blood glucose levels to identify poor glycemic control (repeated glucose level spikes in a temporally located region).

ECG Anomaly Detection

AI Breakthroughs

03

Real World Scenarios

GI Genious

The first-to-market, computer-aided polyp detection system — powered by artificial intelligence (AI). GI Genius™ intelligent endoscopy module has a 99.7% sensitivity rate and less than 1 percent false positives.

Activ Surgical

Activ Surgical announced that it has completed its first case with ActivSight Intelligent Light, a module that can be attached to laparoscopic and robotic systems to provide enhanced visualization during surgery.

By leveraging AR, AI, ML and sensing-based technologies, the ActivEdge Platform will enable surgeons to view critical physiological structures and functions that cannot be seen with the naked eye. By visually mapping the surgical field, Activ Surgical aims to empower surgeons to see the unseen and extend gold standard insights to all surgical systems.

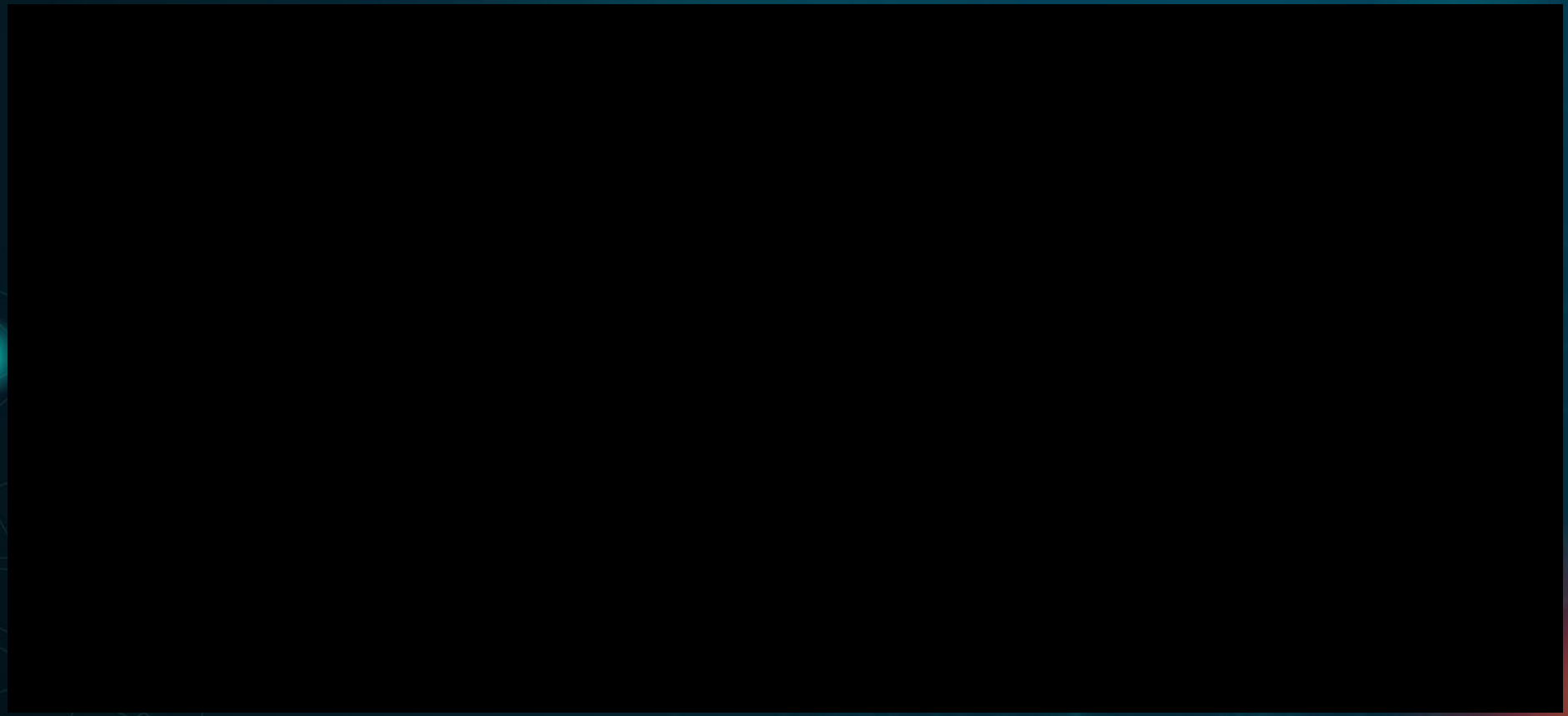
The first AI-enabled ActivSight surgery took place on Dec. 22, 2022, at the Ohio State University Wexner Medical Center. Dr. Matthew Kalady performed a laparoscopic left colectomy using the colorectal AI mode within ActivSight.

Activ Surgical

Proprio

The system uses light field computer vision and AI to help surgeons visualize the patient's anatomy and surgical space in three dimensions without radiation. Sensors and four cameras in different positions monitor the procedure in real-time, stitching the different views together to help a surgeon visualize from different angles and around obstructions. Proprio announced FDA clearance of the Paradigm system in late April.

Proprio

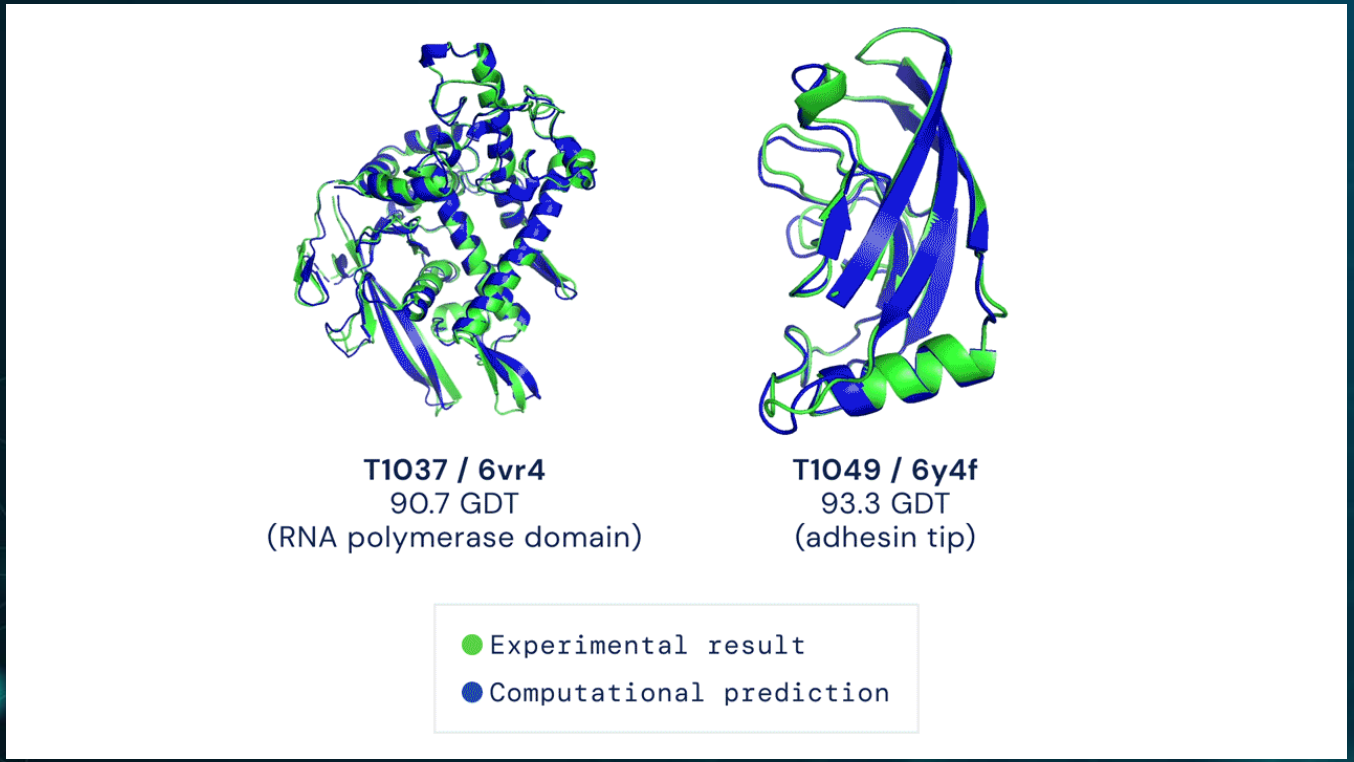


Nuance & Microsoft

DAX Express is an automated clinical documentation application integrated into the workflow that is the first to combine proven conversational and ambient AI with the advanced reasoning and natural language capabilities of OpenAI's GPT-4. Extending the proven Dragon Medical portfolio of solutions and building on the market-leading DAX ambient solution launched in 2020, DAX Express is the next milestone in Nuance's long-standing mission to reduce administrative burden and empower clinicians to spend more time taking care of patients and less time on paperwork.

Google DeepMind

AlphaFold can accurately predict 3D models of protein structures and is accelerating research in nearly every field of biology.



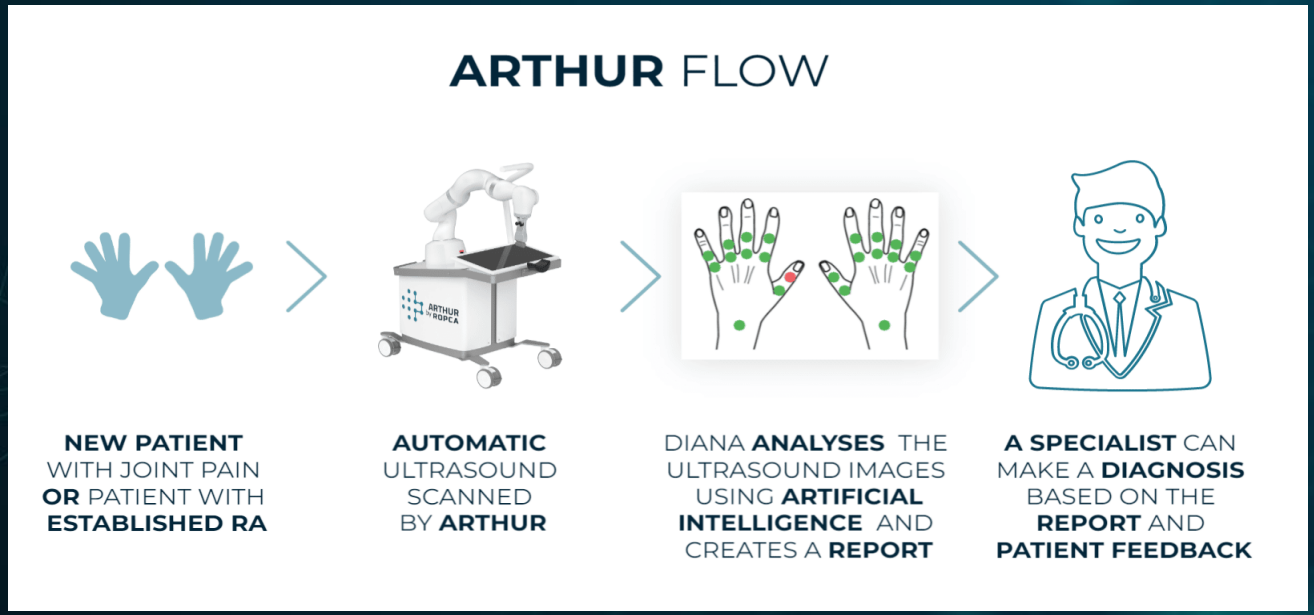
Illumina

Illumina unveils AI software to predict disease-causing genetic mutations in patients. a global leader in DNA sequencing and array-based technologies, today announced the new PrimateAI-3D, an artificial intelligence (AI) algorithm that predicts with unprecedented accuracy disease-causing genetic mutations in patients. The results are published in two papers in the June 2 issue of Science (issue 6648), detailing the training of the algorithm and its application to half a million genomes in the UK Biobank cohort. Two accompanying papers on the primate evolution research that informed the development of PrimateAI-3D also published in the journal.

According to the National Institutes of Health, the amount of genomic data being generated is approaching 40 billion gigabytes each year. The ability to share, analyze, and interpret genomic data is critical to unlocking discoveries that will advance understanding of human health and improve precision medicine.

ROPCA

ROPCA automates the process of ultrasound imaging and image assessment. The platform ARTHUR, with the included artificial intelligence product DIANA, present a solution, to both the increasing number of RA patients, the hospital cost, and the lack of specialists. RA has become more widespread among the elderly, and with the worldwide population increasingly aging, RA is soon going to present a larger problem for to health care system and automation will play a key role in solving this challenge.



Considerations for AI

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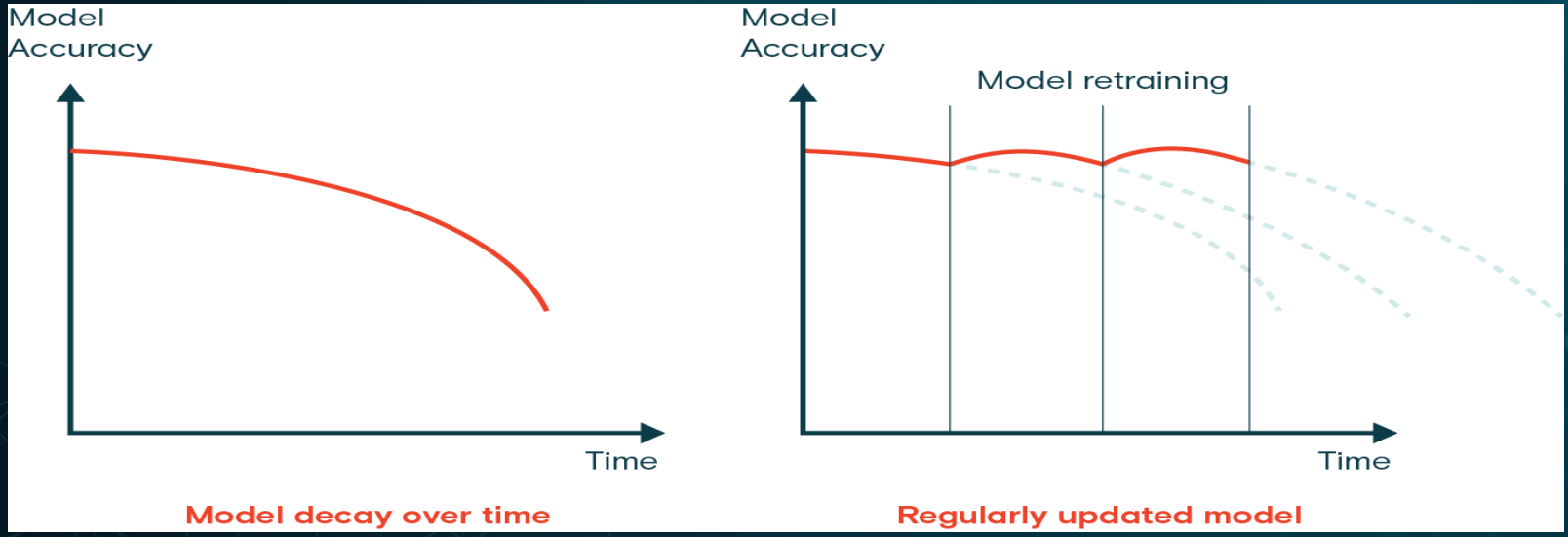
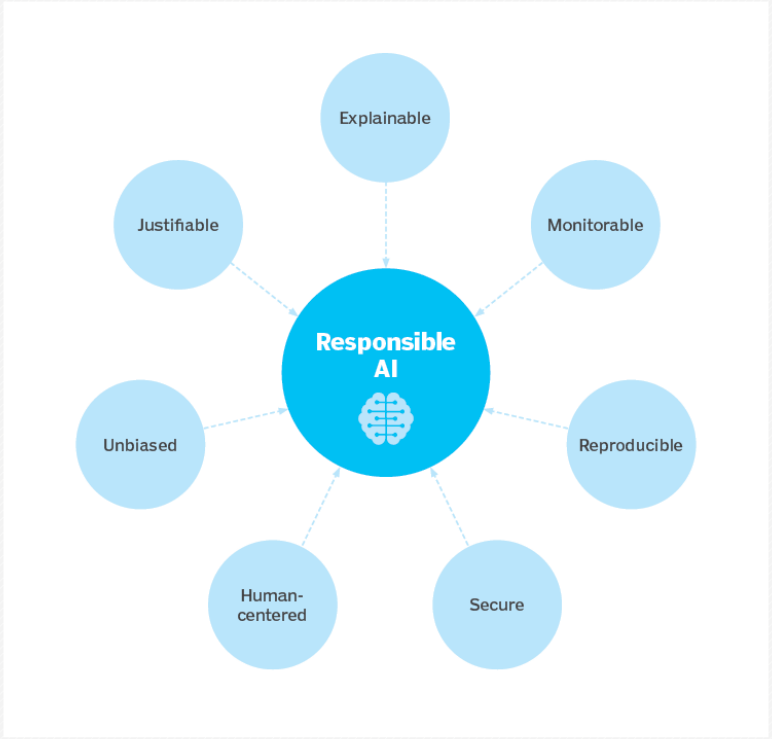
General Considerations

Machine Learning Model Drift



When the model starts to lose its predictive power.
The solution is to retrain the model on a new training set, which reflects the current reality.
How often should you retrain your model? And how do you determine your new training set?
The answer is that ”*it depends”.*
Monitoring the performance by some indicators will help you understand when is time or retraining.

Precision



Responsible AI is the practice of designing, developing, and deploying AI with good intention to empower employees and businesses, allowing companies to engender trust and scale AI with confidence.

Make a best effort towards transparency so that any decisions made by AI are explainable.

The data used to train machine models should not be biased.

The analytic models that support an AI initiative can be adapted to changing environments without introducing bias.

The organization deploying AI is sensitive to its potential impact -- both positive and negative.

Design for responsibility. Review for responsibility early in development.

The way actual users experience our system is essential to assessing the true impact of its predictions, recommendations, and decisions.

Will we lose our jobs?

THANKS!

Do you have any questions?

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