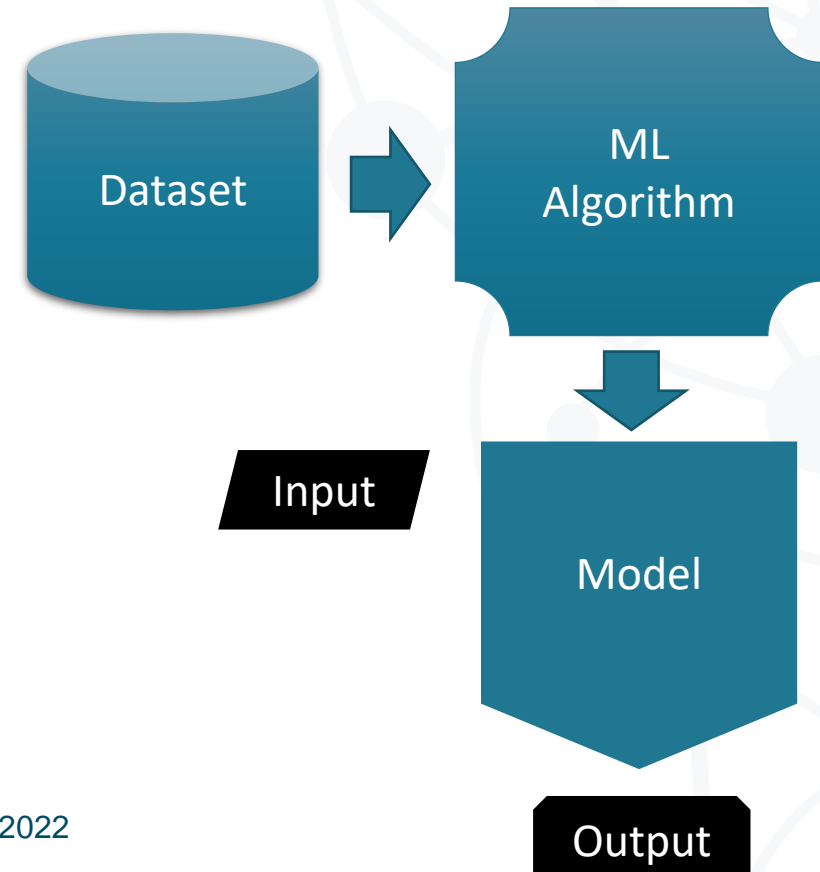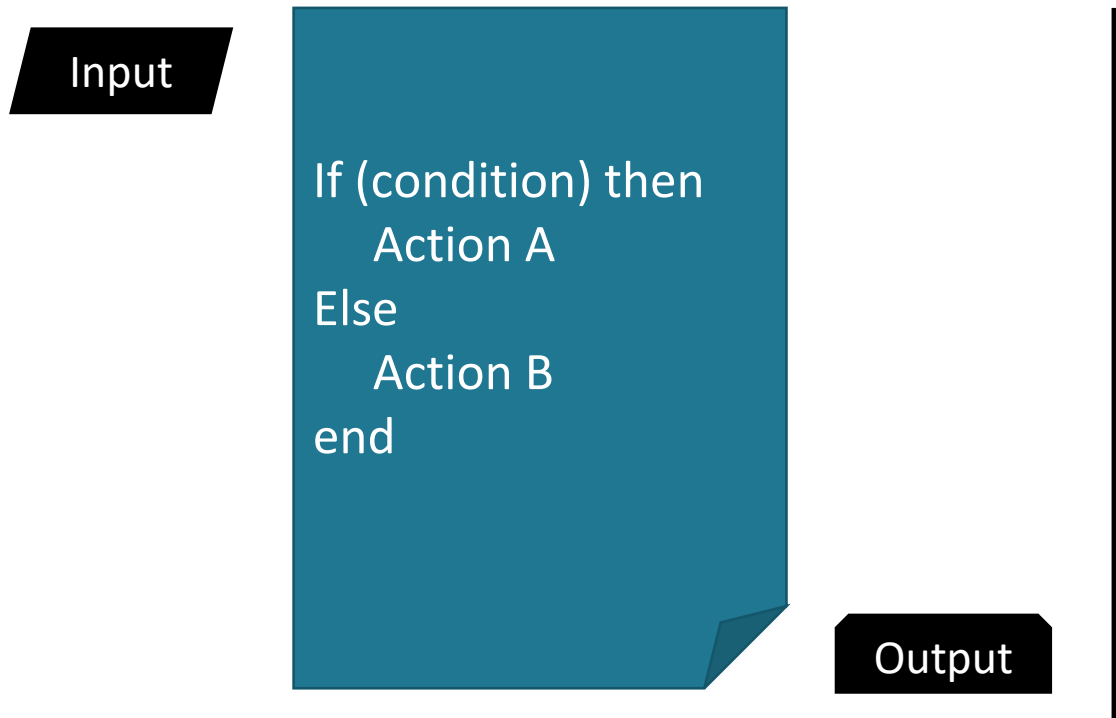# The Technical and Ethical limits of AI
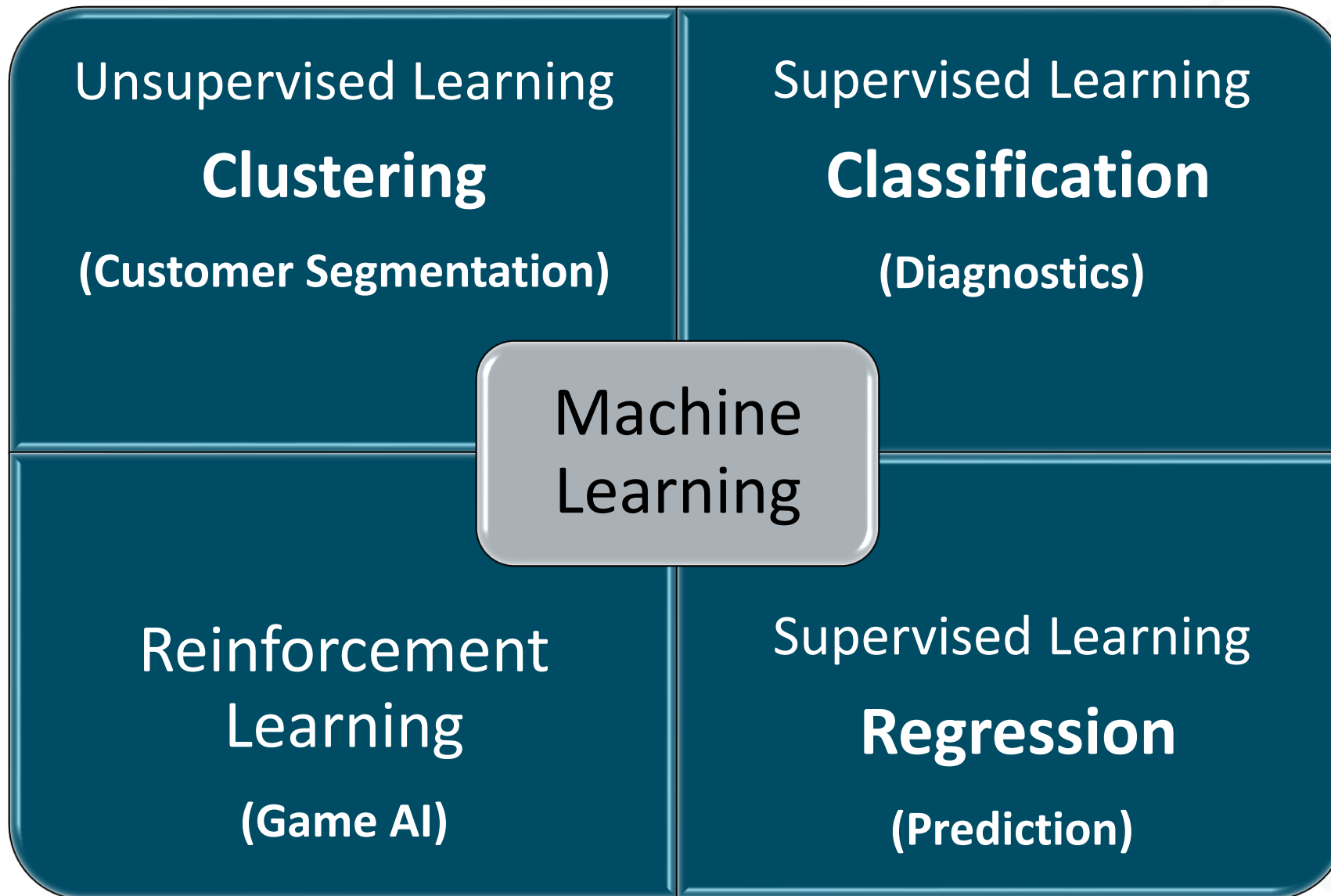
Haytham El Miligi

Agenda

- Introduction

- Machine Learning Pipeline

- Technical Challenges

- Ethical Concerns

- Open Discussion

Introduction

- There are two ways in which you can program a computer

Input

```
If (condition) then
    Action A
Else
    Action B
end
```

Output

Dataset → ML Algorithm

Input

Model

Output

Unsupervised Learning
Clustering
(Customer Segmentation)

Supervised Learning
Classification
(Diagnostics)

Machine Learning

Reinforcement Learning
(Game AI)

Supervised Learning
Regression
(Prediction)

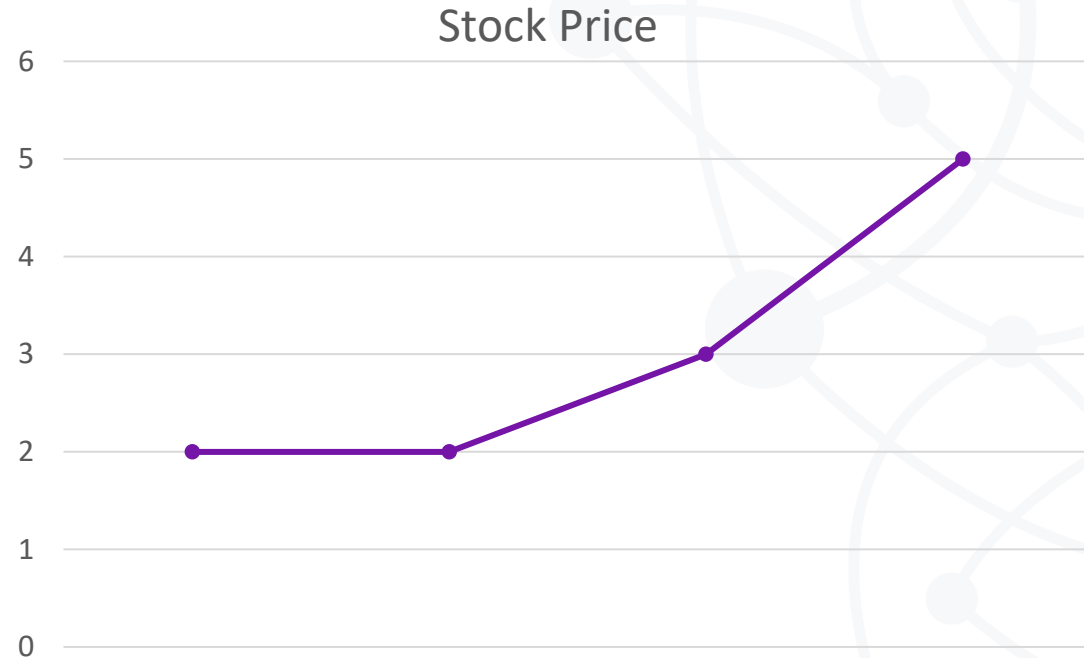# Supervised Learning
Classification

Supervised learning is **an approach to creating artificial intelligence (AI)**, where a computer algorithm is trained on input data that has been labeled for a particular output.
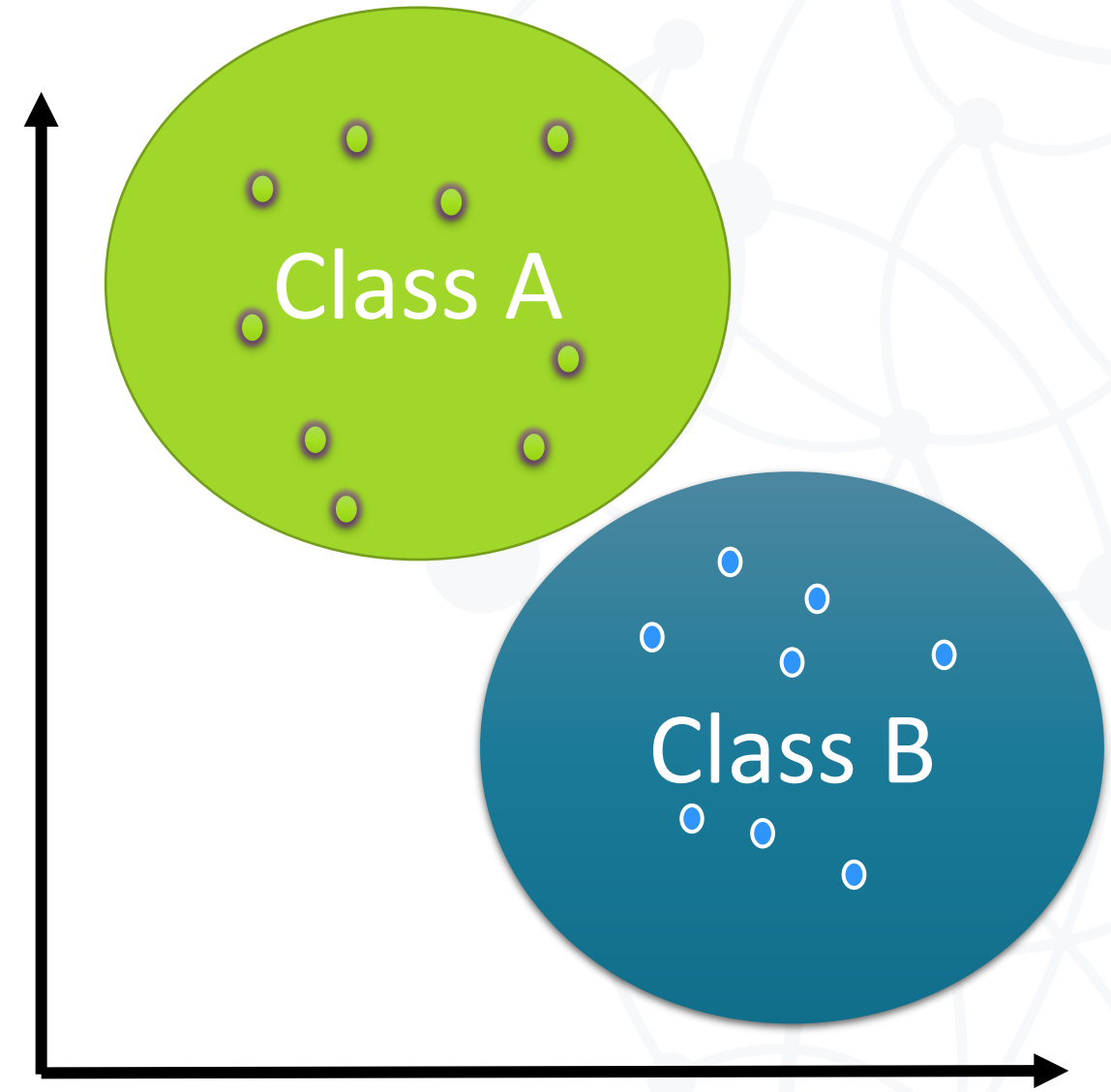
Supervised Learning
Regression

Regression tasks are different, as they expect the model to produce a numerical relationship between the input and output data

Stock Price

Unsupervised Learning
Clustering

In unsupervised learning, the algorithm is given unlabeled data as a training set. Unlike in supervised learning, there are no correct output values; the algorithm determines the patterns and similarities within the data, as opposed to relating it to some external measurement.

**Cluster A**

Cluster B

Cluster C
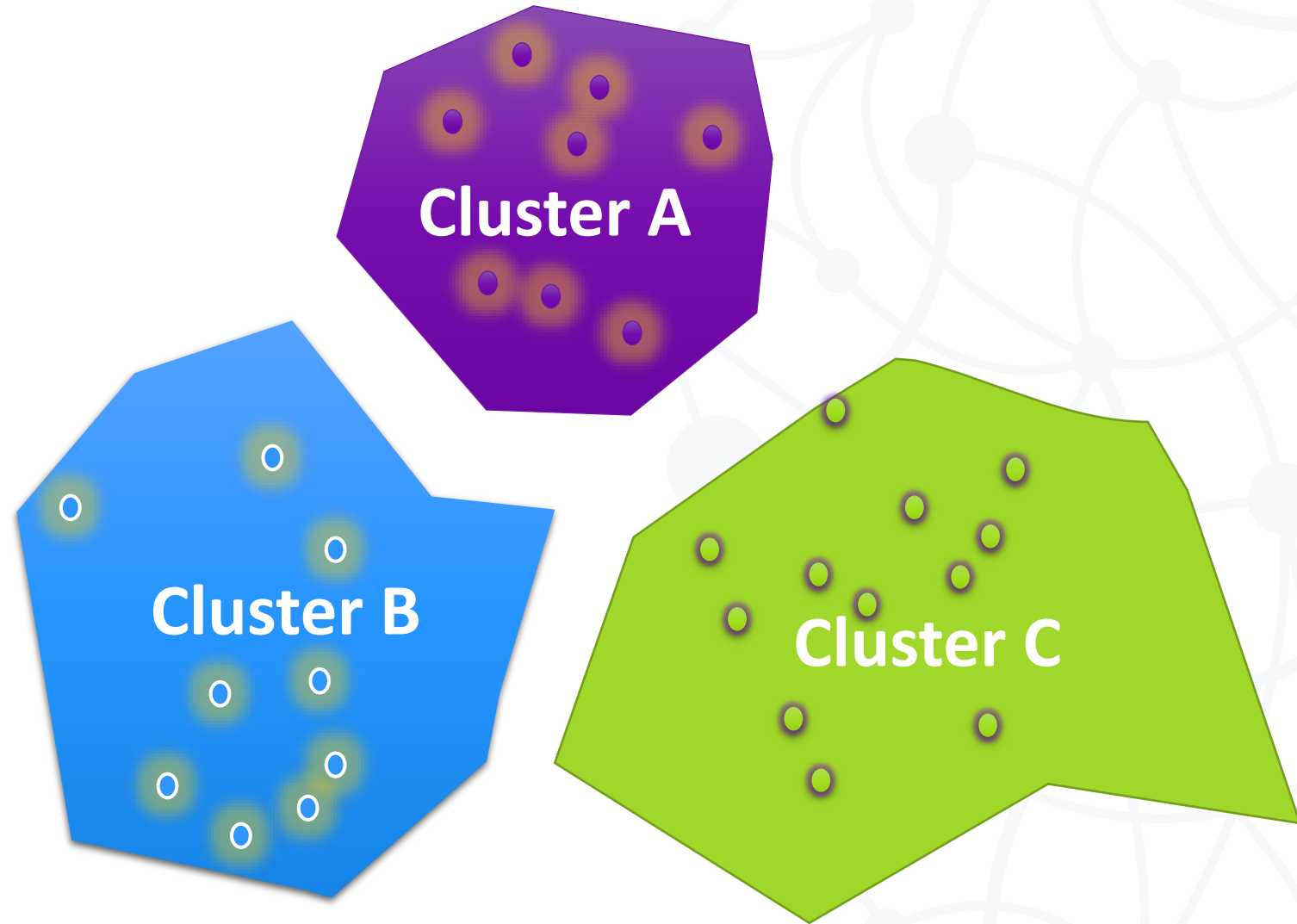
Reinforcement Learning

Reinforcement Learning(RL) is a type of machine learning technique that enables an agent to learn in an interactive environment by trial and error using feedback from its own actions and experiences.

Reinforcement learning uses rewards and punishment as signals for positive and negative behavior.

Problem formulation

Tumor Classification

Benign   **Malignant**
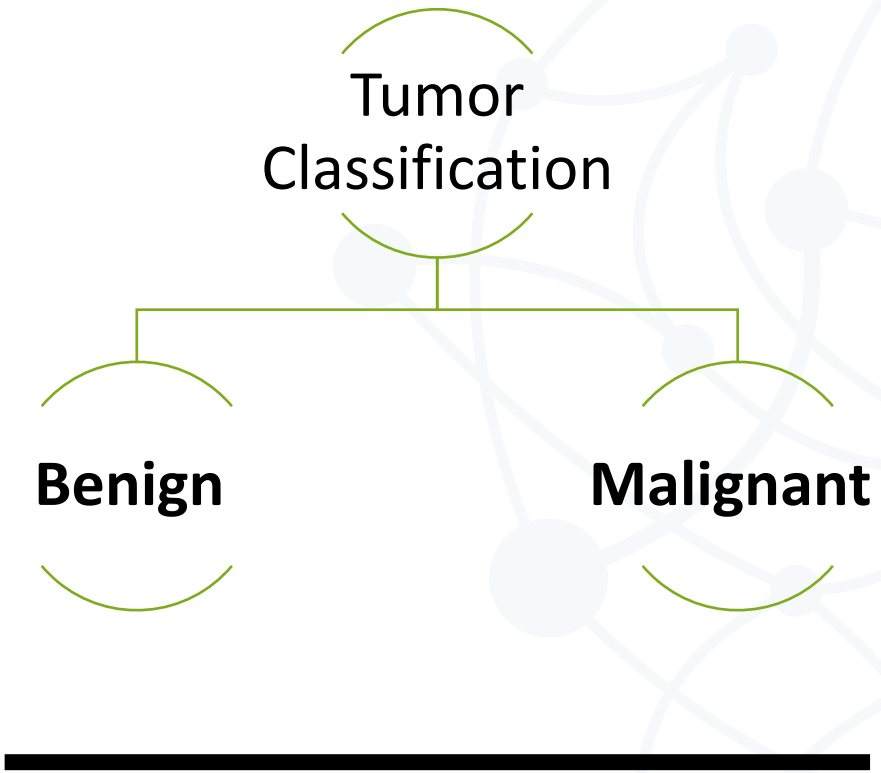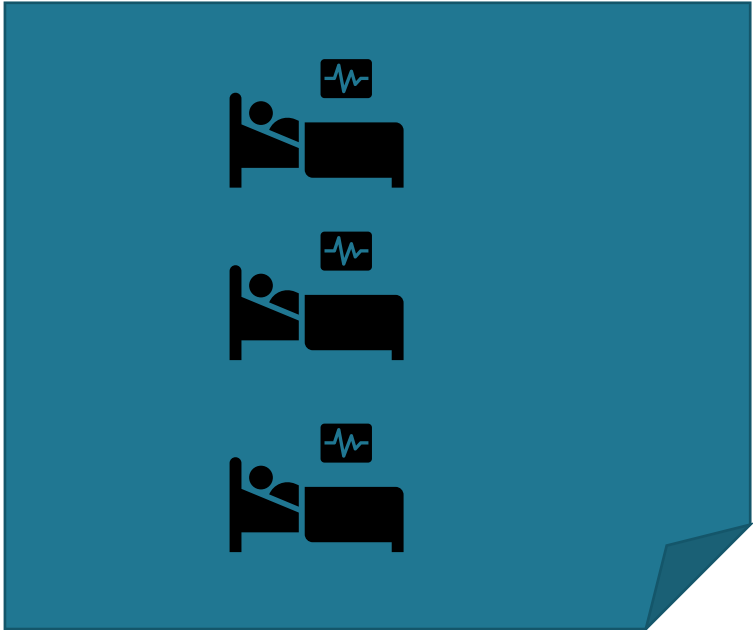
Probability of identifying a tumor as ==Benign== = 98%

AI Revenue by Segment

Consumer Artificial Intelligence Total Revenue by Segment, World Markets: 2016-2025
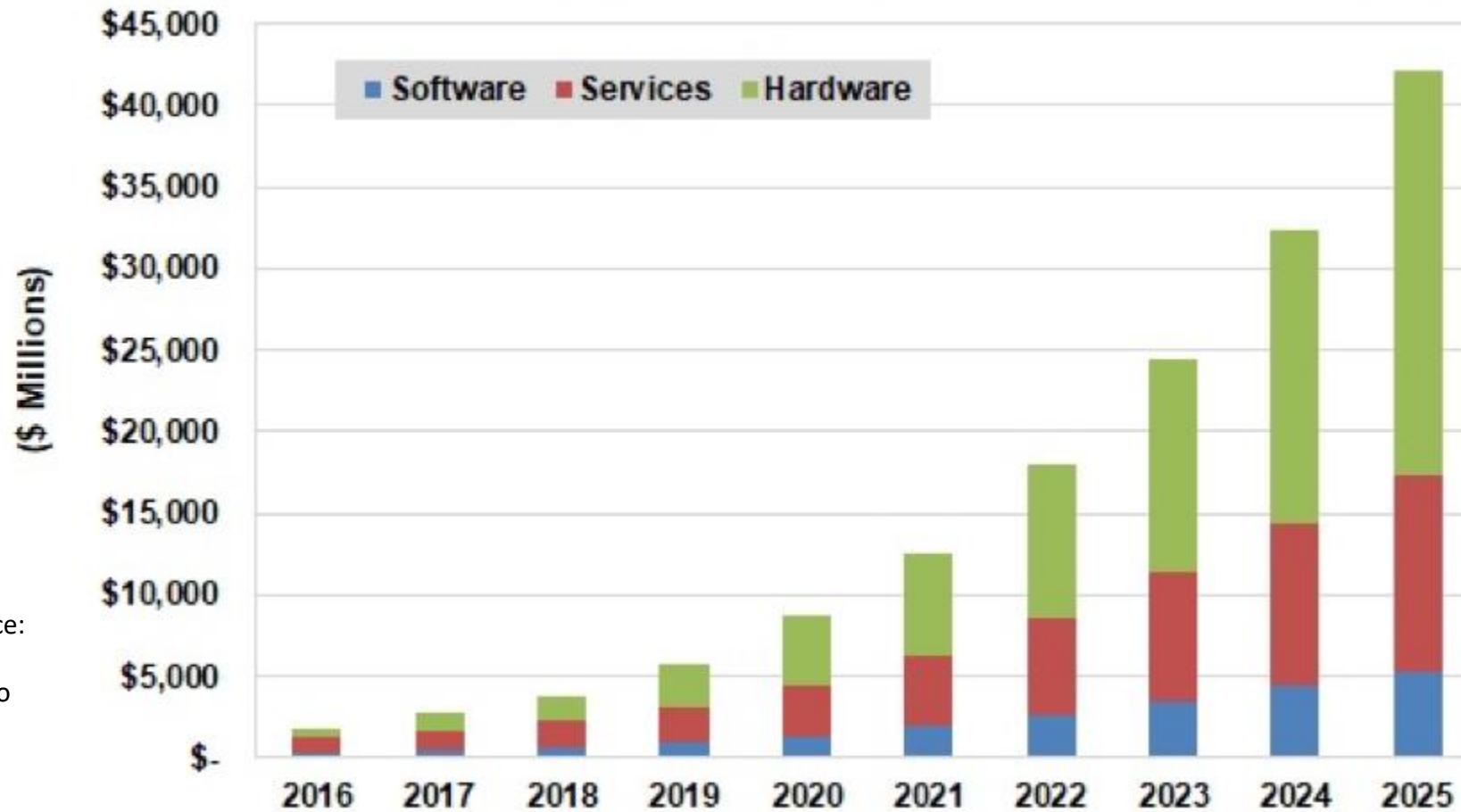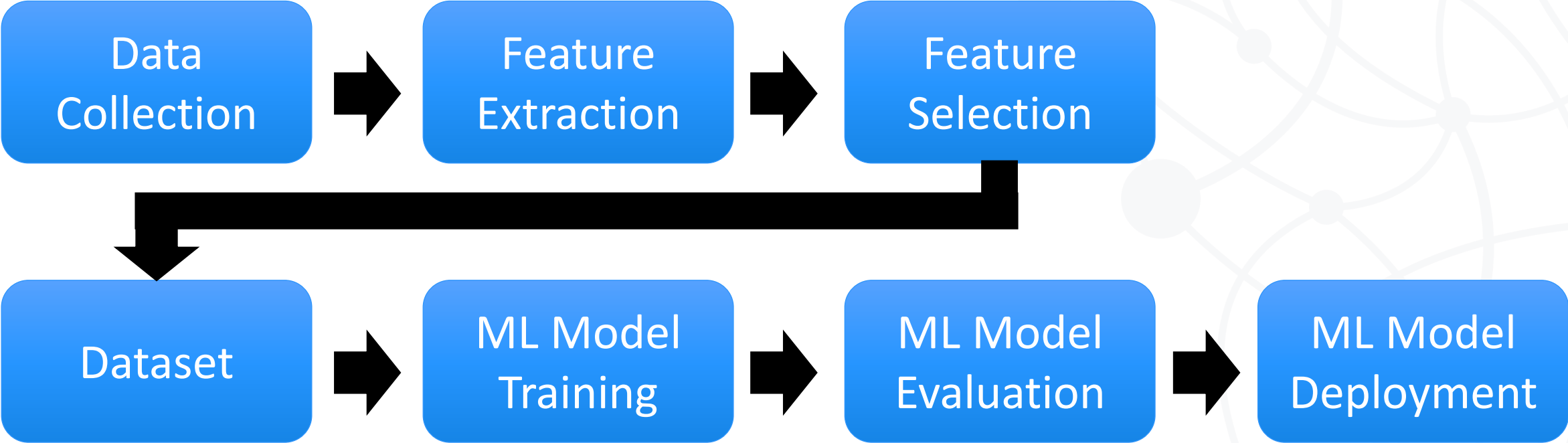
Image Source:
https://semiengineering.com/t
next-phase-of-machine-learnin

AI revenue by segment. Source:
Tractica Report
https://omdia.tech.informa.co
m/topic-pages/artificial-
intelligence

Machine Learning Pipeline


```
Data Collection → Feature Extraction → Feature Selection
                                              ↓
Dataset → ML Model Training → ML Model Evaluation → ML Model Deployment
```
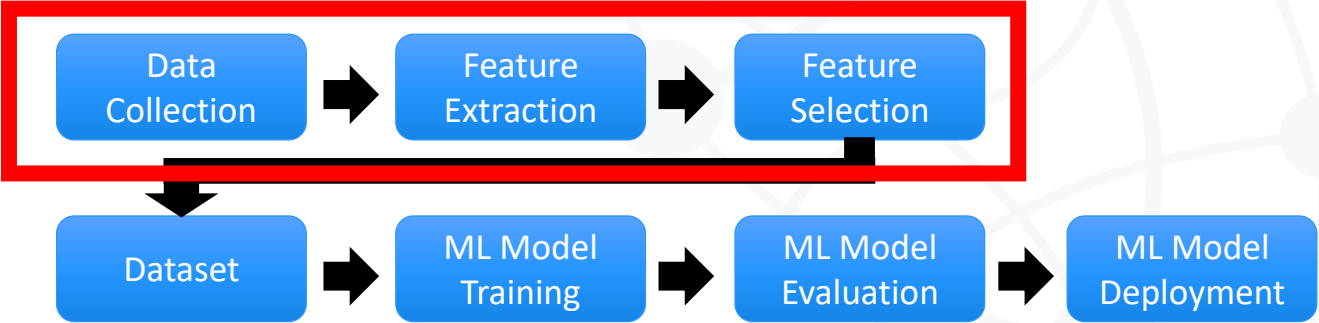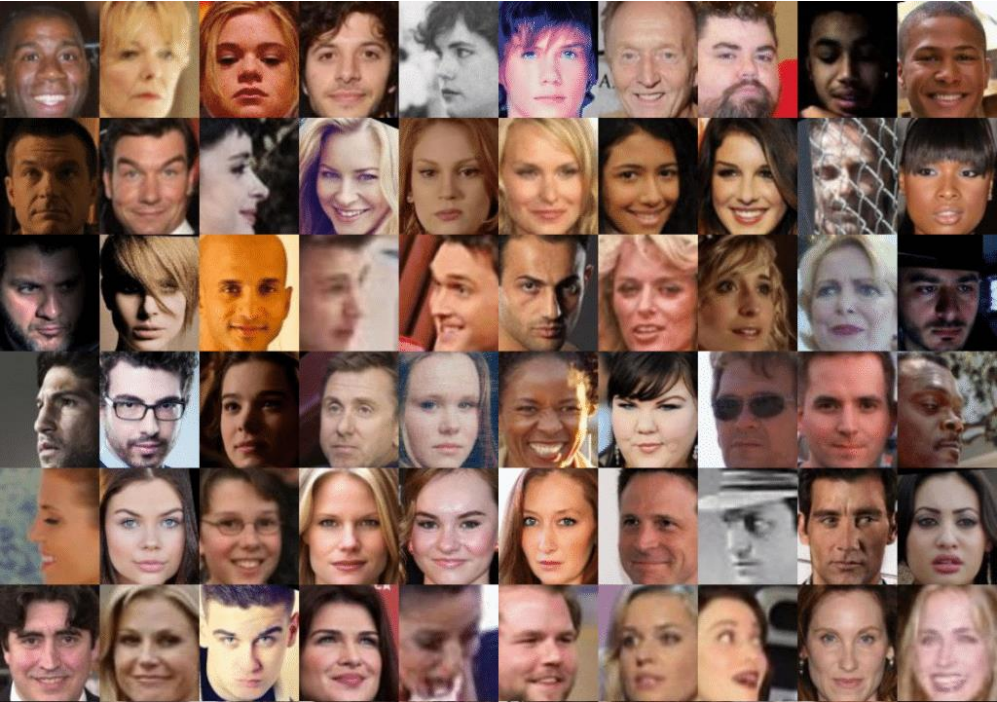
Machine Learning Pipeline

Image Source: https://www.biometricupdate.com/201910/megaface-facial-recognition-dataset-origin-raises-privacy-and-liability-concerns
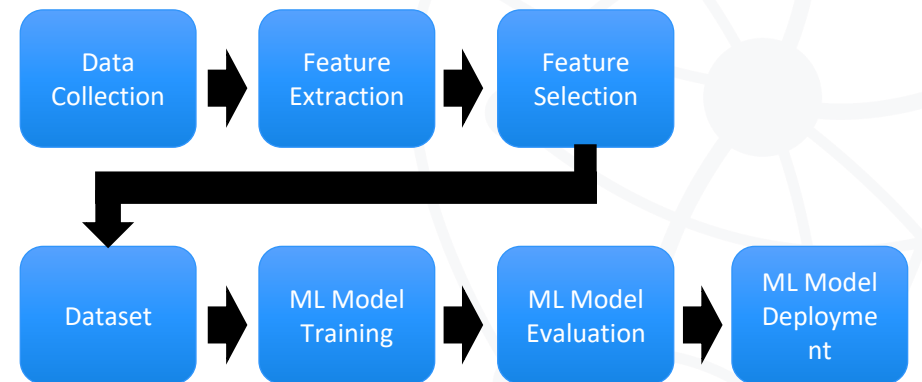
BCNET CONNECT

Technical Challenges

Quality of the datasets used to create the predictive models

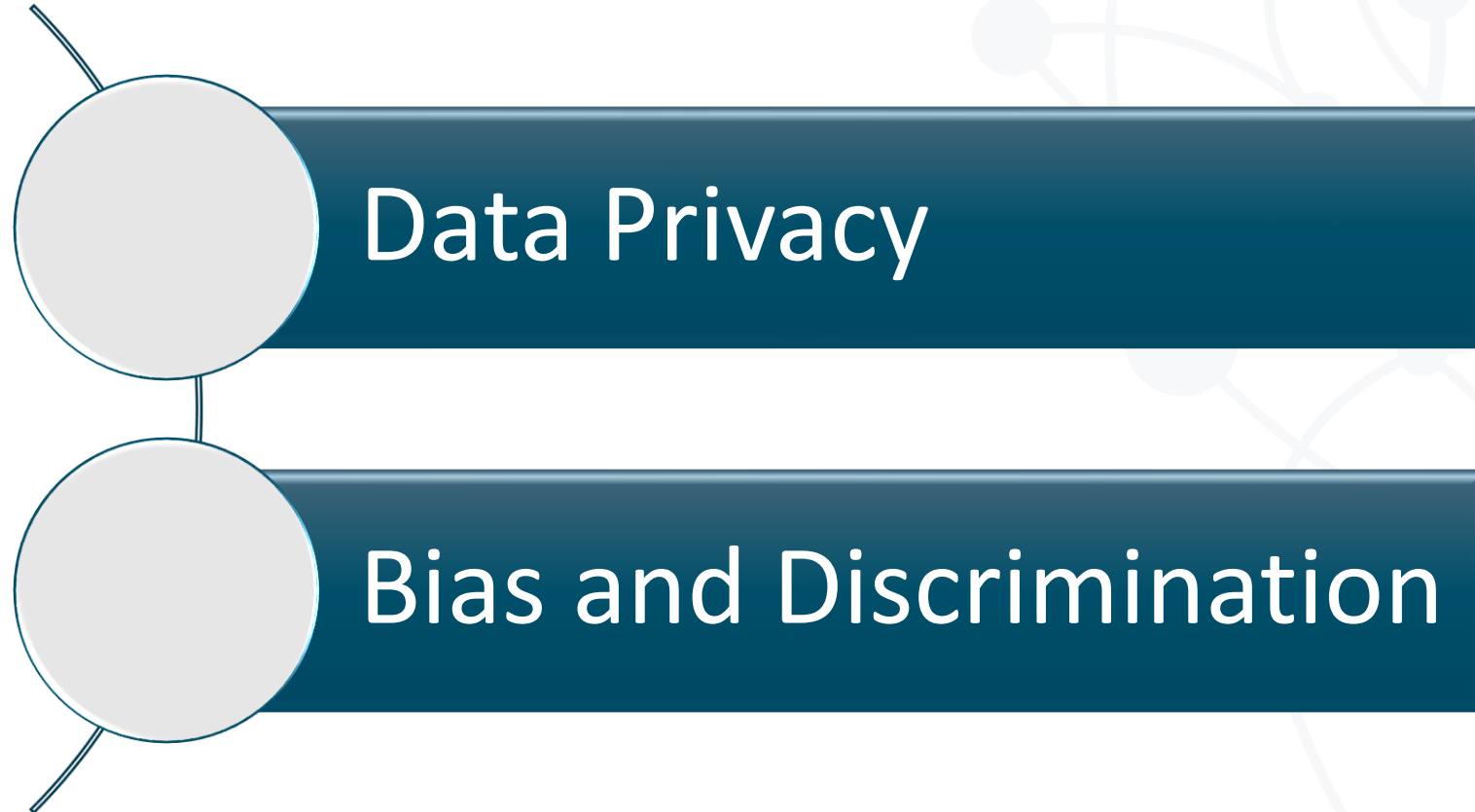Feature selection criteria used to identify the feature vectors

The evaluation methods used to calculate the accuracy of the models

Feature engineering techniques used in machine learning

The algorithms used to train the predictive models

Data Collection → Feature Extraction → Feature Selection

Dataset → ML Model Training → ML Model Evaluation → ML Model Deployment

Ethical Concerns

Data Privacy

Bias and Discrimination

Data Privacy

Personal Information Protection Act - BC

The *Personal Information Protection and Electronic Documents Act*

PIPEDA's 10 fair information principles form the ground rules for the collection, use and disclosure of personal information, as well as for providing access to personal information.

Image Source: https://www.priv.gc.ca/en/privacy-topics/privacy-laws-in-canada/the-personal-information-protection-and-electronic-documents-act-pipeda/p_principle/

Principle 1 - Accountability

An organization is responsible for personal information un accountable for its compliance with these fair information

Principle 2 - Identifying Purposes

The purposes for which the personal information is being before or at the time of collection.

Principle 3 - Consent

The knowledge and consent of the individual are required information, except where inappropriate.

Principle 4 - Limiting Collection

The collection of personal information must be limited to t by the organization. Information must be collected by fair

Principle 5 - Limiting Use, Disclosure, and Retention

Unless the individual consents otherwise or it is required b disclosed for the purposes for which it was collected. Pers required to serve those purposes.

Bias and Discrimination Concerns

- Transferring existing human bias to AI

- Using AI to directly discriminate between people

Transferring existing human bias to AI

MIT News
ON CAMPUS AND AROUND THE WORLD

# Study finds gender and skin-type bias in commercial artificial-intelligence systems

Examination of facial-analysis software shows error rate of 0.8 percent for light-skinned men, 34.7 percent for dark-skinned women.

https://news.mit.edu/2018/study-finds-gender-skin-type-bias-artificial-intelligence-systems-0212

China's social credit system

China's social credit system gives the state the power to monitor every move, of every citizen. The system links footage from 200 million closed circuit TV cameras with people's personal data, letting the state rank its citizens based on their private lives.

Source: https://www.cbc.ca/player/play/1338805315670
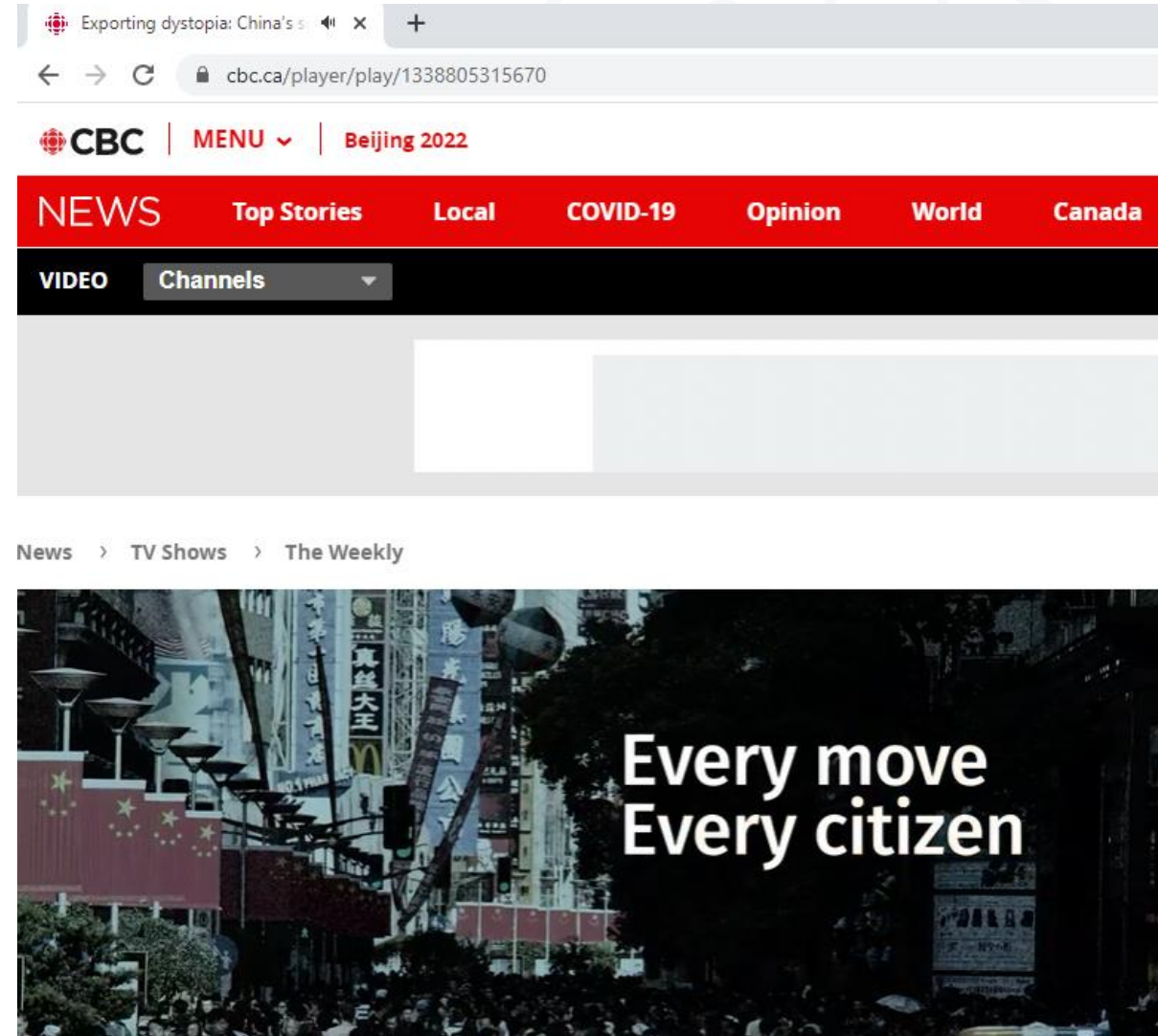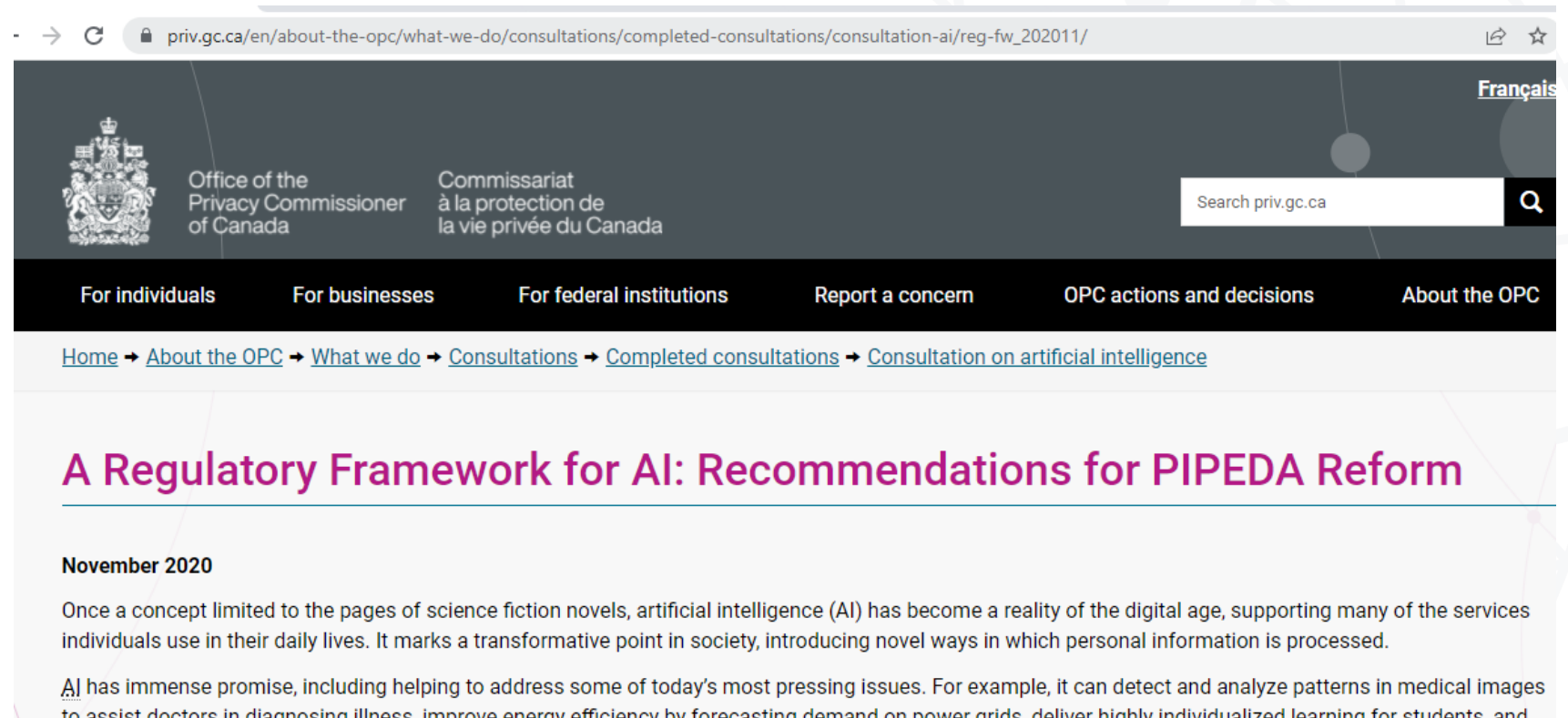
AI Regulations

In Canada, there is no AI-specific regulation yet.

Source: https://www.priv.gc.ca/en/about-the-opc/what-we-do/consultations/completed-consultations/consultation-ai/reg-fw_202011/

Open Discussion