AGGREGATING CHAOS

WHERE MACHINE LEARNING AND THE REAL WORLD COLLIDE
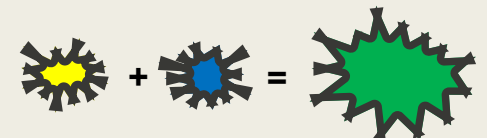
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Me!

Anna Rajander

Senior Manager Business Analysis - RAC
Perth Branch Chair - IIBA Australia Chapter

*BSc/BComm (ANU), MSc(IT) (UNSW),
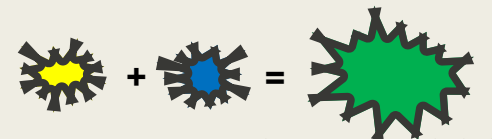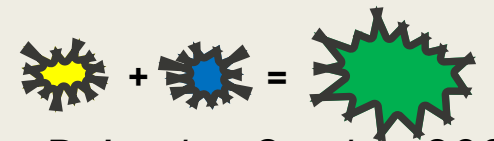GradCert(Maths) (Open), DipBA (BCS)*

Contents...

This presentation will cover:

- What is Machine Learning (ML)

- Considerations when applying ML

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First…. Some Fun!

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Spotify
Your top artists

1
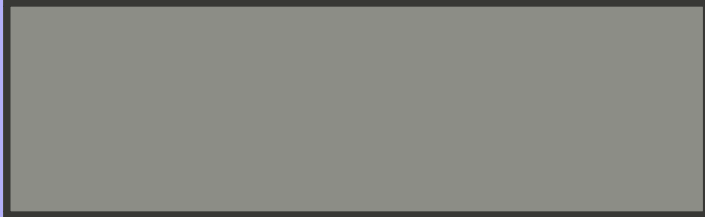
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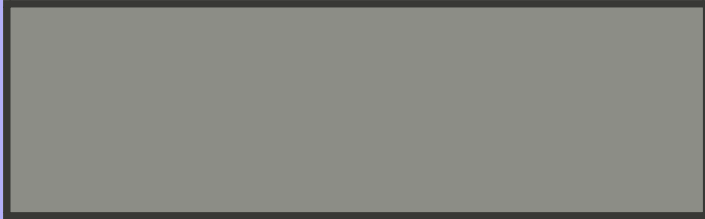
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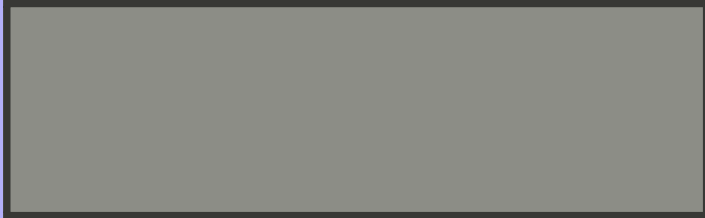
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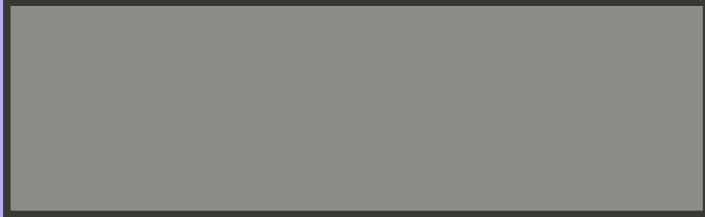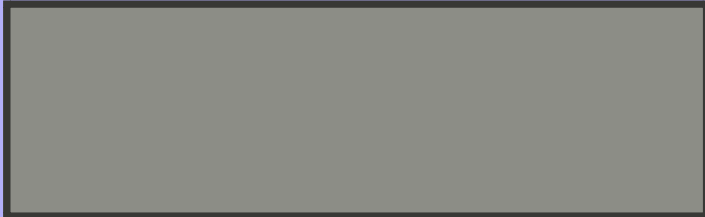
Anna's 2023 Spotify Top Artists

1. American metalcore act, *Emmure*

2. British progressive rock/metal act, *Sleep Token*

3. Australia progressive synth metal act, *Voyager*

4. Music from the hit Australian children television series, *Bluey*
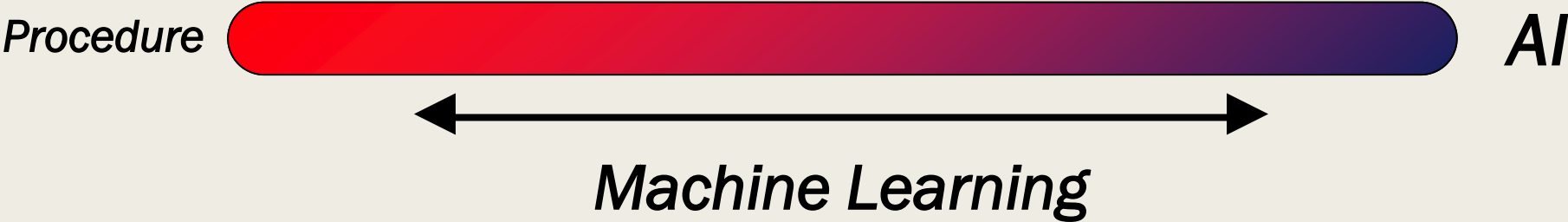
5. British progressive metal act, *TesseracT*
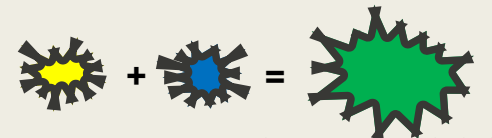
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Definitions
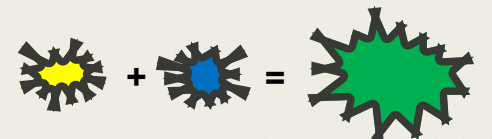
Changing Definition of ML...

Procedure ← [gradient bar] → *AI*

Machine Learning

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AI vs. ML....

While AI and ML are not quite the same thing, they are closely connected. The simplest way to understand how AI and ML relate to each other is:

- *AI is **the broader concept** of enabling a machine or system to sense, reason, act, or adapt like a human.*

- *ML is **an application of AI** that allows machines to extract knowledge from data and learn from it autonomously.*

- *Generative AI refers to **deep-learning models** that can generate high-quality text, images, and other content based on the data they were trained on.*

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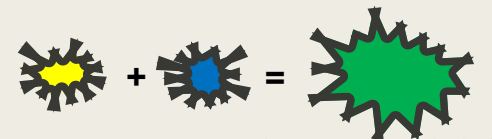
What is Machine Learning?

Machine Learning (ML) is an application or subset of Artificial Intelligence (AI) that allows machines to learn from prior data.

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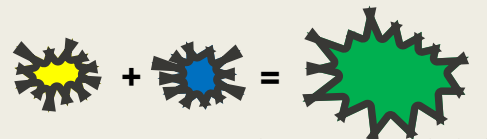
What is a Machine Learning Model?

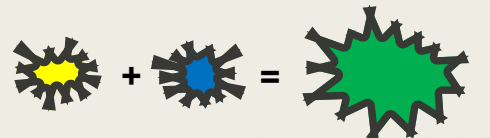*ML models are computer programs that are used to recognise patterns in data or make predictions.*

You need two things to make a learning model: an algorithm, and some data!

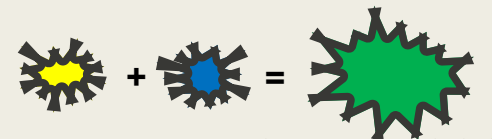*Anna Rajander, October 2024*

Types of ML Algorithm

There are lots of different ML algorithm, but they can generally be classified into 3 different types:

- Supervised Learning Algorithms

- Unsupervised Learning Algorithms

- Reinforced Learning Algorithms*

*Note: Reinforced learning algorithms are usually considered model free

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Developing ML Models

Criteria	Supervised ML	Unsupervised ML	Reinforcement ML
Definition	Learns by using labelled data	Trained using unlabelled data without any guidance.	Works on interacting with the environment
Type of data	Labelled data	Unlabelled data	No – predefined data
Type of problems	Regression and classification	Association and Clustering	Exploitation or Exploration
Supervision	Extra supervision	No supervision	No supervision
Algorithms	Linear Regression, Logistic Regression, SVM, KNN etc.	K – Means, C – Means, Apriori	Q – Learning, SARSA
Aim	Calculate outcomes	Discover underlying patterns	Learn a series of action
Application	Risk Evaluation, Forecast Sales	Recommendation System, Anomaly Detection	Self-Driving Cars, Gaming, Healthcare

Developing ML Models

When developing an ML model, the algorithm used is important…

but the data is crucial.
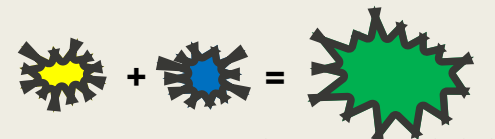
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Applying ML

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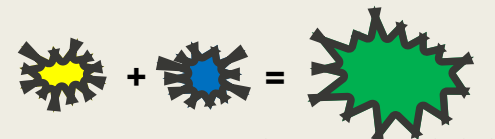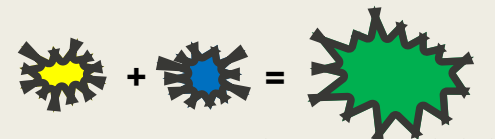
Applying ML to the Real World

Things to consider when applying ML:

- Appropriateness

- Representativeness

- Change

- Impact

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Appropriateness of ML

When looking to apply ML in the real world, it is important to understand what the underlying data was collected for, how it is being interpreted, and whether it is fit for use.

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Appropriateness of ML: Example

Hospital Readmissions:

The funding model for public hospitals in Australia is such that hospitals are given less money for a patient admission if the patient is readmitted as an emergency patient within 28 days of discharge.

As such, hospitals are always looking at ways to reduce their readmissions, including trying to identify patient who are at risk of prior to initial discharge readmission.
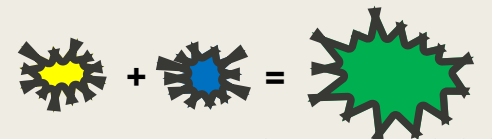
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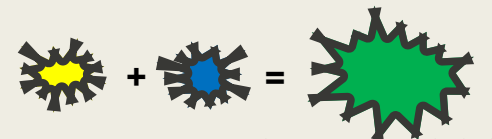
Appropriateness of ML: Example (cont.)
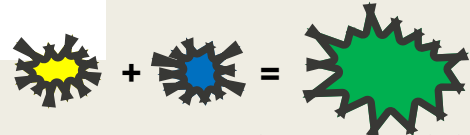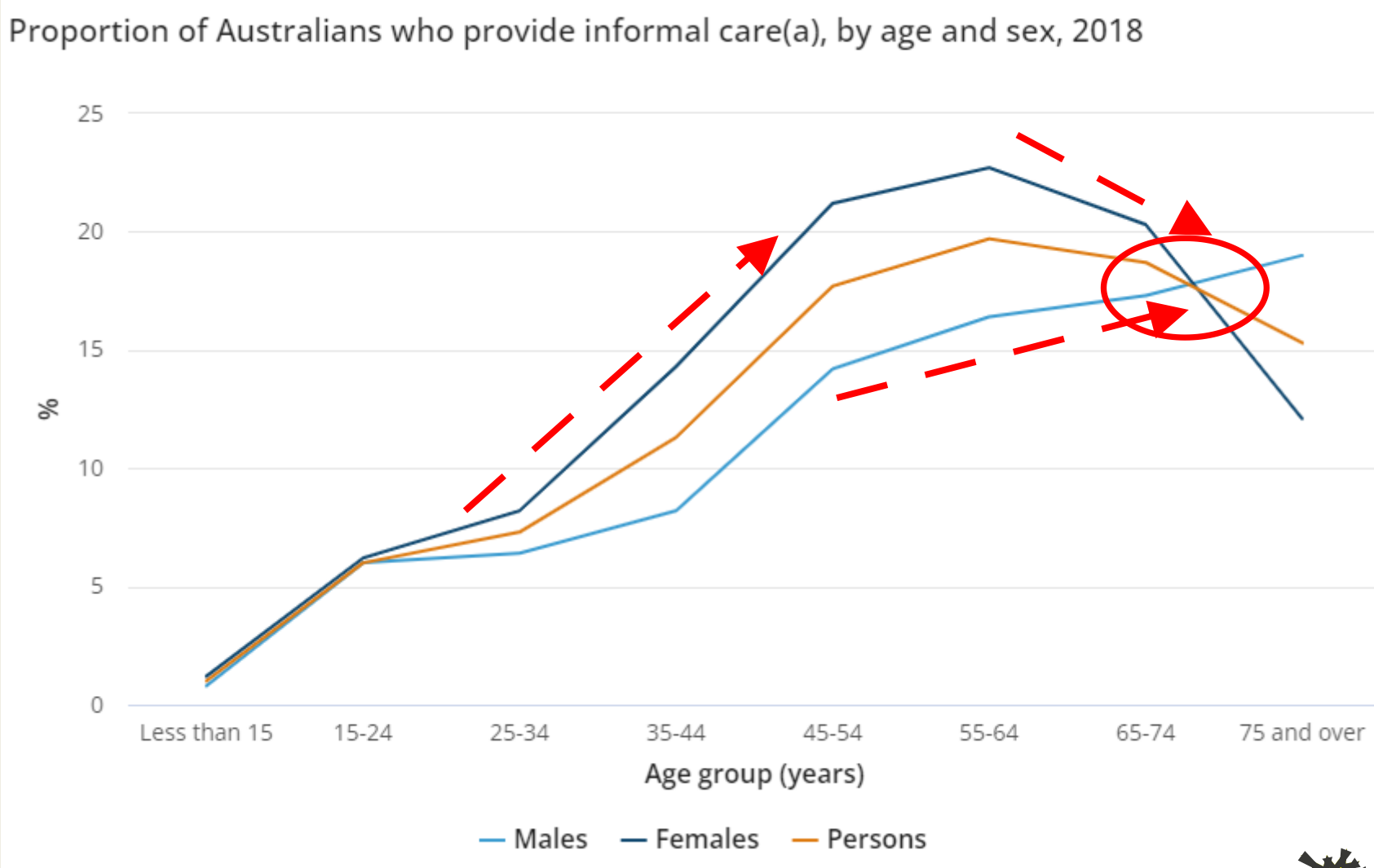
Question:

Can data from the Patient Admission System (PAS) be used to accurately identify patients who are at risk of readmission?

Results:

The team several identified several factors that appeared to increase the likelihood a patient would be readmitted. For example, married men were much less likely to be readmitted then unmarried men.

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ABS Survey of Disability, Ageing and Carers

Proportion of Australians who provide informal care(a), by age and sex, 2018

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Representativeness of ML

When looking to apply ML in the real world, it is important to ask, *has the model been developed using data that is representative of the context to which it is being applied?*

Maini, A. (28 October 2023). *Can AI Really Save the World? ft. Bill Gates [Video].* You Tube. https://www.youtube.com/watch?v=l9m3IKG8i88

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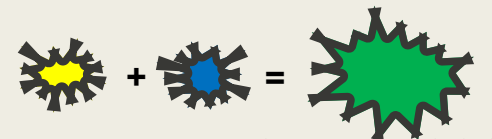
Changes in the Real World

It's important to understand that changes in the real world may change the relevance of the underlying data.

This includes changes to how and when data is collected impacting its accuracy and/or timeliness, as well as changes to regulations and legislation which may change the meaning of the underlying data.

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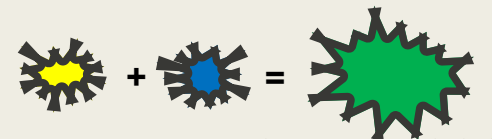
Impact in the Real World

It is important to consider how any ML model is being applied. ML models are often used to influence or automate decision-making based on the latest available data.

When used in this way, ML models are effectively making one or more binary decisions which can be represented using a process map or decision tree.
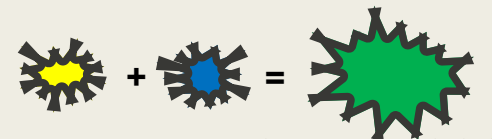
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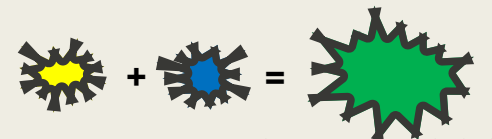
Impact in the Real World (cont.)

The accuracy of decisions made using ML can be categorised as follows:

ML MODEL

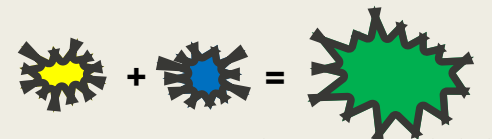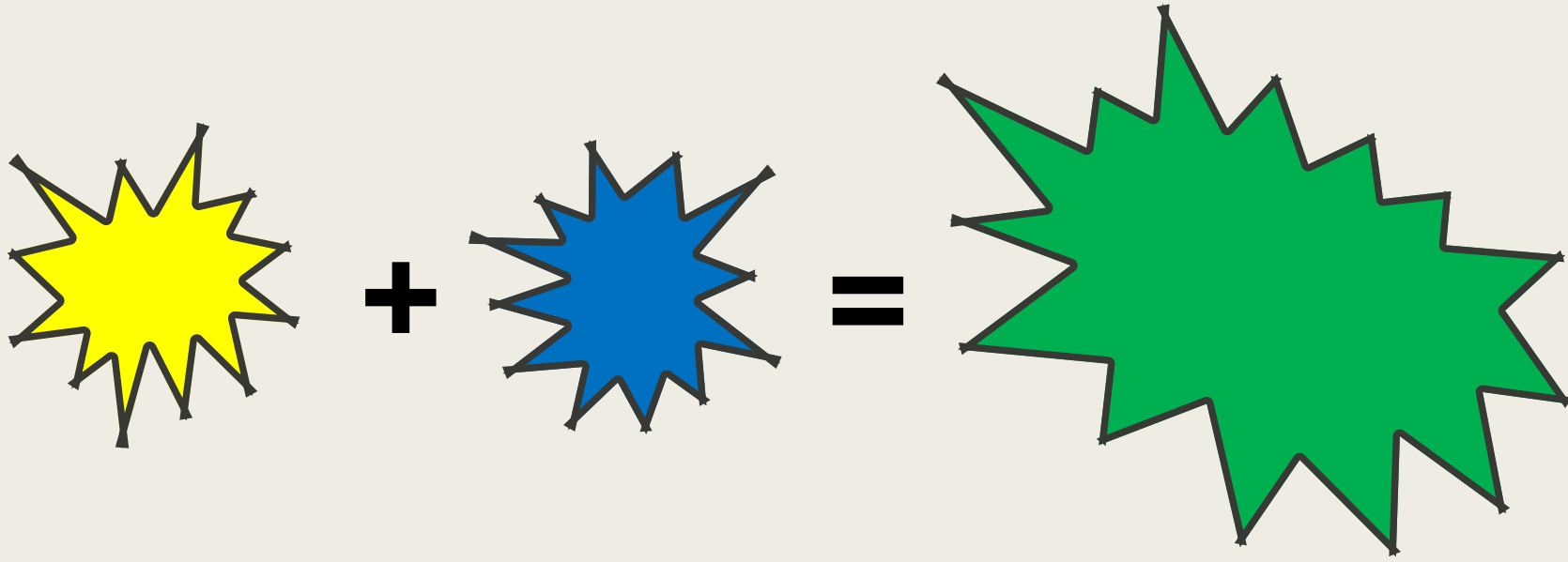|	True	False
True	**True Positive** The model correctly assigns a positive	**False Negative** The model incorrectly assigns a negative
False	**False Positive** The model incorrectly assigns a positive	**True Negative** The model correctly assigns a negative

REAL WORLD

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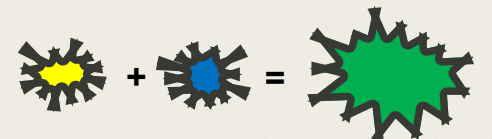
Conclusion...

■ While ML algorithms are useful, *data is powerful!*

■ Consider the application.

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Resources…

- AI vs. Machine Learning: How Do They Differ? | Google Cloud, https://cloud.google.com/learn/artificial-intelligence-vs-machine-learning

- Disability, Ageing and Carers, Australia: Summary of Findings, 2018 | Australian Bureau of Statistics (abs.gov.au)

- *Machine Learning versus AI: Differences*, uses and benefits, Coursera, 30 November 2023. https://www.coursera.org/articles/machine-learning-vs-ai

- Maini, A. (28 October 2023). C*an AI Really Save the World? ft. Bill Gates* [Video]. You Tube. https://www.youtube.com/watch?v=l9m3IKG8i88

- Mitchell, T. *Machine Learning*. Mcgraw-Hill, 1997.

- Supervised vs Unsupervised vs Reinforcement – AITUDE, https://www.aitude.com/supervised-vs-unsupervised-vs-reinforcement/#:~:text=Supervised%20learning%20maps%20labelled%20data,on%20input%20and%20output%20values.

- What is generative AI? - IBM Research https://research.ibm.com/blog/what-is-generative-AI

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Questions