



Machine Learning: An Introduction



Prasanna Ranjith Christodoss

Associate Professor of Computer Science

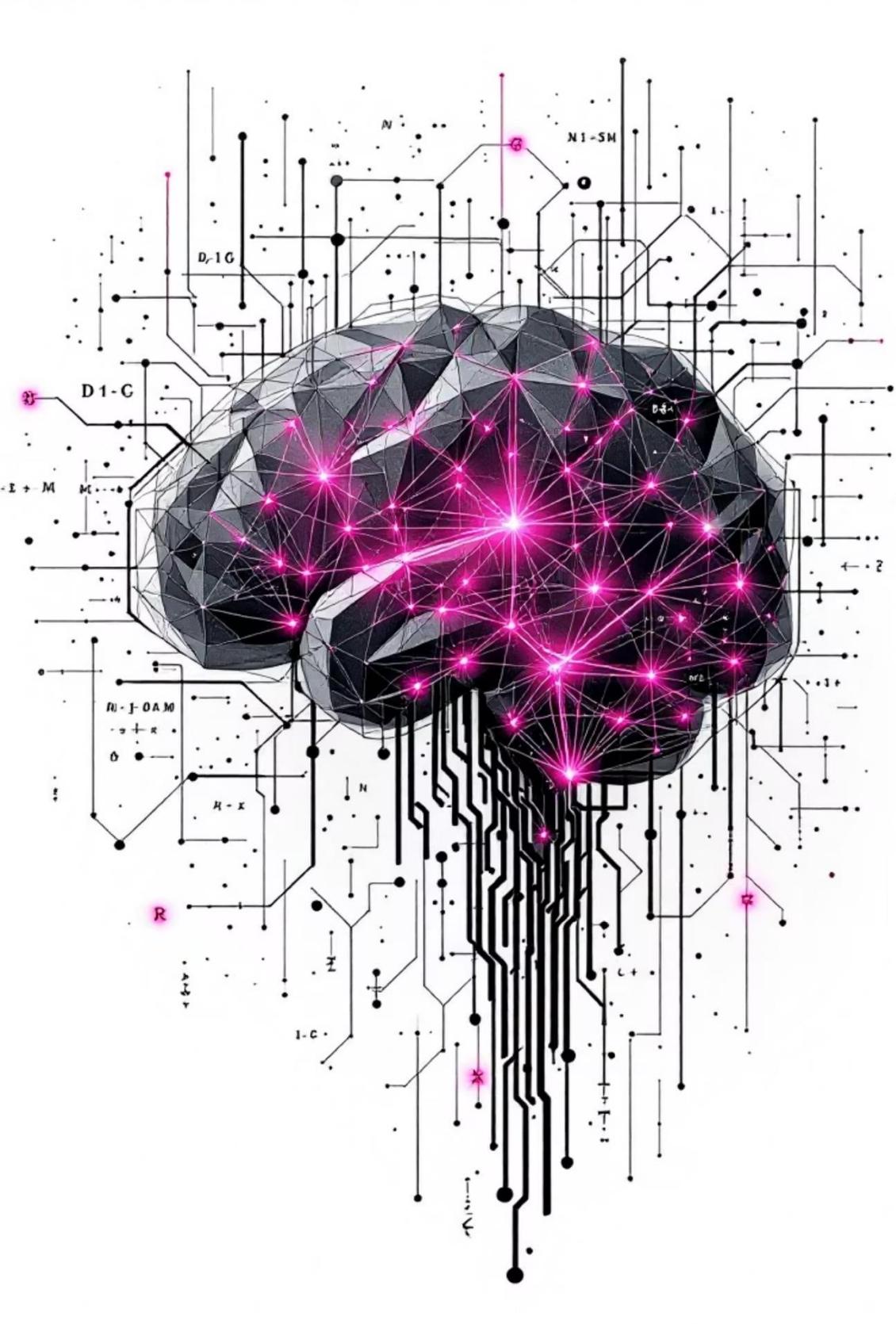
Department of Computing, Mathematics & Physics

Messiah University

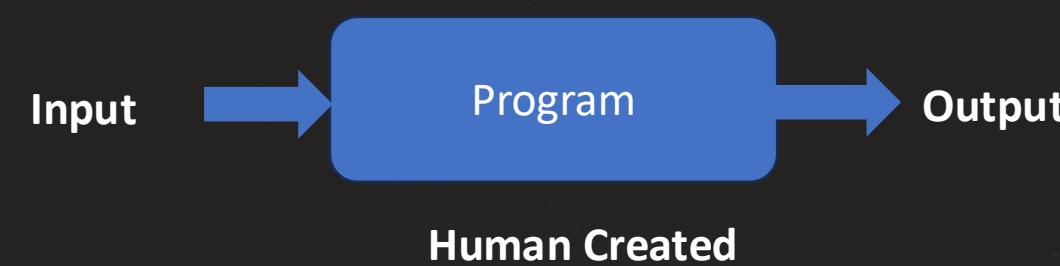
Mechanicsburg, PA 17055

T 717-796-1800 | **Ext** 2739

E prchristodoss@messiah.edu | **W** messiah.edu

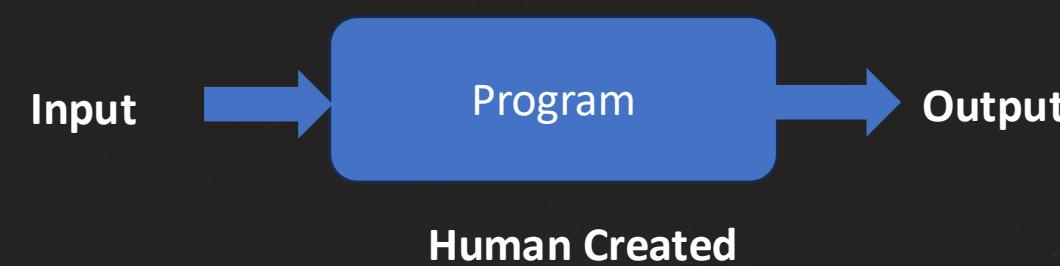


Traditional Programming

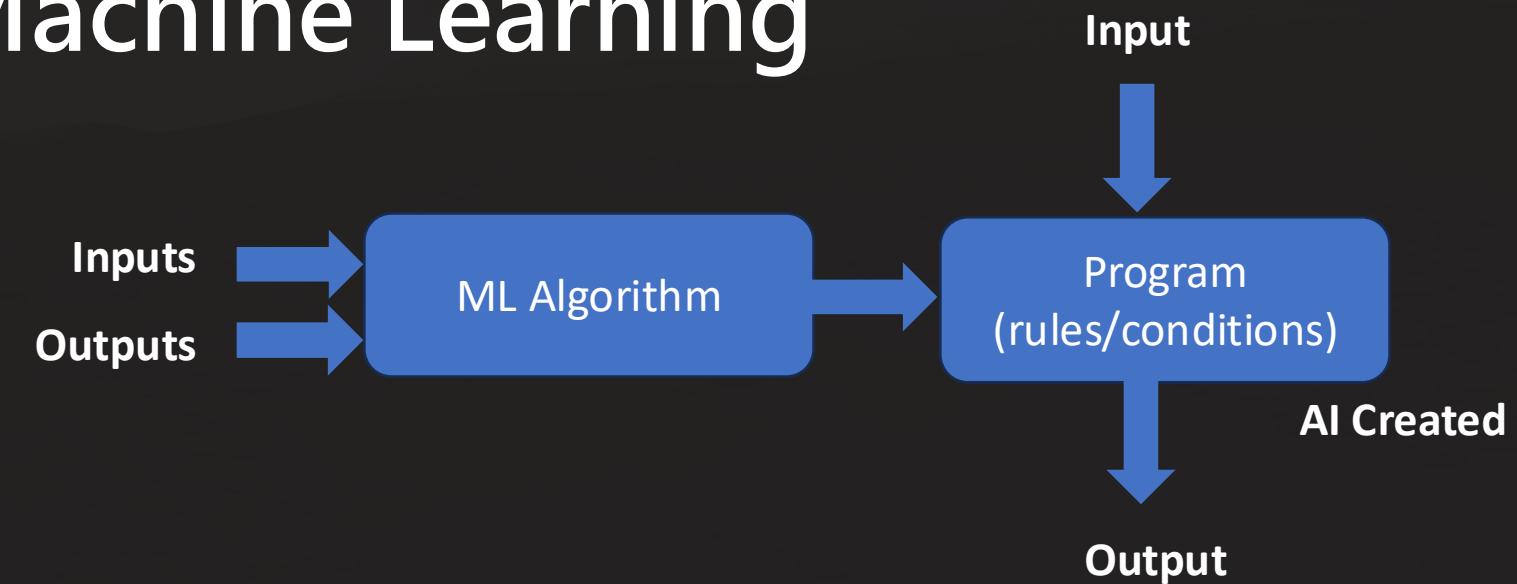


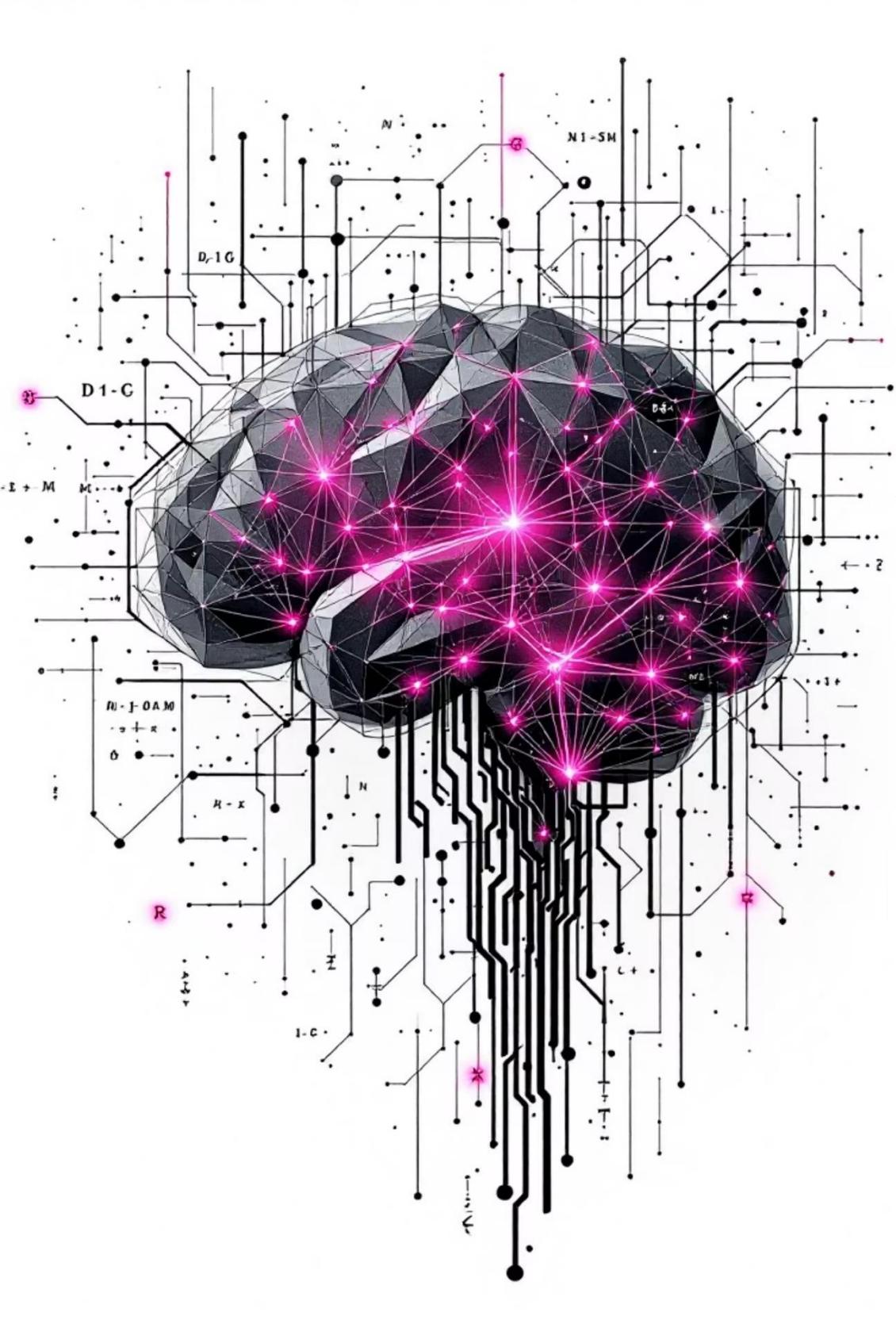


Traditional Programming

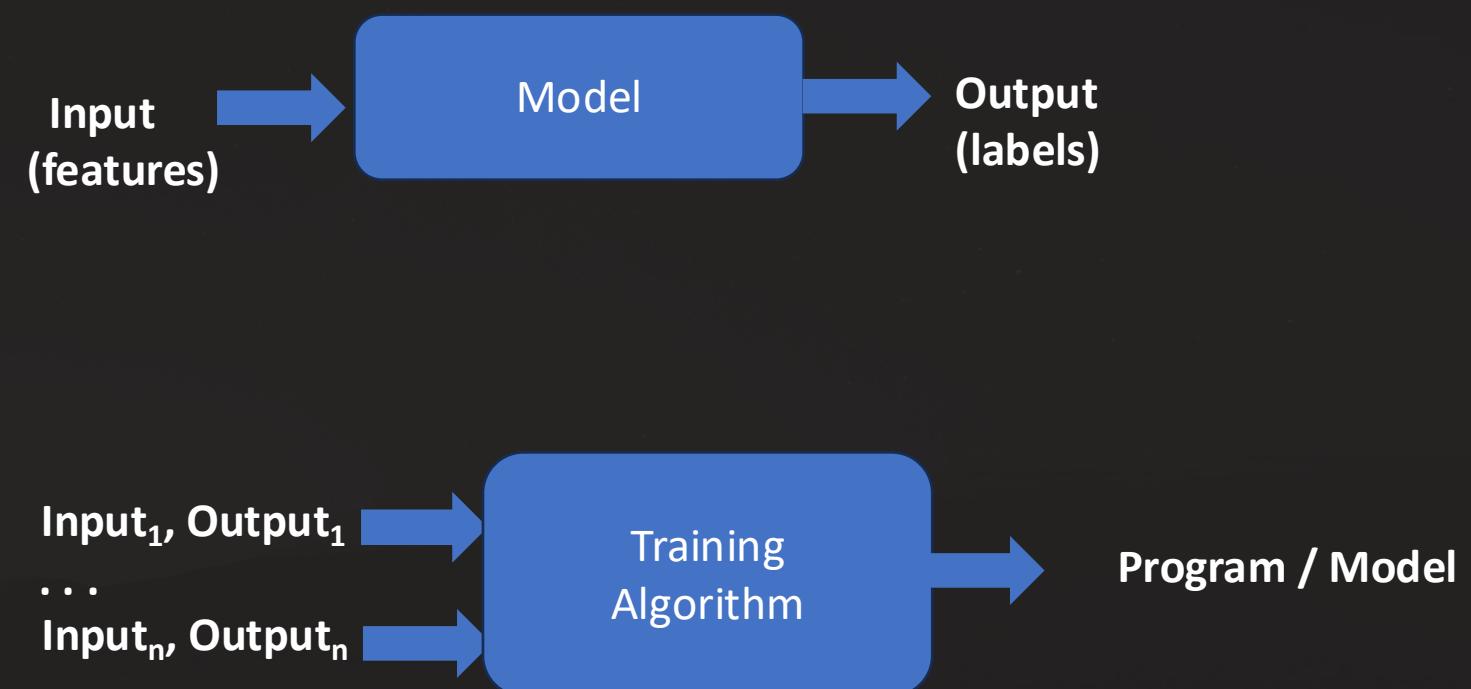


Machine Learning



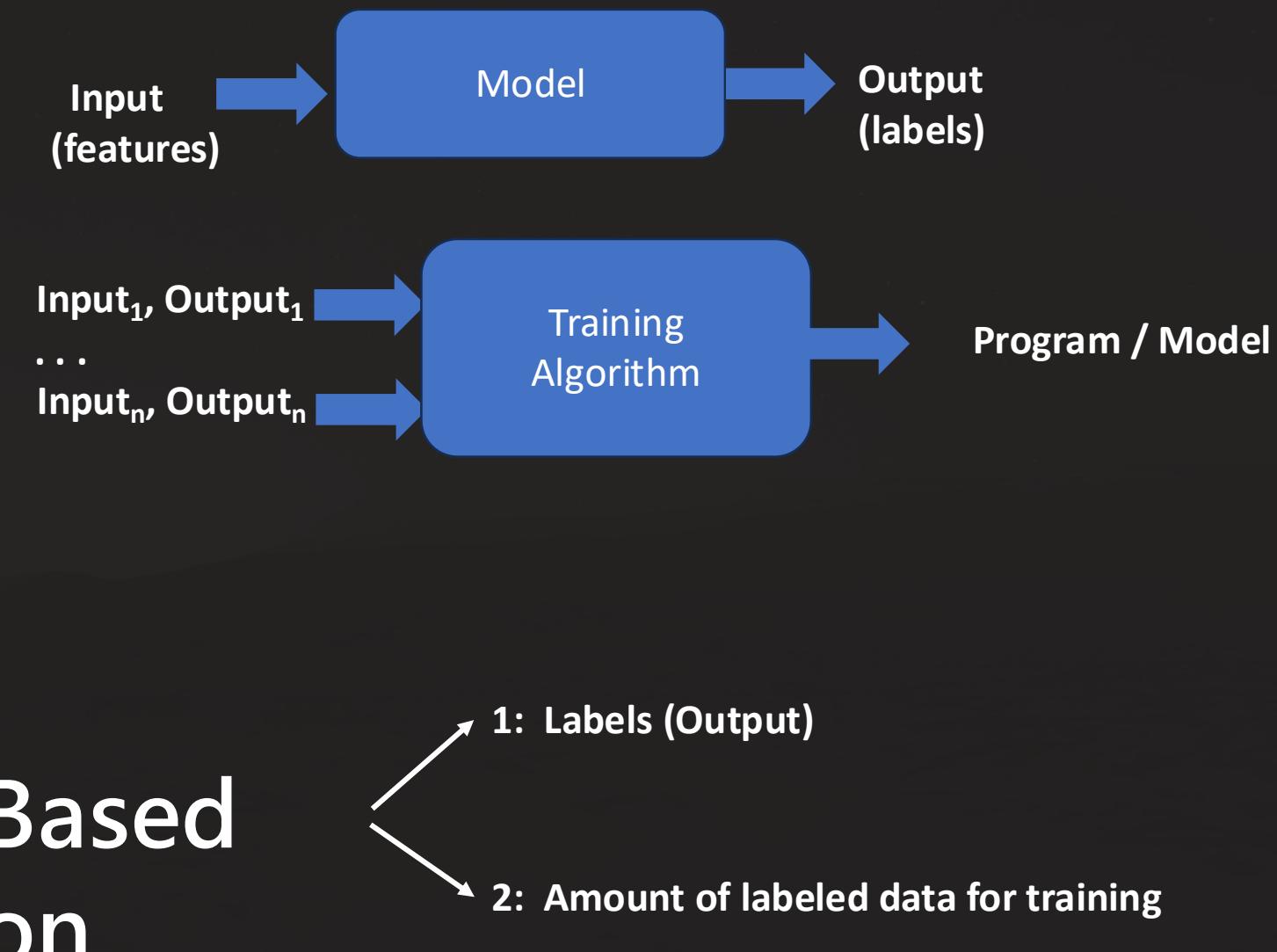


Machine Learning





Types of Machine Learning



Based
on

Types of ML

1: Based on Output / label

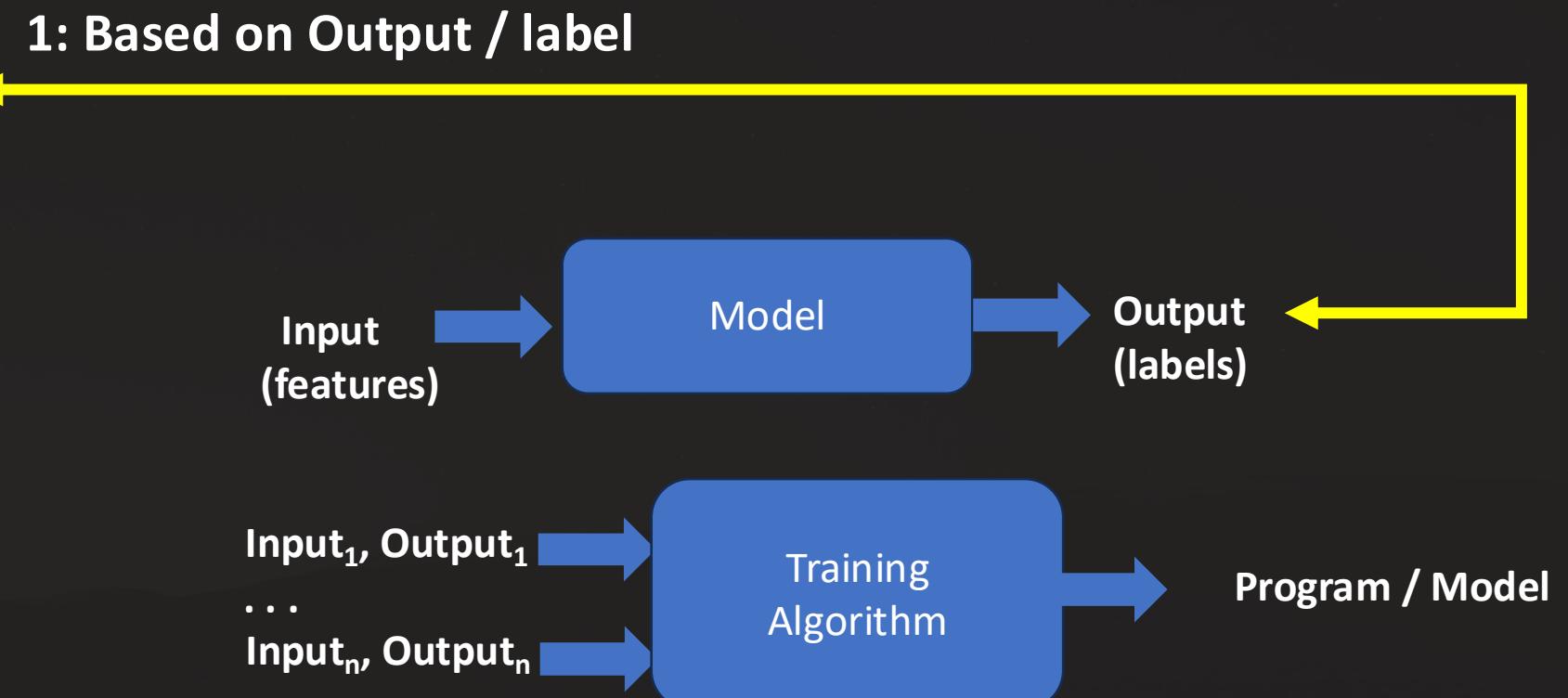
Discrete Classes
(Classification)

Continuous Value
(Regression)

Actions
(Reinforcement Learning)

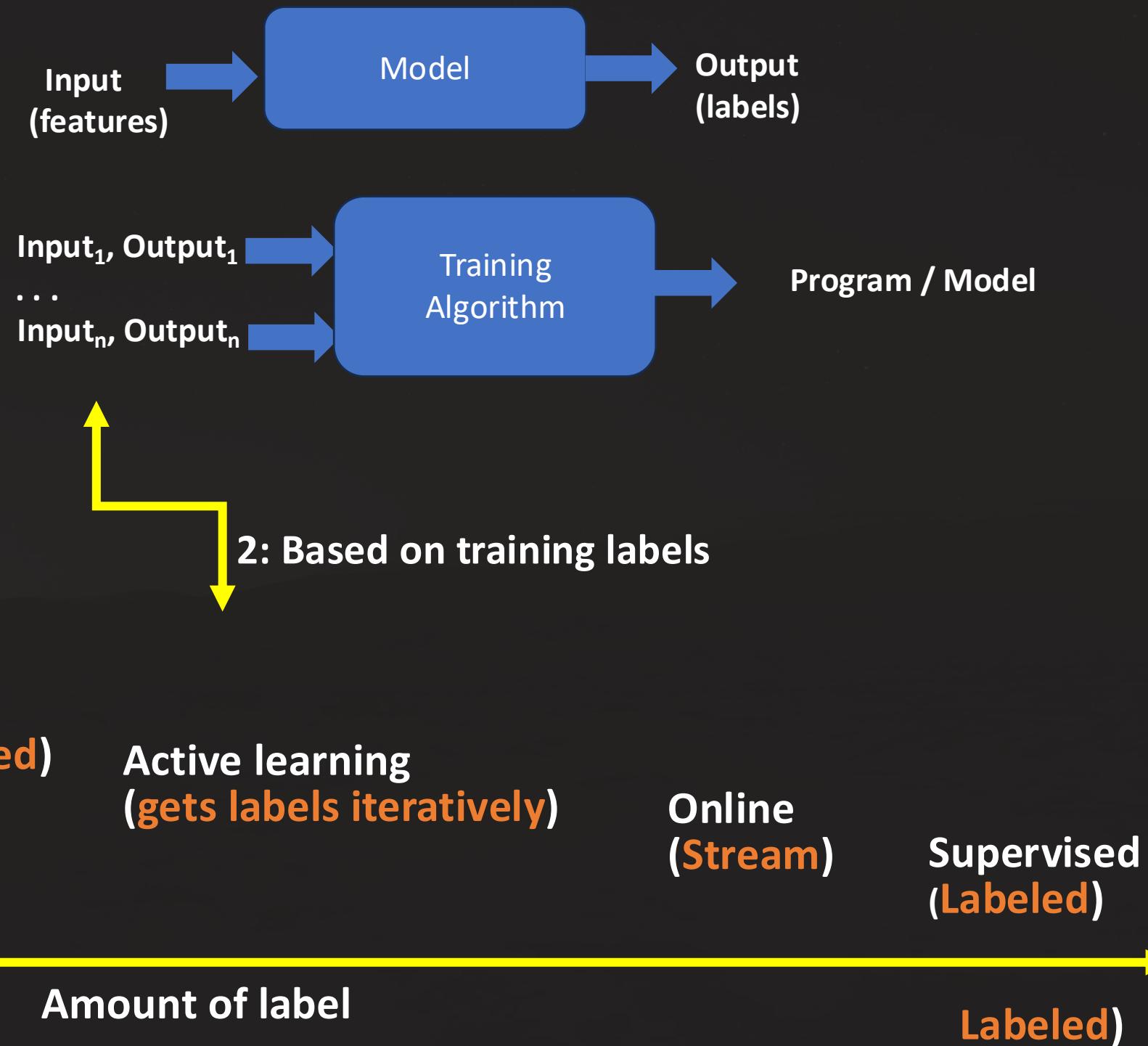
Ranking among items
(Ranking)

Recommendations
(Recommendation System)



Types of ML

2: Based on training labels



Types of ML

2: Based on training labels

Unsupervised
(No Labels)

(No Label)

Amount of label

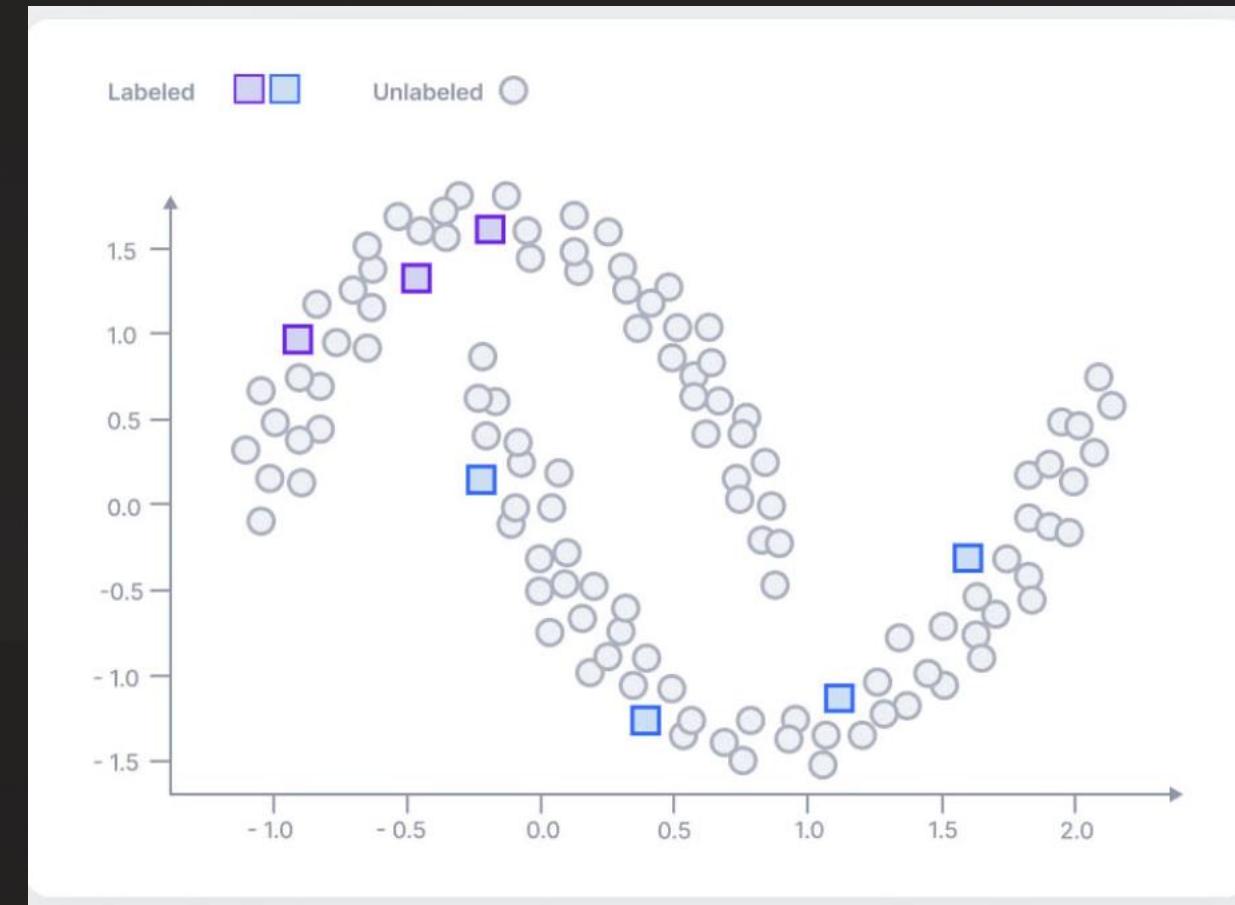
Labeled)



Types of ML

2: Based on training labels

Semi-supervised
(Labeled + unlabeled)



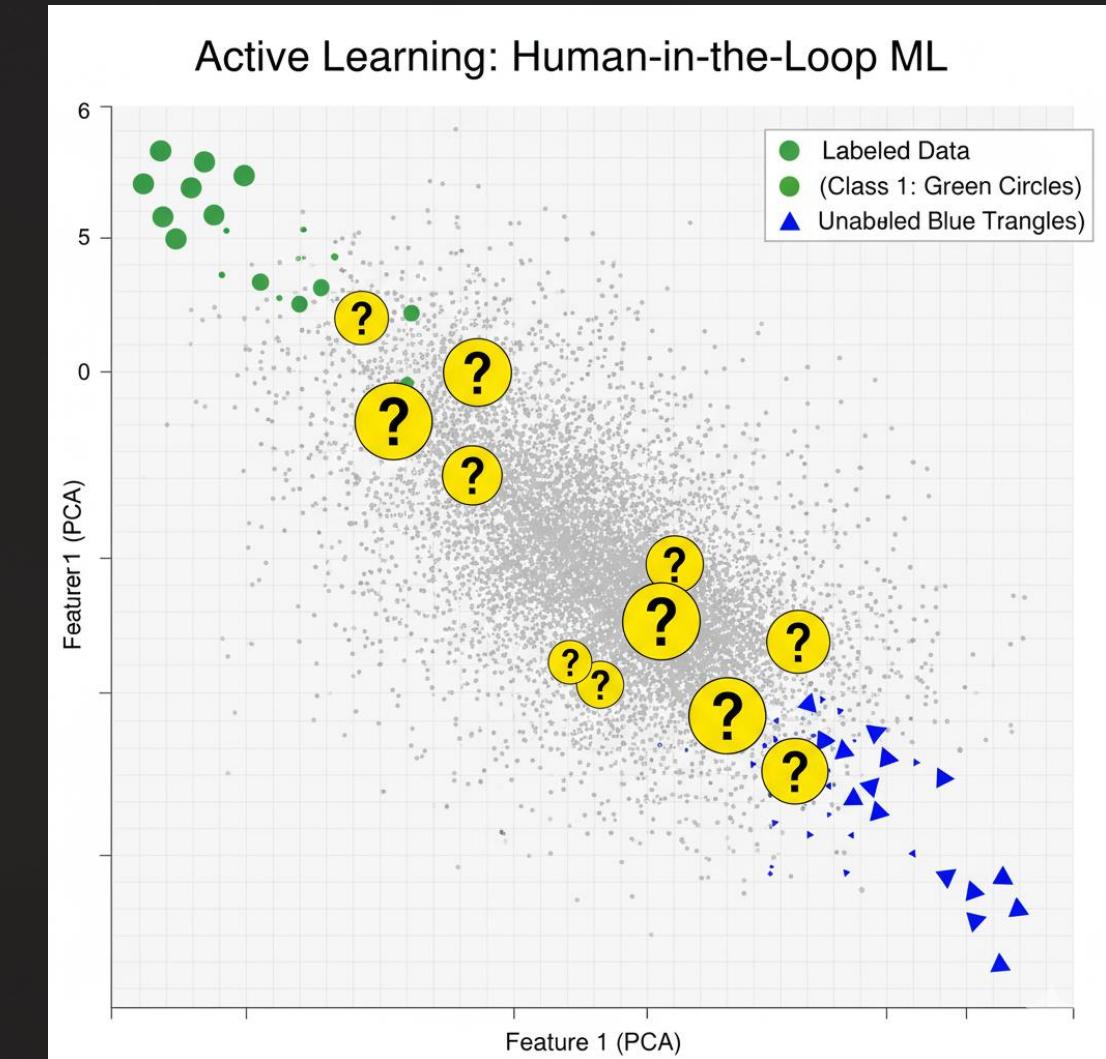
←
(No Label)

Amount of label

→
Labeled)

Types of ML

2: Based on training labels



Active learning
(**gets labels iteratively**)

←
(No Label)

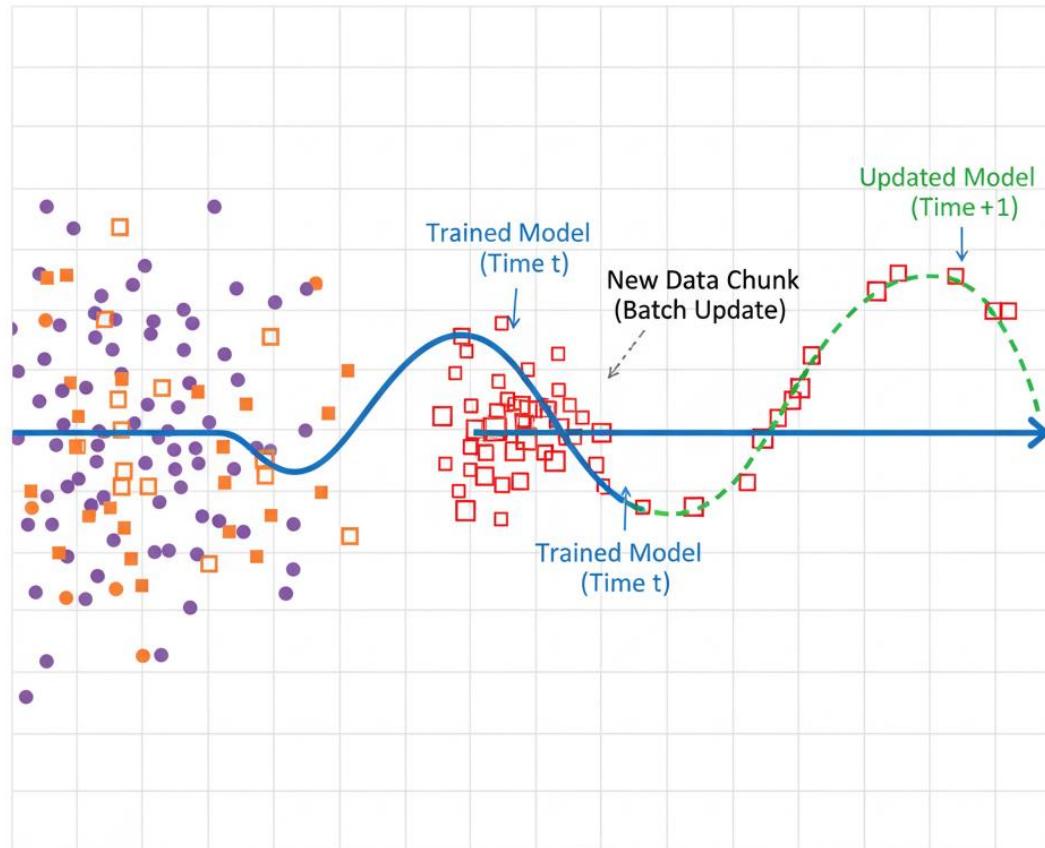
Amount of label

→
Labeled)

Types of ML

2: Based on training labels

Online Stream Learning: Continuous Model Updates



Imagine learning to drive a car:

- **Batch Learning**

- You take **one long driving course**, finish it, and never practice again.
- Your driving skills **don't improve** after the course ends.

- **Online (Stream) Learning**

- You **drive every day**.
- Each new experience (traffic, weather, mistakes) slightly **improves how you drive**.
- You don't restart driving school every time — you **adjust continuously**.

Online
(Stream)

(No Label)

Amount of label

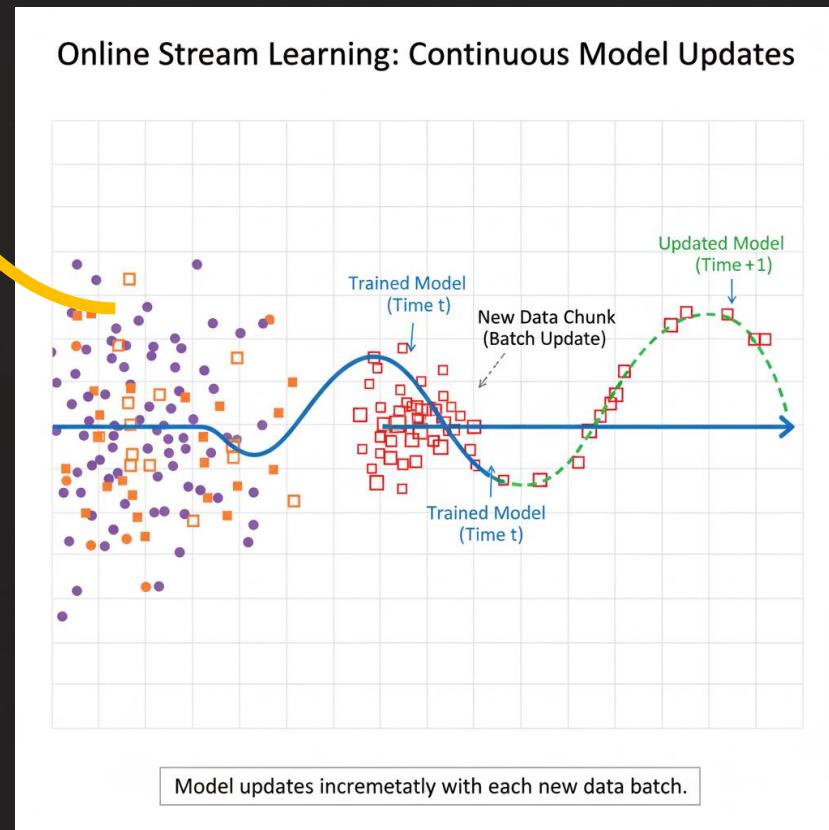
Labeled)

Types of ML

2: Based on training labels

Older data

The model was trained earlier (“Trained Model – Time t”).



Online
(Stream)

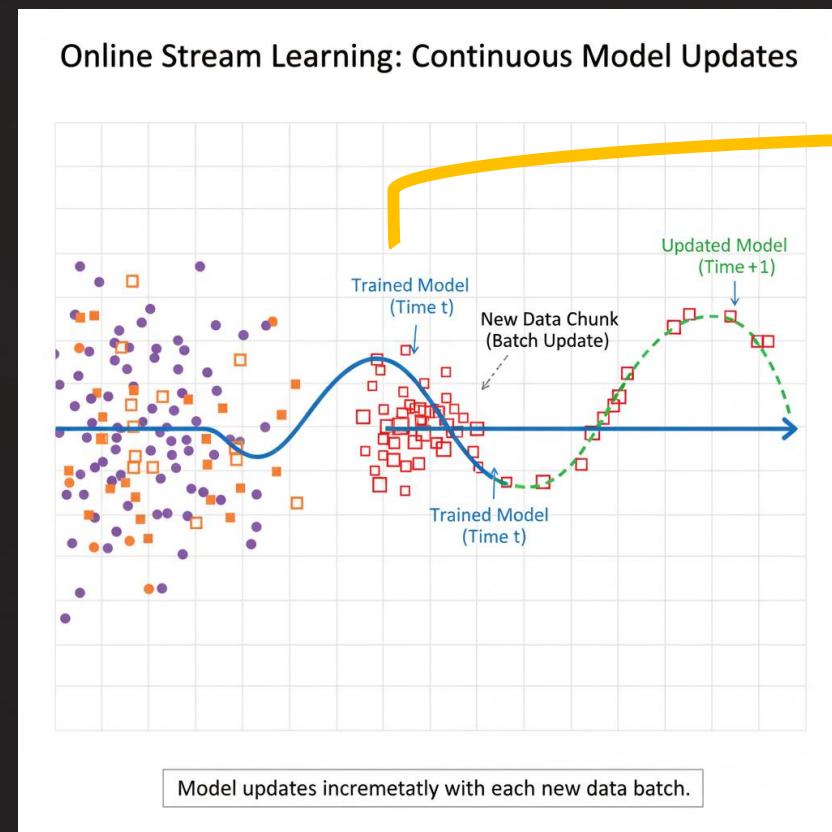
(No Label)

Amount of label

Labeled)

Types of ML

2: Based on training labels



Online
(Stream)

Older data

The model was trained earlier ("Trained Model – Time t").

New data chunk arrives

Data comes in small batches or one point at a time (stream).

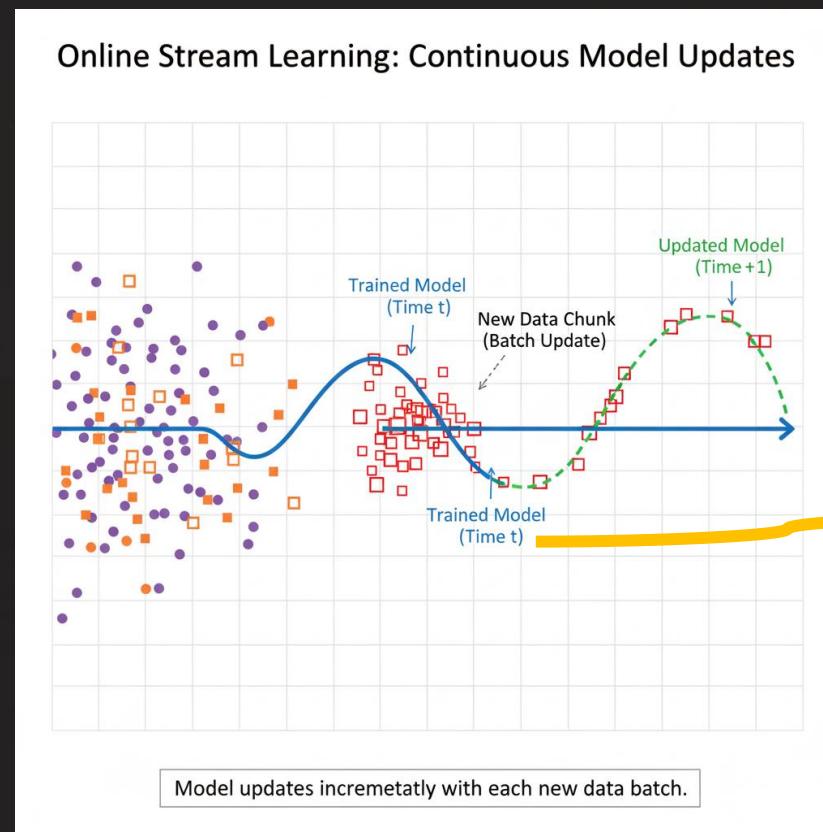
(No Label)

Amount of label

Labeled)

Types of ML

2: Based on training labels



Online
(**Stream**)

Older data

The model was trained earlier ("Trained Model – Time t").

New data chunk arrives

Data comes in small batches or one point at a time (stream).

Model updates itself

Instead of retraining from scratch, it
adjusts incrementally.

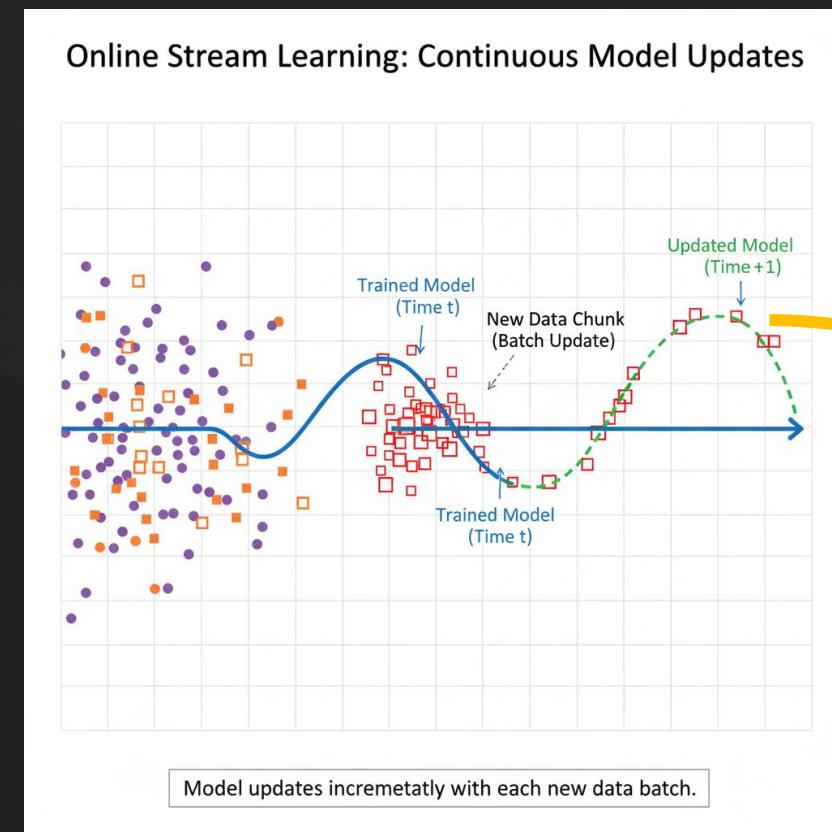
(**No Label**)

Amount of label

Labeled)

Types of ML

2: Based on training labels



Older data

The model was trained earlier (“Trained Model – Time t ”).

New data chunk arrives

Data comes in small batches or one point at a time (stream).

Model updates itself

Instead of retraining from scratch, it **adjusts incrementally**.

Updated model (Time $t+1$)

The green dashed curve shows how the model changes after seeing new data.

Online
(Stream)

(No Label)

Amount of label

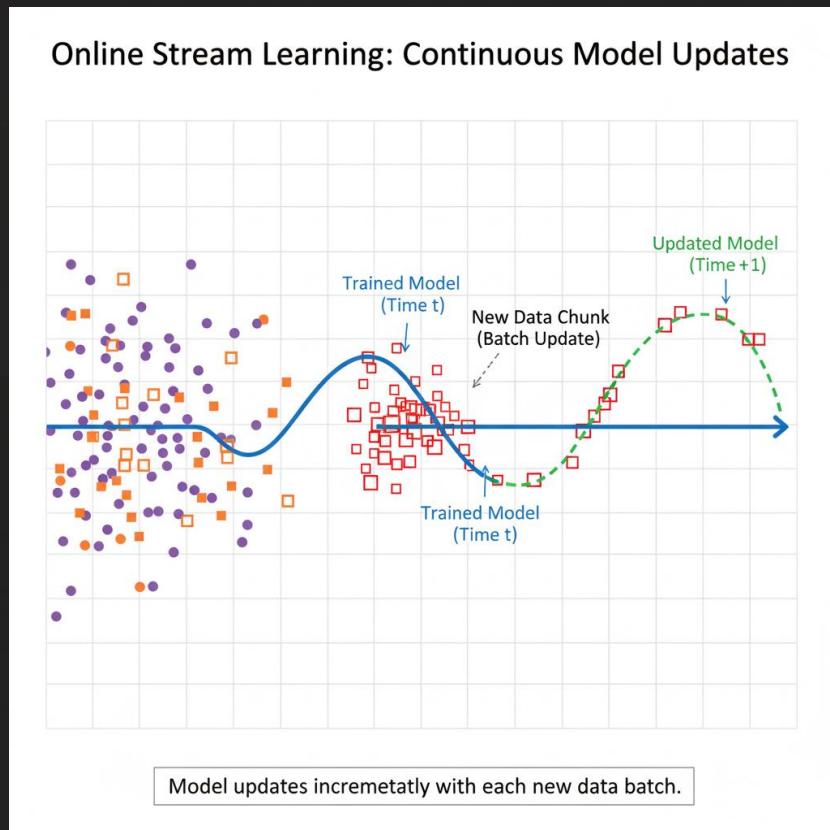
Labeled)

Types of ML

2: Based on training labels

Examples:

- Stock price prediction
- Recommendation systems (Netflix, Amazon)
- Fraud detection
- Sensor and IoT data
- Real-time user behavior tracking

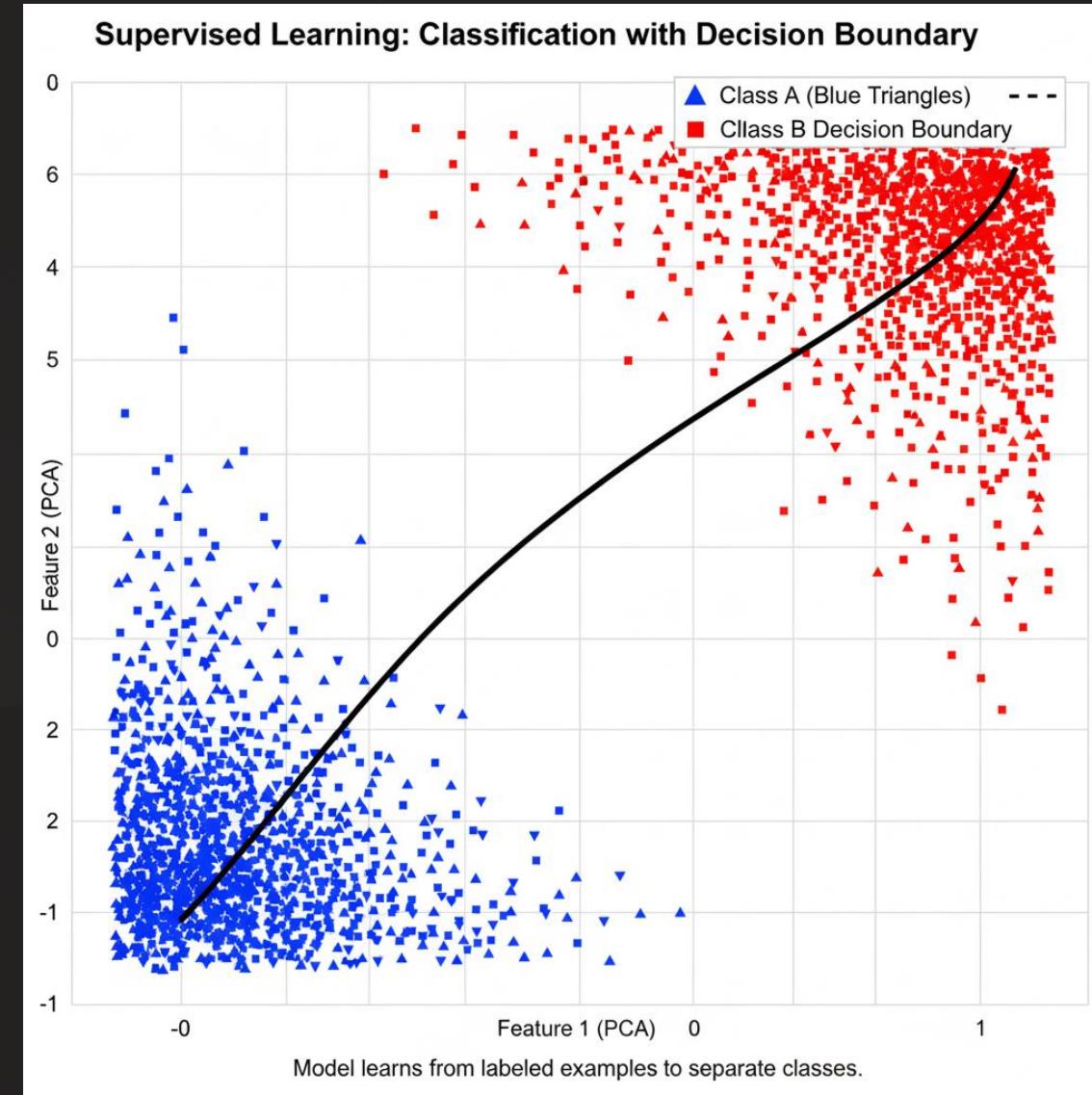


Online
(Stream)



Types of ML

2: Based on training labels



Supervised
(Labeled)

←
(No Label)

Amount of label

Labeled)

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The screenshot shows the homepage of the International Journal of Information Technology, Research and Applications (IJITRA). The header features a logo of a tree growing out of a book, labeled 'PRISMA'. The title 'INTERNATIONAL JOURNAL OF INFORMATION TECHNOLOGY, RESEARCH AND APPLICATIONS' is displayed prominently. A navigation bar below the header includes links for HOME, AIMS & SCOPE, EDITORIAL TEAM, SUBMISSIONS, CURRENT, ARCHIVES, INDEXING, and CONTACT US. To the left, there is a large image of a person wearing a VR headset, with the journal's name and logo overlaid. The right side contains descriptive text about the journal's focus on various IT topics and its intended audience.

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