

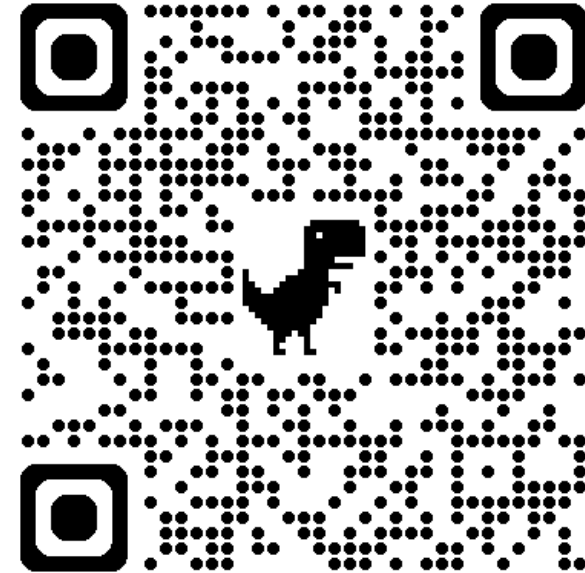


# Foundations and Frontiers: Introduction to Machine Learning (ML) for Interdisciplinary Research

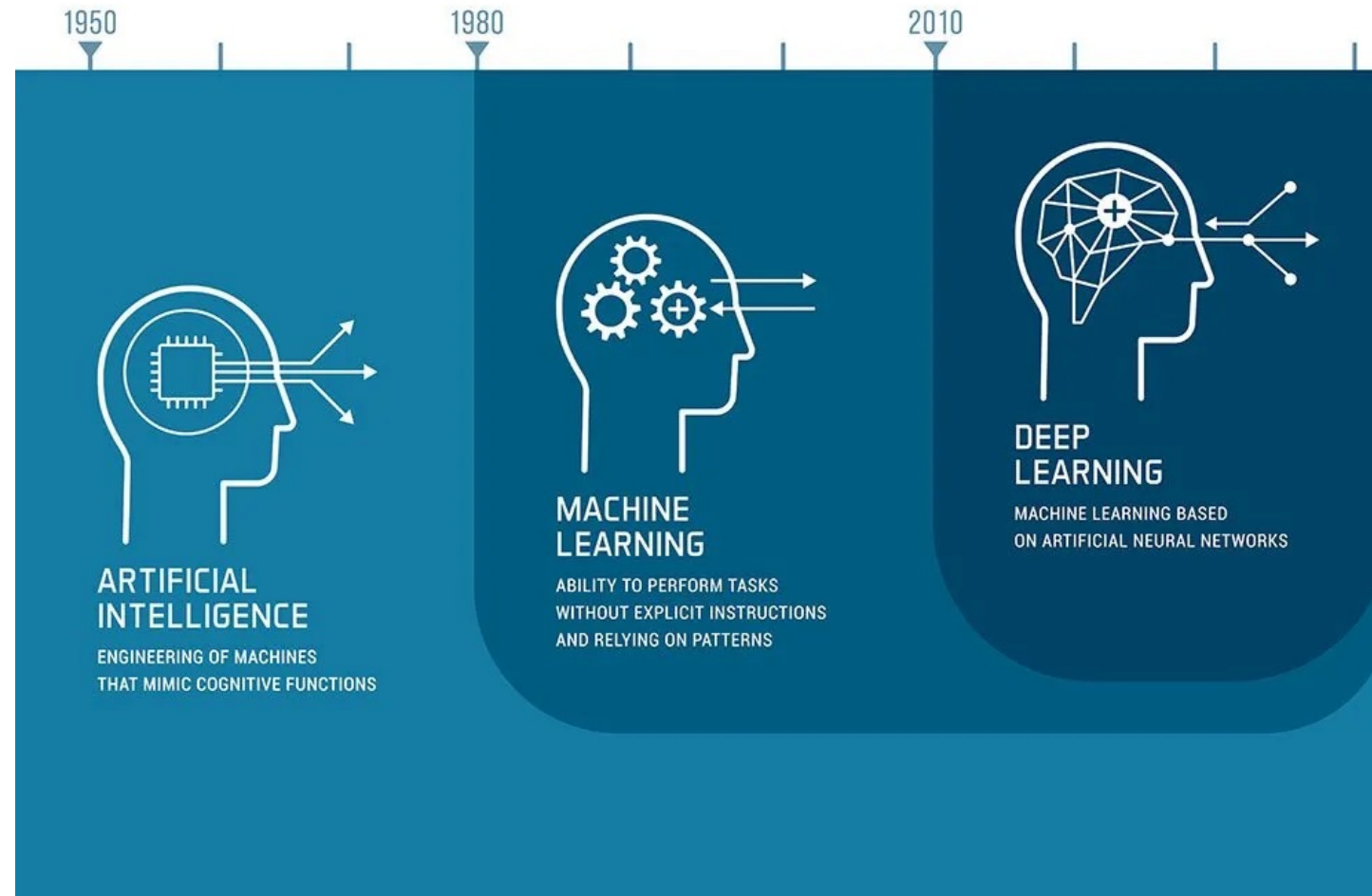
## **Presenter:**

**Thanh Tran, PhD candidate in Machine Learning, EAIT**

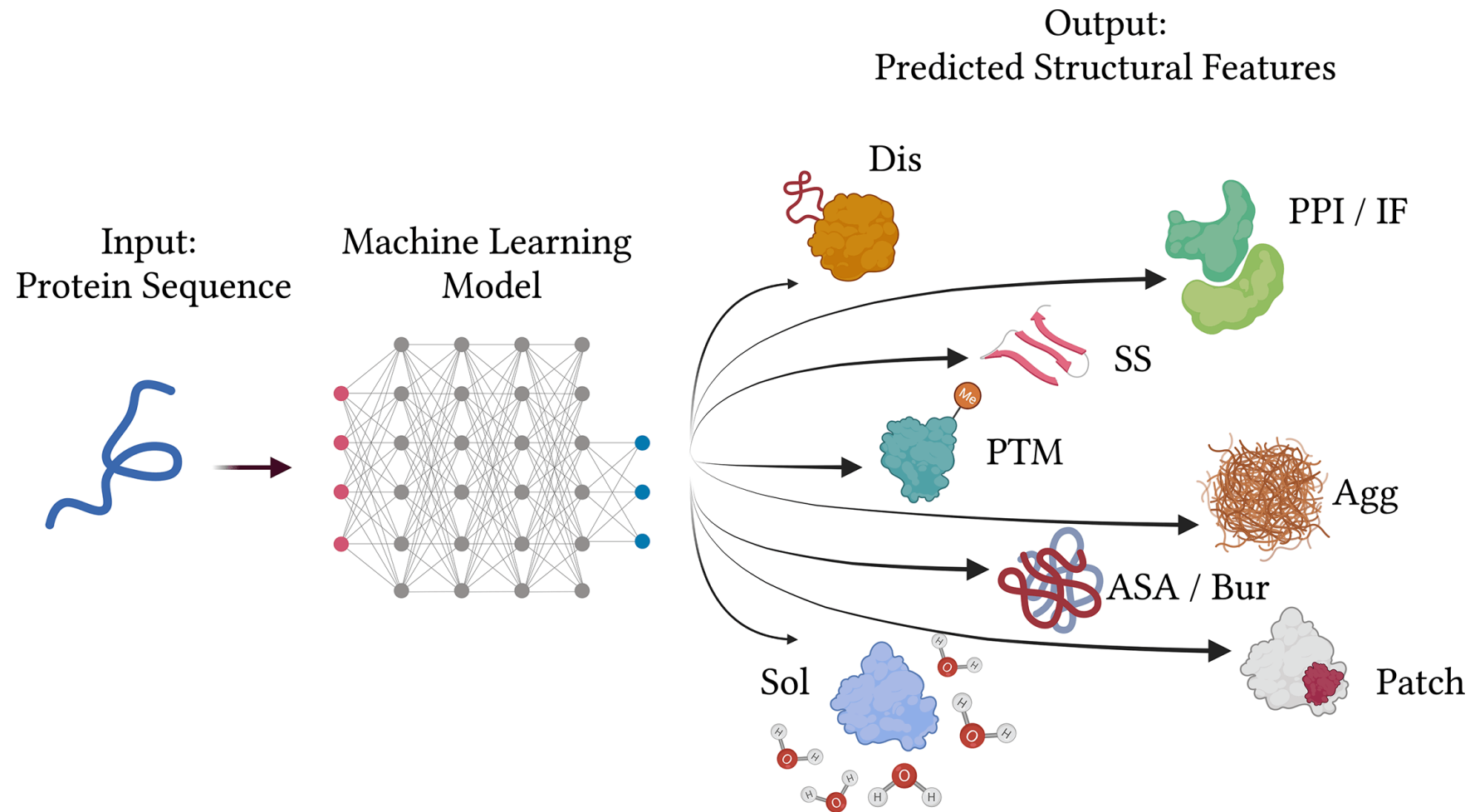
- **Experienced in machine learning engineering, data science, and research**
- **Specialize in advanced neural networks for traffic management**
- **Enjoy learning about AI, data science**



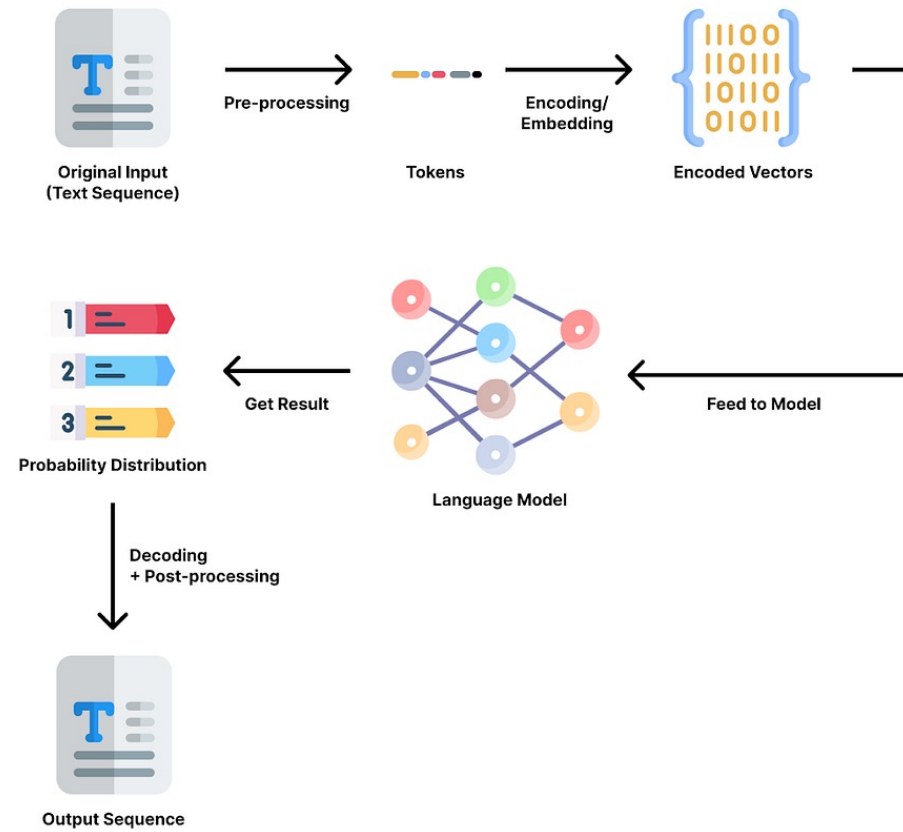
# Understanding the Impact of Machine Learning



# Some Applications of Machine Learning



# Some Applications of Machine Learning





# Machine Learning Tools



TensorFlow – a popular tool that offers easy model development using high-level APIs, support for parallel neural network training, and extensive community support



PyTorch – a tool used in the development of machine learning applications for creating deep models, productizing them, and training them

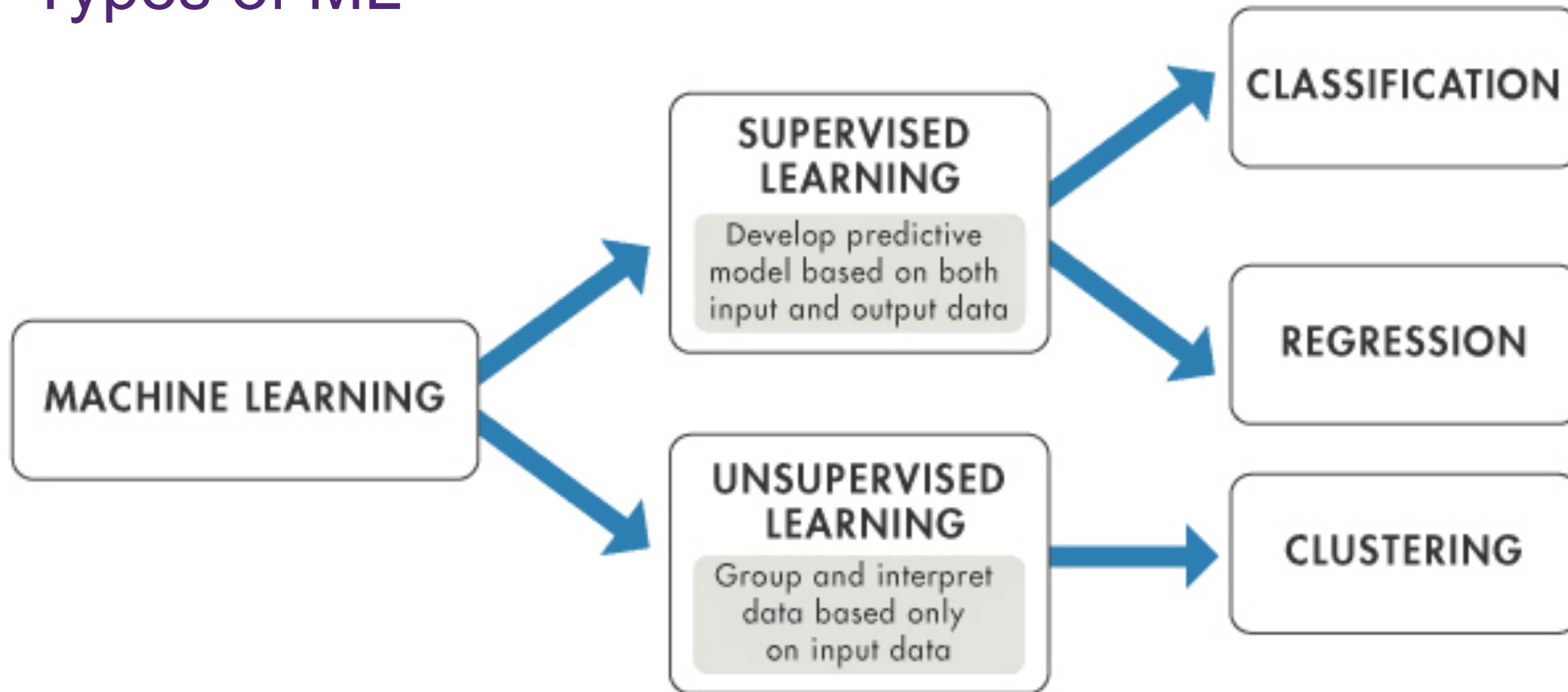


Scikit-Learn – an open-source Python library that offers a variety of machine learning algorithms, pre-processing techniques, cross-validation, and visualization methods

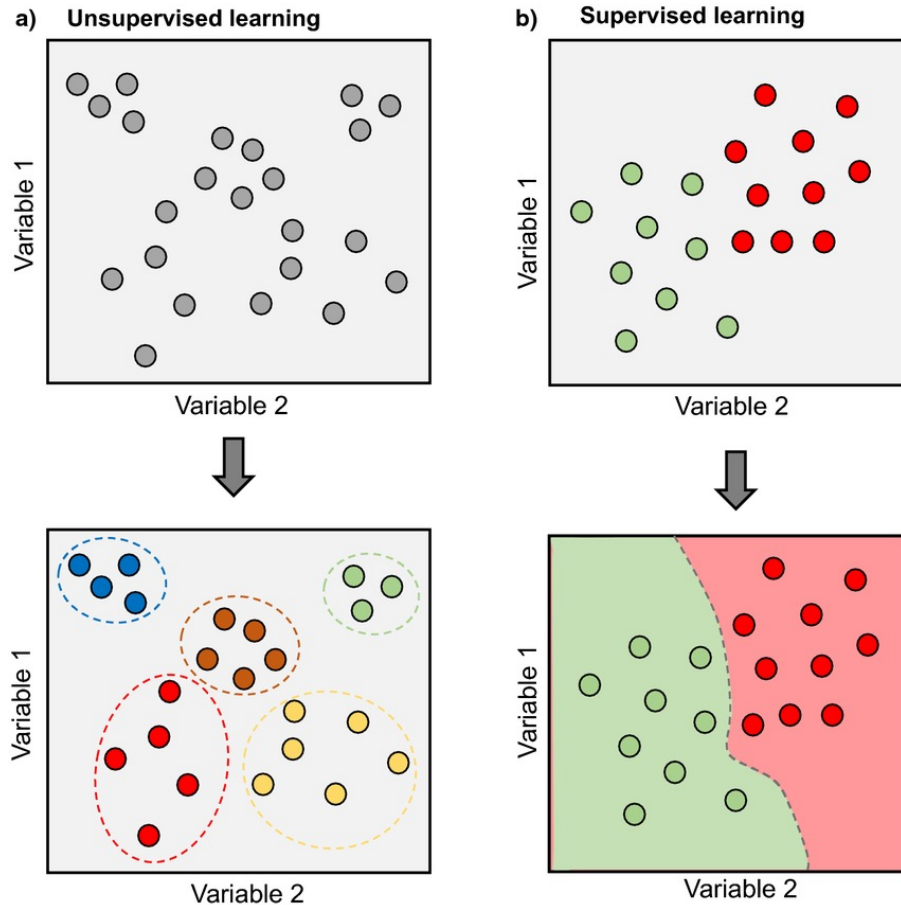


Google TensorFlow – a popular open-source machine learning framework developed by Google

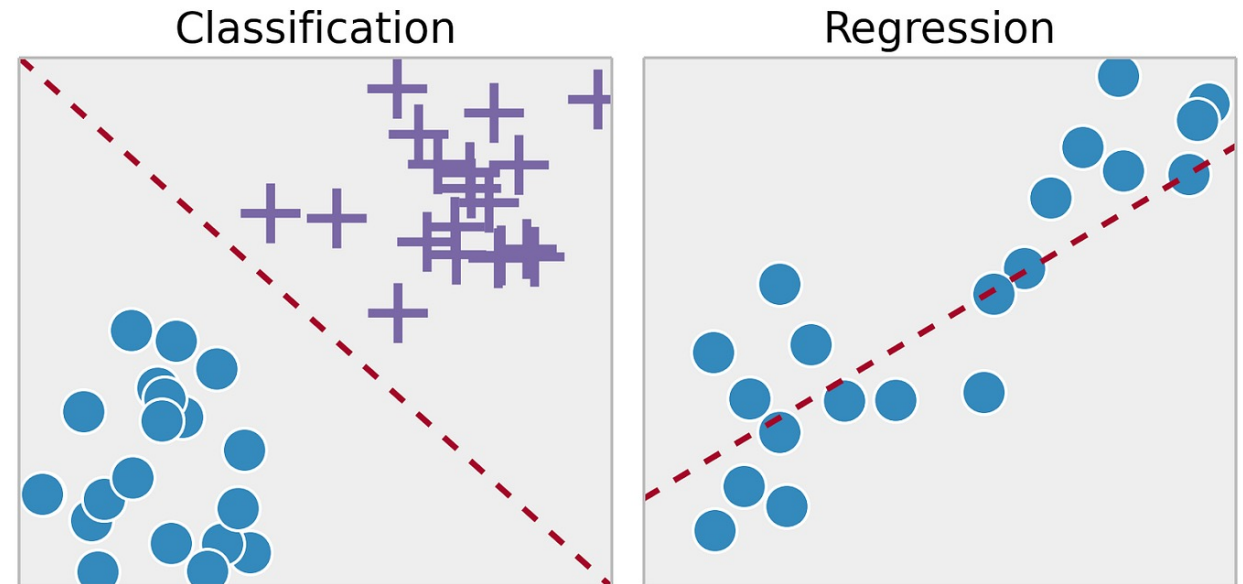
# Types of ML



# Common types of ML



[https://www.researchgate.net/figure/Supervised-and-unsupervised-machine-learning-a-Schematic-representation-of-an\\_fig3\\_351953193](https://www.researchgate.net/figure/Supervised-and-unsupervised-machine-learning-a-Schematic-representation-of-an_fig3_351953193)



<https://towardsdatascience.com/supervised-vs-unsupervised-learning-14f68e32ea8d>



# Machine Learning Models in Action

What do you want the machine learning system to do?

I want to see if there are natural clusters or dimensions in the data I have about different situations.

I want to learn what actions to take in different situations.

Do you want the ML system to be active or passive?

**ACTIVE**

The system's own actions will affect the situations it sees in the future.

**PASSIVE**

The system will learn from data I give it.

Do you have access to data that describes a lot of examples of situations and appropriate actions for each situation?

Yes

Could a knowledgeable human decide what actions to take based on the data you have about the situation?

No

Could there be patterns in these situations that humans haven't recognized before?

No

Yes

**UNSUPERVISED LEARNING MAY BE APPROPRIATE**

clustering  
anomaly detection

**SUPERVISED LEARNING MAY BE APPROPRIATE**

neural nets  
support vector machines  
regression  
recommender systems

**MACHINE LEARNING IS NOT USEFUL**

**REINFORCEMENT LEARNING MAY BE APPROPRIATE**

Will the system be able to gather a lot of data by trying sequences of actions in many different situations and seeing the results?

No

Yes



Credit: Thomas Malone, MIT Sloan | Design: Laura Wentzel

ML is for you?

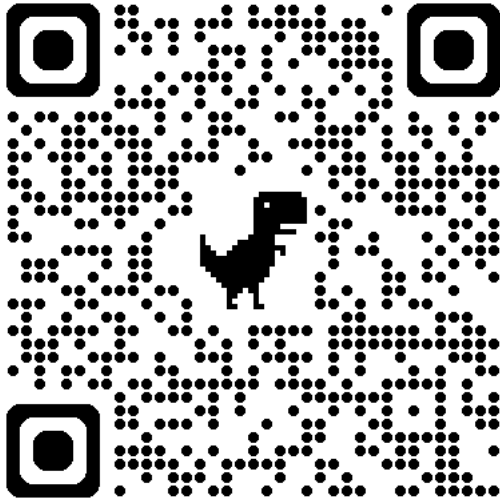


<https://forms.office.com/r/TaBFqQMuei>

## Context:

You are conducting research in a variety of fields and want to determine if machine learning (ML) techniques are applicable to your work. Based on the decision flowchart provided by MIT Sloan, answer the following questions by choosing the most appropriate machine learning approach or determining if machine learning is not useful.

### Team based activity



Answer; <https://shorturl.at/nULxq>

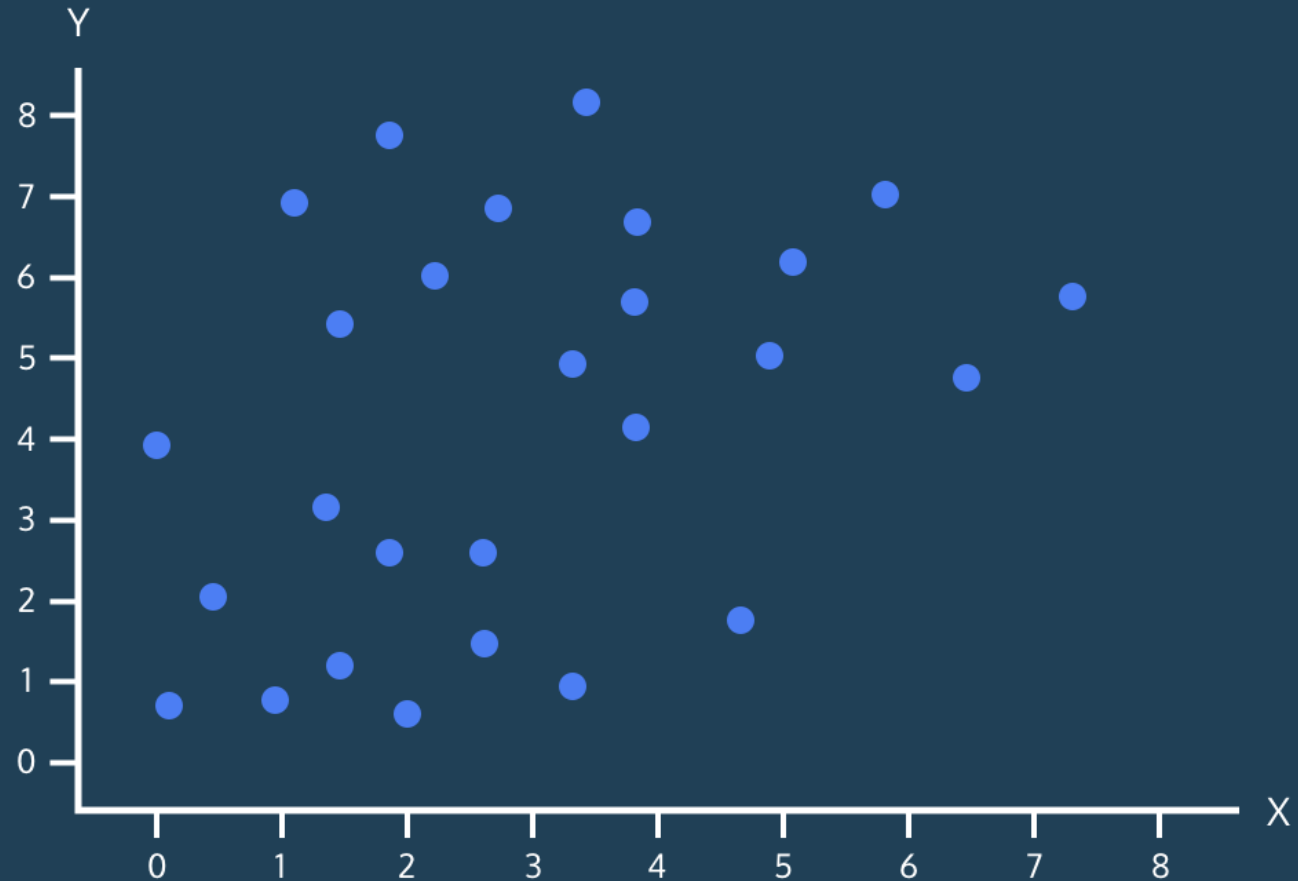
ML is for you?



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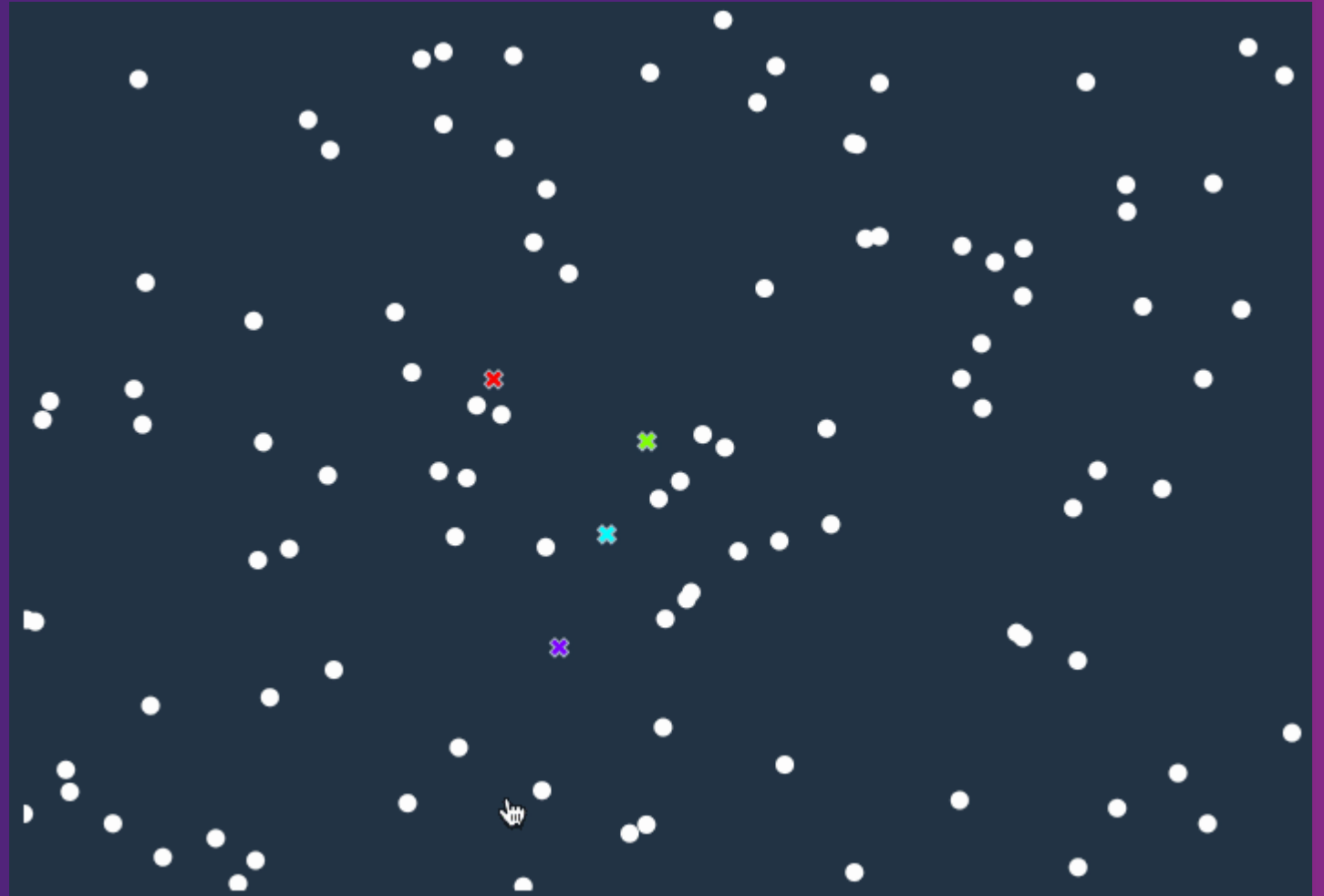
# Machine Learning, **Unsupervised** Learning Algorithm, Clustering with **Kmean**



1. Place  $k$  random centroids for the initial clusters.
2. Assign data samples to the nearest centroid.
3. Update centroids based on the newly assigned samples.



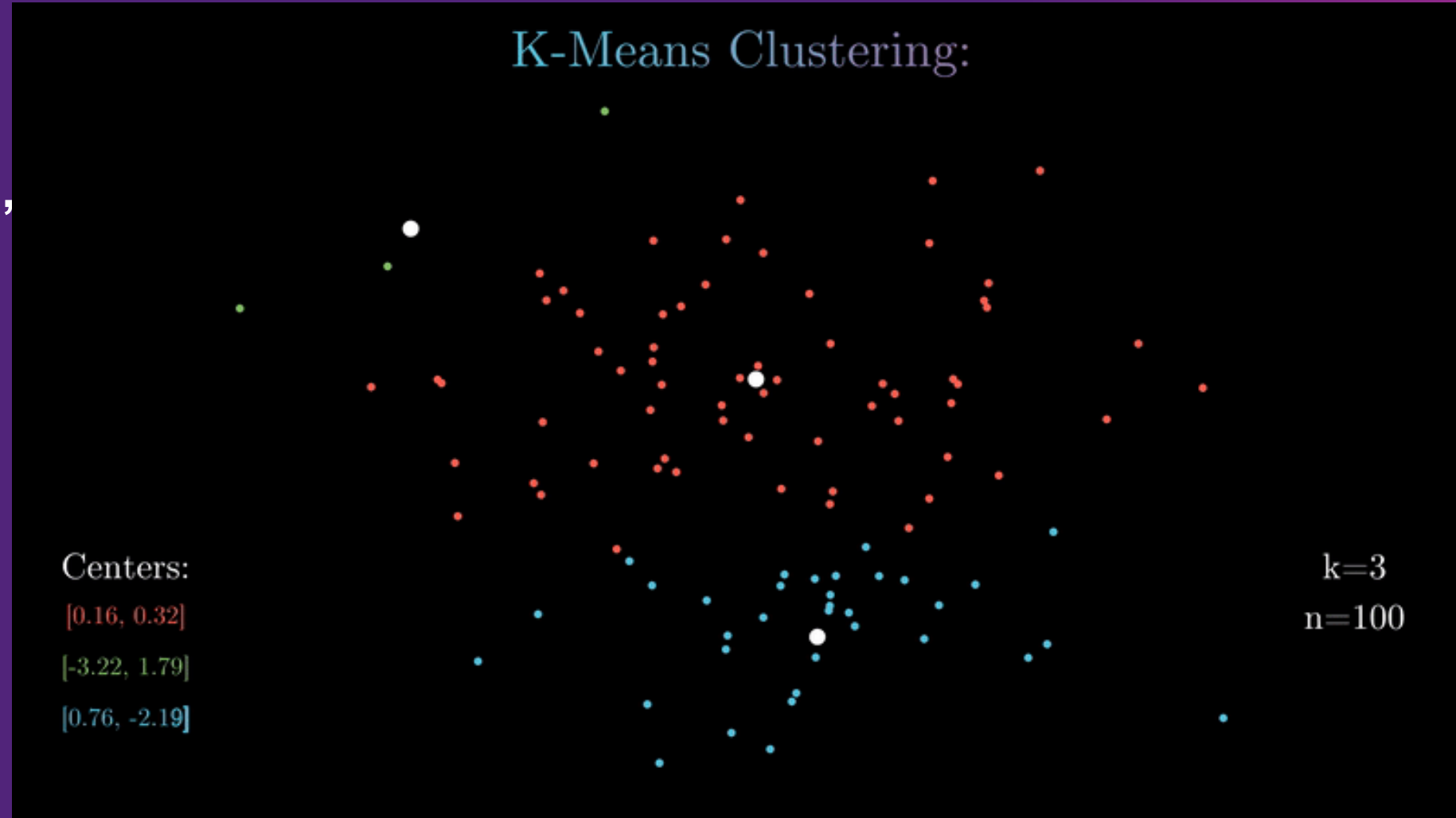
# Machine Learning, Unsupervised Learning Algorithm, Clustering with Kmean



<https://www.datacamp.com/tutorial/cluster-analysis-in-tableau>

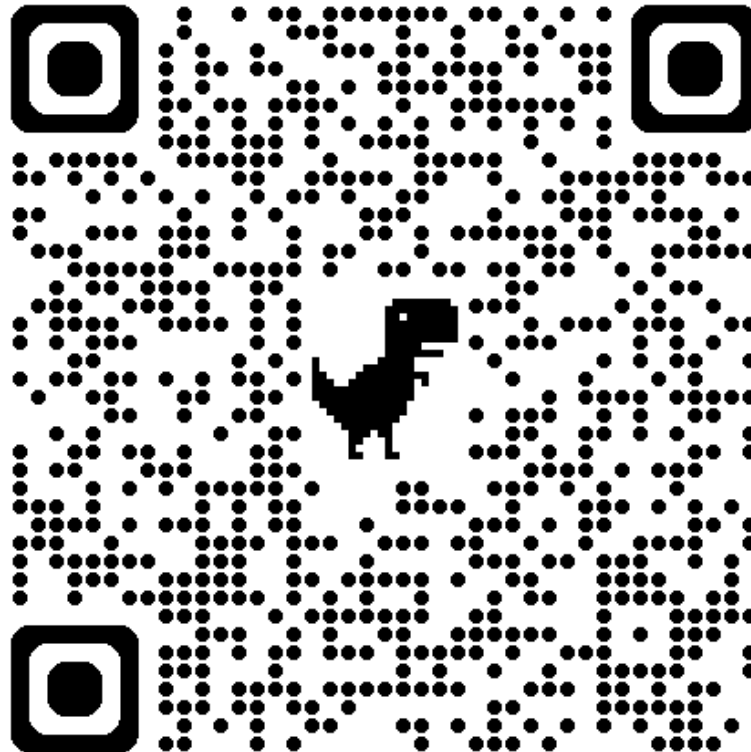


# Machine Learning, Unsupervised Learning Algorithm, Clustering with Kmean



<https://www.linkedin.com/pulse/k-means-clustering-use-cases-kartik-lokare-1f>

# Exercise with different datasets



<https://shorturl.at/tVPsl>



# Upcoming Events and Notifications

Student Staff Partnership

Statistics with Python Seminar

Statistics Network

Online resources

Library training

# SSP Seminar Feedback

