



The background features a white surface scattered with numerous colored dots in various sizes and colors, including red, orange, yellow, purple, blue, green, and cyan. A large, semi-transparent gray polygon is positioned in the center. Inside this gray shape, the words "CONCEPT DRIFT" are written in a bold, white, sans-serif font.

# CONCEPT DRIFT



# CONCEPT DRIFT

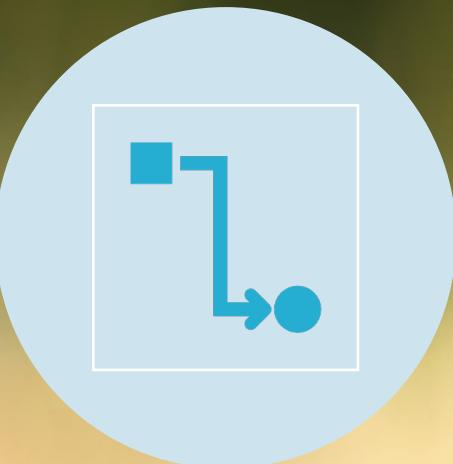
- Introduction
- Overview of concept drift
- Before we start
  - Concept drift with SL
  - Concept drift with UL
  - Concept drift with RL



A small green seedling with two leaves grows out of dark, moist soil. The background is a soft-focus green, suggesting a natural environment. A white, rounded rectangular frame with a dotted border is positioned in the upper left corner, containing the text.

Concept drift  
with SL

# Concept drift with SL



CONCEPT DRIFT



DATA DRIFT

# Concept drift with SL



ข้อมูลใน training set จะต้องประกอบด้วย distribution เดียวเท่านั้น



ข้อมูลใน training set จะต้องประกอบด้วย concept เดียวเท่านั้น

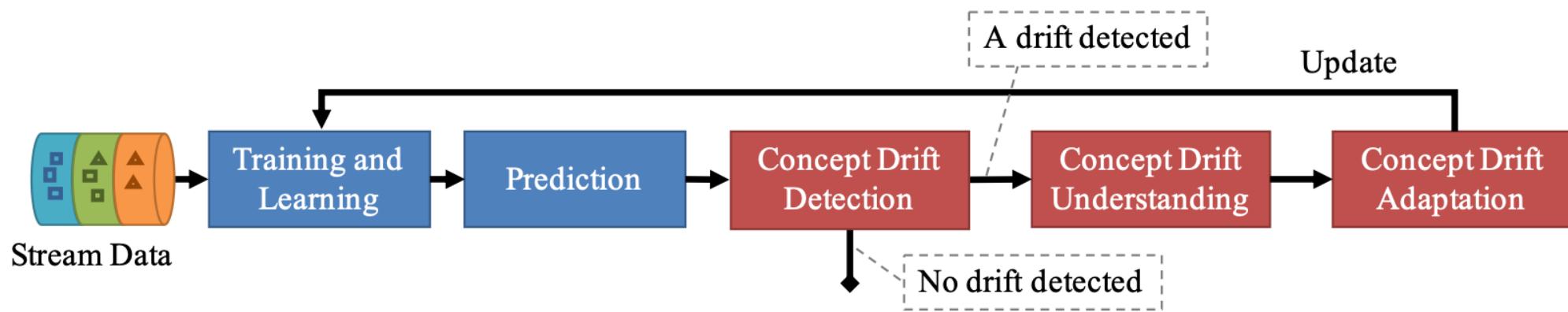


เพื่อทดสอบความ general, ข้อมูลใน training set และ test set ต้องอยู่ใน concept เดียวกัน



ข้อมูลที่นำ model ไปใช้จริง จะต้องอยู่ใน concept เดียวกันกับ training set และ test set

# Concept drift with SL



# Concept drift with SL



Error Rate-based Drift Detection



Data Distribution-based Drift Detection



Multiple Hypothesis Test Drift Detection

# Concept drift with SL



Error Rate-based Drift Detection



Data Distribution-based Drift Detection



Multiple Hypothesis Test Drift Detection

# Concept drift with SL



Error Rate-based Drift Detection



Data Distribution-based Drift Detection



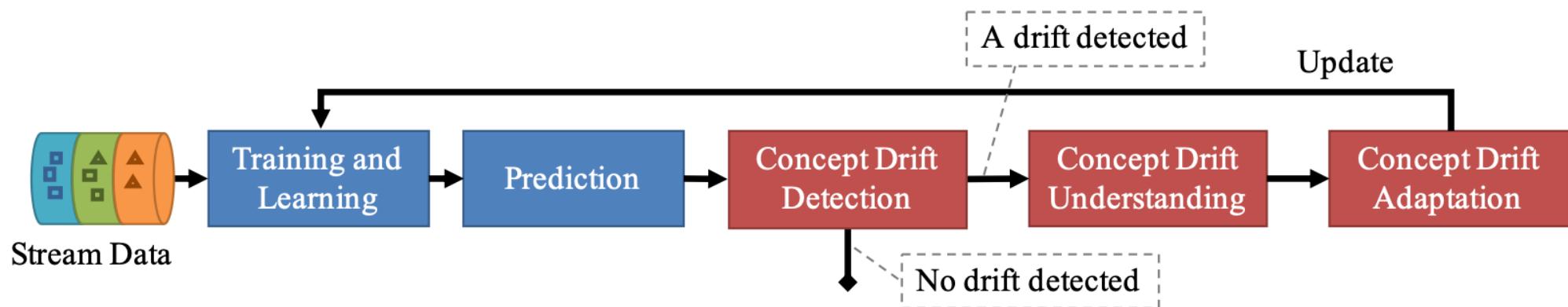
Multiple Hypothesis Test Drift Detection

# Error rate-based drift detection

Alarm (2SD)

Confirm (3SD)

# Concept drift with SL



# Concept drift understanding



WHEN



HOW



WHERE

# Concept drift understanding



WHEN

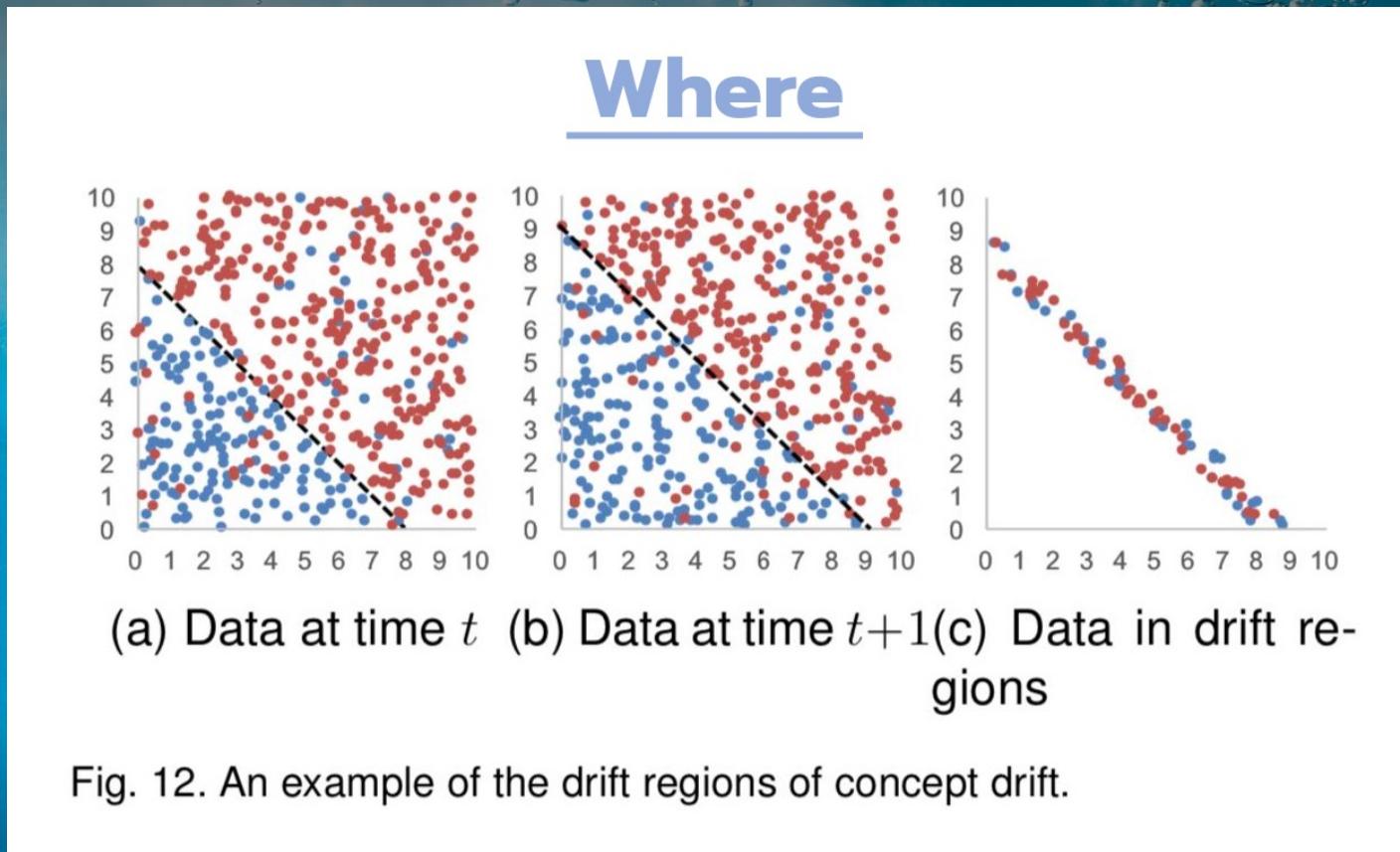


HOW

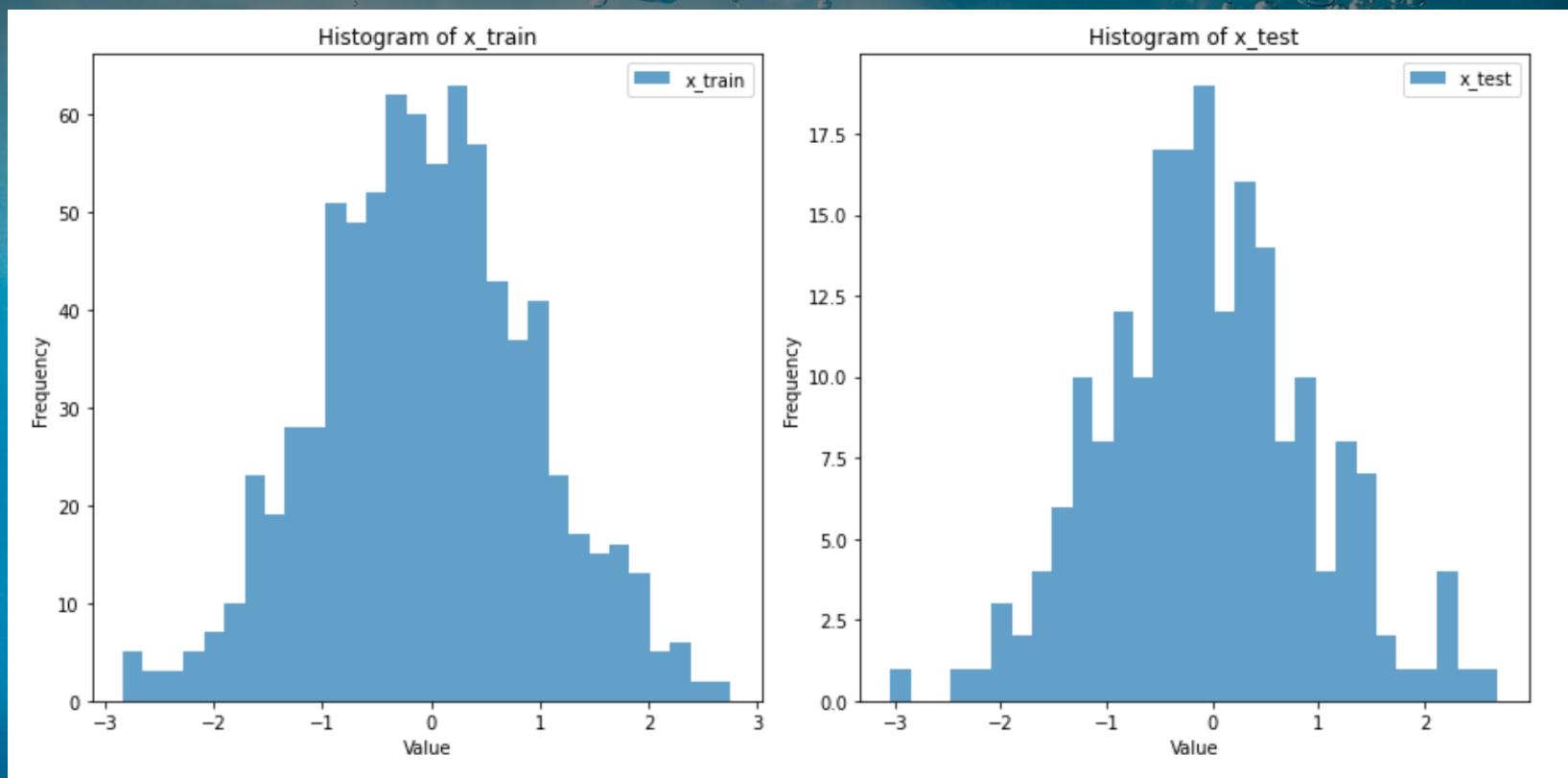


WHERE

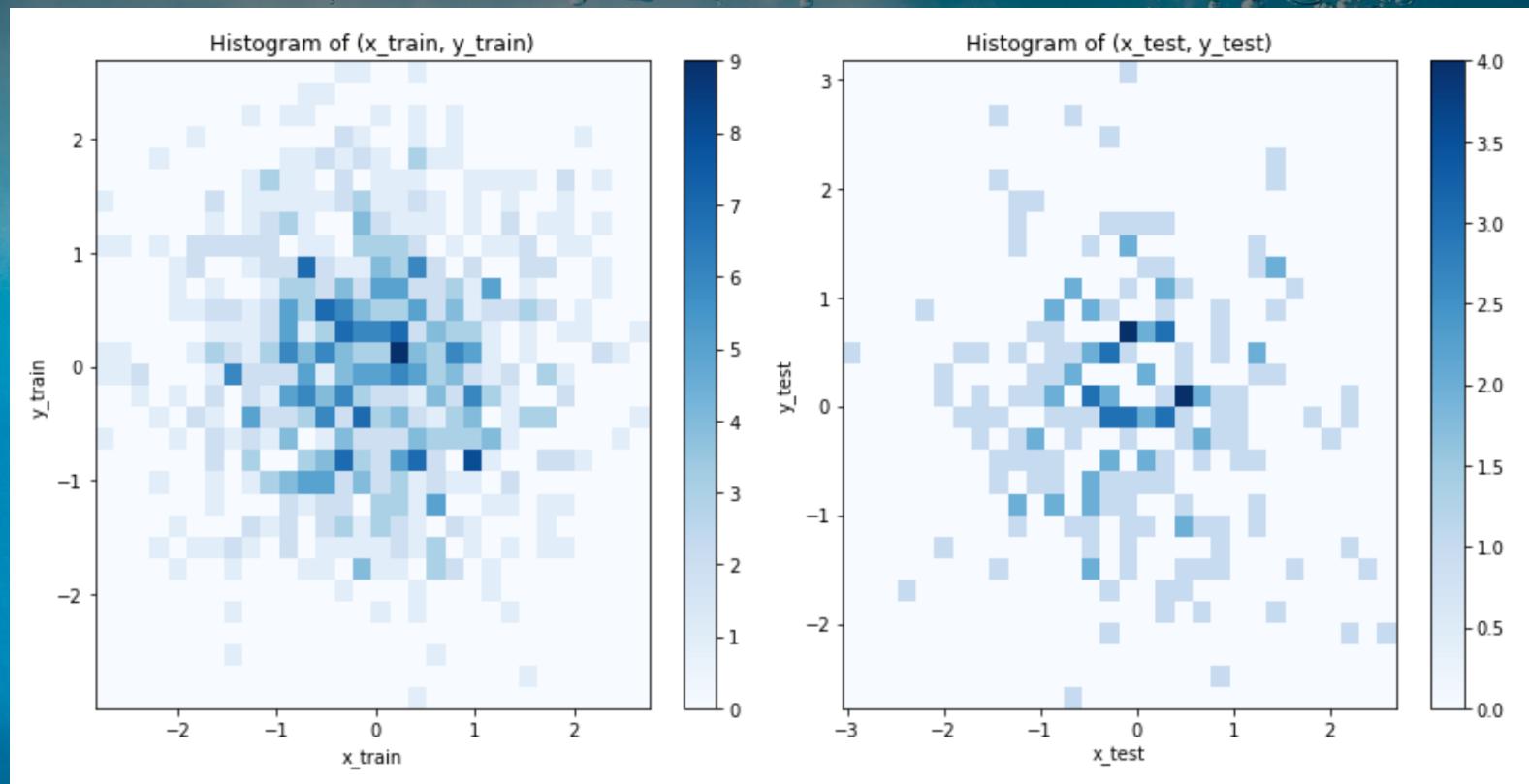
# Concept drift understanding



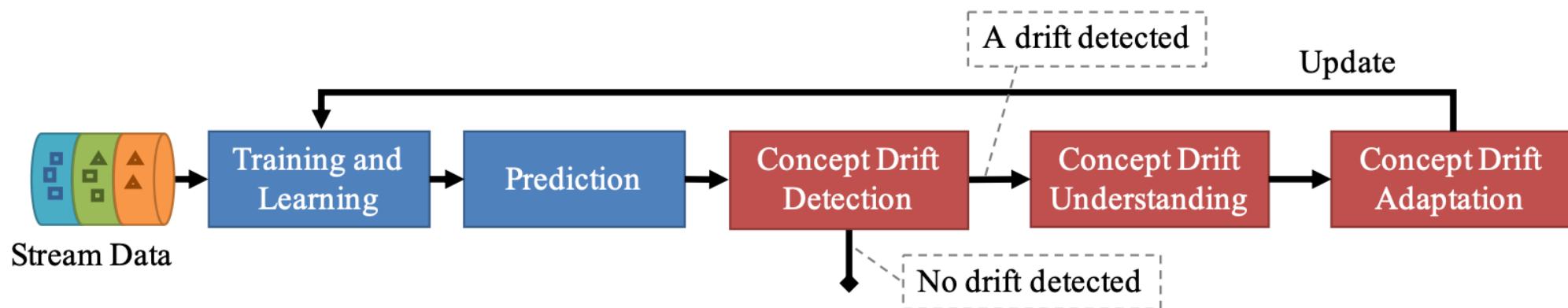
# Concept drift understanding



# Concept drift understanding



# Concept drift with SL



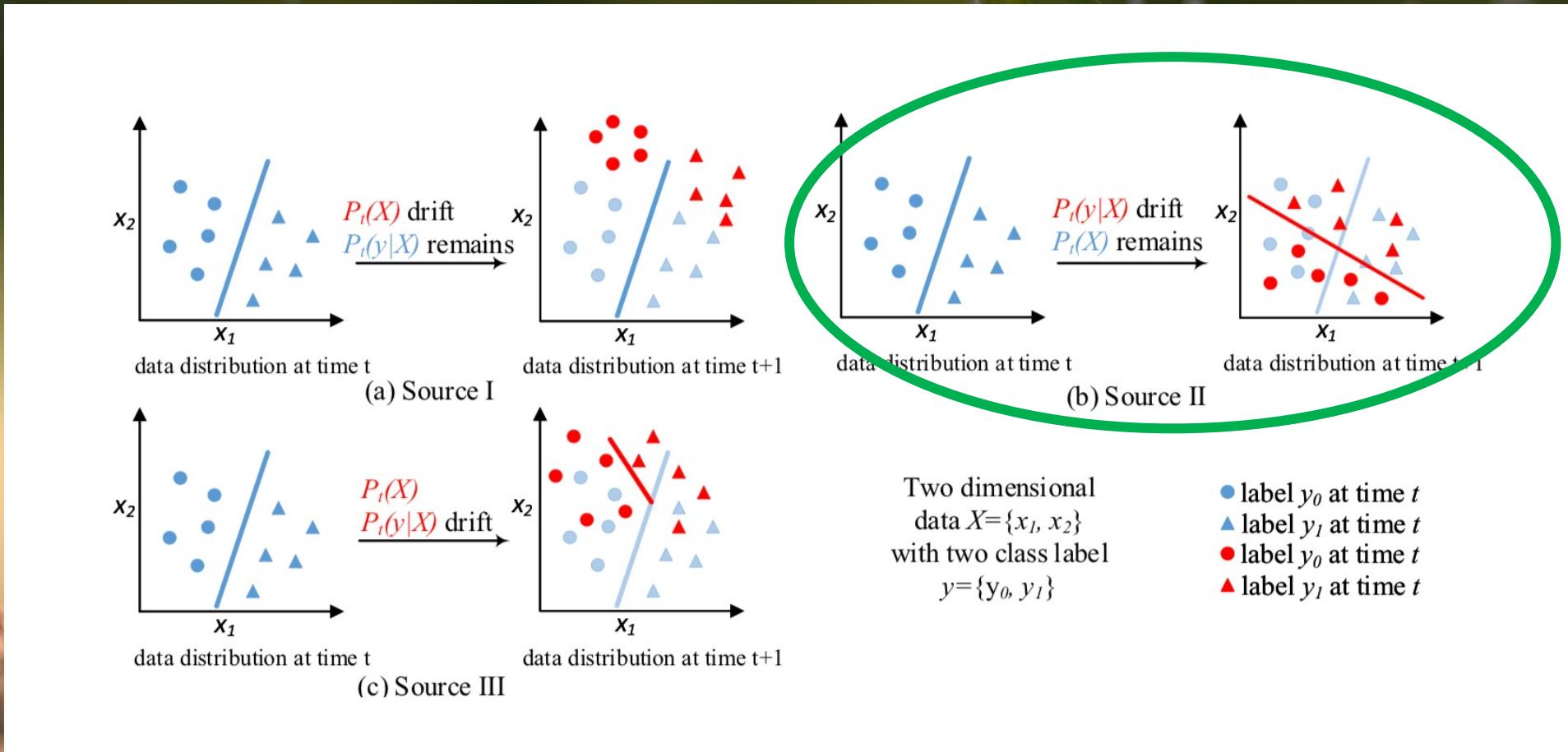
# Concept drift with SL

Incremental learning

Adaptive ensemble learning

Retrain

# Concept drift with SL



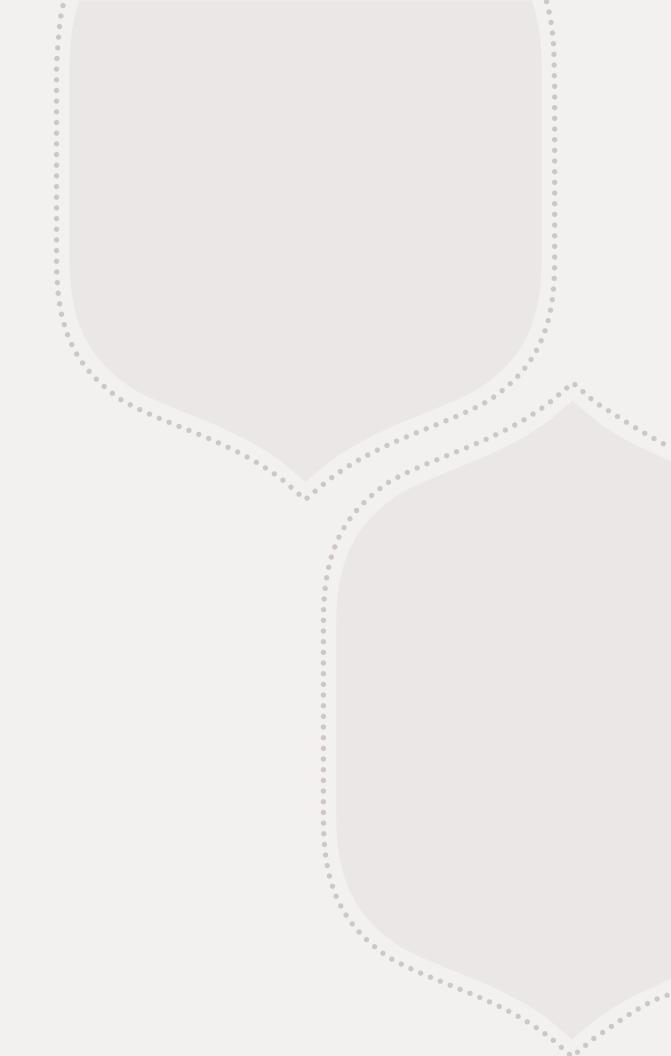
# Concept drift with SL

Incremental learning

Adaptive ensemble learning

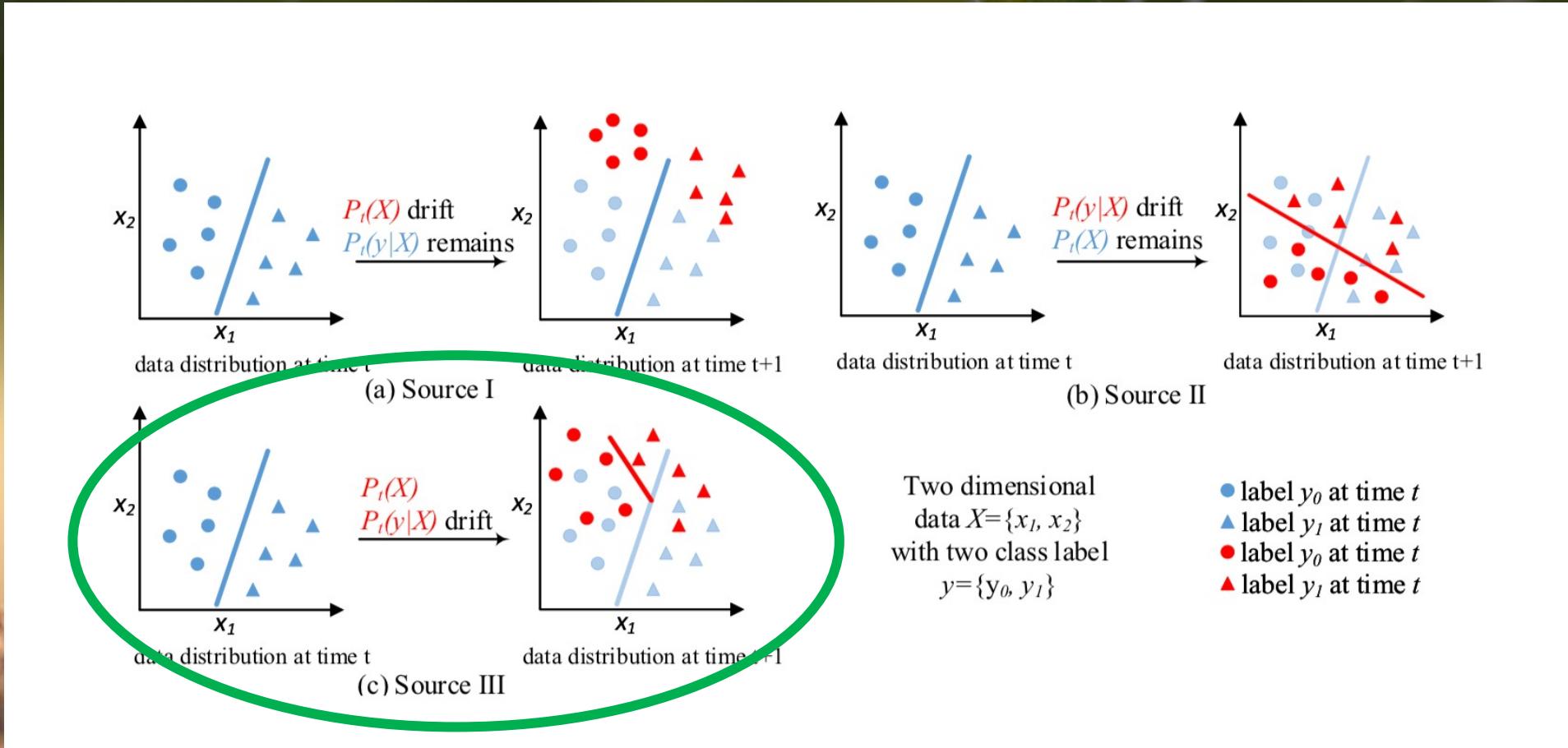
Retrain

# Explain incremental learning



\*\*\* อ่านนำข้อมูล 2 concept ใส่ลงไปพร้อมกันตอนทำ  
incremental learning

# Concept drift with SL



# Concept drift with SL

Incremental learning

Adaptive ensemble learning

Retrain (Train from synthesis data)

ทำไม incremental learning ถึงรับมือกรณี data drift ไม่ดี?

# Concept drift with SL

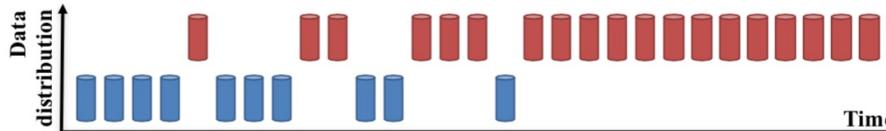
## Sudden Drift:

A new concept occurs within a short time.



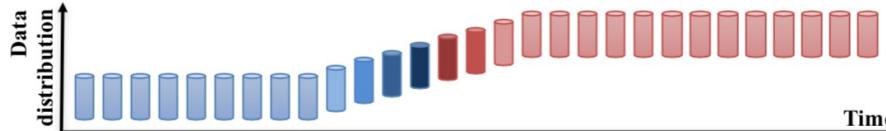
## Gradual Drift:

A new concept gradually replaces an old one over a period of time.



## Incremental Drift:

An old concept incrementally changes to a new concept over a period of time.



## Reoccurring Concepts:

An old concept may reoccur after some time.



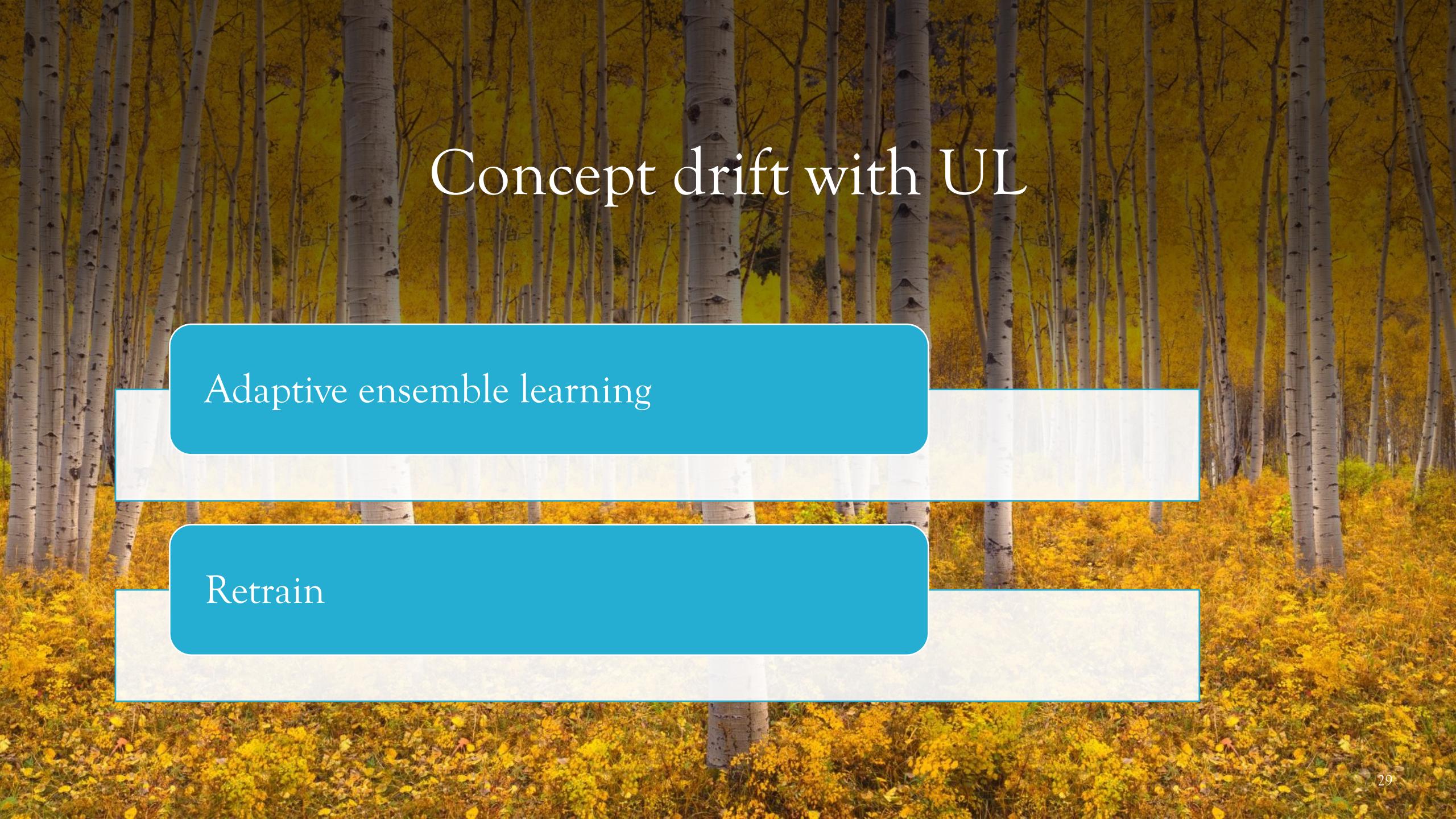


# Concept drift with UL

A photograph of a forest of aspen trees. The trunks are white with dark brown lenticels and some black spots. The ground is covered with fallen yellow leaves. The background shows more trees and a bright sky.

# Concept drift with UL

## EVALUATION METRIC FOR CLUSTERING



# Concept drift with UL

Adaptive ensemble learning

Retrain

The background image shows a wide-angle landscape of a deep canyon with red and brown layered rock walls. A winding asphalt road cuts through the valley floor. The sky is filled with dramatic, light-colored clouds.

# Concept drift with RL

# Concept drift with RL

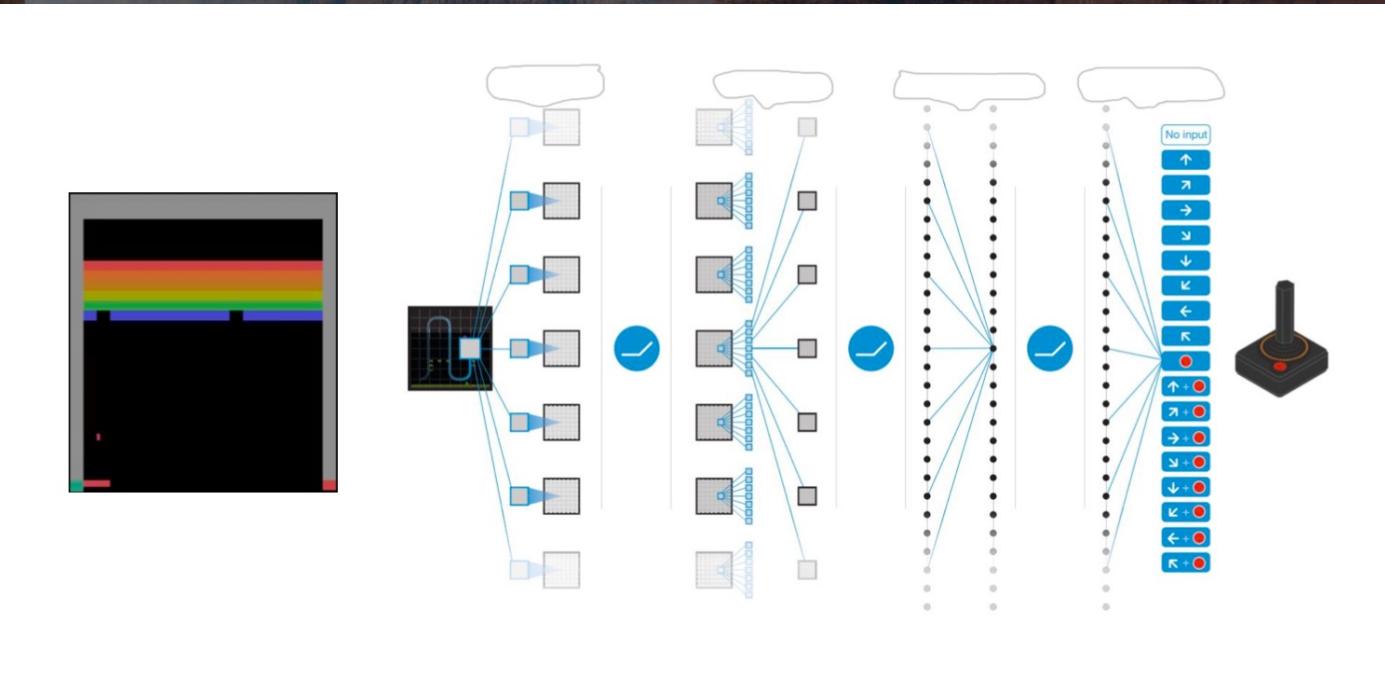


Concept drift with DeepRL

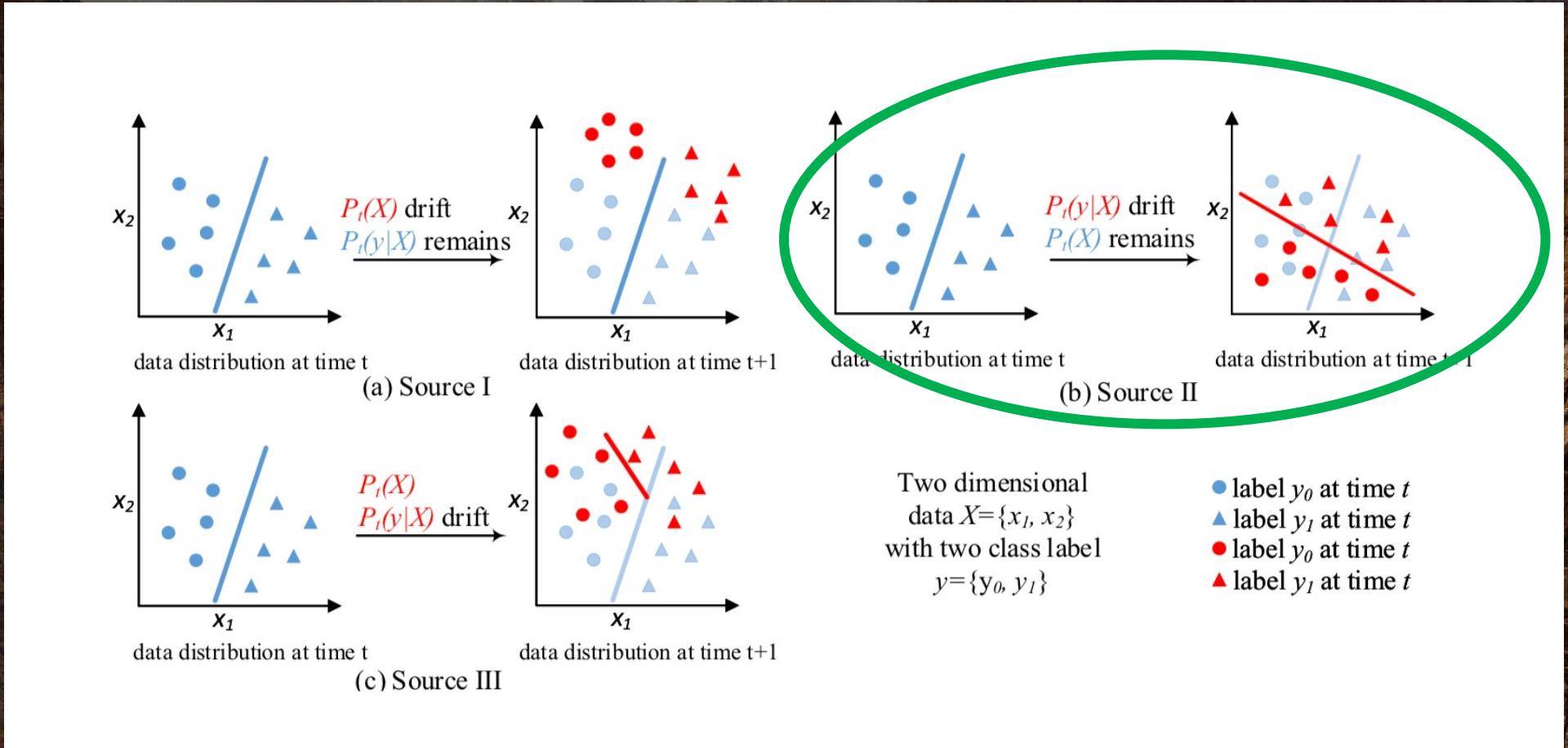


Concept drift with Genetic algorithm

# Concept drift with DeepRL

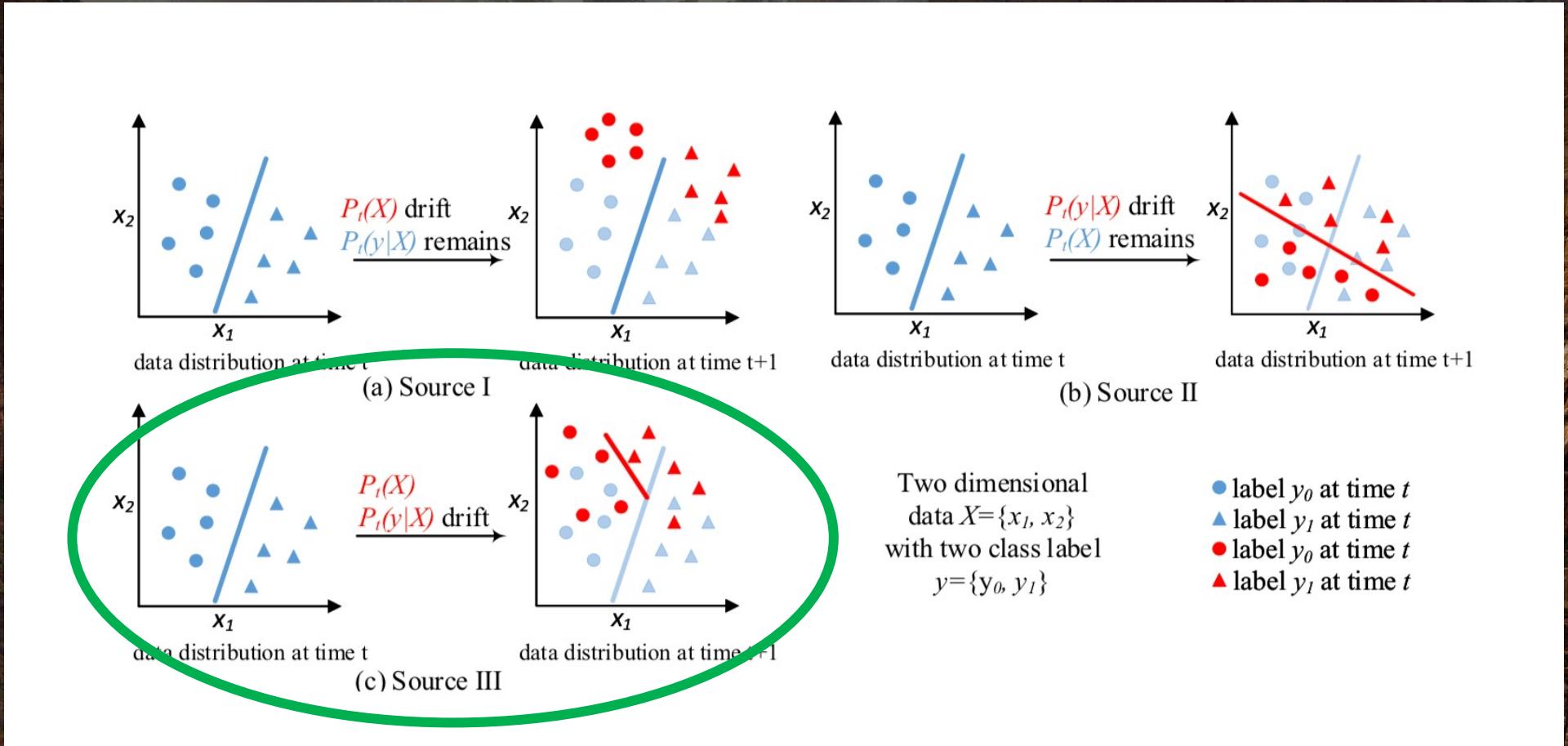


# Concept drift with Genetic algorithm



# Explain

# Concept drift with Genetic algorithm

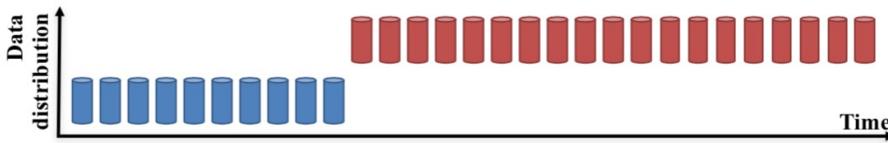


# Explain

# Concept drift with Genetic algorithm

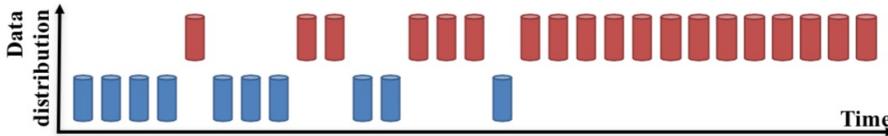
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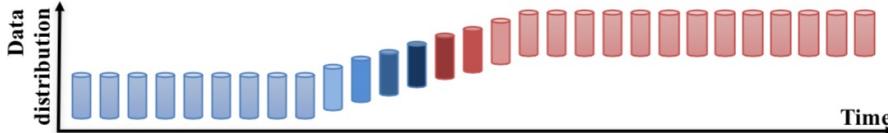
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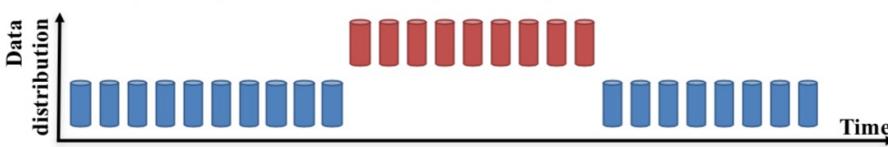
## Incremental Drift:

An old concept incrementally changes to a new concept over a period of time.



## Reoccurring Concepts:

An old concept may reoccur after some time.





THANK YOU