Introduction to Artificial Intelligence

VICTORIA UNIVERSITY OF
WELLINGTON
TE HERENGA WAKA

COMP307/AIML420

Search and Machine Learning Basics: Tutorial

Dr Fangfang Zhang

fangfang.zhang@ecs.vuw.ac.nz

How to get Help

1. Helpdesk (**highly recommended**)
   Monday-Friday, CO242b, 4:00-5:00pm, 5:00-6:00pm (extra ones on due week)
   Zoom: https://vuw.zoom.us/my/comp307
2. Look at the lectures and search information, e.g., google
3. Post questions/discussions on forum (do not share solutions)
4. Discuss with classmates
5. Email us (Yi/Andrew/Fangfang) or come to our office

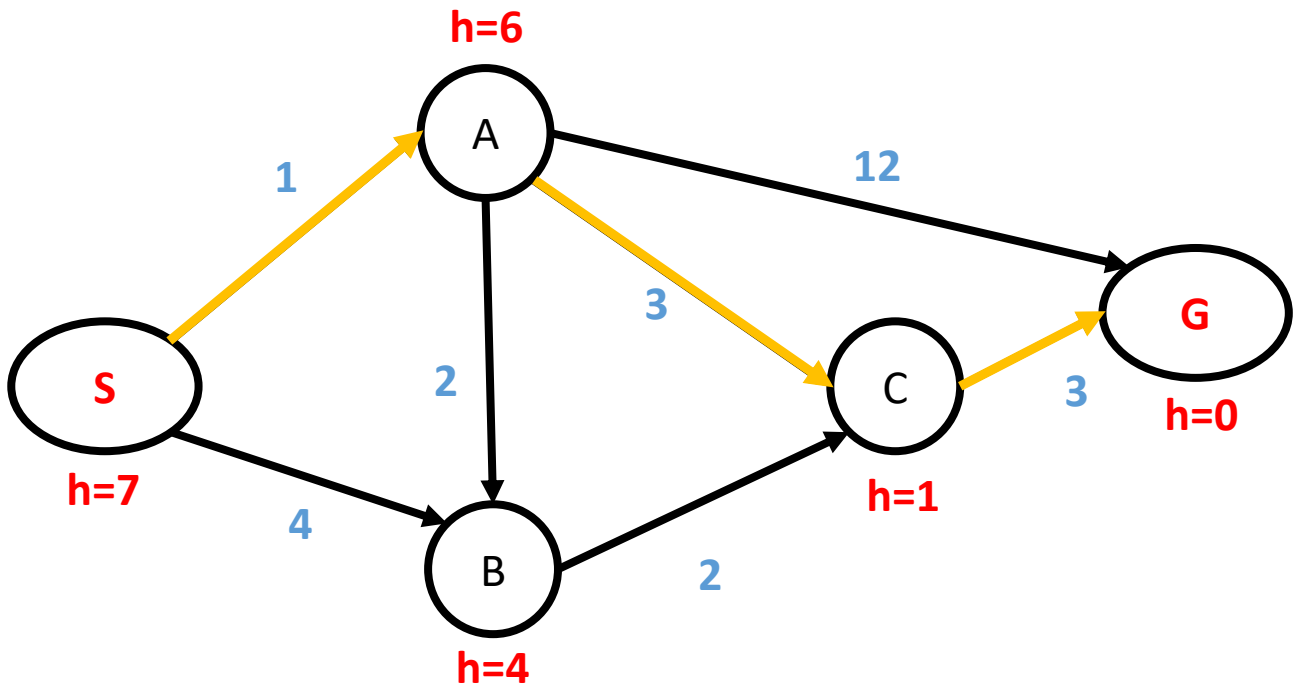
Tips for doing assignments

1. Answer the questions as required (keys, not more)
2. Upload documents properly, e.g., your answer, readme file, dataset
3. Provide source code **and** executable program
4. Show your thinking whenever it is possible
5. Any difficulties, contact us ASAP!

COMP307/AIML420 Week 2 (Tutorial)

1. Announcements
   - Assignment 1
     - When to start?
     - What to do now?
   - Helpdesk sessions
2. Nature of this course
   - Uncertainty:
     - Uncertain (AI)
     - Certain (other courses)
   - Solutions/answers:
     - Unique?
     - Best?
     - Good?
   - Algorithms/methods:
     - Step-by-step => the correct version (others)
     - Main ideas => many different versions (AI)
   - Details vs guidelines
3. Search (Lectures 2 & 3)
   - Search strategies
     - Uninformed
     - Informed
     - Beyond classic search
   - Classic vs. local search
   - (Genetic) Beam search
4. Machine Learning (Lecture 4)
   - Type of learning systems
     - Supervised learning
     - Unsupervised learning
   - Machine learning tasks
     - Classification
     - Regression
     - Clustering
   - Line fitting
     - Over-fitting

A* Search



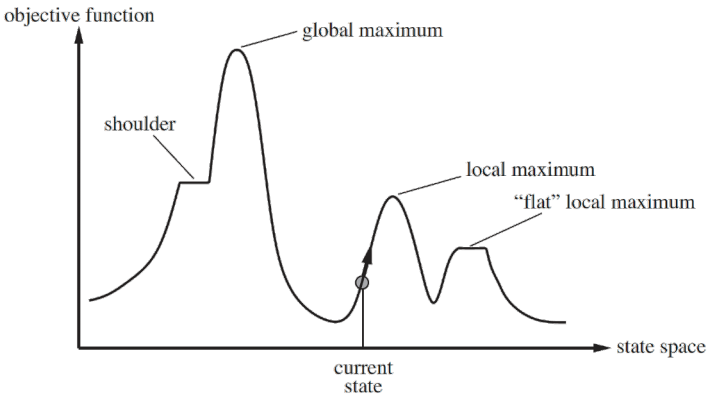
Step1:
f(A) = 1 + 6 = 7
f(B) = 4 + 4 = 8
f(A) < f(B), we choose **A** as **new** start node

Step 2:
f(B) = 1 + 2 + 4 = 7
f(C) = 1 + 3 + 1 = 5
f(G) = 1 + 12 + 0 = 13
f(C) < f(B) < f(G), we choose **C** as **new** start node

Step 3:
f(G) = 1 + 3 + 3 + 0 = 7
We achieve the goal **G**

Task: find the shortest path from S to G
f(n) = g(n) + h(n), choose the one with lowest f(n)
Note: g(n) is the cost of the path from the start node to n
h(n) is the estimated cost of the cheapest path from n to the target node

Classic vs Local Search



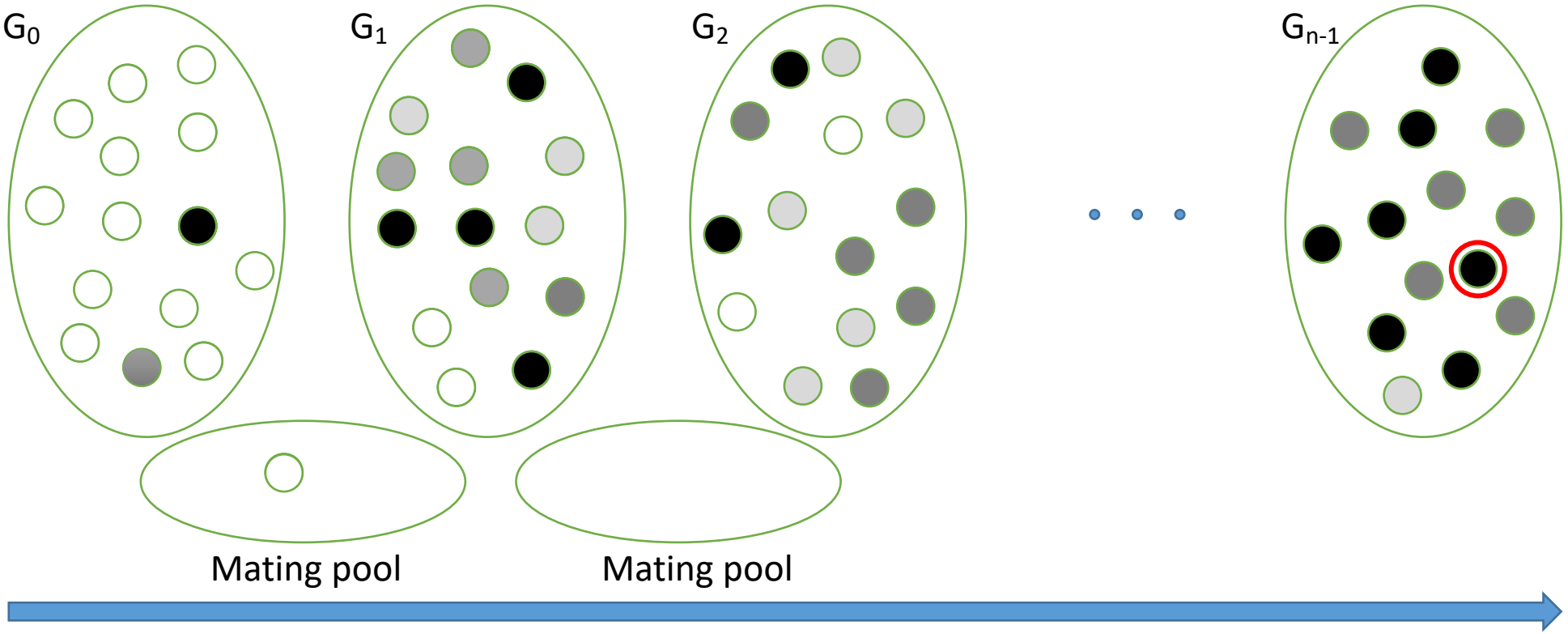
Classic Search

- Assumptions:
  - Observable
  - Deterministic
  - known environment where the solution is a sequence of actions
- The path is a solution

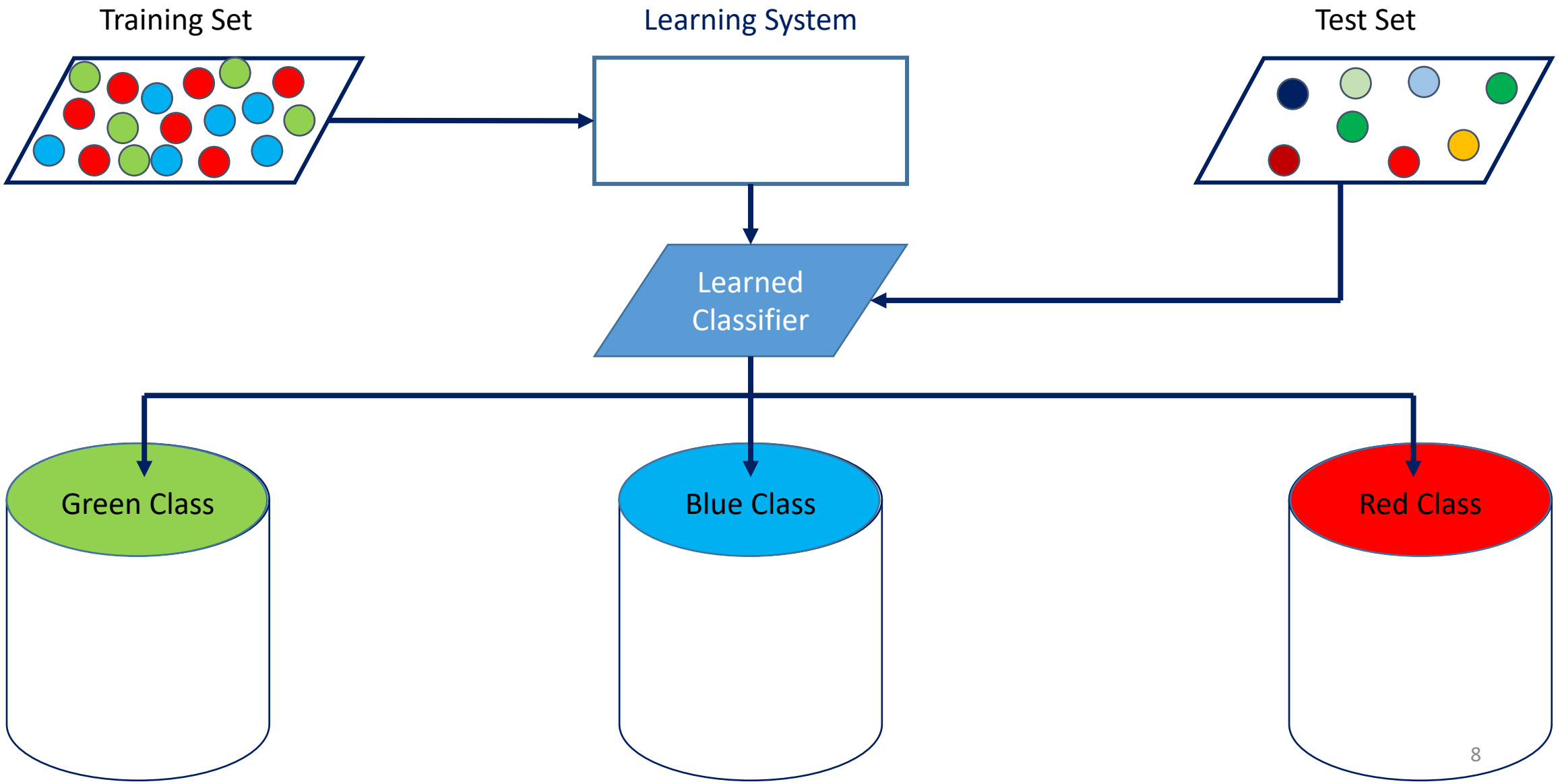
Local Search

- Useful for solving optimisation problems
- Aim to find the best state according to an objective function
- Only keep one state and its evaluation
- Choose the best successor

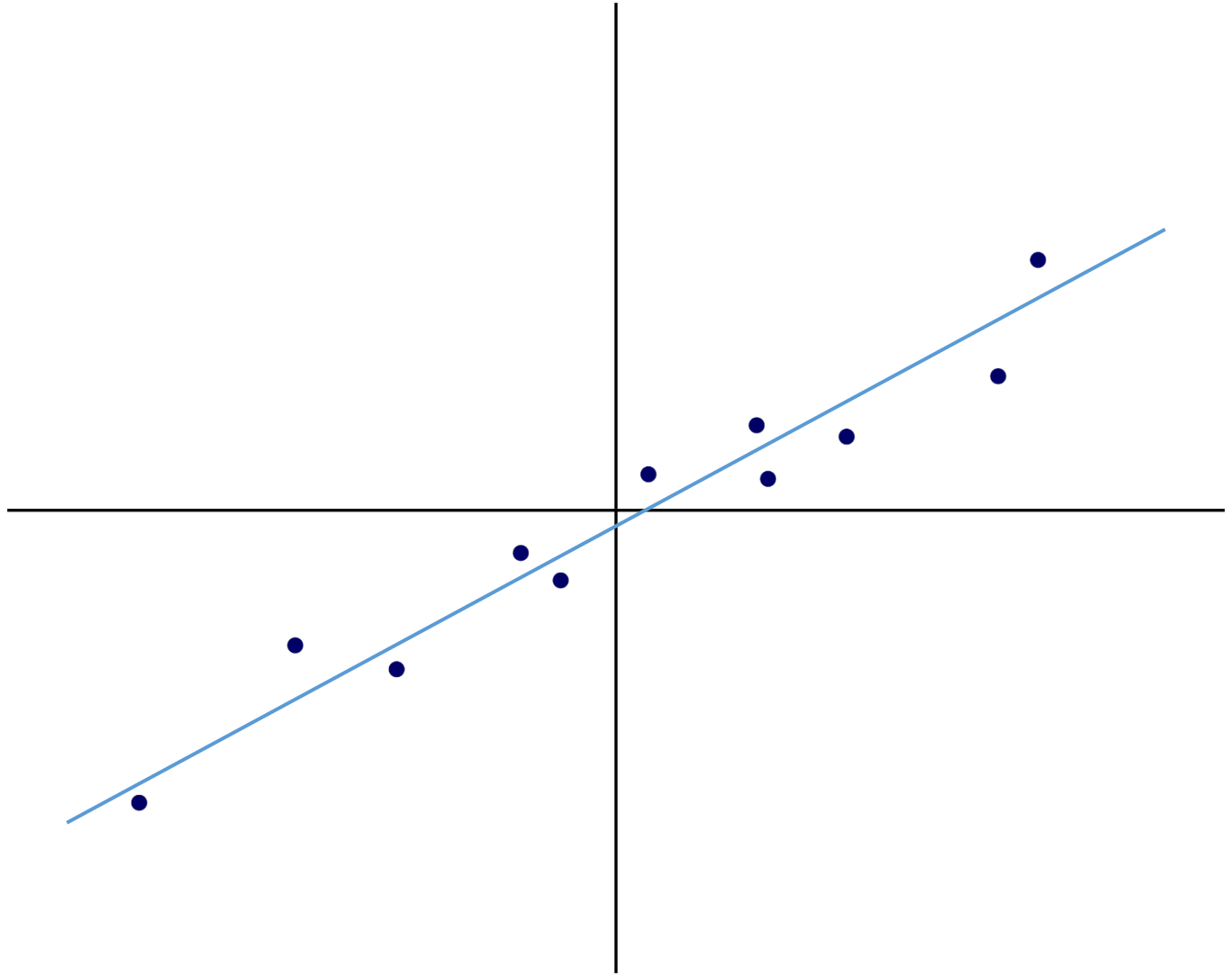
(Genetic) Beam Search



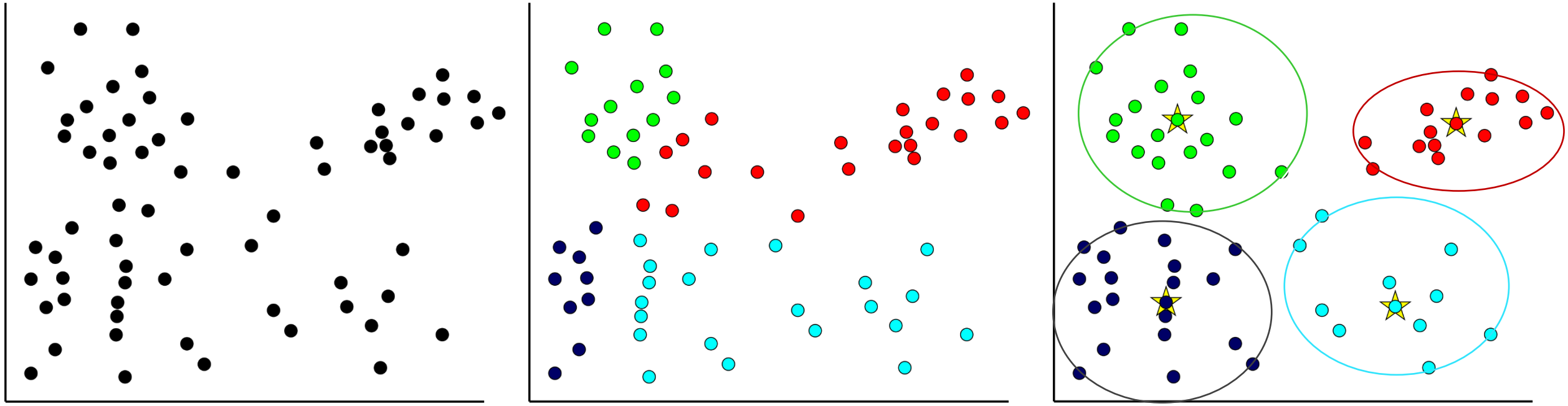
Supervised Learning (Classification)



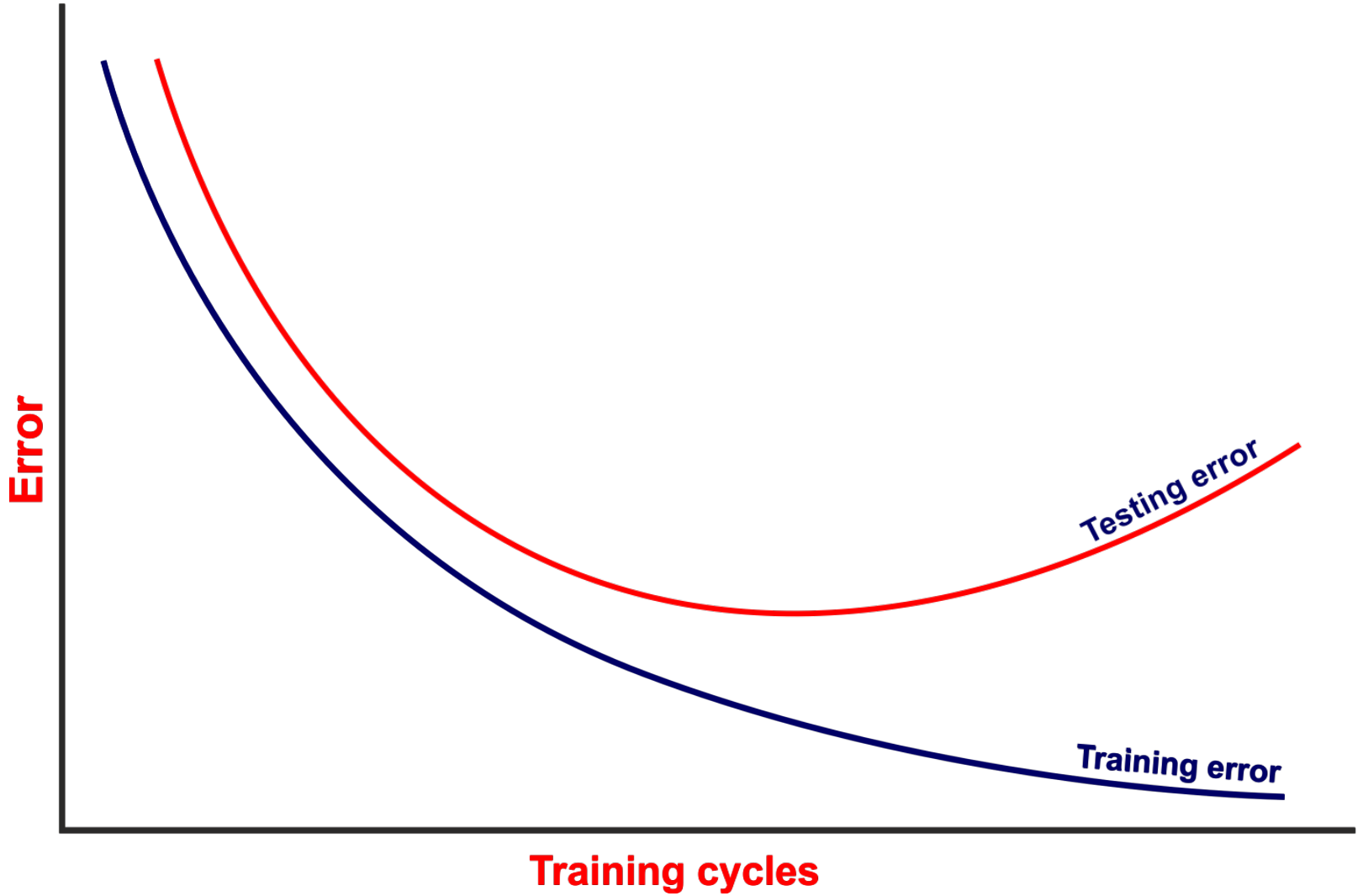
Supervised Learning (Regression)



Unsupervised Learning (Clustering)



Over-fitting



Validation Set

- What?
- Why?
- How?