中原大學
工業與系統工程學系
Chung Yuan Christian University
Department of Industrial and Systems Engineering

SK計劃課程
114-2授課教師教學內容

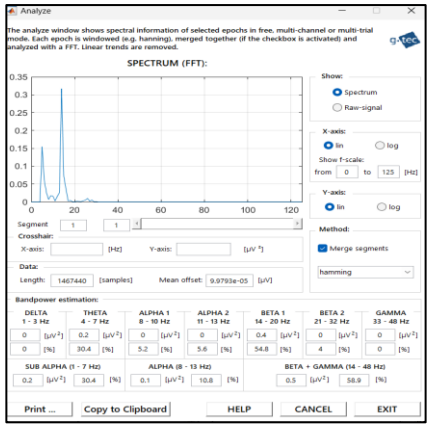
SOLVER KNIGHT COURSES

- 課程時間目前可能安排於：
  3-CD、5-78

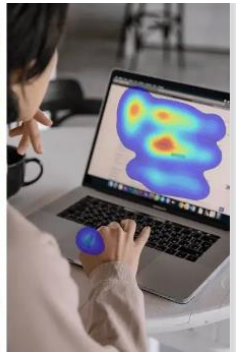
  *各教師課程內容規畫會另調整安排
- 114-2開課課程：個案研究、問題解決
- 115-1開課課程：個案研究、工業工程方法
- 115-2開課課程：個案研究、問題解決
- 116-1開課課程：個案研究、工業工程方法

Case study: Ergonomics
個案研究: 人因工程

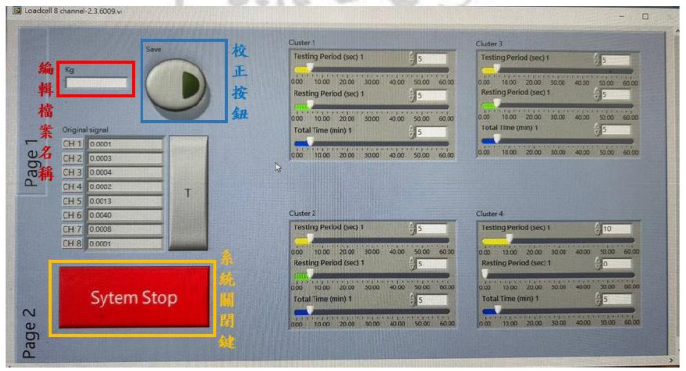
EEG



眼動儀 Eye-tracking



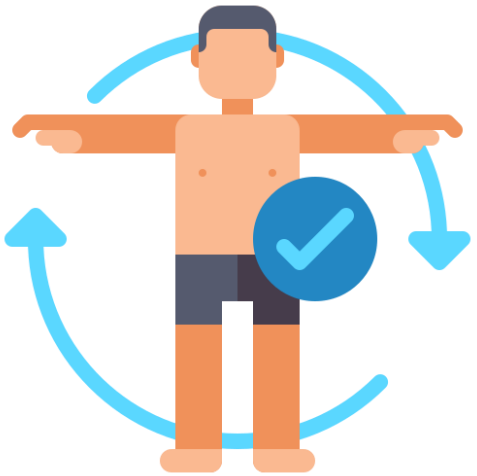
推拉力設備



Case study: Ergonomics
個案研究: 人因工程

1. Prerequisite: Motion and Time Study, Ergonomics
2. Course Design 依實際授課狀況 適時滾動式調整

No.	Content
1	Lecture: Introduction of course and ergonomics, introduce HW1
2	Oral presentation-HW1, Lecture: MSDs, introduce HW2
3	Oral presentation-HW2, Lecture: KIM, introduce HW3
4	Offline
5	Oral presentation of guided reading-HW3, introduce HW4
6	Offline: Prepare mid-term exam
7	Oral presentation of guided reading-HW4
8	Final project-topic
9	Conduct experiment
10	Conduct experiment
11	Data analysis
12	Discussion
13	Offline: Prepare final report of slide & hard-copy
14	Final presentation



Case Study

(Service Quality and Crisis Management)

Case material is taken from Kung-Hwa Management Cases Collections

Case Study

(Service Quality and Crisis Management)

Teaching Plan and Class Discussion:

1. Service Quality Perceived by Customers
2. Service Failure
4. Service Recovery
5. Crisis Management
6. Case study on Service Industry

   Aviation, Hospital, Hotel, Catering industry...

Simulation – FlexSim and Witness

- Kendall notations and basic Statistics and Queueing Concepts 1 hour

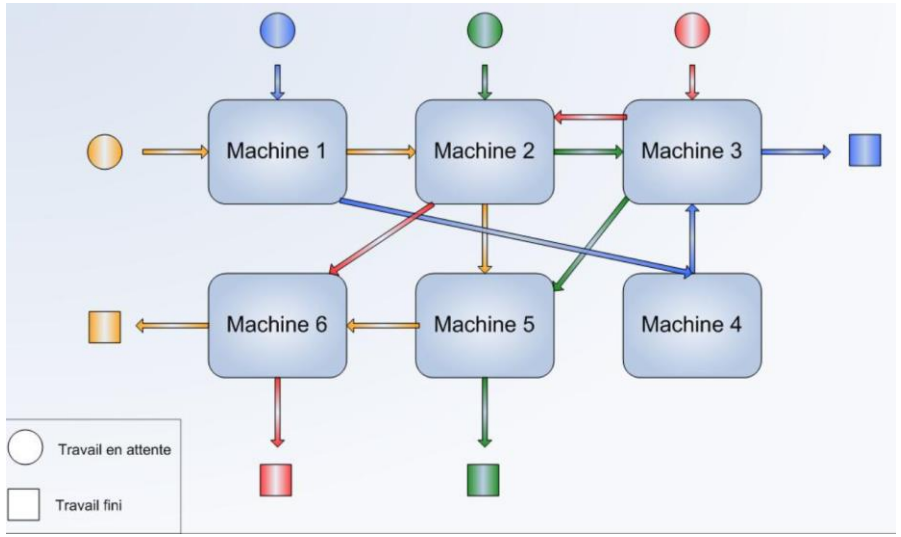
- FlexSim Little Factory (2 hours)
  - Source, Sink, Queue, Processor
  - Conveyors, Stack, Transporter, AGV
  - Global Table, List
- Witness Little Factory (2 hours)
  - TBD

- FlexSim Healthcare Little model (4 hours)
  - Process Flow
  - People Module

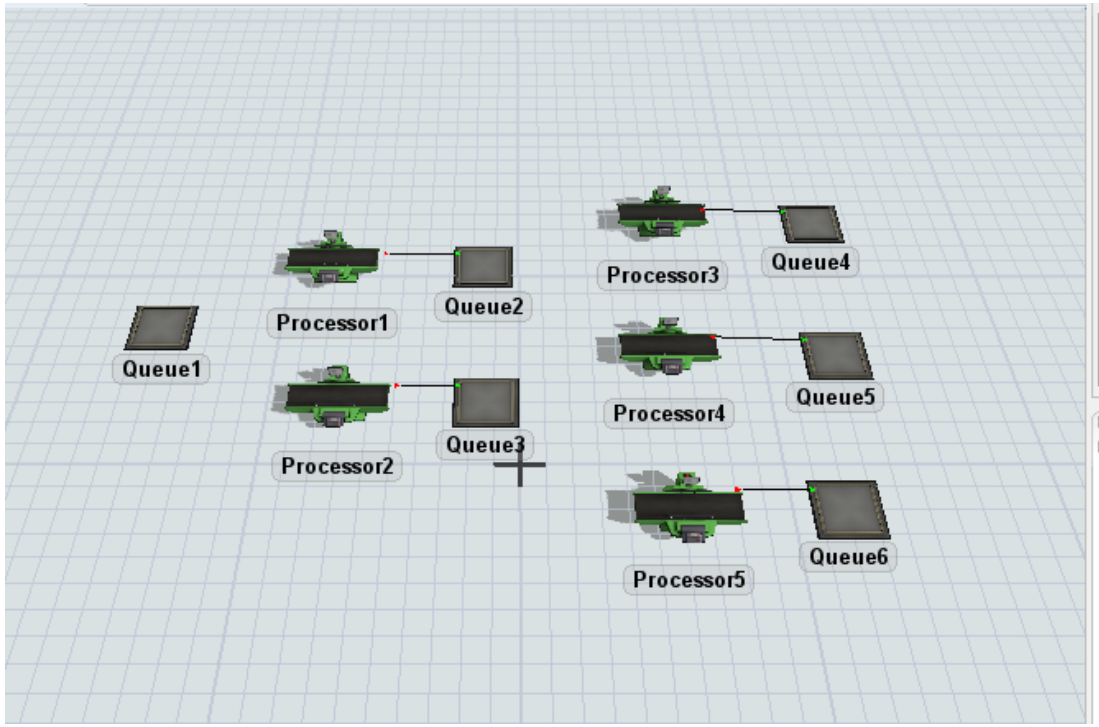
- Case study
  - Student Group Project

- 3D Model
  - Queue × 6 – temporally place items

Simple Jobshop System

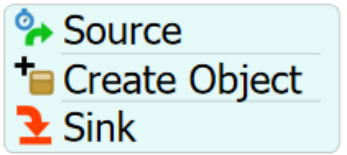


- General Process flow
  - Source – Generate Token
  - Create Object – Generate item (product)
  - Sink – Destroy Token
- 3D Model
  - Queue × 6 – temporally place items
  - Processor × 5 – proceed items
- Tool Box
  - Item List
  - Global Table



	M1	M2
P1	1	3
P2	1	4
P3	1	5
P4	2	3
P5	2	4
P6	2	5

ProcessFlow | ItemList1 Entries

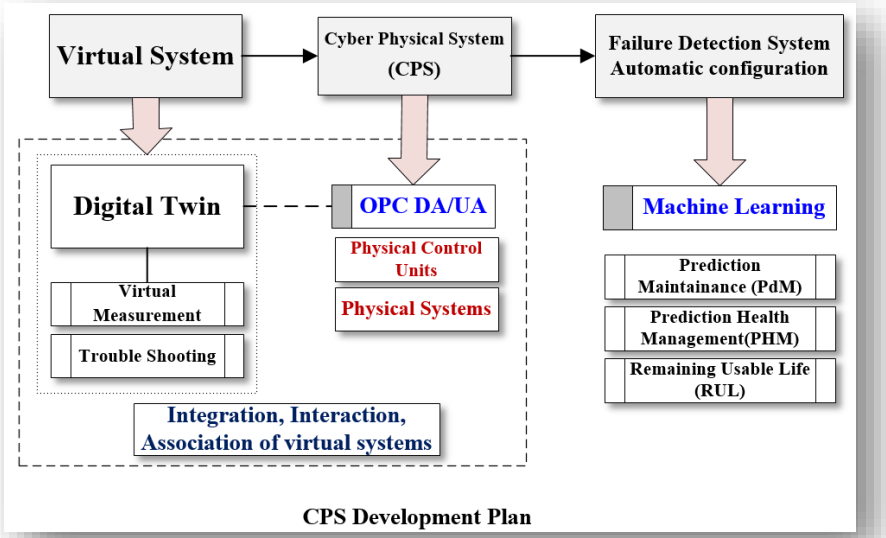


Manufacturing/AI：CPS introduction

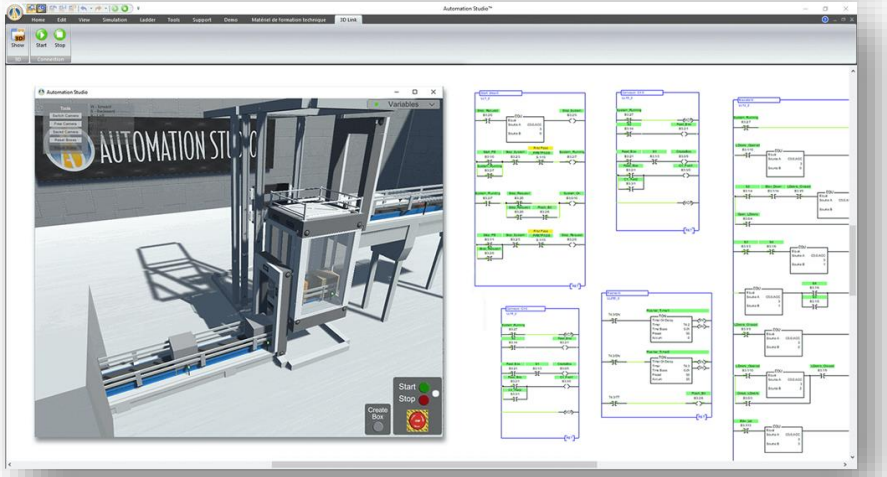
- Phase 1: Virtual system development
  - Platform： Automation Studio

1. Introduction of technologies applied to manufacturing systems
2. Process control introduction
   a) Actuators
   b) Electric control system (JIC and IEC standards)
   c) PLC and Ladder diagrams
   d) Sequential Function Charts (SFC)
   e) 3D virtual system development (Case study and existing equipment)

Note: Please refer to the figures
(1) CPS development Plan and
(2) CPS development details



CPS Development Plan



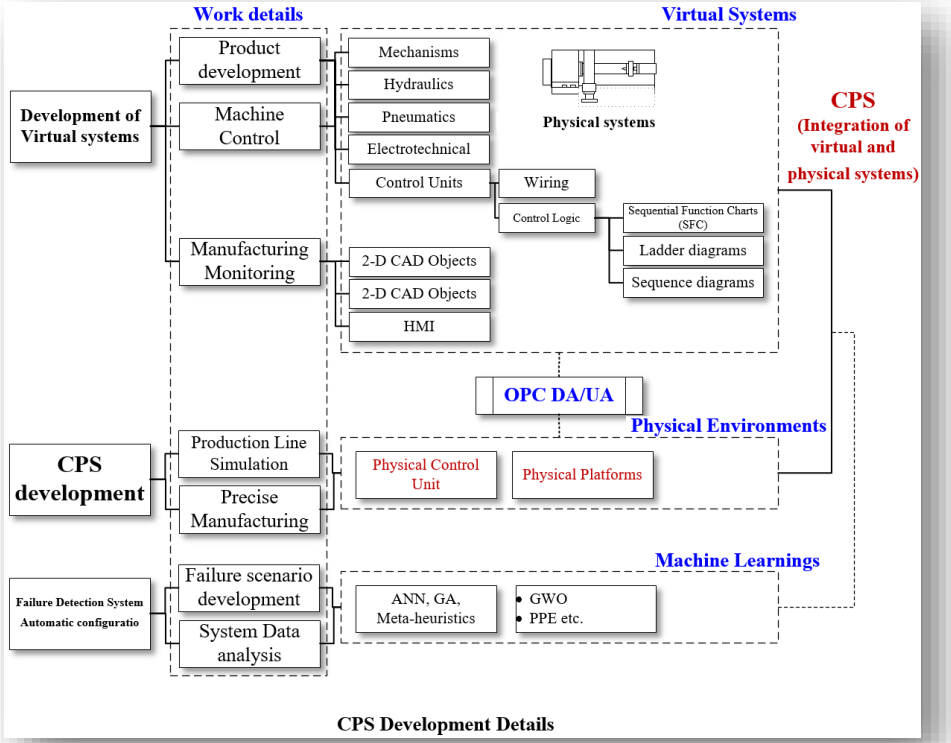
Manufacturing/AI：CPS introduction

- Phase 2: CPS development
  - Platform： Automation Studio

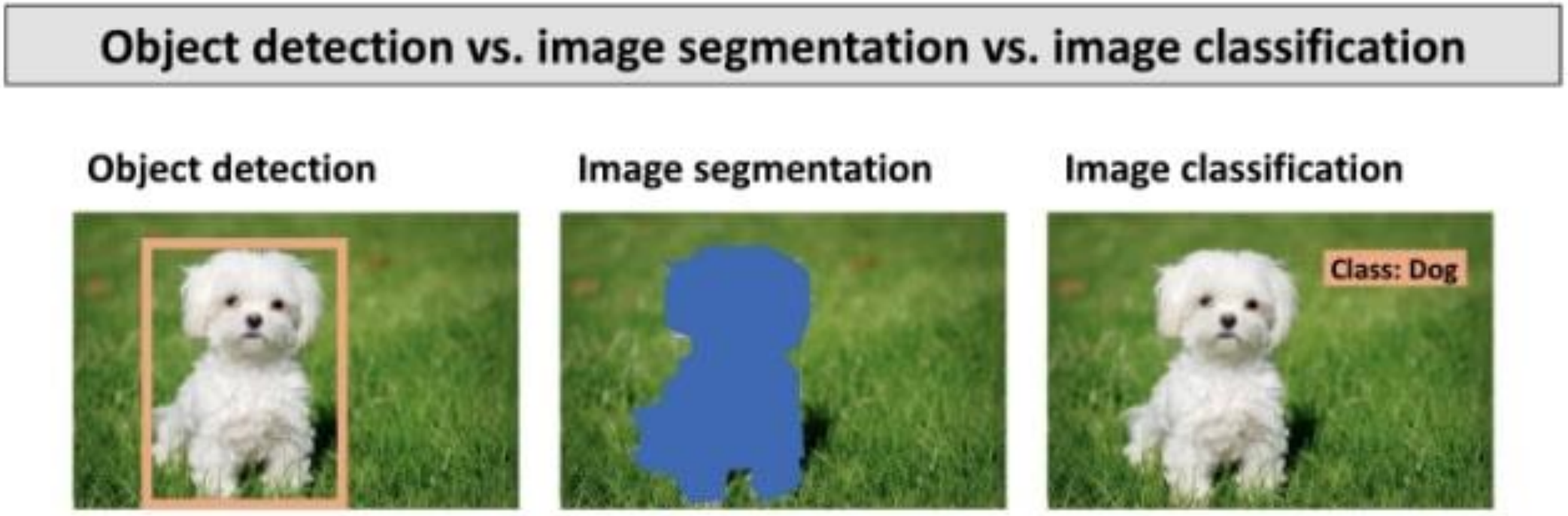
1. Introduction of physical control units
   a) Mitsubishi
   b) Omron

2. Introduction of communication strategies
   a) OPC severs
   b) OPC DA/UA
   c) Communications

Note: Please refer to the figures
(1) CPS development Plan and
(2) CPS development details



AI Technology for Computer Vision Application(1/2)



Source: https://levity.ai/blog/what-is-an-image-classifier

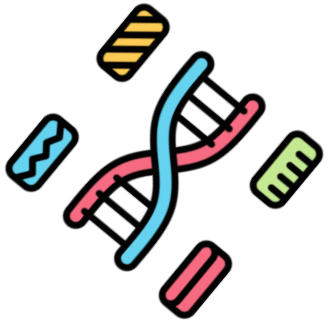
- Course Objectives
  - To learn the SOTA Object Detection and image segmentation method : YOLOv9

AI Technology for Computer Vision Application(2/2)

- Course Outline
  - What is Object Detection and Image Segmentation ?
  - Fundamentals of Convolutional Neural Network (CNN)
  - The Object Detection and Segmentation method : YOLOv9
  - The implementation of YOLOv9 using Pytorch library
    - » Train a YOLOv9 model using the image training dataset
    - » Inference the image testing dataset using your YOLOv9 model

AI real-time Field Crowd Surveillance Application

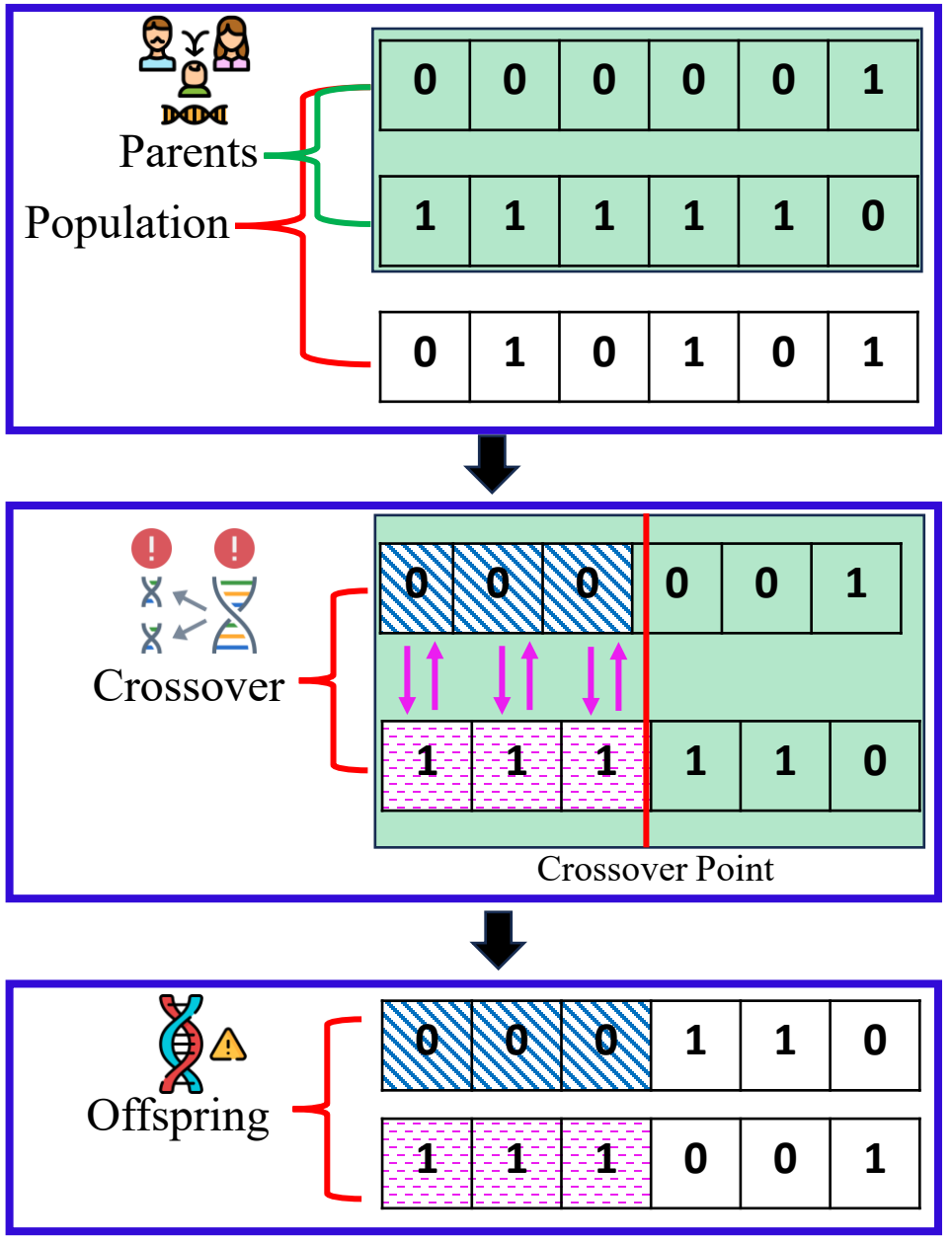
Industrial Safety Surveillance Application



Metaheuristic Algorithm I
Genetic Algorithm (GA)

This course will focus on the GA, a very common type of **Metaheuristic Algorithm**, which is suitable for situations where the best answer is sought among many choices.

※GA is applicable to many Industrial Engineering problems in Management Science and Operations Research.



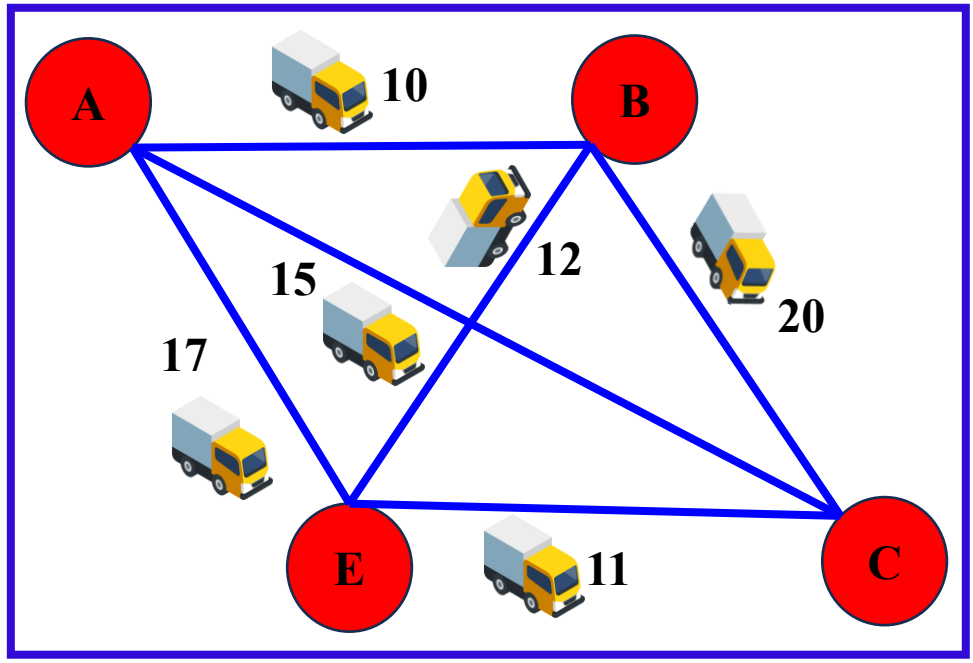
Course Objectives:

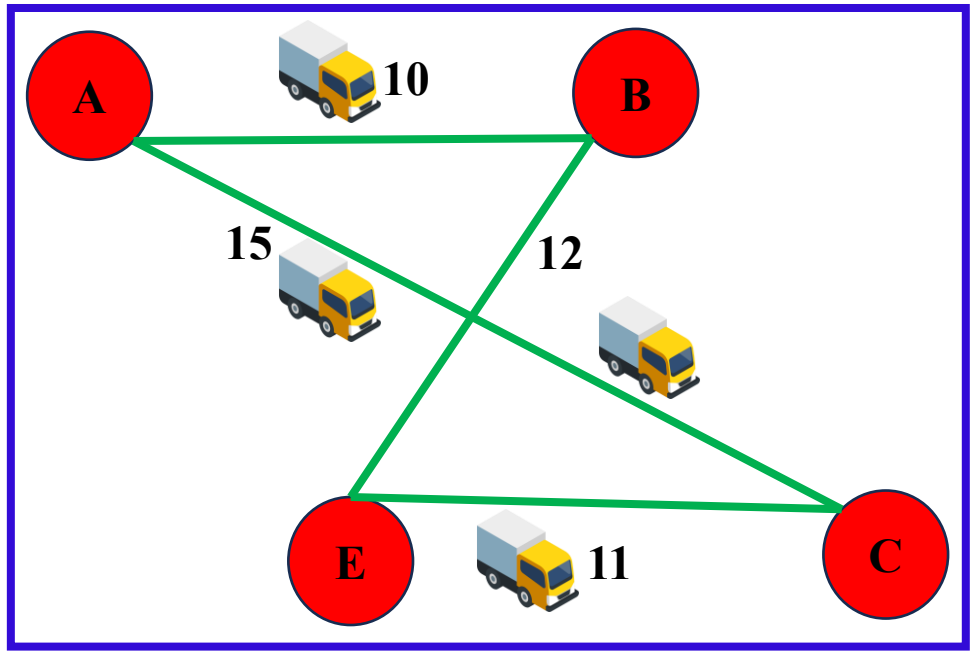
- ✓ Understand the basic concepts and operation principles of GA.
- ✓ Learn to design and implement simple GA to solve practical problems.
- ✓ Explore the practical applications of GA in management science and operations research.

Metaheuristic Algorithm II

Travelling salesman problem (TSP)

The application of metaheuristic algorithm.





The **Travelling Salesman Problem (TSP)** is a classic combinatorial **Optimization** problem.

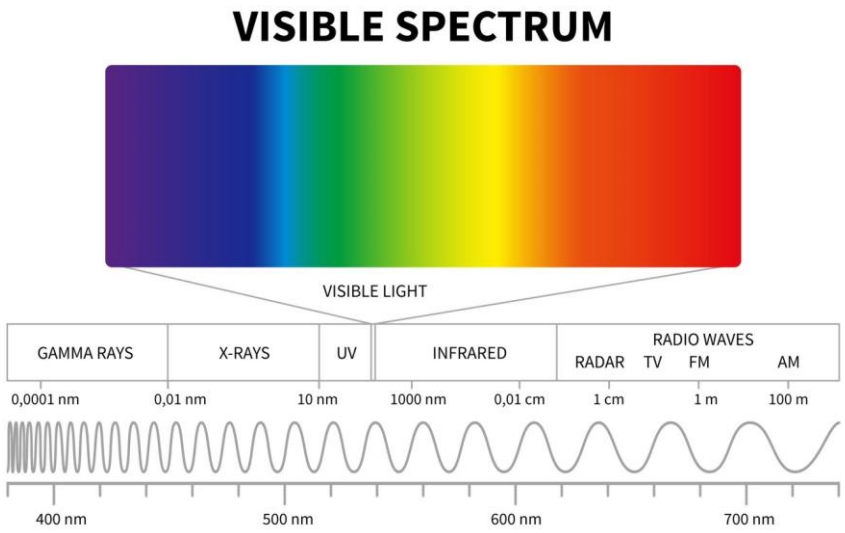
- The goal is to find the shortest possible route that allows a salesman to visit each city exactly once and return to the starting city.
- TSP is widely used in **Logistics**, **Routing**, and **Scheduling** applications.

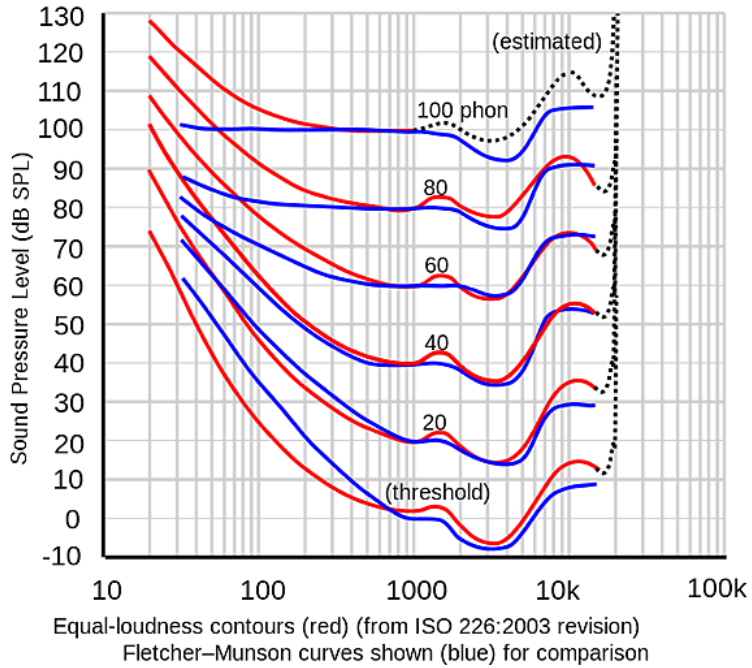
Course Objectives:

- ✓ Understand the definition and challenges of the TSP.
- ✓ Learn how to apply GA, PSO, and SA to solve the TSP and compare their effectiveness and characteristics.

Human factors in lighting and sound

- Learn about lighting-related knowledge
- Understand the impact of lighting on user
- Learn about sound-related knowledge
- Understand the impact of sound on user





Equal-loudness contours (red) (from ISO 226:2003 revision)
Fletcher–Munson curves shown (blue) for comparison

Human factors in lighting and sound

- Through experiments, understand the interaction between humans and lighting environments.
- Using deep learning, model human behavior in lighting environments.
- Through experiments, understand the interaction between humans and sound environments.
- Using deep learning, model human behavior in sound environments.

$$\mathrm{Ln}\left(\frac{P_H}{1-P_H}\right) = -10.847 + 0.189X_{WS} + 0.005X_{EN} - 0.146X_D$$

$$\mathrm{Ln}\left(\frac{P_M}{1-P_M}\right) = -0.491 + 0.065X_{WS} - 0.079X_{EN} - 0.081X_D$$

$$\mathrm{Ln}\left(\frac{P_L}{1-P_L}\right) = -0.995 + 0.051X_{WS} - 0.061X_{EN} - 0.063X_D$$