

授課教師：Loke
Kar Seng

Instructor:Loke Kar Seng

課程名稱：柔性計算

Course Title : Soft Computing

2026/5/6

課程代號： IM5109701 Course Code 學分數： 3 Credits	必選修：選修/半學年 Required/Electve:Elective/Half Yr. 先修課程： Prerequisites
節次教室： M6(MA-215) M7(MA-215) M8(MA-215) Time/Location	
專業核心能力： Core Professional Competencies	
課程網址： Course Website	
課程宗旨： Course Objectives	<p>This course explores the evolving landscape of soft computing, moving beyond traditional paradigms (neural networks, evolutionary algorithms, swarm intelligence) into modern gradient-based symbolic systems and hybrid neuro-symbolic approaches. Students will learn how non-gradient optimization methods (genetic algorithms, swarm intelligence, evolutionary strategies, differential evolution, CMA-ES, ant colony optimization) complement gradient-driven symbolic learning (differentiable inductive logic programming, differentiable symbolic regression, soft decision trees, neural cellular automata). The course emphasizes hands-on construction and experimentation: students will implement algorithms, compare paradigms, and build hybrid systems. Guided by Feynman's principle—“What I cannot build, I cannot understand”—the course prioritizes activity-based learning, coding practice, and iterative projects. By the end, students will be able to design, implement, and critically evaluate soft computing systems that integrate symbolic reasoning with neural learning.</p>
課程大綱： Outline of Lectures	<p>Proposed Course content</p> <p>A. Non-gradient based</p> <ol style="list-style-type: none"> 1. Swarm Intelligence - PSO 2. Nature-Inspired Optimization - Bee, Firefly, Ants 3. Evolutionary based algorithms - GA, ES, Differential Evolution, CMA-ES <p>B. Gradient-based Neuro-Symbolic approaches</p> <ol style="list-style-type: none"> 1. Differential inductive logic program 2. Symbolic Regression 3. Soft Decision Trees 4. Neuro-symbolic approach 5. Neuro cellular automata
授課方式： Method of Instruction	<p>講授 Lecture：0%</p> <p>分組討論 Group discussion：0%</p> <p>案例研討 Case study：0%</p> <p>操做練習 Practical exercises：0%</p> <p>講授 Lecture：%</p>

教科書： None
Textbooks

參考書目： It will be given throughout the course
References

修課須知：
Notice

評量方式： 1 Assignment and 3 Projects (Tentative)
Grading

備註說明： English language and proficiency in coding (python)
Notes