Introduction to Advanced Aspects of Nature-Inspired Search and Optimisation

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Module 06-32235: Advanced Aspects of Nature-Inspired Search and Optimisation

Learning outcomes

- ▶ Describe different nature-inspired search and optimisation methods and explain how they are applied to solve real world problems
- ▶ Discuss relations, similarities and differences between the most important heuristics and nature-inspired algorithms presented in the module and other search and optimisation techniques
- ▶ Design and adapt nature-inspired algorithms including operators, representations fitness functions and potential hybridisations for non-trivial problems
- ▶ **Implement nature-inspired algorithms using different programming languages and compare them experimentally**

What we will implement

We will learn how to implement

- ▶ Week 1: Introduction and Matlab/Octave programming
- ▶ Week 2: Solving Travelling Salesman Problems (TSP) using Simulated Annealing
- ▶ Week 3: Solving set cover/partitioning problems using Evolutionary Algorithms
- ▶ Week 4: Solving continuous optimisation problems using Particle Swarm Optimisation
- ▶ Week 5: Solving Vehicle Routing Problem using Random Key Encoding

What programming languages?

- **Matlab**
- Python
- Java
- C/C++

How the 4 hours lab sessions are organised

- **Session 1** (Monday 11:00-13:00, 2 hours): I will present some real-world problems and algorithms for solving them, and explain some **code examples**
- **Sessions 2 and 3** (Monday 17:00-18:00 and Tuesday 9:00-10:00): You can try those code examples and complete some practical exercises. More like a help session, not compulsory to come! TAs will be in the lab to help.

How we access

- Exam (40%) and two main CAs + class tests (60%)
  - CA 1: Issue on 20th Jan. and deadline on 17th Feb.
  - CA 2: Issue on 17th Jan. and deadline on 23rd Mar.