# ISLab

Universidade do Minho
Escola de Engenharia
Departamento de Informática

Mestrado Integrado em Engenharia Informática
Mestrado em Engenharia Informática
Computação Natural
2019/2020

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- Departamento de Informática
  Escola de Engenharia
  Universidade do Minho

- Grupo ISLab – (Synthetic Intelligence Lab)

- Centro ALGORITMI
  Universidade do Minho

PSO Exercises

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Synthetic Intelligence Lab
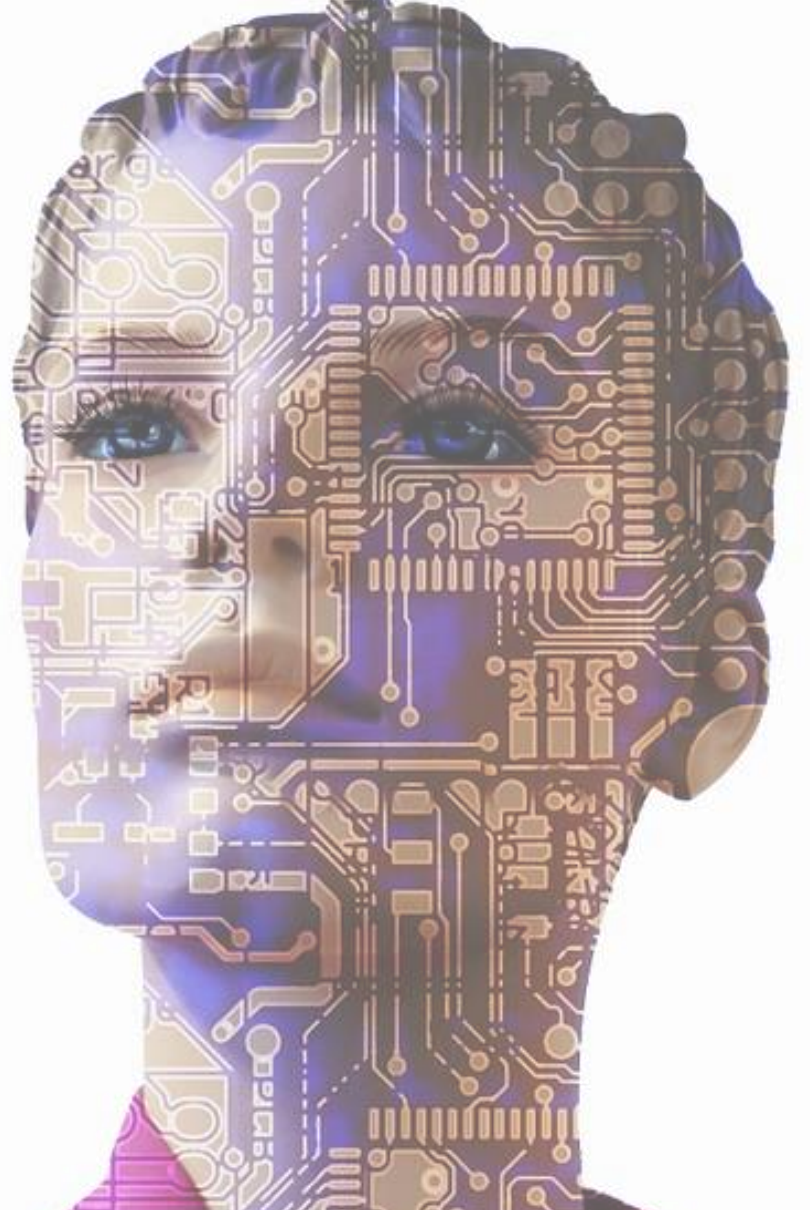
- **Objective:** Implement in Python a Particle Swarm Optimization algorithm to solve the proposed exercises
- **Goal:**
  - Implement and study the algorithm learning process.
  - Evaluate how the w, c_1, c_2 hyperparameters can finetune the optimization process.
  - Report main results and conclusions.
- **Analyse first:**
  - Tutorial: https://towardsdatascience.com/nature-inspired-optimization-algorithms-particle-swarm-optimization-2cd207d0d37e
  - Brief PSO Summary: https://www.youtube.com/watch?v=JhgDMAm-imI
  - Python Code Guideline: https://www.youtube.com/watch?v=7uZcuaUvwq0

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Synthetic Intelligence Lab

Exercise 1:

Minimize

$$f(x) = \sum_{i=1}^{N}(x_i - a_i)^2$$

$$N = 30$$

$$-100 \leq x_i \leq 100$$

$$-80 \leq a_i \leq 80$$

Where a_i is selected previously

Exercise 2:

Imagine that you want to obtain a polynomial approximation for the sin x function. From a polynomial: $a_0 + a_1 x + a_2 x^2 + \cdots + a_n x^n$

For this, it is necessary to discover the values of the coefficients $< a_0, a_1, \cdots, a_n >$ that minimize the differences between the values predicted by the polynomial and the real values of the sin(x) function in the interval $[-\frac{\pi}{2}, \frac{\pi}{2}]$

<u>**Proposed exercises by Rui Mendes - Particle Swarm Optimization**</u>

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