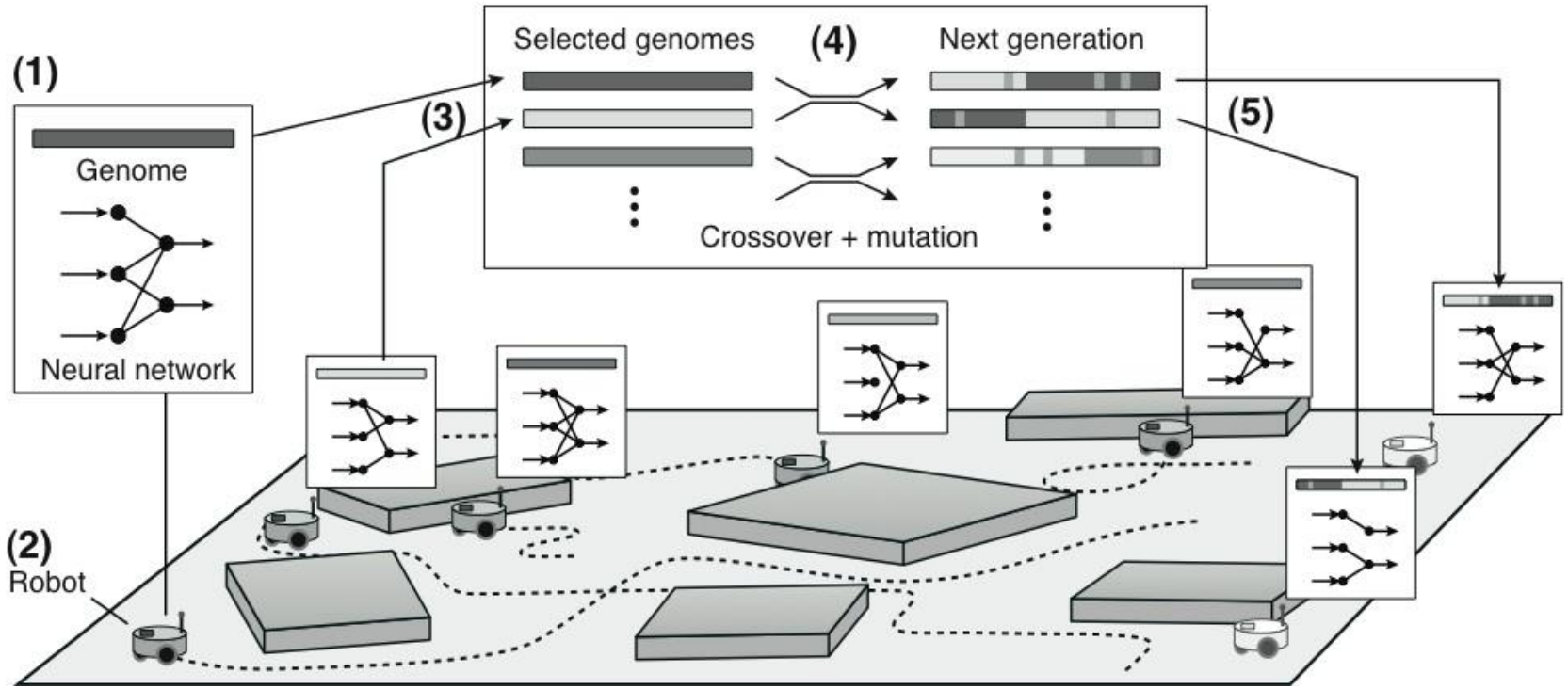
Evolutionary Robotics

Adaptive co-design of robotic brains & bodies inspired from evolution, development, learning, and behavior



Course objectives

- Master Evolutionary Computation: methods and algorithms
- Learn and apply combination of EC and neural networks
- Learn about applications to robotics and biology
- Gain hands-on experience with experiments in physics-based simulations
- Design, perform, and analyze evolutionary robotics experiments

Teachers

Dario Floreano
Lecturer

Fuda van Diggelen
Instructor

Alexander Dittrich
Teaching Assistant

Alexander Ertl
Teaching Assistant

Hongze Wang
Teaching Assistant

EPFL LIS Laboratory of Intelligent Systems

Teaching Method

Every Thursday: 9am - 1pm, 4 credits
Typical day: 2hrs lectures + 2hrs exercises & project

Lectures
Methods
Algorithms
Applications and Results

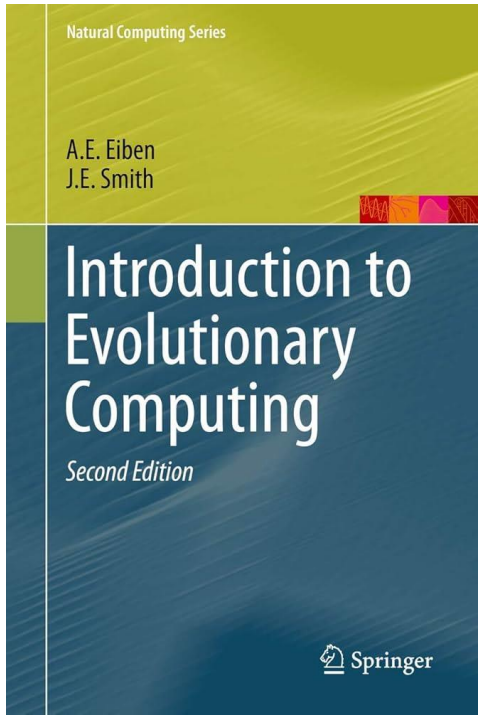
Assessment: MCQ

Exercises and project
Implement and apply algorithms
Devise evolutionary experiments
Co-evolve your own simulated robots

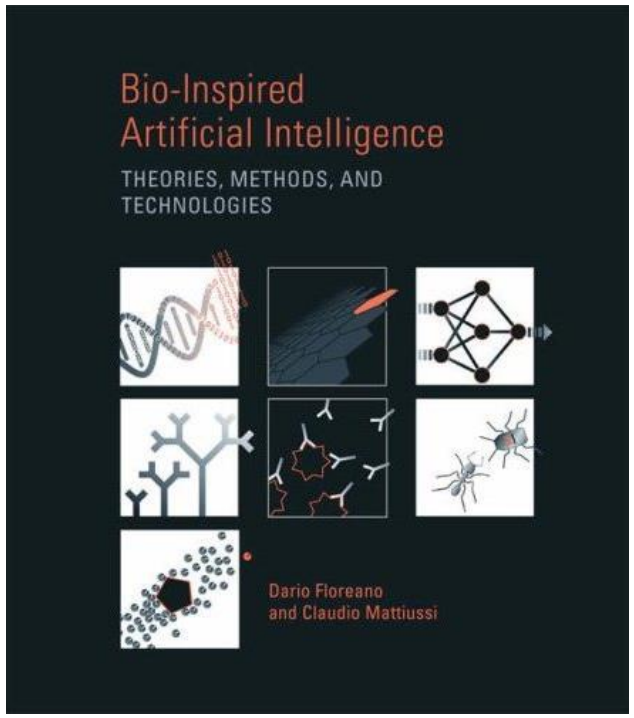
Assessment: Report

Lectures	Exercises
Introduction to EC	Introduction to simulator
Evolutionary Strategies	Implement ES algorithm
Evolution of Neurocontrollers	Evolve Neurocontrollers
Reinforcement Learning and EC	Compare RL and EC
Evolutionary Multi-objective Optimization	Apply MO algorithm
Evolution of Learning Algorithms	Analyse Pareto Front
Coevolution of Body and Neurocontrollers	Coevolve robot body and control
Quality Diversity Optimization	Morphology analysis
Competitive and cooperative coevolution	Project
Towards robot self-reproduction	Project
Project	
Project presentations	

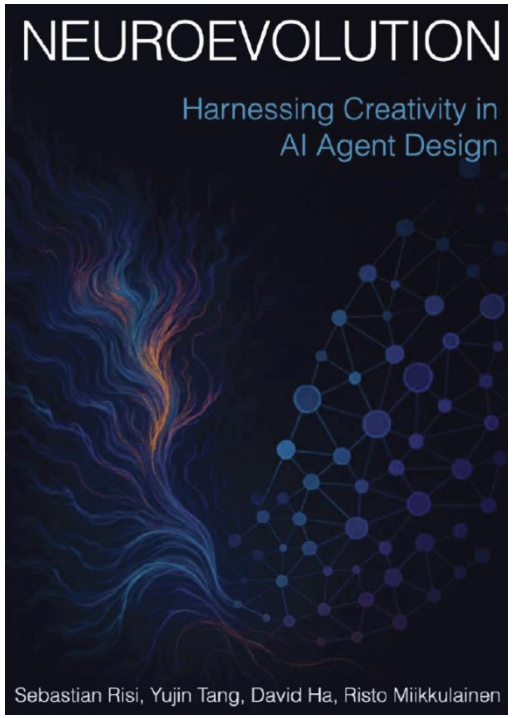
Supporting Material



2003, 2015, Springer



2009, 2023, MIT Press



2026, MIT Press

- Additional technical and scientific articles and links to online material posted on Moodle
- Lecture Slides and Video recordings
- Exercise & Project Code + Instructions on GitHub

Evaluation

Grade

- 50% Written exam (Multiple Choice Questions)
- 50% Project

Written exam

- Date and time will be set and announced by SAC in April 2026
- No support material (books, notes, devices) allowed
- Student with special arrangements from SAC, please e-mail Fuda.vanDiggelen@epfl.ch before the exam