Advanced Optimization
Lecture/Exercise 2: The Travelling Salesperson Problem

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Master AIC

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Course Overview

	Date		Topic
1	Tue, 20.11.2018	Dimo	Randomized Algorithms for Discrete Problems
2	Tue, 27.11.2018	Dimo	Exercise: The Travelling Salesperson Problem
3	Tue, 4.12.2018	Dimo	Evolutionary Multiobjective Optimization I
4	Tue, 11.12.2018	Dimo	Evolutionary Multiobjective Optimization II
	vacation		
5	Tue, 8.1.2019	Dimo	Looking at Data
6	Tue, 15.1.2019	Anne	Continuous Optimization I
7	Tue, 29.1.2019	Anne	Continuous Optimization II
	???		oral presentations (individual time slots)

all lectures from 14h00 till 17h15

here in E107 in Nov/Dec and in E105 in January

Assignment of Papers

All papers are relevant to current research in Randopt but the starred ones indicate possible *concrete research projects as follow-ups.

1*) Two-dimensional subset selection for hypervolume and epsilon-indicator

2*) RM-MEDA: A regularity model-based multiobjective estimation of distribution algorithm.

3*) A universal catalyst for first-order optimization. Mirwaisse, Antoine

4*) Optimized Approximation Sets for Low-Dimensional Benchmark Pareto Fronts. Malik, David

5*) Covariance matrix adaptation for multi-objective optimization.

Martin Bauw

101) Efficient optimization of many objectives by approximation-guided evolution. Robin, Luc, Samuel, Cedric

102) PISA - A Platform and Programming Language Independent Interface for Search Algorithms

103) A Mean-Variance Optimization Algorithm. Jiaxin

104) Theoretical foundation for CMA-ES from information geometry perspective.

105) Population Size Adaptation for the CMA-ES Based on the Estimation Accuracy of the Natural Gradient. Nouredine

106) CMA-ES with Optimal Covariance Update and Storage Complexity, Hao

107) Exponential natural evolution strategies. Luca

Today's Lecture

1. Exercise: The Travelling Salesperson Problem (TSP)
   - reminder: problem definition + evolutionary algorithms
   - rest of the day: exercise

Motivation:

- Motivation 1: show that it is easy to implement a working randomized search heuristic for the TSP
- Motivation 2: in research, you need to
  - prototype often (i.e. quickly)
  - try out many things
- hence: good idea to train this in python ☺

The Traveling Salesperson Problem (TSP)

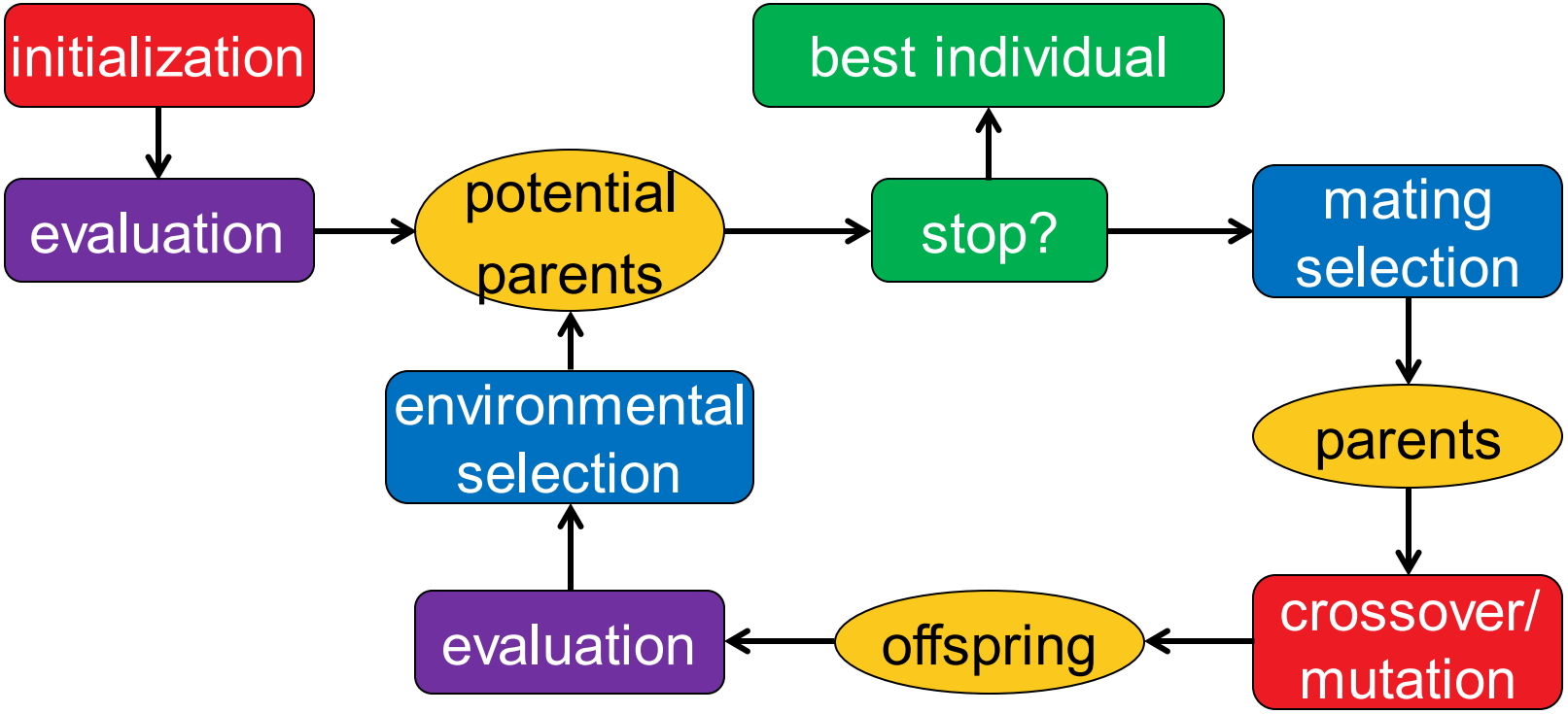
Reminder: TSP

Traveling Salesperson Problem (TSP)

- Given a set of cities and their distances
- Find the shortest path going through all cities
- Actually several variants:
  - Symmetric vs. asymmetric
  - Euclidean TSP

$$\Omega = S_n \text{ (set of all permutations)}$$

Reminder: Generic Framework of an EA



stochastic operators

"Darwinism"

stopping criteria

Important:
representation (search space)