











What is evolution?

- If a collection of objects (population) satisfies that
- they are able to reproduce
 children inherit features of parents
- condent innent features of parents
 features undergo small random variation
- 4. features effect reproductive capabilities

Then

The features will change over time such that the population will fit the environment better and better

7

Note: living organisms satisfy 1-4 This is our best explanation for life on Earth Evolutionary Computing Introduction



















What is an EA?					
		ALG-2			
	SYN	BOLIC PARAMETE	RS		
Representation	Bit-string	Bit-string	Real-valued	Real-valued	
Overlapping pops	N	Y	Y	Y	
Survivor selection	-	Tournament	Replace worst	Replace worst	
Parent selection	Roulette wheel	Uniform determ	Tournament	Tournament	
Mutation	Bit-flip	Bit-flip	N(0,)	N(0,σ)	
Recombination	Uniform xover	Uniform xover	Discrete recomb	Discrete recomb	
	NU	MERIC PARAMETE	RS		
Generation gap	-	0.5	0.9	0.9	
Population size	100	500	100	300	
Tournament size	-	2	3	30	
Mutation rate	0.01	0.1	-	-	
Mutation stepsize	-	-	0.01	0.05	
Crossover rate	0.8	0.7	1	0.8	

What is an EA? (cont'd)

Make a principal distinction between EAs and EA instances and place the border between them by:

Option 1

• There is only one EA, the generic EA scheme • Previous table contains 1 EA and 4 EA-instances

Option 2

• An EA = particular configuration of the symbolic parameters · Previous table contains 3 EAs, with 2 instances for one of them

- Option 3
- An EA = particular configuration of parameters
 Notions of EA and EA-instance coincide
 Previous table contains 4 EAs / 4 EA-instances









Parameter tuning: testing and comparing different values before the "real" run

Problems:

- users mistakes in settings can be sources of errors or sub-optimal performance
- costs much time
- parameters interact: exhaustive search is not practicable
- good values may become bad during the run







Ontology - Terminology					
	LOWER PART				
METHOD	EA	Tuner			
SEARCH SPACE	Solution vectors	Parameter vectors			
QUALITY	Fitness	Utility			
ASSESSMENT	Evaluation	Test			
 Fitness ≈ objective Utility = ? MBF-utility, AES-ut robustness utility, 	function value ility, SR-utility, combi	ned utility,			



















Culture change?

- · Fast and good tuning can lead to radically new attitude
- Past & present: robust EAs preferred
- Future: problem-specific EAs preferred
- Old question: what is better the GA or the ES?
- New question: what symbolic configuration is best?
- ... with parameters tuned using same time/effort
 Black box with 3 layers inside and a single START button

 Assumption: tuner level less sensitive to its parameters
 - Never mind the No Free Lunch theorems







Recommendations

- DO TUNE your evolutionary algorithm
- Do not forget the magic constants
- Decide: speed or solution quality?
- · Decide: specialist of generalist EA?
- Record and report tuning effort
- Try our toolbox: http://sourceforge.net/projects/mobat

