Evolutionary Algorithms
Introduction

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Outline

About me: Rudolf Kruse

- 1979 diploma (Mathematics) degree from the University of Braunschweig, Germany

- 1980 PhD in Mathematics, 1984 the venia legendi in Mathematics from the same university

- 2 years at the Fraunhofer Gesellschaft

- 1986 joined the University of Braunschweig as a professor of computer science

- Since 1996 he is a full professor at the Department of Computer Science of the University of Magdeburg

- **Research:** statistics, artificial intelligence, expert systems, fuzzy control, fuzzy data analysis, computational intelligence, and information mining

- mailto:kruse@iws.cs.uni-magdeburg.de

The research group: Computational Intelligence

Teaching:

- Intelligente Systeme   Bachelor (2 V + 2 Ü, 5 CP)
- *Evolutionäre Algorithmen*   Bachelor (2 V + 2 Ü, 5 CP)
- Neuronale Netze   Bachelor (2 V + 2 Ü, 5 CP)
- Fuzzy-Systeme   Master (2 V + 2 Ü, 6 CP)
- Bayes'sche Netze   Master (2 V + 2 Ü, 6 CP)
- Intelligente Datenanalyse   Master (2 V + 2 Ü, 6 CP)
- (Pro-)Seminare: Information Mining, Computational Intelligence

Research excerpt:

- Detection & Visualisation of interesting patterns
  (M. Steinbrecher)
- Dynamical analysis of social networks (P.Held)
- Machine learning based on the Dual-Process Theory (C.Braune)
- Temporal Data Mining in Medicine & SE (C. Moewes)

Organisational

- Lecture date: Mo., 13:15–14:45 Uhr, G29-307
- No lecture: 20.05.2013 (Pfingsten)
- Last lecture: 08.07.2013
- Information on the lecture:
  http://fuzzy.cs.ovgu.de/wiki/pmwiki.php?n=Lehre.EA2013

  - Slides of the lecture and exercise sheets will be available as PDF every week
  - Further important announcements and appointments!

Content and learning targets of the lecture

- Introduction to biological basics of evolution and genetics
- Comments on genetic operators (e.g. selection, cross-over, recombination, mutation)
- Overview on different evolutionary algorithms and genetic programming
- Discussion of its benefits and disadvantages based on several examples
- Treatment of similar techniques (e.g. Simulated Annealing)
- Application examples

About the exercise

Ambition:

- Application of appropriate modeling techniques for the design of evolutionary algorithms
- Usage of numerical optimization methods for problem solving
- Evaluation and application of evolutionary programming to analyze complex systems
- Obtain skills for successful development of evolutionary algorithms

Your task:

- Rework of the lecture
- Treatment of the exercise sheets
- Regular participation on the exercises
- Alternate: Attendance on the prgramming competition

Exercise

- You will explain your solutions!
- Tutor draws attention on mistakes and answers the questions
- Tutor won't calculate the exercises for you!
- no predefined sample solution!
- Tutor: Pascal Held mailto:pascal.held@ovgu.de
- Room G29-015, Consultation: everytime when meeting him in his office

Exercise: 2 dates to choose

- Tue., 11:15–12:45 Uhr ,Room G05-117
- Wed., 11:15–12:45 Uhr ,Room G29-E037
- Registration:
  https://iws.cs.uni-magdeburg.de:8443/frs/subscribe

About the exam

- written exam: 120 minutes
- Dates, rooms et al. will be announced in the lecture and on the website
- no further accessories allowed
- only writing material (pencil, but only blue or black writing pens)
- Publication of the results: HISQIS
- Inspection of the exams is possible (date on the WWW)

Conditions for Certificate and Exam: 1st Choice

Students who want to pass the lecture by writing the exam or want to get a „Schein" with grade have to

- work regularly and successfully in the exercise,
- tick at least two thirds of the assignments,
- present a solution at least two times during the exercise
- pass the exam after the lecture

Passing the exam: Receiving a „Schein" without a grade is possible

Conditions for Certificate and Exam: 2nd Choice

**Students who want to write the exam or want to get a „Schein"
with grade can**

- take part on the **programming competition**
- pass the exam after the lecture
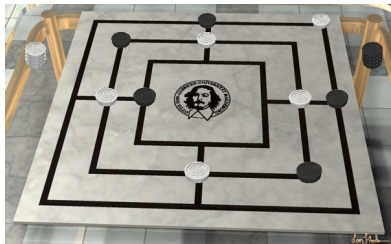
So, participation on the exercise is optional
The programming competition also submits for the exam

About the programming competition
Many thanks to Andrea Unger and Thomas Steube

Quelle: http://www.genetic-programming.com/
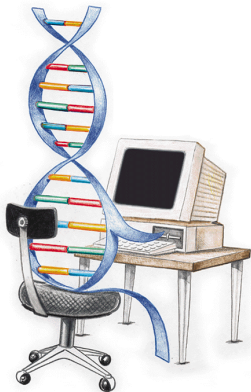
- Idea: EAD-Lecture 2003
- Goal: Development of a Merels-AI
- In this lecture: Optimization of gaming strategies by using EA
- Beginning of registration: 08.04.2013 at 15:00 Uhr