



Syllabus

2009 Fall Term

E8360 Evolutionary Computation

Evolutionary computation is the study of computational systems that use ideas and get inspiration from natural evolution. Its techniques can be applied to optimization, learning and design. Example topics covered in this module include natural and artificial evolution, evolutionary, chromosome representations, search operators, co-evolution, constraint handling techniques, niching and speciation, genetic programming, classifier systems and theoretical foundations.

The aims of this module are to:

- Introduce the main concepts, techniques and applications in the field of evolutionary computation
- Give students some experience on when evolutionary techniques are useful, how to use them in practice and how to implement them with different programming languages.

Textbook:

- R. Eberhart and Y. Shi, "Computational Intelligence: Concepts to Implementations," Morgan Kaufmann, 2007.
- D. Ashlock, Evolutionary Computation for Modeling and Optimization: Springer, 2006.
- Y. Shi, Swarm Intelligence: Morgan Kaufmann, 2001.

Instructor: Yihjia Tsai

1. Introductory Readings on Evolutionary Computation
2. Genetic Algorithms and Evolving Rule Sets
3. Genetic Programming and Biology
4. Genetic Programming Formalisms
5. Statistics in Genetic Programming
6. Evolutionary Programming and Evolution Strategies
7. Artificial Neural Networks
8. Swarm Intelligences
9. Student Presentations

Reference:

- E. Bonabeau, M. Dorigo, and G. Theraulaz, Swarm Intelligence: From Natural to Artificial Systems: Oxford University Press, 1999.
- M. Dorigo, L. M. Gambardella, M. Birattari, A. Martinoli, R. Poli, and T. Stützle, "Ant Colony Optimization and Swarm Intelligence," in 5th International Workshop, ANTS 2006, Brussels, Belgium, September 4-7, 2006: Springer, 2006, p. 526.
- E. Mitleton-Kelly, Complex Systems and Evolutionary Perspectives of Organisations: The Application of Complexity Theory to Organisations: Pergamon, 2003.

Grading: 40% home works + quizzes, 10% attendance, 50% final presentation and report