

Pattern Matching Algorithms (Fall 2011)

Room: Students 105, Room 006 **Time:** W 14:00 - 16:00

Instructor: *Prof. Amihood Amir*

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Office hours: By appointment or whenever the instructor is in his office.

Text: There will be no textbook. We will use recent papers and class transparencies. See <http://www.cs.biu.ac.il/~amir/patmat.html>. Possible textbooks on pattern matching are: **Text Algorithms** by Crochemore and Rytter, Oxford University Press, 1984; **Pattern Matching Algorithms** by Apostolico and Galil, Oxford University Press, 1997; **Algorithms on Strings, Trees, and Sequences** by Gusfield, Cambridge University Press, 1997; **Jewels of Stringology** by Crochemore and Rytter, World Scientific, 2002.

Prerequisites: Algorithms 2.

Course Contents:

Pattern matching problems are among the oldest in computer science. Yet, the area is still a fertile ground for very active current research. Part of its appeal is in its many application domains, such as text editing, computer vision, or molecular biology. Another aspect is that pattern matching has produced or incorporated some novel and powerful algorithmic techniques.

We will investigate various pattern matching problems with particular emphasis on the techniques employed for their solutions.

Syllabus: The following is a tentative schedule.

1. Automata methods (Knuth-Morris-Pratt, Aho and Corasick, Boyer-Moore).
2. Dueling (Amir-Benson-Farach, Vishkin).
3. Renaming (Kosaraju, Karp-Miller-Rosenberg).
4. Periodicity (Galil).
5. Deterministic Sampling (Vishkin).
6. Suffix Trees (on-line, equal processing time per symbol).
7. Lowest Common Ancestor (Berkman).
8. Convolutions (Fischer-Paterson, Abrahamson).
9. Dynamic Programming (Levenshtein, Landau-Vishkin).
10. Counting (Amir-Butman-Lewenstein).
11. Geometric Techniques (Amir-Butman-Crochemore-Landau-Schaps)
12. Asynchronous pattern matching.
13. Approximate Periodicity.

Grade: There will be a final exam.