Advanced Algorithmics (6EAP)  
Project proposals

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Key info

• Project = 1-2-3 person teams
• Essay – May 24
• Poster & submission: May 30th
• Poster Session  
  – Delay: 1 day = 20% of max points
• Prerequisite for exam

Expectations:

• Study the problem
• Implement, Evaluate, Compare, Measure, ...
• Your task is to make the project interesting to  
  others: right questions; cool applications; novel ideas; desire to read; materials to complement next year courses.
• Find a clear objective and focus, state it, study it!
• 20-40h
• Report – Poster

Tasks

• Here is a list of some proposals
• You can propose your own.
• Or select some on your own  
  – from international competitions  
    • e.g. IOI (ACM) olympics finals series  
    • implementation challenges from DIMACS, etc.
    • etc.

• Compare some alternative algorithms, and try to improve on them
• Take a problem and try to apply algorithmic problems to solve it
• Take an algorithm from the literature, implement and test
• Find cool ways to study/visualise algorithmic ideas presented in the course.

Combinatorial search

• Optimal solution from a (or any) state
• “Discover” the short assembly step algorithms
• Provide solutions

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4.5.2012
Bloom filter(s)

- Bloom filter storage of text using de Bruijn graphs (see video)

Graph layout

- Graph layout
  - “Physical Spring model” with some extra added constraints or specialised nodes for stars, cliques, connection strength, etc.
  - Create a nr of criteria and try to minimize nr of crossings, area of graph, etc.

Constrained Spring Embedding Layout

- Define certain areas (or lines, etc) that “attract” nodes. Allow graph to “layout” itself dynamically.

Visit all cities... - physically!

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- 652, 652
4.5.2012

• 648, 636

Seriation

• Serialise matrices
• (2-way)

Biclustering

• Ordering rows and columns to reveal modules/areas of high “coherence”


Alizadeh et al., Nature 403:503-11, 2000


[http://eiid.ee/b3](http://eiid.ee/b3)
### Some algorithmic competition

- Test your skills on some algorithmic competition

### Robust Regression (Differential Evolution)

Fitting a regression line using minimum median error as a measure.

\[ aX + bY + c = 0 \]

\[ Y = aX + c \]

Find \( a \) and \( c \)

### Differential Evolution

Fit any polynomial, use mean or median, add MDL based identification of the degree of polynomial

\[ A_n X^n + A_{n-1} X^{n-1} + \ldots + A_1 X + A_0 \]
Traveling Salesman

- Experiment with different meta-heuristics

Your own projects

- Ask a question
- Study literature
- Propose solution
- Implement
- Experiment and report results of experiments