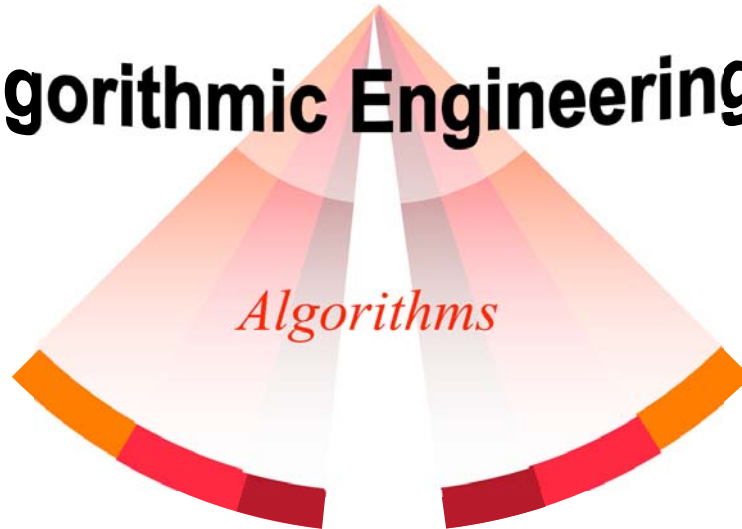


# Algorithmic Engineering



The intelligence behind the hardware

**WEEKLY EXERCISE DUE WEEK 9**



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*Task 1 : Describe in pseudo-code an algorithm for TSP that computes the optimal path in  $O(2^n n^2)$*

- ▶ The algorithm given in the notes computes the value of the shortest path. Modify the idea to provide the details of a version that provides the tour of minimum cost.

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*Task 2*

- ▶ Prove the bound of  $O(2^n n^2)$  time for the dynamic programming algorithm for TSP

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## Task 3

- Investigate and describe the best results know for the Steiner spanning tree problem in Euclidean 2-Dimensional space.

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## Summary of Assessment

Item	Assessment Task	Length	Weighting	Total Marks	Relevant Learning Outcomes	Due Day and Time
1.	2 Executive summaries or Research surveys	9-10 hrs	20% (2x10%)	10	1,2 and 3	Week 4 and 8
2.	Programming Assignment 1	50hrs	30%	30	2,4	Week 12
3A	Weekly exercises	2hrs	20% (10x2%)	2	1,2,3,4	Week 2,3,4,5,6,7,8,9,10,11
3B	Research Project	20hrs	20%	20	1,2,3,4	Week 7
4.	Final exam		20%	20	2, 4	End of semester exam period

**NOTE: ASSESMENT ITEMS 3 ARE ALTERNATIVES. STUDENTS NEED TO COMPLETE 3A or 3B, BUT NOT BOTH**

The 2 executive summaries or research surveys are assignments that involve a package of readings and performing a summarizing research activity. Reading consists of critically reading 3-5 research articles. The analysis and evaluation should result in an executive summary or survey. Each is worth 10% (a total of 20% for the course). You can submit up to 4 summaries out of different packages of readings, the best 2 will be used to compute your grade. A list of readings and their packaging will be available in the WEB site. You may choose to build a package of your own. In that case, the papers must be from proceedings of the FOCS, SODA, STOC and ISAAC Conferences after 2002 or from the "Journal of Algorithms" or the "Journal of Experimental Algorithms" or similar forum discussing parameterized complexity and algorithmic engineering. **DUE DATE: Week 2, 4, 6, 8 and 10**

One programming assignment for 30%. You are required to program yourself an algorithm of your choice in the programming language of your choice. But it must clearly be an algorithm for a core techniques in parameterized complexity solving an NP-hard problem with a fixed-parameter tractable algorithm. You must provide a report of your implementation including testing that validates to some extent, its correctness. **DUE DATE: Week 12**

Ten Weekly exercises. These will be described at the end of a lecture and will be due 8 days after the corresponding lecture on a Friday. Each represents a small exercise of algorithmic engineering dealing with some specific technique. They could also indicate the possibility of a larger project that could be the basis for an Honours, Masters or PhD research program.

One research project for 20%. You are to propose a topic or problem that can be addressed by Algorithmic Engineering techniques. You must obtain some realistic data for your problem (perhaps data available on the WEB, or you may postulate an industrial partner who would supply the data). You must use at least two algorithmic engineering techniques to attempt to solve the problem. You may use public domain software or demo version of commercial systems. You must produce a report analyzing and critically evaluating your experience. **DUE DATE: Week 7**

Exam. There will be 1 Final exam worth 30%. The exam is 2hrs.

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