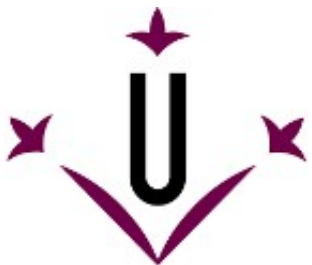


Advanced Programming in Artificial Intelligence

APAI Race

Grau en Enginyeria Informàtica
Universitat de Lleida

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Context

- Practical case
- 50% of the total grade (Covid-19 modifications)
- Minimum of 3 (over 10)
- In groups of 2 students (exceptionally 3)
- Design and development of a **Complete** Solver for SAT + presentation of a research paper
- Final deadline (**not the race**): **June 5th**
- No participant in the race: **Maximum grade of 7**

The APAI Race²: Submission

- Deadline: May 28th, 12:00 AM (GMT +2)
- Submission
 - Participants: Names of the group members
 - Solver: Name of the solver
 - Sent to the activity of the race in the Virtual Campus (with the names of the members of the group)
 - Benchmarks: 5 instances to upload into your shared space in the Virtual Campus (zip/tgz file)
 - File names: {id_group}_{id_instance}.cnf
 - Max size per instance: 100KB
 - Will be requested during the race

The APAI Race²: Rules

- **Benchmarks**
 - Files in CNF format (explained in class)
 - Generated with the rnd-cnf-gen.py and rnd-graph-gen.py
- **Solver**
 - Programming language: Python (lab version)
 - Running parameters
 - \$./solver_name <input_cnf_formula>
 - Output format
 - Comments (will be ignored): c comment
 - Solution: s SATISFIABLE / s UNSATISFIABLE
 - Values to variables: v -1 2 3 -4 5 -6 -7 -8 0

The APAI Race²: Rules

- Benchmarks

```
c Random formula
p cnf 3 4
1 -2 3 0
2 3 -1 0
-1 -2 3 0
2 -3 0
```

- Solver output (the 'v' line can be another solution)

```
c Solver Name
s SATISFIABLE
v -1 2 3 0
```

```
c Solver Name
s UNSATISFIABLE
```

(in case the problem
has no solution)

The APAI Race²: Resources

- Computational resources
 - Time: 10 seconds per instance (CPU time)
 - Memory: system limit
 - Be careful with swapping
- Penalization
 - Timeout: 20 seconds
 - Bug: 10000 seconds

The APAI Race²: Results

- Results
 - Total time
 - CPU time for each solved/unsat instance
 - 20 seconds for each timeout instance
 - 10000 seconds for each buggy solution
- Classification
 - Rank solvers by total time
 - Less (time) is better

The APAI Race: Environment

- Race environment
 - `race-complete.py`: \$ `./race.py <benchmark-folder> <solver>`
 - Runs every `.cnf` file in the benchmark folder with the solver
 - Sets the CPU time limit for each run
 - For each run outputs the CPU time or the penalization
 - At the end outputs the total time (score used to rank the solver)

After the Race

- If there is enough time...
 - Each group will explain the techniques and heuristics used in the solver
- Evaluation
 - Better solver → better grade for the practical case
 - The source code will be revised
 - May decrease the grade

Complete SAT Research Paper

- **Presentation of a research paper**
 - 35% APAI race²
 - 15% Presentation of a research paper
 - Read and understand a research paper about **complete SAT solvers**
 - Make some slides explaining the paper
 - Make a 10-15 minutes presentation of the paper
 - In English
 - Revise you presentation before sending it...

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