

# Combinatorial Algorithms

## RM35KOA

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CoContest 2024  
week 14  
20. 5. - 27. 5. 2024

# CoContest 2024

## Motivation

- ▶ a real-life issue as a combinatorial problem
- ▶ to resolve "infeasible" dependency in the cheapest way

The problem is known in the literature as the "minimum feedback arc set."

## Instances

- ▶ complete graphs
- ▶ layered graphs ("chained" bipartite graphs)
- ▶ trees

# Possible Solutions

## Optimal

1. **topological sorting** with the highest sum of edge costs
2. **finding all cycles** and removing at least one edge of each of them with the lowest cumulative sum

## Threshold & Ranking

1. **greedy topological sorting** in a random order of vertices
2. genetic algorithm
3. **decomposition** into strongly connected components
4. **greedy acyclic graph** from the edges with the highest weight
  - ▶ in addition extended with local search procedure
    - 4.1 add random edges and regain acyclicity by removing the cheapest edge in each cycle
5. weight normalization by the edge degrees?

# Statistics

## KOA:

- ▶ top 10 solutions:
  - ▶ C/C++: 7
  - ▶ Python: 3 (7th position)

## Hall of Fame 2024

1. Matěj Kříž (2.06)
2. Jan Hřebec (2.56)
3. Viktorie Valdmanová (5.38)
4. Michal Reiser (5.75)
5. Aleš Kučera (5.81)

## KO:

- ▶ top 10 solutions:
  - ▶ C/C++: 9
  - ▶ Python: 1 (3rd position)

## Hall of Fame 2024

1. Viacheslav Larionov (5.75)
2. Lukáš Cezner (8.00)
3. Tomáš Děd (9.13)
4. Jakub Rada (9.38)
5. David Čech (9.56)

# Industrial Informatics Department

- ▶ way of cooperation:
  - ▶ semestral project
  - ▶ diploma thesis
  - ▶ part-time job
  - ▶ doctorate
- ▶ what we do:
  1. optimization algorithms
  2. machine learning (mainly for industry)
  3. scheduling
  4. planning
  5. simulations
  6. embedded systems
  7. robotics, automotive
  - ▶ both theoretical research and industry cooperation and applications



For more information about what we are doing, our projects, thesis topics, etc., please visit:

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