
Algorithmic Methods for Mathematical Models

Course Project

Mehdi Hassanpour
Keith Joseph D'souza



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The Chess Tournament!

The Problem

Given

- A set of players
- Some tournament rules (constraints)
- Participants need to rest! (Students too)

Find

- Scheduling
 - Optimization
 - Comparison of various methods
-

ILP Model

- Decision variable to keep track of matches and slots

#ATTEMPT 1

- Merge everything in one variable
- $X[i][j] = k$: i (white) vs j (black) on slot k
- EFFICIENCY! (and probably smart)

- Nope, just complex



ILP Model (cont.)

- And we suddenly remembered the Sudoku problem...
- Boolean Variables

(sorry! no more memes)



ILP Model (cont.)

- Boolean variable X_{ijk} :
 - 1: If i plays vs j on day k
 - 0: Otherwise
- Black and white constraints?

Heuristic Methods

- Scheduling
 - Matches are predetermined...
- Optimization (greedy + grasp)
- Improvements (local search)

Heuristic Methods (cont.)

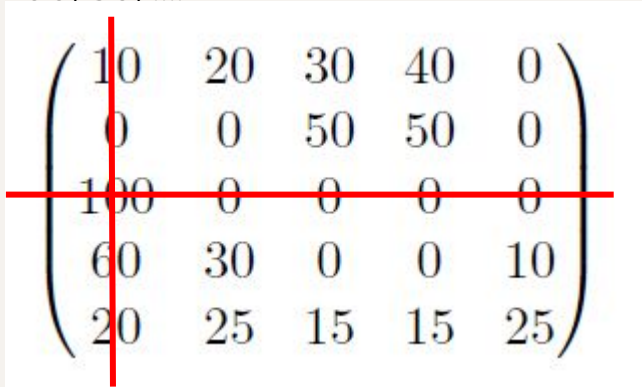
- Schedule regardless for arbitrary rest vector
 - Player i rests on day i !
 - Solve optimization problem with greedy/grasp
 - Map the solution to our *arbitrary* rest vector
-

Heuristic Methods (cont.)

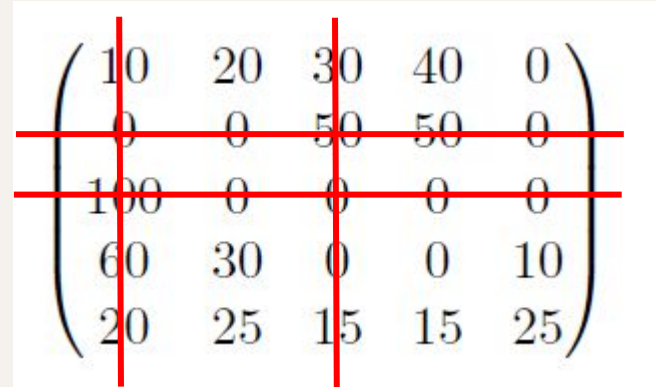
- Player i rests on day i !
- Schedule match i vs j on day $k = i + j \bmod N$
- Does it work?
- a vs b and c vs d are scheduled on the same day
- $a == c$?

Greedy

- Pick the maximum p from points matrix (and hope for the best)
- Some values cannot be picked anymore...
- 100, 50,



10	20	30	40	0
0	0	50	50	0
100	0	0	0	0
60	30	0	0	10
20	25	15	15	25



10	20	30	40	0
0	0	50	50	0
100	0	0	0	0
60	30	0	0	10
20	25	15	15	25

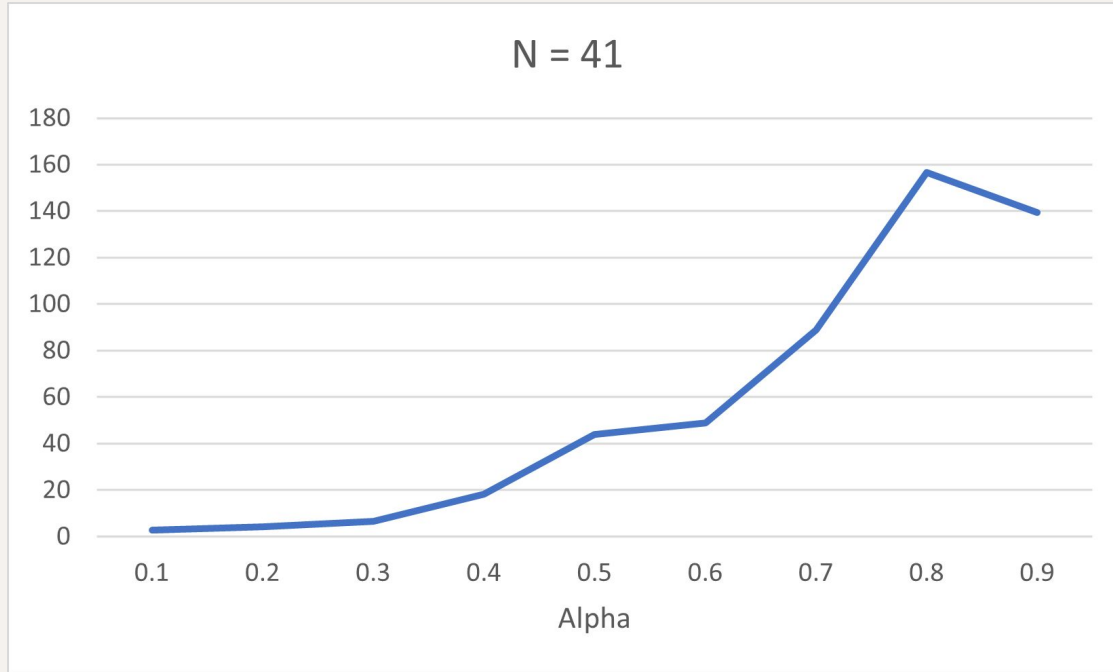
Grasp

- A set of candidates
- Set a threshold for cost function
- Randomly choose one

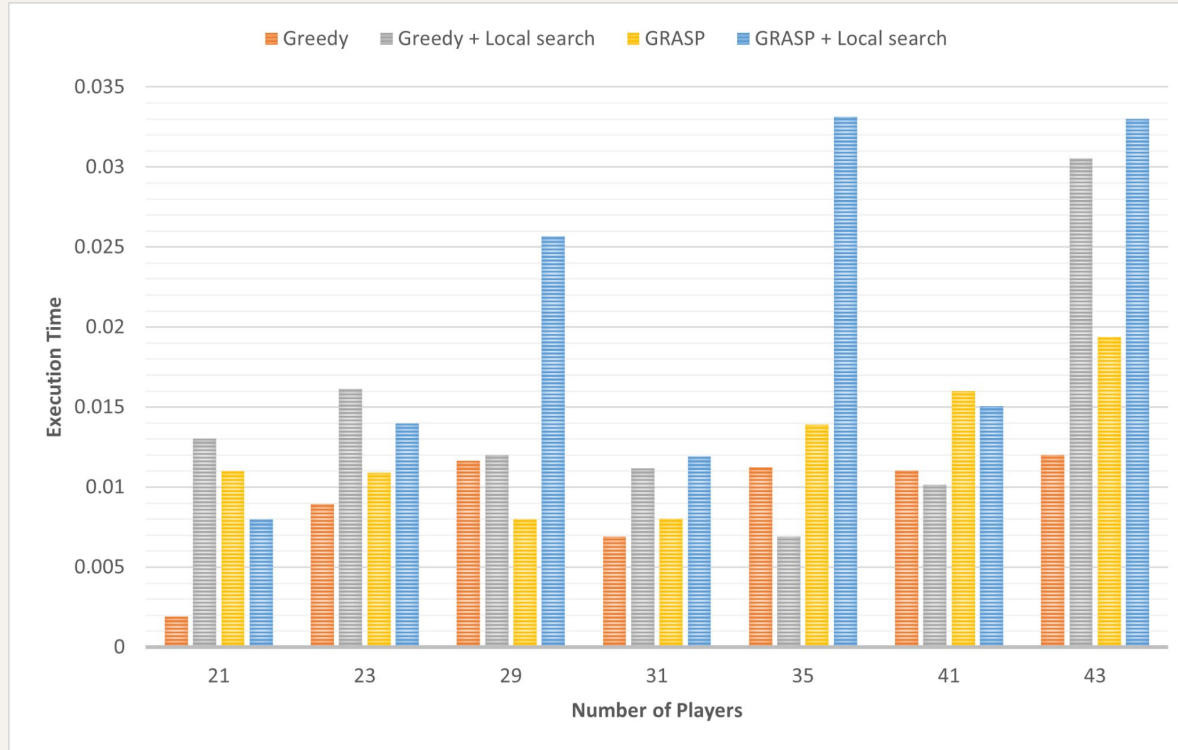
Local Search

- Swap any two elements..
- Does it get better?

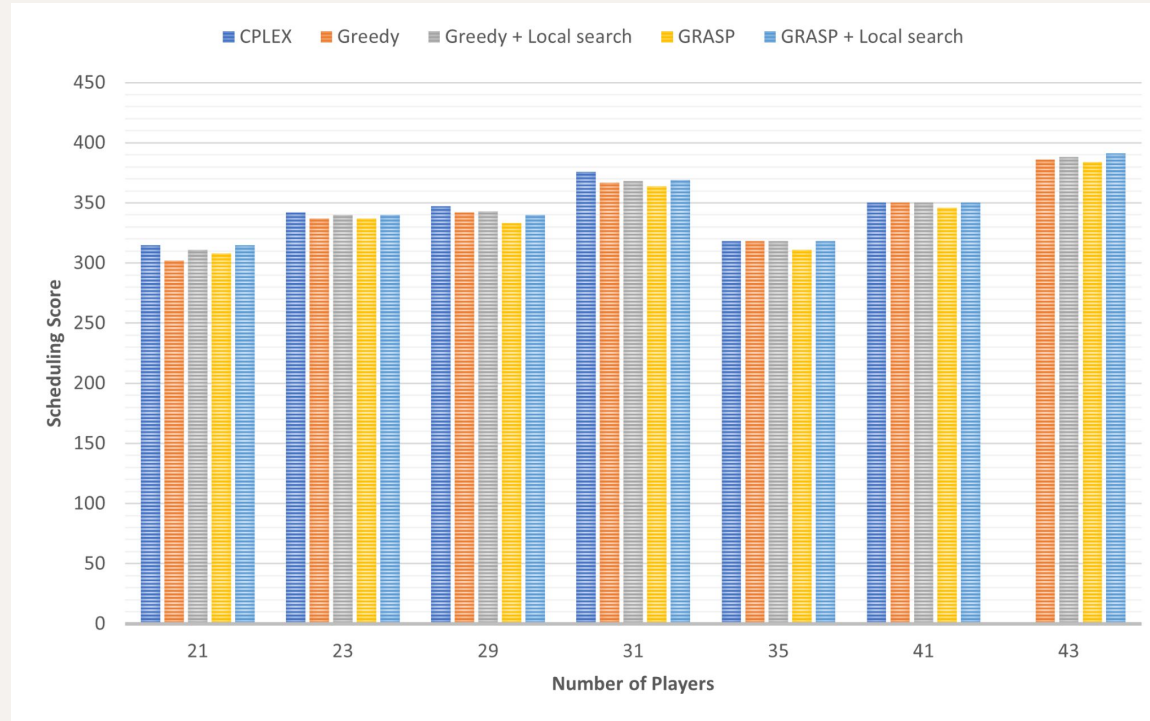
Finding the perfect Alpha!



Comparing execution times



Quality of Solution



The image features two thin, dark horizontal lines. The top line starts with a curved segment on the left and then continues straight to the right edge. The bottom line starts straight from the left edge and ends with a curved segment on the right. The word "Thanks!" is centered between these lines.

Thanks!