Optimization in Sports Scheduling

Kevin Pauga

Initial Construction

- Who are the clients?
  - Conference and League Offices
  - Administrators and Coaches
  - Consumer and Fan
  - Television Executives
- Inputs
  - Number of Teams
  - Number of Competitions
  - Available Dates
- Base Parameter Consultations
- Intended Outcome
- Feasible, Playable, Optimal

Hard and Soft Constraints

- Non-negotiable Variables
- Types of Variables
  - Facility Conflicts
  - Competitive Balance
  - Travel
  - Number of Home Weekends/Weekdays
- No perfect schedule – how do we balance pain across the schedule?
- How do we handle differing opinions on constraints?
- Negative-based scoring system
  - Scoring system can adjust in real time
  - Logarithmic scale
- Flushing out a single issue (and the resulting trade-off)
- Art vs Science

Using Gurobi

- Have created an Excel-based interface
- Size and scope of problem
- What is optimal?
- Can we solve all the way through?
- How do we know when a schedule is done?
- How has Gurobi helped the process?

Formulas   Data   Review   View   Automate   Help

Kevin Pauga   KP

Comments   Share ⌄

	Min	Max			1 @									2 @								3 @								4 @								5 @							6 @
5	5	0	6	Wed	3-Jan																																							
6	1	0	6	Thu	4-Jan																																								
7	4	0	6	Sat	6-Jan																																								
8	1	0	6	Sun	7-Jan																																								
9	1	0	1																																									
10	3	0	0	Tue	9-Jan																																								
11	3	0	6	Wed	10-Jan																																								
12	0	0	6	Thu	11-Jan																																								
13	5	0	6	Sat	13-Jan																																								
14	1	0	6	Sun	14-Jan																																								
15	0	0	6	Tue	16-Jan																																								
16	6	0	6	Wed	17-Jan																																								
17	0	0	6	Thu	18-Jan																																								
18	5	0	6	Sat	20-Jan																																								
19	1	0	6	Sun	21-Jan																																								
20	0	0	6	Tue	23-Jan																																								
21	6	0	6	Wed	24-Jan																																								
22	0	0	6	Thu	25-Jan																																								
23	5	0	6	Sat	27-Jan																																								
24	1	0	6	Sun	28-Jan																																								
25	0	0	6	Tue	30-Jan																																								
26	6	0	6	Wed	31-Jan																																								
27	0	0	6	Thu	1-Feb																																								
28	6	0	6	Sat	3-Feb																																								
29	0	0	6	Sun	4-Feb																																								
30	0	0	6	Tue	6-Feb																																								
31	6	0	6	Wed	7-Feb																																								
32	0	0	6	Thu	8-Feb																																								
33	6	0	6	Sat	10-Feb																																								
34	0	0	6	Sun	11-Feb																																								
35	0	0	6	Tue	13-Feb																																								
36	6	0	6	Wed	14-Feb																																								
37	0	0	6	Thu	15-Feb																																								
38	5	0	6	Sat	17-Feb																																								
39	1	0	6	Sun	18-Feb																																								
40	0	0	6	Tue	20-Feb																																								
41	6	0	6	Wed	21-Feb																																								
42	0	0	6	Thu	22-Feb																																								
43	3	0	6	Sat	24-Feb																																								
44	3	0	6	Sun	25-Feb																																								
45	0	0	6	Tue	27-Feb																																								
46	6	0	6	Wed	28-Feb																																								
47	0	0	6	Thu	29-Feb																																								
48	5	0	6	Sat	2-Mar																																								
49	1	0	6	Sun	3-Mar																																								
50	0	0	6	Tue	5-Mar																																								
51	6	0	6	Wed	6-Mar																																								
52	0	0	6	Thu	7-Mar																																								
53	0	0	6	Sat	9-Mar																																								
54	6	6	6	Sun	10-Mar																																								
56			Great																																								

new

MEN	1	2	3	4	5	6	7	8	9	10	11	12
1/3/2023	at 8	at 9	at 12	at 7		10	4	1	2	at 6		3
1/4/2023					at 11						5	
1/6/2023	6	12	7	9		at 1	at 3		at 4			at 2
1/7/2023					8			at 5				
1/9/2024										11	at 10	
1/10/2024		at 10	5		at 3			11		2	at 8	
1/11/2024	at 12			at 6		4	9		at 7			1
1/13/2024												
1/14/2024	7			8	10		at 1	at 4		at 5	12	at 11
1/16/2024		3	at 2			at 9			6			
1/17/2024										at 12		10
1/18/2024	4	5	6	at 1	at 2	at 3	8	at 7	11		at 9	
1/20/2024												
1/21/2024	at 11	at 6	at 10	7	12	2	at 4			3	1	at 5
1/23/2024								9	at 8			
1/24/2024						7	at 6					
1/25/2024	at 10	9	at 5	12	3			at 11	at 2	1	8	at 4
1/27/2024												
1/28/2024	2	at 1	4	at 3	at 7		5		10	at 9	at 12	11
1/30/2024						at 8		6				

Talking Points

- Every competition has an optimal place, but not every game can land there.
- How do we evaluate schedules?
  - Cost
  - Travel Time
  - Missed Class
  - Fan Impact (ticket sales, television, concessions, parking, etc.)
- Alignment across multiple leagues/conferences
- COMMUNICATION!
- Handling positive and negative feedback
- EQUITABLE, not equal

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