Schedule optimization

(Yoga fitness chain)

Evaluated the existing class schedule for various studios and recommended an optimal class schedule to maximize gross profit. Developed the optimization model leveraging GENOUD algorithm, taking into consideration ~200 variables

Class schedule optimization for a yoga fitness chain

Situation

- The studios have relatively low utilization rates because of lower number of classes offered, leading to lower gross profits
- Partnered with the company in evaluating the current schedule of the studios and recommending optimal schedule (for all class type offerings) for each studio to maximize the gross profit

Accordion Value Add

- Defined a consolidated schedule for each studio with ~200 variables (slots available) based on start time, end time and turn time
- Calculated the attendance trends based on historical performance and estimated same class type and cross class type cannibalization based on incremental benefit from having multiple classes
- Created the optimal schedule by maximizing the total weekly gross profit using an advanced evolutionary optimization algorithm called 'Genetic optimization using derivatives (GENOUD)' subject to constraints such as minimum attendance per class and share of classes of each class type

Impact

- Optimal schedule recommendations helped the company identify the studios with high opportunity
- Implementing the recommended schedule changes helped the company improve the gross profit by 30%-50% at high opportunity studios

Schedule optimization methodology, constraints and algorithm used

Maximize the total weekly attendance subject to the following constraints:

- Minimum attendance of **8 students** per class
- **Share of specific** classes has to cross respective minimum threshold values

Optimization methodology:

- Optimized on R using GENetic Optimization Using Derivatives (GENOUD) which is an **evolutionary search-based algorithm**
- Algorithm scheduled to run **for 500 iterations**; Each iteration includes **1,000 different samples** of 280 class type combinations
- Each **iteration would evolve** based on the learnings (sample with maximum attendance) from the previous iteration

Multiple rooms within each location (R1/R2)

Optimal schedule - Attendance by class type														
	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
Start time	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
5:30 AM	10	9	20	10	15	18	26		10	9	14	10		
6:45 AM	13	11	18	25	19	13	34		10	13	13	18	10	
8:00 AM	11	10		14	11	9	18		10	10	10	28	14	16
9:15 AM	20	16	16	22	12	20	19	12	19	22	27	9	28	32
10:30 AM	12	9	11	13	16	9	18	13	18	14	34	19	40	20
11:45 AM	16	11	18	23	11	16	18	8	13	26	34	25	34	23
1:00 PM	14	12	14	12	11	12	12	14	10	15		10	14	11
2:15 PM	10	12	10	9	8	9	14	10	12	12	17	11	16	17
3:30 PM	16	18	16	17	15	14	12	14	13	9	14	17	21	14
4:45 PM	30	10	23	25	11	31	24	19	18	13	13	9		10
6:00 PM	46	23	29	52	36	21	23	28	16	24			19	11
7:15 PM	13	21	36	12	8	15	9	17	11		9	13	15	9
8:30 PM	15	12	17	12	9	11	12	12	9	11	13		20	13
9:45 PM	10	10	8	9	9	10	9	8	9				9	

- **Count indicates estimated attendance**
- **Color indicates class type (blank indicates no class scheduled)**

Optimal schedule suggests 61 unchanged classes, 38 classes with different class types and 80 new classes

Distribution of changes to current schedule vs. optimal schedule, # of classes