Project: The Hipster Tourist Problem (HTP)

"Hipsters are a subculture of men and women typically in their 20s and 30s that value independent thinking, counter-culture, progressive politics, an appreciation of art and indie-rock, creativity, intelligence, and witty banter." They often also love travelling and sharing about their new experiences. You can hear about "that amazing coffee" or "the mind-blowing organic Nasi Lemak with a twist" on their Insta account. We will have fun this term solving one of their pressing problems, how to visit a city and make the most of it.

A friend whom you met during the overseas exchange program plans to visit Singapore during the spring break. In addition to sightseeing, he/she wants to taste the local food. Your friend asks you for suggestions on lodging, places of interests, and restaurants (or hawker centers).

Task 1:

Every project group has to suggest two hotels, name 20 attractions and five dining places in Singapore for your friend. For each suggestion, your friend wants to know its region (central (C), north (N), north-east (O), east (E), west (W), or unknown (U)[1]). For an attraction, your friend also wants to know the expected cost and if the activity is mostly indoor or outdoor. In addition, you can associate each suggestion with up to five key words.

Put your suggestion in a csv file. You can find the template on eDimension. Submit your csv file to me via email before 11:59 pm on Monday, Feb 7, 2020. Your file name and the email title are ATO_Group_X_T1, where X is the group number. The number of regions your suggestions span is a consideration in grading.

Based on your suggestions and his/her own research, your friend wants to stay at Hotel H1. Your friend also shortlists 24 attractions and ten dining places in Singapore (refer to the appendix section on the last pages).

Assume that your friend leaves the hotel at 9 am after breakfast and returns to the hotel before 9 pm. He/she spends one hour on meals. Lunch can take place between 12 noon and 2 pm and dinner between 6 and 8 pm. Your friend decides to spend exactly half an hour at each attraction visited (which is unrealistic, but for the purpose of the project only).

Knowing that you are taking a scheduling course, your friend asks you to schedule his/her one-day visit in Singapore from 9 am to 9 pm.

[1] Regions of Singapore from https://www.newlaunchesreview.com/regions-of-singapore/.

Task 2:

Construct a schedule that minimizes the total cost of transportation and attraction that satisfies the following:

- Your friend leaves Hotel 1 no earlier than 9 am and returns no later than 9 pm
- Your friend cannot have the two meals at the same place. The meal duration is one hour and must fall in the respective interval (between 12 noon and 2 pm for lunch and between 6 and 8 pm for dinner)
- Your friend spends exactly half an hour at every attraction visited
- There is no visit to an outdoor attraction between 11 am and 4 pm
- Your friend visits at least eight attractions of which at least three of them are outdoor
- You friend must visit at least two regions in addition to the region where the hotel belongs

Formulate the problem as a mathematical program by defining

- the decision variables,
- the objective function,
- the constraints, and
- the parameters.

Solve your program using AMPL. If the solver was not able to find an optimal solution in 30 minutes, report the best objective function value and the best bound found. If the solver does not find a feasible solution in 30 minutes, relax some of the constraints so that you can get a feasible solution in 30 minutes.

Submit your AMPL model and data files and short report with no more than three pages to me via email before 11:59 pm on Fri, Feb 21, 2020. You are strongly encouraged to write your report in Latex. Your file name and the email subject are ATO_Group_X_T2. In your report, you should

- **explain how you model the transportation cost,**
- **state any other assumptions you made in modeling,**
- **present and explain your mathematical model clearly,**
- **a screenshot showing the progress of the solver after half an hour. Indicate the best objective function value and the best dual bound, and**
- **(bonus) present your best feasible schedule and state the total cost on transportation and the total cost of visiting attractions.**

Appendix

Table 1: Hotels

Hotel	Hotel Name	Region
H1	Mandarin Orchard Singapore	C

Table 2: Dining places

Dining place	Restaurant name	Region
D1	Jamie's Italian	C
D2	Odette	C
D3	Timbre+	C
D4	Simpang Bedok	E
D5	Tian Tian Hainanese Chicken Rice Bedok	E
D6	Orchid Live Seafood	N
D7	Chomp Chomp Food Centre	O
D8	Punggol Nasi lemak	O
D9	Buey Tahan See-Food CCK	W
D10	Miam Miam French & Japanese Cafe Kitchen	W

Table 3: Attractions

Attraction	Attraction name	Region	Cost (SGD)	Indoor/Outdoor
A1	1-Altitude	C	40	Indoor

A2	ArtScience Museum	C	30	Indoor
A3	Botanic Gardens	C	5	Outdoor
A4	Fort Canning Art Centre	C	30	Indoor
A5	Gardens by the bay	C	20	Indoor
A6	Haw Par Villa	C	10	Outdoor
A7	Universal Studios Singapore	C	81	Outdoor
A8	East Coast Park	E	0	Outdoor
A9	Jewel Changi Airport	E	20	Indoor
A10	Pulau Ubin	E	10	Outdoor
A11	Wild Wild Wet	E	32	Outdoor
A12	Yunomori Onsena & Spa	E	99	Indoor
A13	Night Safari	N	50	Outdoor
A14	Sngapore Zoo	N	40	Outdoor
A15	Sungei Buloh Wetland Reserve	N	0	Outdoor
A16	River Safari	N	41	Indoor
A17	Coney Island	O	15	Outdoor
A18	Pulau Ubin	O	3	Outdoor
A19	Punggol Waterway Park	O	0	Outdoor
A20	Chinese Garden	W	5	Outdoor
A21	Jurong Bird Park	W	35	Outdoor
A22	Science Centre Singapore	W	12	Indoor
A23	Singapore Discovery Centre	W	15	Indoor
A24	The Rink	W	22	Indoor