TeacherCourse

October 8, 2023

[34]:
```
import pandas as pd
df=pd.read_csv("TeacherPreferences.csv")
```

[35]:
```
df.columns
```

[35]:
```
Index(['ProfName', 'YrOfExp', 'Rank', '1030MM', '1030TM', '1400TM', '1400MM',
       '1400TA', '1400TA.1', '1400MA', '1400MA.1', '1400ME', '1410TA',
       '1410MA', '1410TA.1', '1410TM', '1410ME', '2300TA', '2300TA.1',
       '2300ME', '2370TA', '2370MA', '2370TM', '2370ME', '2420TM', '2420TA',
       '2420MA', '2420TE', '2450TA', '2450MA', '2450TM', '2550TM', '2550TA',
       '2550ME', '2600TA', '2600MA', '2600TE', '2690MA', '2690TE', '2810TM',
       '2810TA', '305GMA', '305GTE', '305GME', '3060TM', '3060TE', '3100MA',
       '3240TA', '3250ME', '3260TA', '3270TA', '3310MA', '3310TM', '3320MA',
       '3370TA', '3380TA', '339RTE', '3410TA', '3410TA.1', '3450MA', '3450TA',
       '3520TA', '3520TA.1', '3530ME', '3540MA', '3660MA', '3680TM', '4230TE',
       '4380MA', '4380TA', '4400MA', '4450MA', '4450MA.1', '4470TA', '4470MA',
       '4490MA', '4660MA', '4690MA', '4700MA', '4900ME', '6150ME', '6300TA',
       '6470TE', '6730MA'],
      dtype='object')
```

[41]:
```
df.shape[1]
```

[41]:
```
84
```

[36]:
```
def calculate_updated_preference(row):
    years_of_experience = row['YrOfExp']
    rank = row['Rank']
    if rank == 'Assoc':
        increase_value = 0.4
    elif rank in ['Assistant', 'Lecturer']:
        increase_value = 0.2
    elif rank == 'Prof':
        increase_value = 0.6

    for col in df.columns[3:]:
        row[col] = row[col] + 0.001 * years_of_experience + increase_value

    return row
```

```
# Apply the function to each row
df = df.apply(calculate_updated_preference, axis=1)
```

[37]:
```
df.head(15)
```

[37]:

	ProfName	YrOfExp	Rank	1030MM	1030TM	1400TM	1400MM	1400TA	\
0	Teng	20	Assoc	0.420	0.420	2.420	2.420	3.420	
1	Durney	16	Assoc	0.416	0.416	1.416	1.416	1.416	
2	Knaeble	5	Assistant	0.205	0.205	2.205	3.205	2.205	
3	Embry	5	Lecturer	4.205	4.205	4.205	4.205	4.205	
4	Knutson	5	Assoc	0.405	0.405	0.405	0.405	0.405	
5	Sharp	5	Lecturer	0.205	0.205	4.205	4.205	4.205	
6	Wagstaff	7	Lecturer	0.207	0.207	0.207	0.207	0.207	
7	Jones	1	Assistant	2.201	2.201	2.201	2.201	2.201	
8	Rudolph	19	Prof	0.619	0.619	1.619	1.619	1.619	
9	Mortenson	2	Lecturer	0.202	0.202	1.202	1.202	1.202	
10	Tang	9	Prof	0.609	0.609	2.609	2.609	2.609	
11	Jenson	4	Lecturer	0.204	0.204	0.204	0.204	0.204	
12	Zeng	3	Assoc	0.403	0.403	2.403	1.403	2.403	
13	Thackeray	6	Lecturer	2.206	2.206	2.206	2.206	1.206	
14	Harrison	18	Prof	0.618	0.618	2.618	1.618	2.618	

	1400TA.1	1400MA	…	4470MA	4490MA	4660MA	4690MA	4700MA	4900ME	\
0	3.420	3.420	…	0.420	0.420	0.420	0.420	0.420	0.420	
1	1.416	1.416	…	0.416	0.416	0.416	0.416	0.416	0.416	
2	2.205	3.205	…	3.205	0.205	0.205	0.205	0.205	0.205	
3	4.205	4.205	…	0.205	0.205	0.205	0.205	0.205	0.205	
4	0.405	0.405	…	0.405	0.405	0.405	0.405	0.405	0.405	
5	4.205	4.205	…	0.205	0.205	0.205	0.205	0.205	0.205	
6	0.207	0.207	…	3.207	0.207	4.207	4.207	0.207	1.207	
7	2.201	2.201	…	0.201	2.201	0.201	0.201	0.201	0.201	
8	1.619	1.619	…	3.619	0.619	0.619	0.619	0.619	0.619	
9	1.202	1.202	…	0.202	0.202	0.202	0.202	0.202	0.202	
10	2.609	0.609	…	0.609	0.609	0.609	0.609	0.609	0.609	
11	0.204	0.204	…	0.204	0.204	3.204	4.204	0.204	1.204	
12	2.403	1.403	…	3.403	0.403	0.403	0.403	1.403	0.403	
13	1.206	1.206	…	0.206	0.206	0.206	0.206	0.206	0.206	
14	2.618	1.618	…	0.618	0.618	0.618	0.618	0.618	0.618	

	6150ME	6300TA	6470TE	6730MA
0	0.420	0.420	0.420	0.420
1	0.416	0.416	0.416	0.416
2	0.205	0.205	0.205	0.205
3	0.205	0.205	0.205	0.205
4	0.405	0.405	0.405	0.405
5	0.205	0.205	0.205	0.205

```
6    2.207   0.207   0.207   0.207
7    0.201   0.201   0.201   0.201
8    2.619   0.619   3.619   0.619
9    0.202   0.202   0.202   0.202
10   0.609   0.609   0.609   0.609
11   0.204   0.204   0.204   0.204
12   3.403   0.403   2.403   0.403
13   0.206   3.206   0.206   0.206
14   0.618   0.618   0.618   0.618

[15 rows x 84 columns]
```

[38]:
```
pip install pulp
```

```
Requirement already satisfied: pulp in c:\users\disha\anaconda3\lib\site-
packages (2.7.0)
Note: you may need to restart the kernel to use updated packages.
```

[44]:
```
import pulp

prob = pulp.LpProblem("Professor_Class_Assignment", pulp.LpMaximize)

# Define decision variables
num_faculty = len(df)
num_courses = len(df.columns) - 3  # Exclude the first 3 columns (ProfName,␣
 ↪YrOfExp, Rank)

# Create a binary variable for each combination of professor and course
x = pulp.LpVariable.dicts("prof_course", ((i, j) for i in range(num_faculty)␣
 ↪for j in range(num_courses)), cat='Binary')

# Define the objective function (maximize the sum of preferences)
objective = pulp.lpSum(df.iloc[i, j+3] * x[(i, j)] for i in range(num_faculty)␣
 ↪for j in range(num_courses))
prob += objective

# Define constraints
for i in range(num_faculty):
    if df.iloc[i, 2] in ['Lecturer', 'Assistant']:
        prob += pulp.lpSum(x[(i, j)] for j in range(num_courses)) <= 3
    elif df.iloc[i, 2] == 'Assoc':
        prob += pulp.lpSum(x[(i, j)] for j in range(num_courses)) <= 4
    elif df.iloc[i, 2] == 'Prof':
        prob += pulp.lpSum(x[(i, j)] for j in range(num_courses)) <= 5

for j in range(num_courses):
    prob += pulp.lpSum(x[(i, j)] for i in range(num_faculty)) == 1
```

```
# Solve the problem
prob.solve()

# Extract the solution
solution = [[pulp.value(x[(i, j)]) for j in range(num_courses)] for i in␣
 ↪range(num_faculty)]

# Print the results
for i in range(num_faculty):
    for j in range(num_courses):
        if solution[i][j] == 1:
            print(f"Professor {df.iloc[i, 0]} assigned to Course {df.
 ↪columns[j+3]}")
```

```
Professor Teng assigned to Course 2300TA
Professor Teng assigned to Course 2450TA
Professor Teng assigned to Course 2810TA
Professor Teng assigned to Course 3320MA
Professor Durney assigned to Course 3270TA
Professor Durney assigned to Course 339RTE
Professor Durney assigned to Course 3540MA
Professor Durney assigned to Course 3680TM
Professor Knaeble assigned to Course 2420MA
Professor Knaeble assigned to Course 3310MA
Professor Embry assigned to Course 1030MM
Professor Embry assigned to Course 1030TM
Professor Embry assigned to Course 1400TM
Professor Embry assigned to Course 1400MM
Professor Embry assigned to Course 1400TA.1
Professor Knutson assigned to Course 305GMA
Professor Knutson assigned to Course 305GTE
Professor Knutson assigned to Course 305GME
Professor Knutson assigned to Course 3450TA
Professor Sharp assigned to Course 1400TA
Professor Sharp assigned to Course 2550TM
Professor Sharp assigned to Course 2550ME
Professor Wagstaff assigned to Course 3380TA
Professor Wagstaff assigned to Course 4660MA
Professor Wagstaff assigned to Course 4690MA
Professor Jones assigned to Course 2420TM
Professor Jones assigned to Course 2420TA
Professor Jones assigned to Course 2810TM
Professor Rudolph assigned to Course 2600TE
Professor Rudolph assigned to Course 3250ME
Professor Rudolph assigned to Course 4470MA
Professor Rudolph assigned to Course 6150ME
Professor Rudolph assigned to Course 6470TE
```

```
Professor Mortenson assigned to Course 3310TM
Professor Mortenson assigned to Course 4380MA
Professor Mortenson assigned to Course 4380TA
Professor Tang assigned to Course 1410ME
Professor Tang assigned to Course 3060TM
Professor Tang assigned to Course 3060TE
Professor Tang assigned to Course 4230TE
Professor Jenson assigned to Course 2550TA
Professor Jenson assigned to Course 3410TA
Professor Jenson assigned to Course 3660MA
Professor Zeng assigned to Course 3240TA
Professor Thackeray assigned to Course 2450TM
Professor Thackeray assigned to Course 3260TA
Professor Thackeray assigned to Course 3450MA
Professor Thackeray assigned to Course 6300TA
Professor Harrison assigned to Course 2370TA
Professor Harrison assigned to Course 2370MA
Professor Harrison assigned to Course 2370TM
Professor Harrison assigned to Course 2450MA
Professor Harrison assigned to Course 3370TA
Professor Harrison assigned to Course 4400MA
Professor Sanati assigned to Course 3520TA
Professor Sanati assigned to Course 3520TA.1
Professor Sanati assigned to Course 3530ME
Professor Sanati assigned to Course 4700MA
Professor Sanati assigned to Course 4900ME
Professor Sanati assigned to Course 6730MA
Professor Sajal assigned to Course 2600TA
Professor Sajal assigned to Course 2690MA
Professor Sajal assigned to Course 2690TE
Professor Sajal assigned to Course 3100MA
Professor Lyde assigned to Course 3410TA.1
Professor Lyde assigned to Course 4450MA
Professor Lyde assigned to Course 4450MA.1
Professor Lyde assigned to Course 4490MA
Professor Anderson assigned to Course 1410TA
Professor Anderson assigned to Course 1410MA
Professor Anderson assigned to Course 1410TA.1
```

[ ]: