State St Traffic

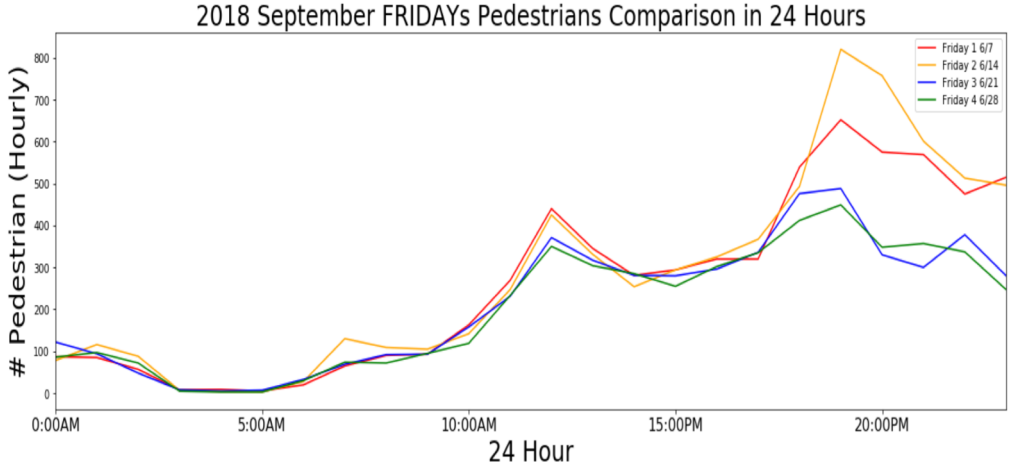
Songyang Cheng, Mianzhi Huang, Nelson Linscott, Shou Kurosu

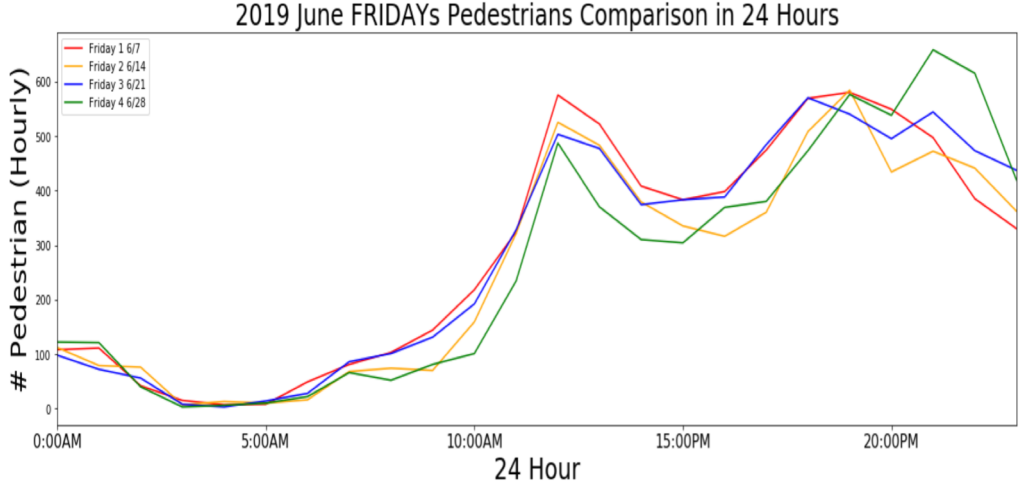
Pedestrain Flow

1. One peak around 12 pm - 2 pm on both Saturday and Sunday.

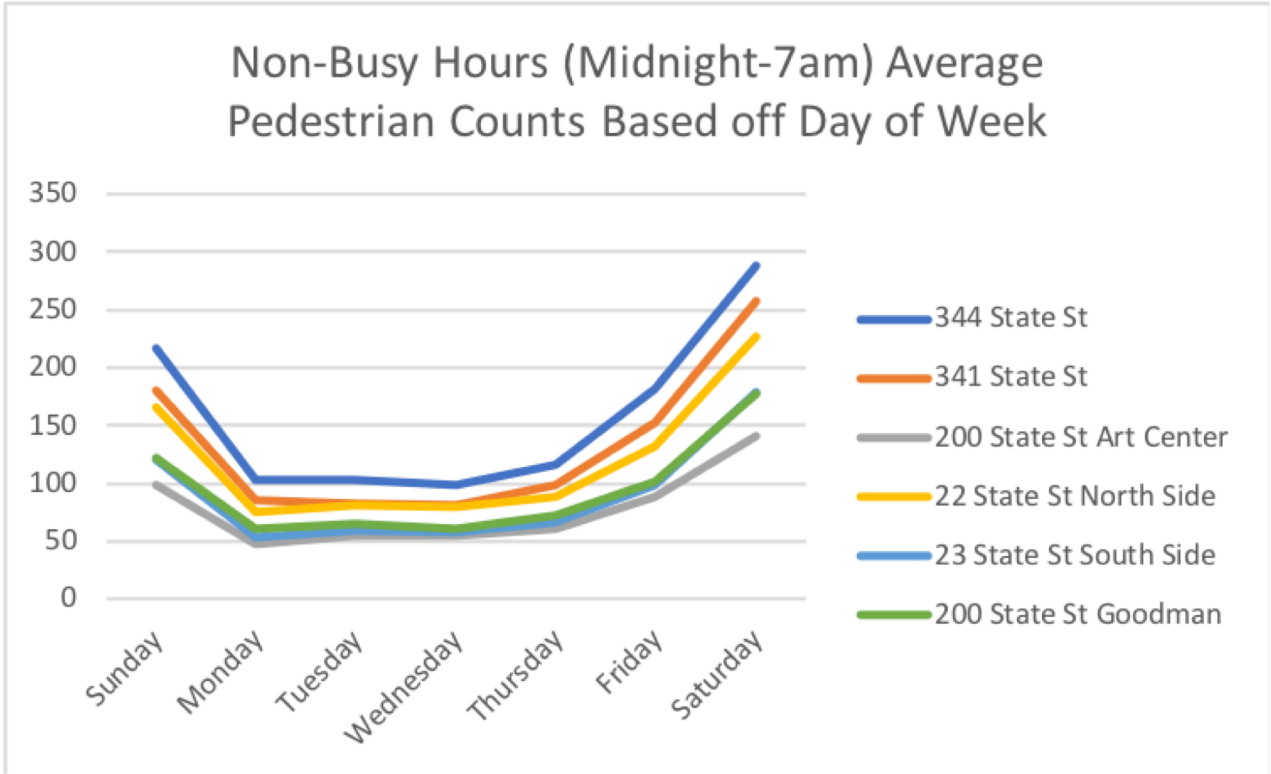
   Two peaks, one around 12 pm and the other around 6 pm, from Monday to Friday. (commuting)

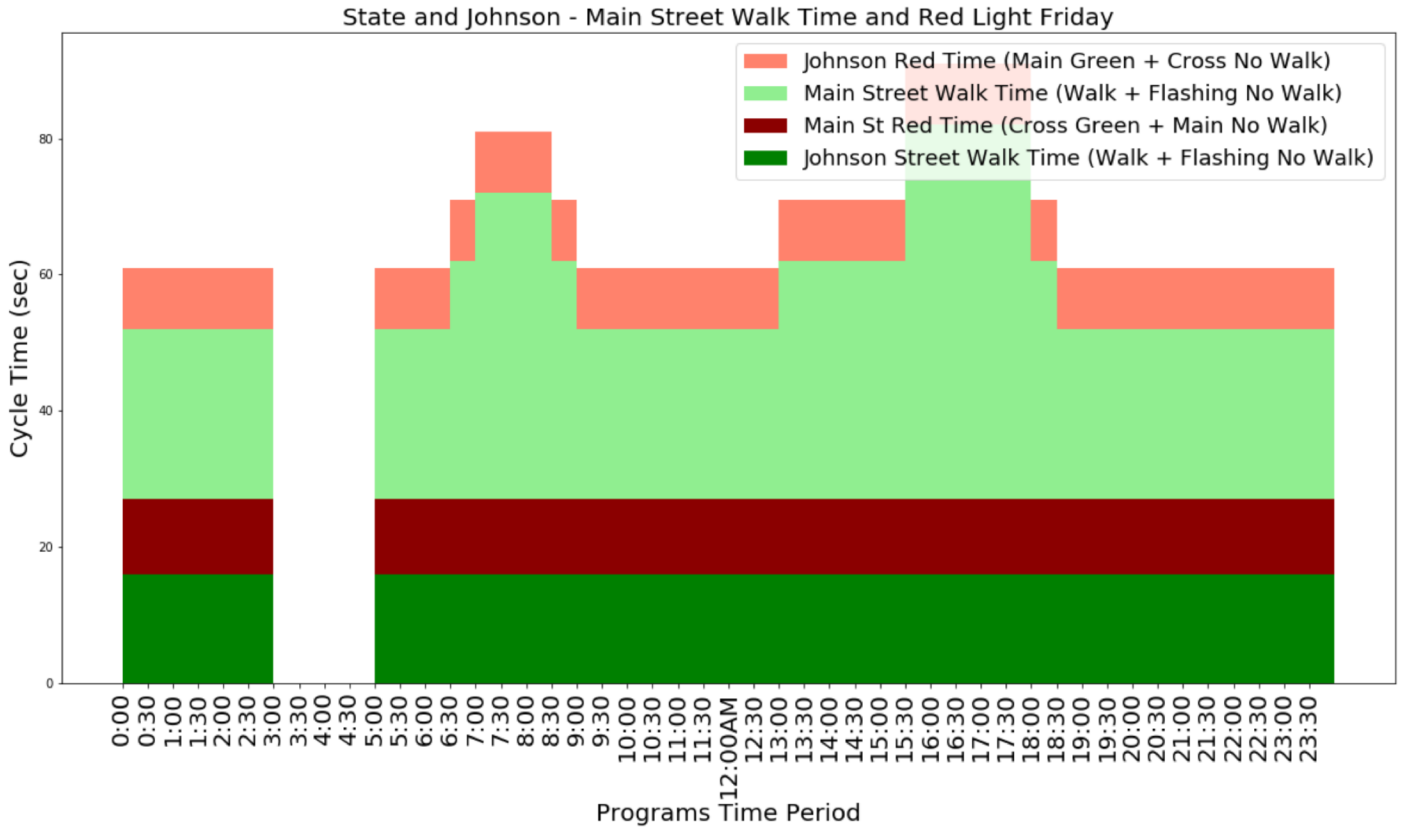
1. The number of people who walk on Saturday is almost as twice large as the number who walk on weekdays.

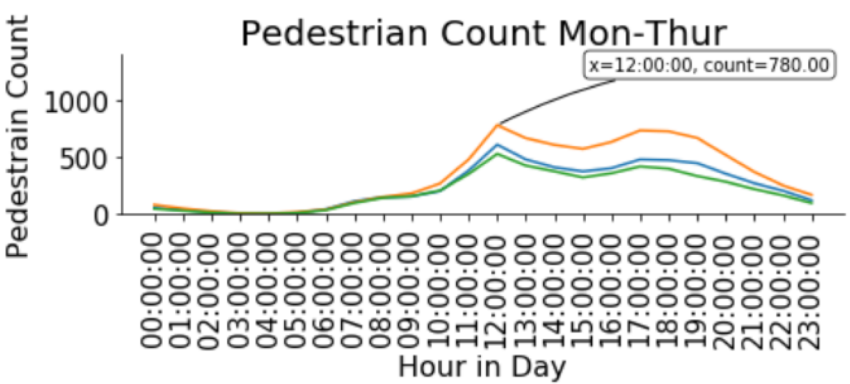


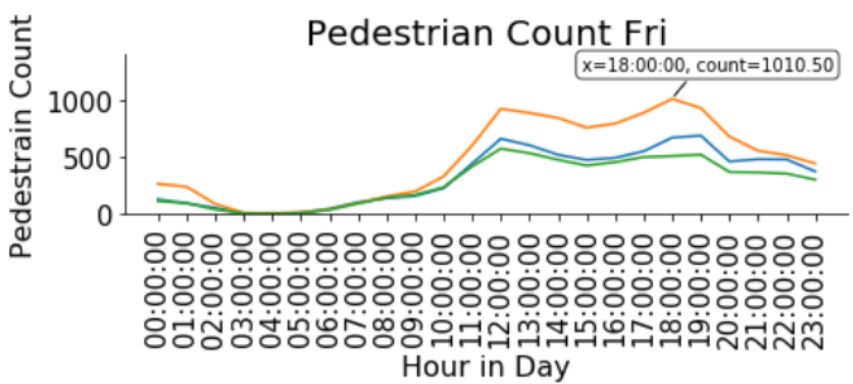


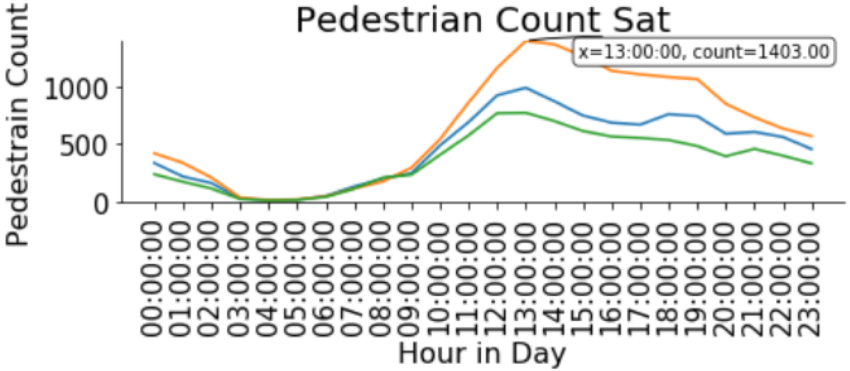
Patterns on Friday in 2018 Sep and 2019 June Indicate a need to focus on controls based on Friday night variations

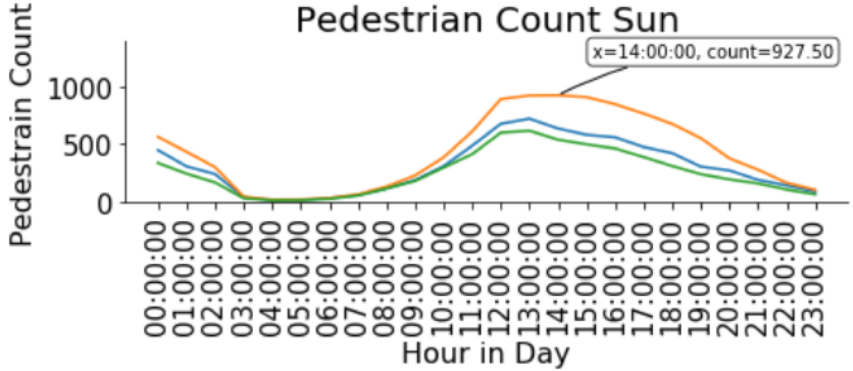

Non-Busy Hours (Midnight-7am) Average Pedestrian Counts Based off Day of Week
350
300
250
200
150
100
50
0
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
344 State St
341 State St
200 State St Art Center
22 State St North Side
23 State St South Side
200 State St Goodman

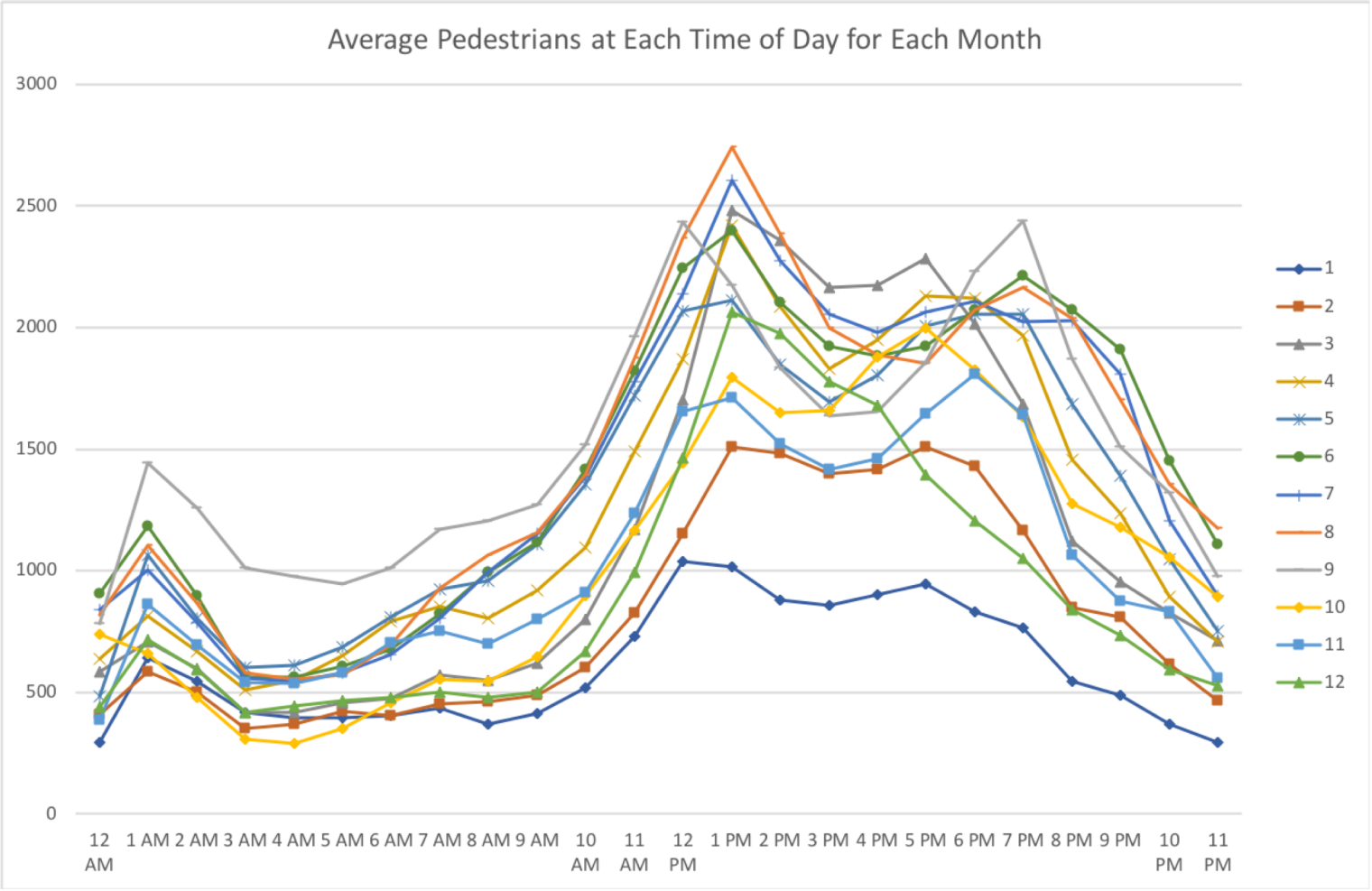

State and Johnson - Main Street Walk Time and Red Light Friday
Johnson Red Time (Main Green + Cross No Walk)
Main Street Walk Time (Walk + Flashing No Walk)
Main St Red Time (Cross Green + Main No Walk)
Johnson Street Walk Time (Walk + Flashing No Walk)
Cycle Time (sec)
0
20
40
60
80
0:00
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
8:00
8:30
9:00
9:30
10:00
10:30
11:00
11:30
12:00AM
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30
22:00
22:30
23:00
23:30
Programs Time Period

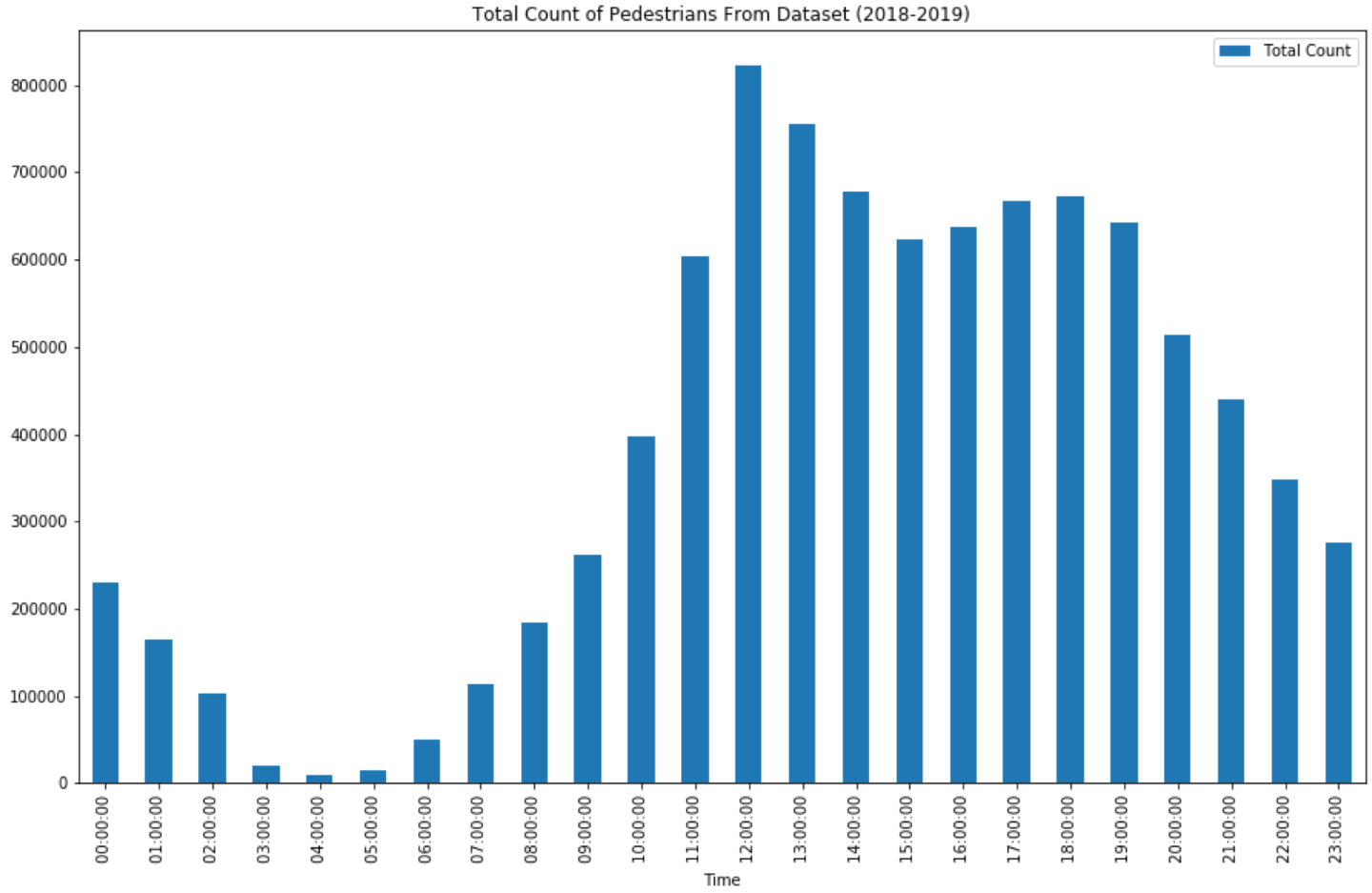

Pedestrian Count Mon-Thur
x=12:00:00, count=780.00
Pedestrain Count
1000
500
0
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
Hour in Day


Pedestrian Count Fri
x=18:00:00, count=1010.50
Pedestrain Count
1000
500
0
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
Hour in Day
Dayton
Gorham
Johnson


Pedestrian Count Sat
x=13:00:00, count=1403.00
Pedestrain Count
1000
500
0
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
Hour in Day


Pedestrian Count Sun
x=14:00:00, count=927.50
Pedestrain Count
1000
500
0
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
Hour in Day

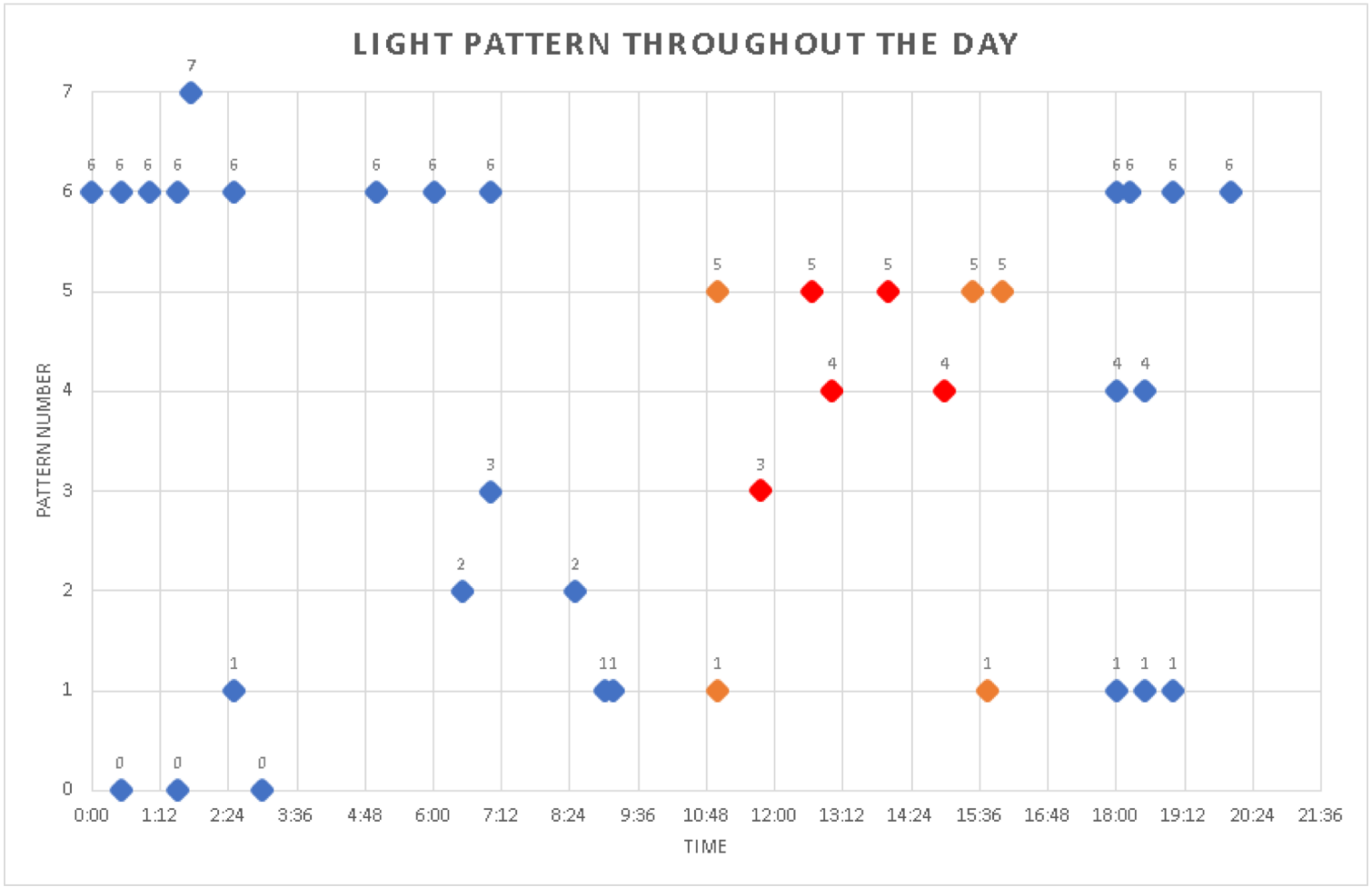

Average Pedestrians at Each Time of Day for Each Month
3000
2500
2000
1500
1000
500
0
12 AM
1 AM
2 AM
3 AM
4 AM
5 AM
6 AM
7 AM
8 AM
9 AM
10 AM
11 AM
12 PM
1 PM
2 PM
3 PM
4 PM
5 PM
6 PM
7 PM
8 PM
9 PM
10 PM
11 PM
1
2
3
4
5
6
7
8
9
10
11
12

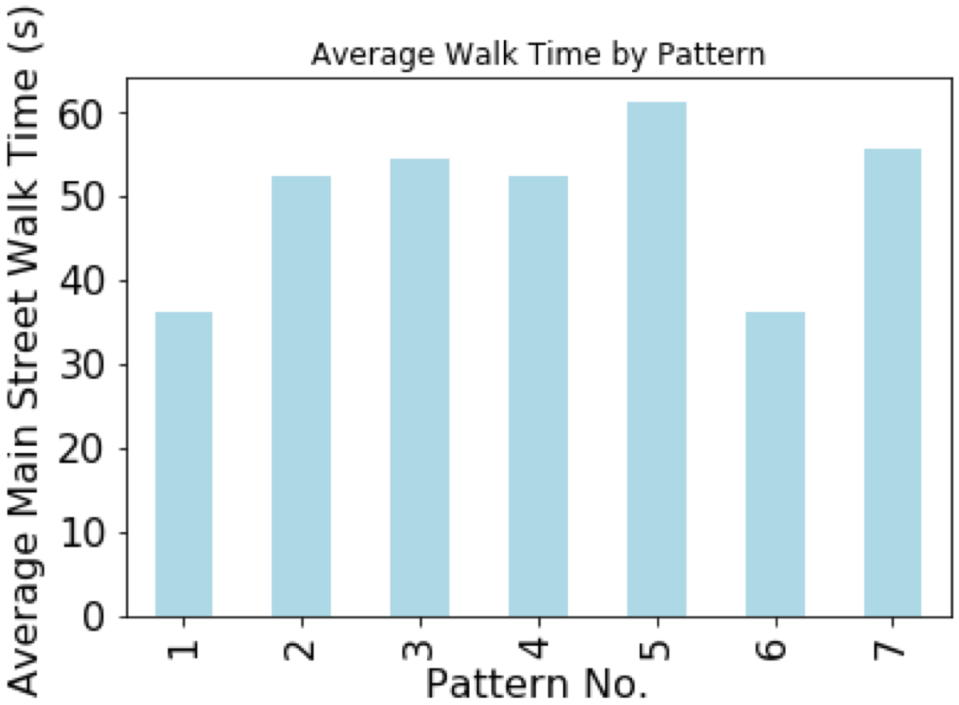

Total Count of Pedestrians From Dataset (2018-2019)
Total Count
800000
700000
600000
500000
400000
300000
200000
100000
0
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
Time

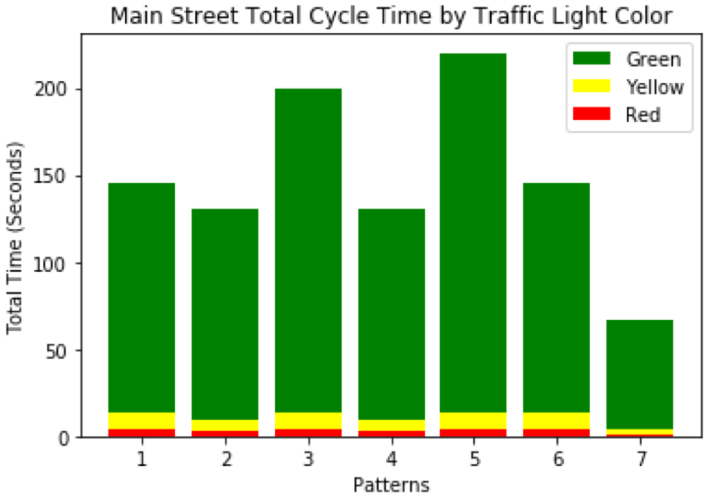
Green Lights Cycle

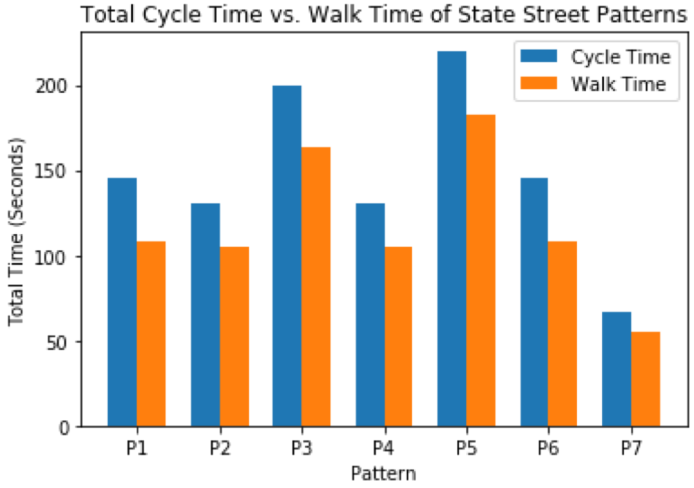
Go across Main Street(Dayton/Gorham/Johnson) = go along State St wait for a long time.

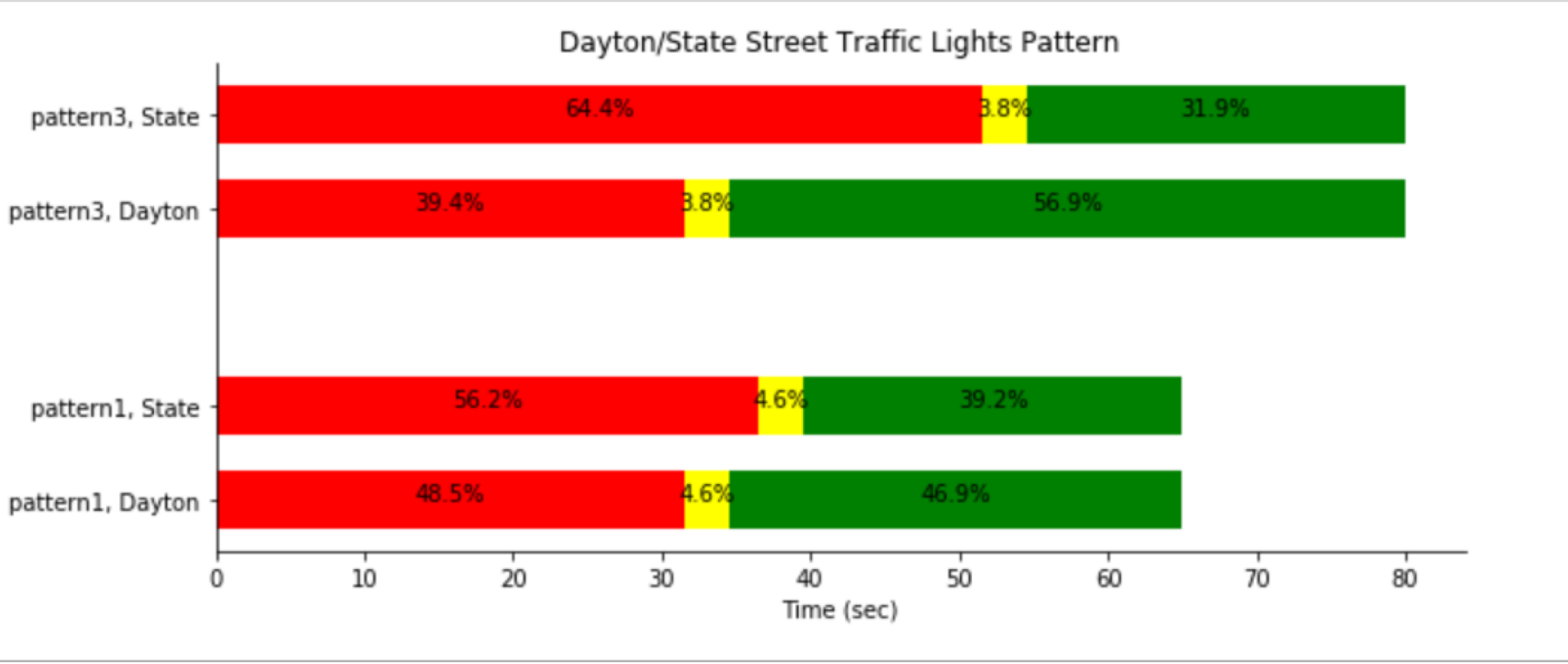
about three or four times than the other way around

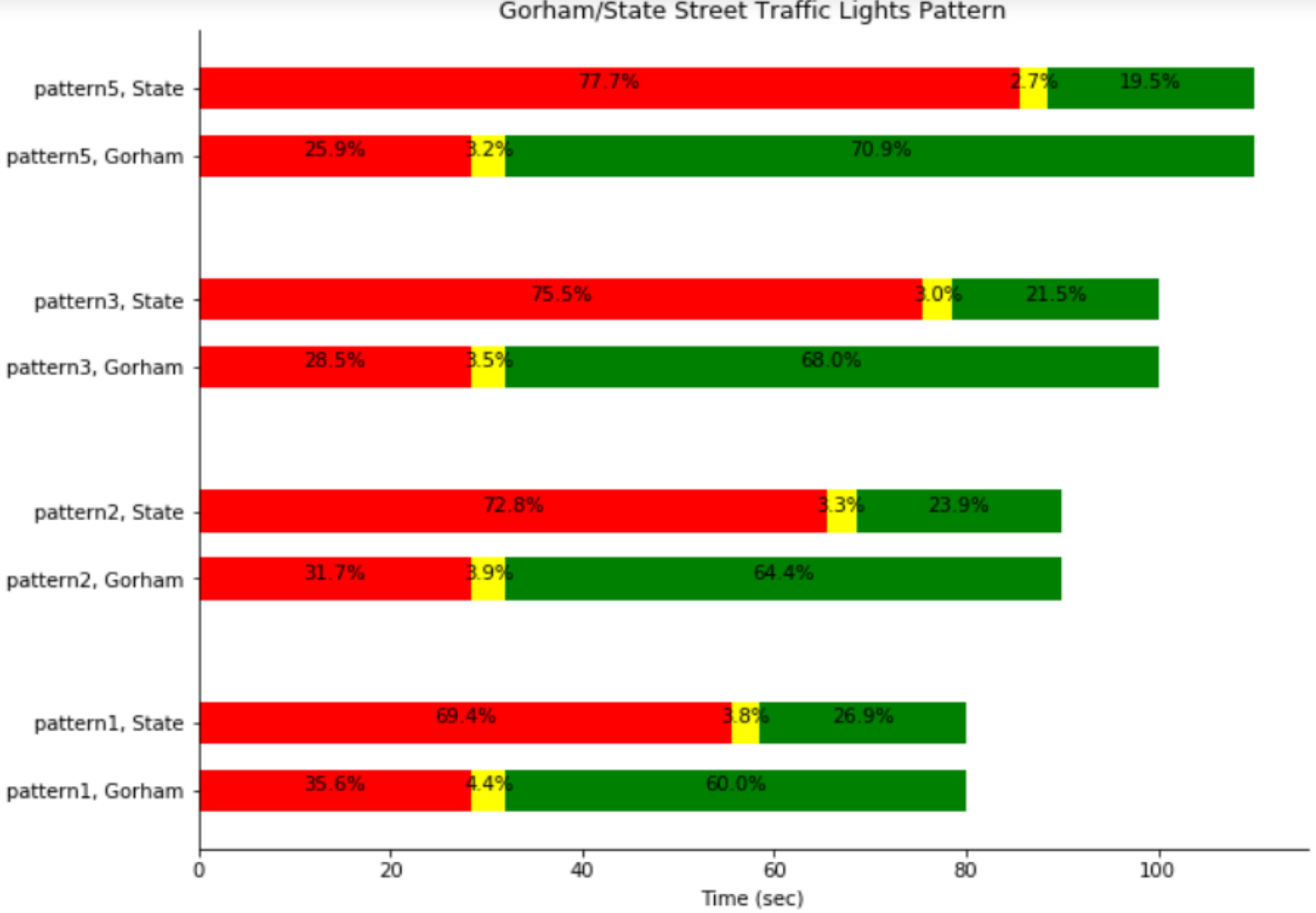

LIGHT PATTERN THROUGHOUT THE DAY
PATTERN NUMBER
TIME
0
1
2
3
4
5
6
7
0:00
1:12
2:24
3:36
4:48
6:00
7:12
8:24
9:36
10:48
12:00
13:12
14:24
15:36
16:48
18:00
19:12
20:24
21:36

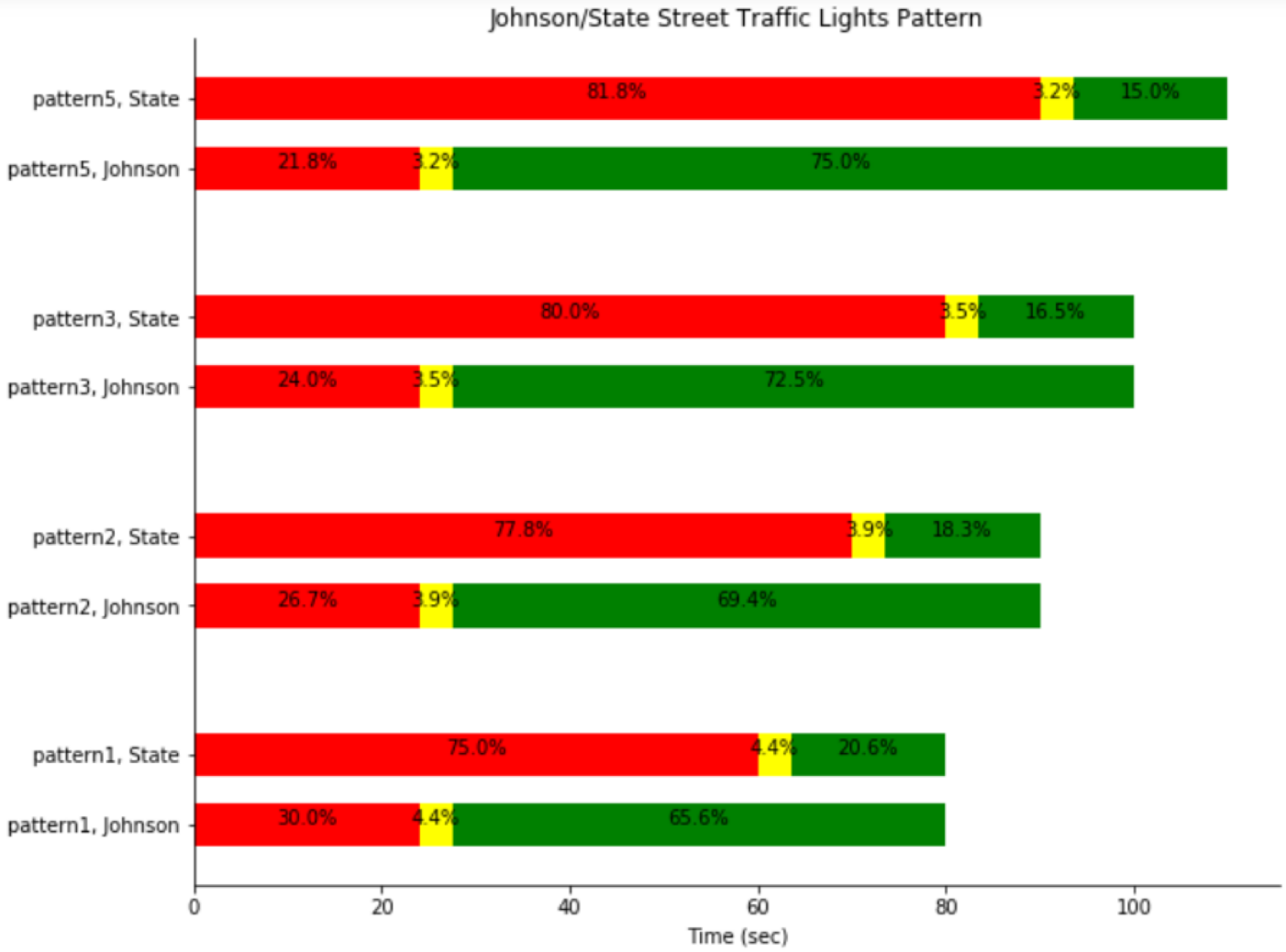

Average Walk Time by Pattern
Average Main Street Walk Time (s)
0
10
20
30
40
50
60
1
2
3
4
5
6
7
Pattern No.


Main Street Total Cycle Time by Traffic Light Color
Green
Yellow
Red
Total Time (Seconds)
0
50
100
150
200
1
2
3
4
5
6
7
Patterns


Total Cycle Time vs. Walk Time of State Street Patterns
Cycle Time
Walk Time
Total Time (Seconds)
0
50
100
150
200
P1
P2
P3
P4
P5
P6
P7
Pattern

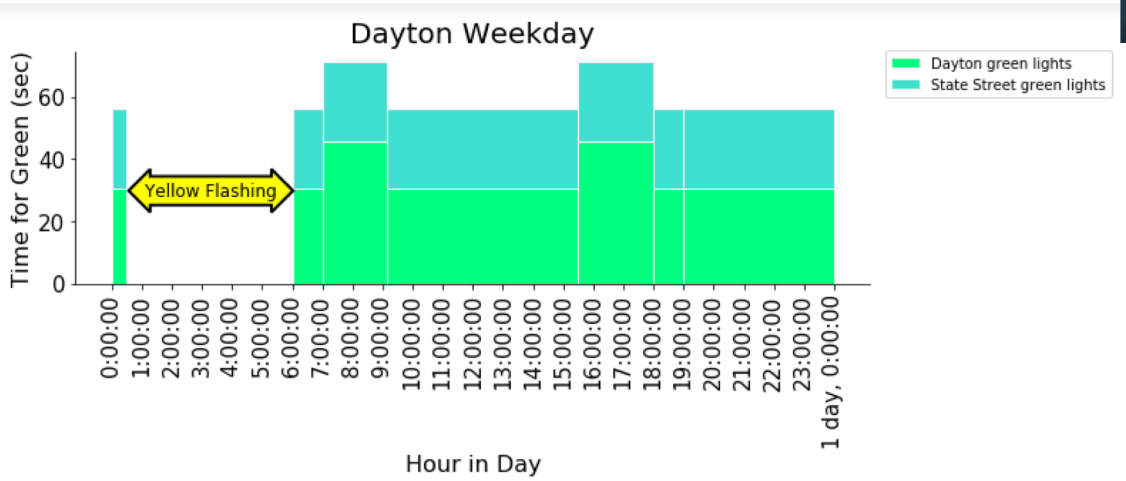

Dayton/State Street Traffic Lights Pattern
pattern3, State
64.4%
3.8%
31.9%
pattern3, Dayton
39.4%
3.8%
56.9%
pattern1, State
56.2%
4.6%
39.2%
pattern1, Dayton
48.5%
4.6%
46.9%
0
10
20
30
40
50
60
70
80
Time (sec)

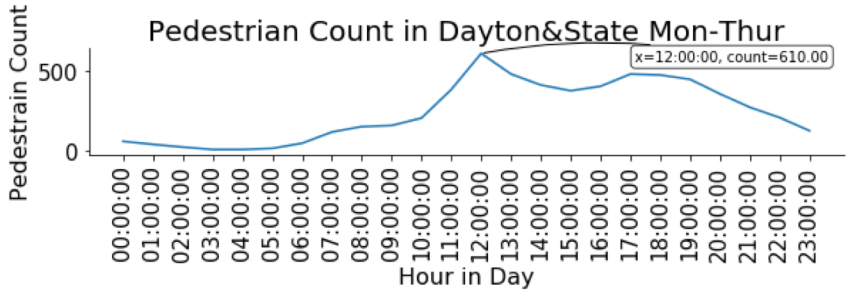

Gorham/State Street Traffic Lights Pattern
pattern5, State
77.7%
2.7%
19.5%
pattern5, Gorham
25.9%
3.2%
70.9%
pattern3, State
75.5%
3.0%
21.5%
pattern3, Gorham
28.5%
3.5%
68.0%
pattern2, State
72.8%
3.3%
23.9%
pattern2, Gorham
31.7%
3.9%
64.4%
pattern1, State
69.4%
3.8%
26.9%
pattern1, Gorham
35.6%
4.4%
60.0%
0
20
40
60
80
100
Time (sec)

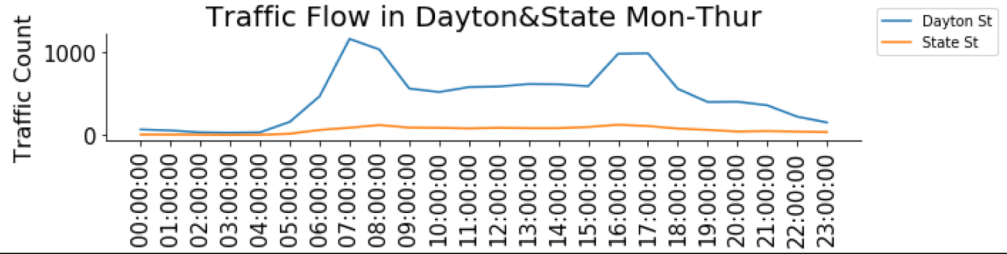

Johnson/State Street Traffic Lights Pattern
pattern5, State
pattern5, Johnson
pattern3, State
pattern3, Johnson
pattern2, State
pattern2, Johnson
pattern1, State
pattern1, Johnson
81.8%
3.2%
15.0%
21.8%
3.2%
75.0%
80.0%
3.5%
16.5%
24.0%
3.5%
72.5%
77.8%
3.9%
18.3%
26.7%
3.9%
69.4%
75.0%
4.4%
20.6%
30.0%
4.4%
65.6%
0
20
40
60
80
100
Time (sec)

Light Pattern, Pedestrian and Traffic

1. Light cycle are too long, should adopt shorter and more frequent cycle pattern.
2. Pattern does not align with morning peak (6 - 8 am).


Dayton Weekday
Dayton green lights
State Street green lights
Time for Green (sec)
0
20
40
60
Yellow Flashing
0:00:00
1:00:00
2:00:00
3:00:00
4:00:00
5:00:00
6:00:00
7:00:00
8:00:00
9:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
1 day, 0:00:00
Hour in Day


Pedestrian Count in Dayton&State Mon-Thur
x=12:00:00, count=610.00
Pedestrain Count
0
500
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
Hour in Day

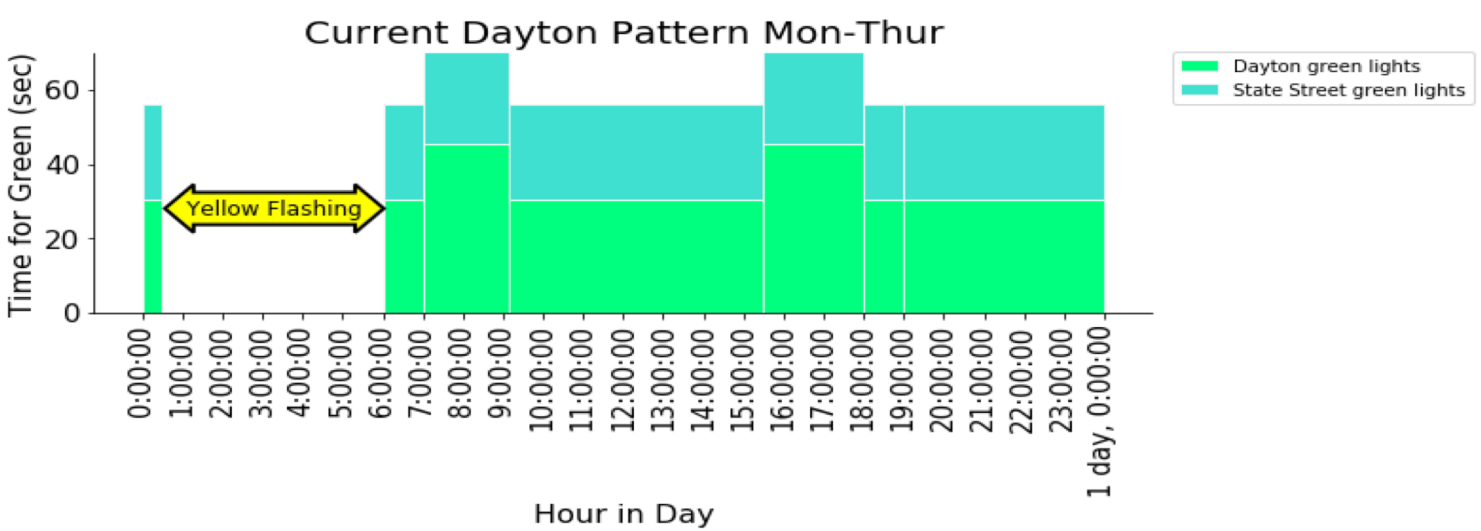

Traffic Flow in Dayton&State Mon-Thur
Dayton St
State St
Traffic Count
0
1000
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00

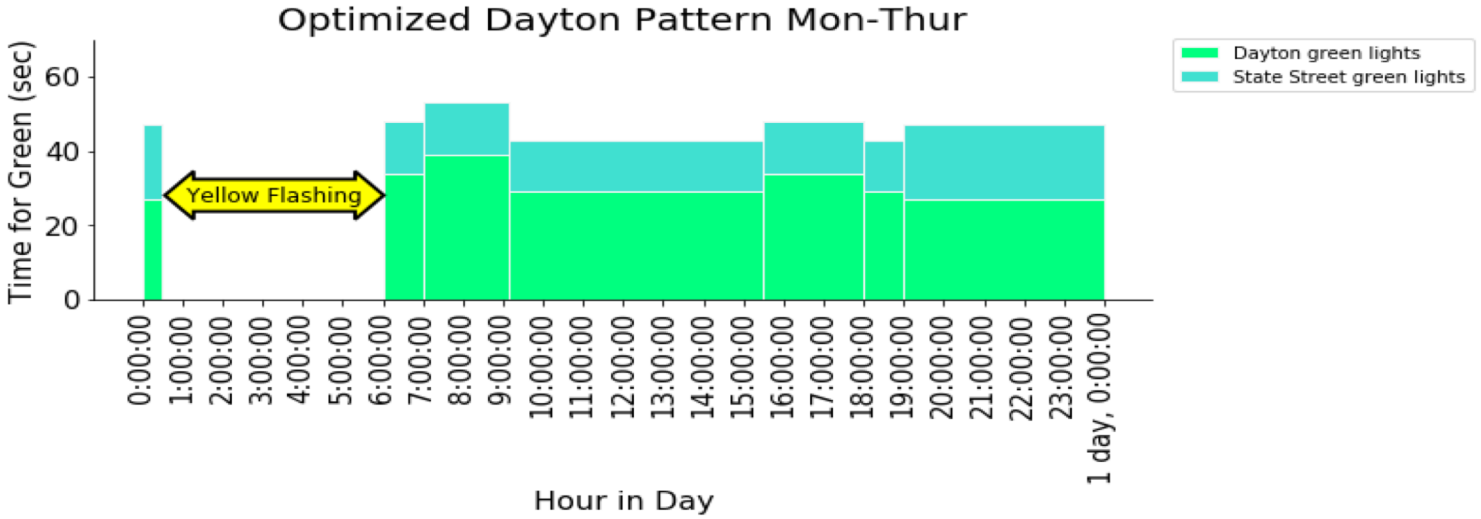
Metric and Optimization

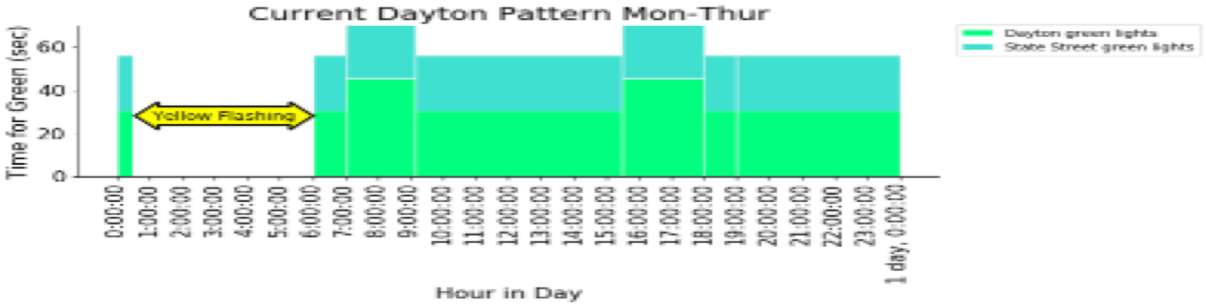
Assumption:

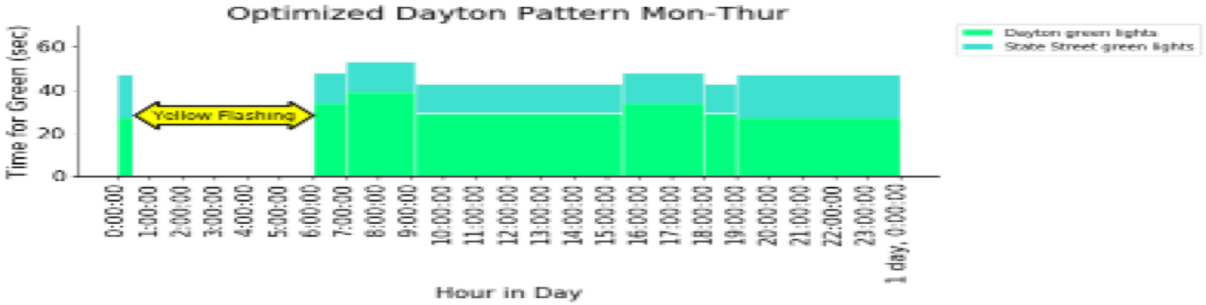
1. 4/5 pedestrain wait for Main Street Red Light,
   3/5 pedestrians will wait for Cross Street Red Light.

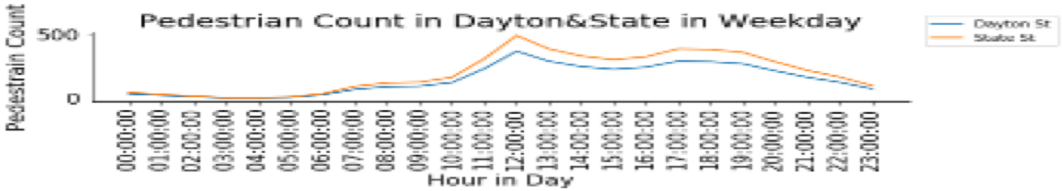
1. Every car will pass the intersection in 2 seconds.
2. Pedestrian and Cars come in a constant speed. Uniformly distributed according to time.
3. Define anger index = 1/3000*(waiting time)^2

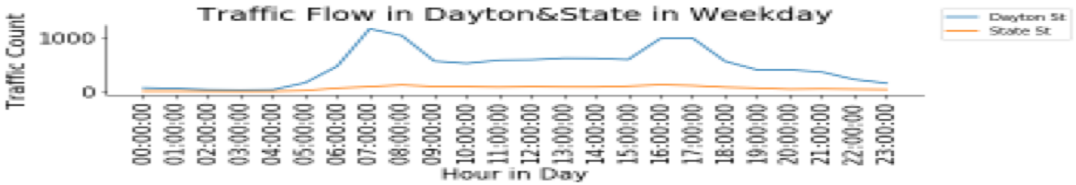

Current Dayton Pattern Mon-Thur
Time for Green (sec)
0
20
40
60
Yellow Flashing
Dayton green lights
State Street green lights
0:00:00
1:00:00
2:00:00
3:00:00
4:00:00
5:00:00
6:00:00
7:00:00
8:00:00
9:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
1 day, 0:00:00
Hour in Day

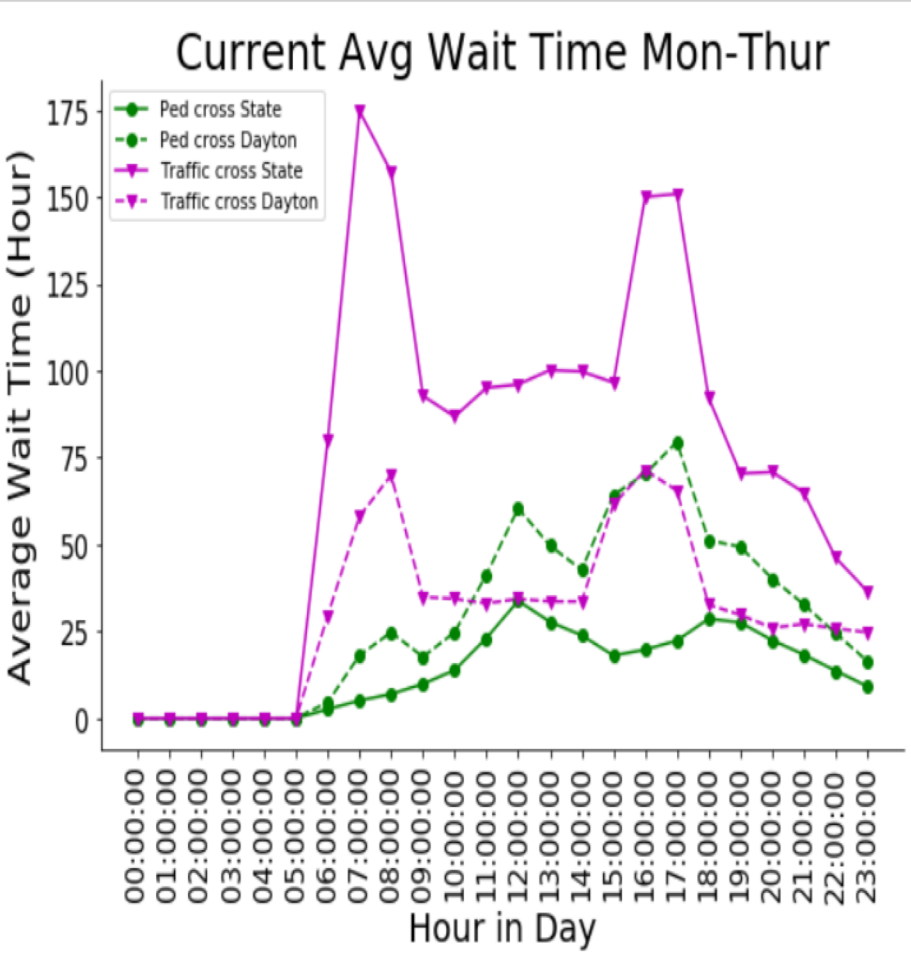

Optimized Dayton Pattern Mon-Thur
Time for Green (sec)
0
20
40
60
Yellow Flashing
Dayton green lights
State Street green lights
0:00:00
1:00:00
2:00:00
3:00:00
4:00:00
5:00:00
6:00:00
7:00:00
8:00:00
9:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
1 day, 0:00:00
Hour in Day

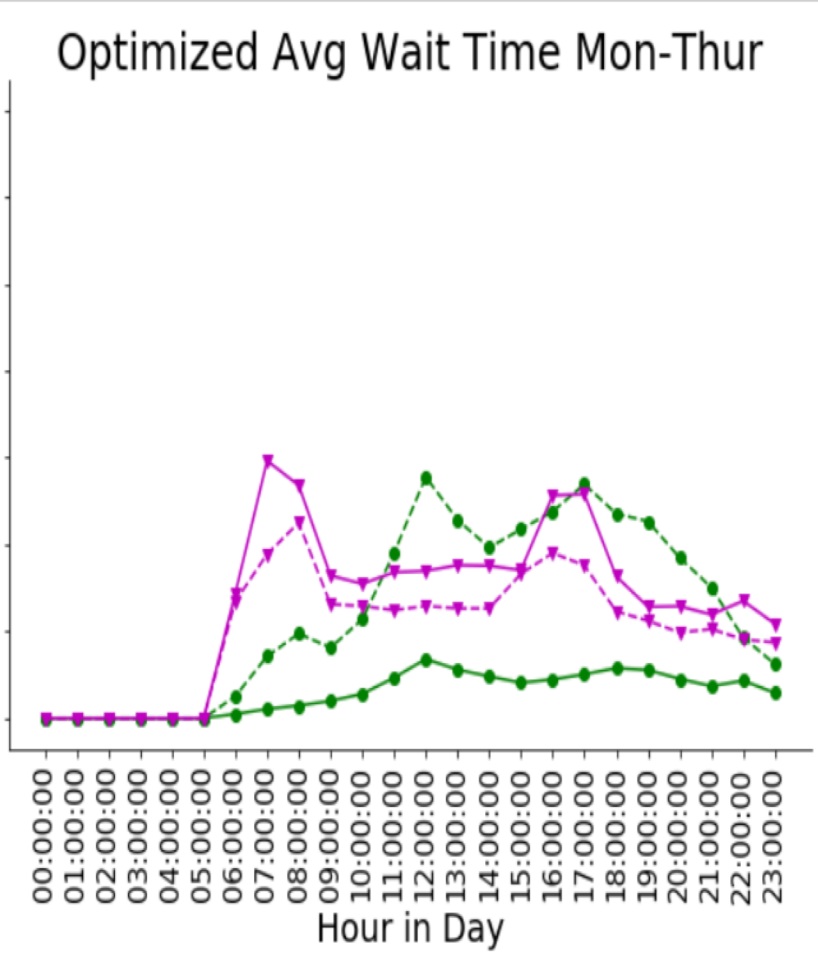

Current Dayton Pattern Mon-Thur
Time for Green (sec)
Yellow Flashing
Dayton green lights
State Street green lights
Hour in Day

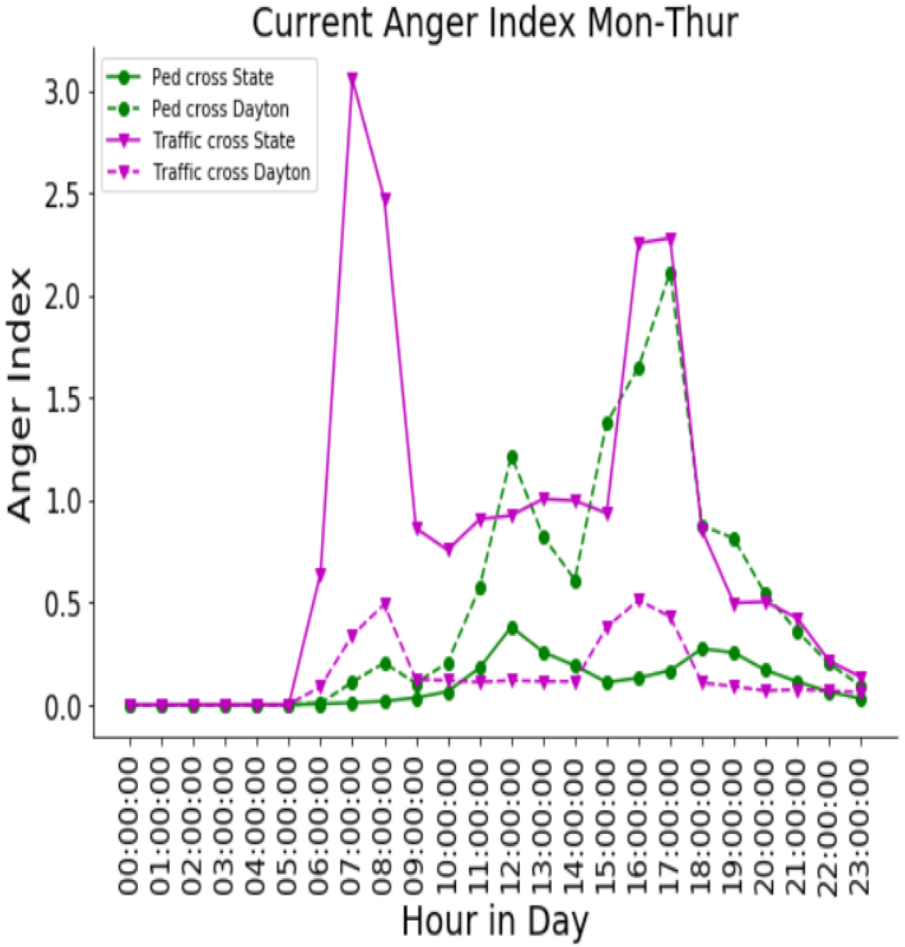

Optimized Dayton Pattern Mon-Thur
Time for Green (sec)
Yellow Flashing
Dayton green lights
State Street green lights
Hour in Day

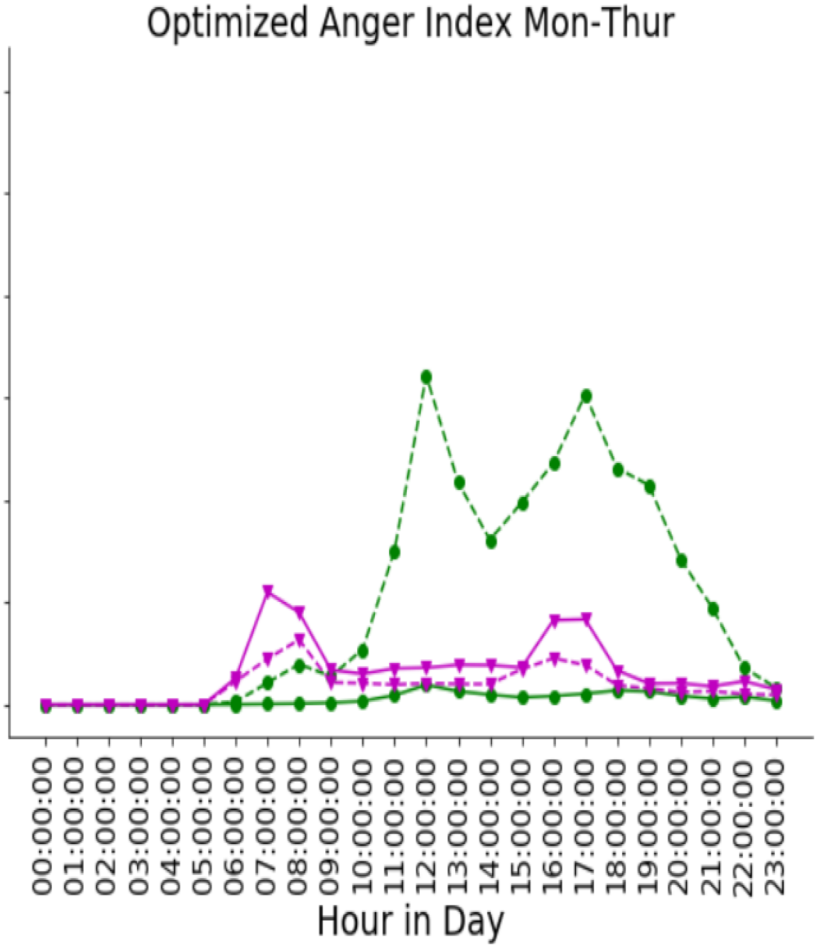

Pedestrian Count in Dayton&State in Weekday
Pedestrain Count
Dayton St
State St
Hour in Day

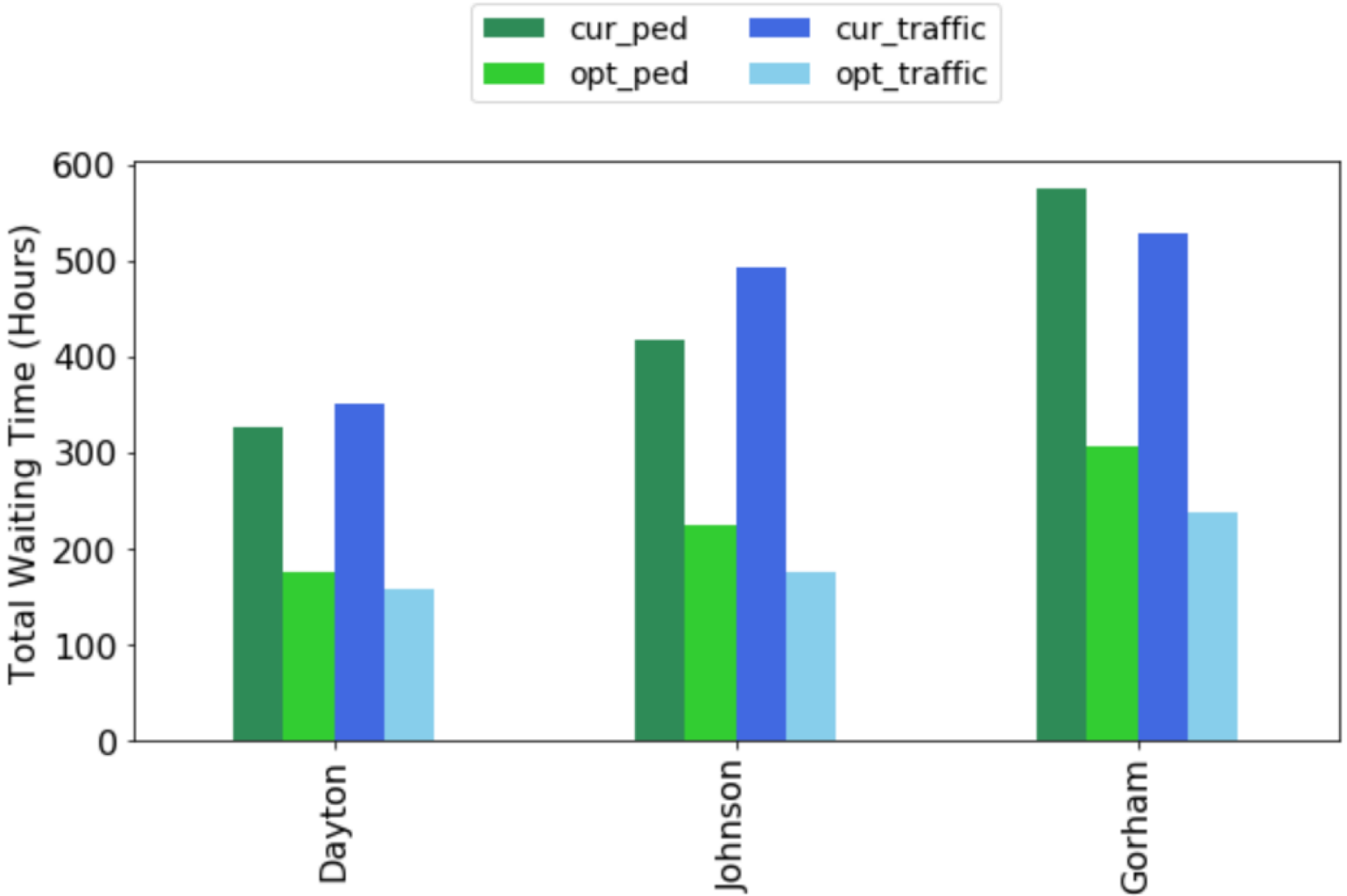

Traffic Flow in Dayton&State in Weekday
Traffic Count
Dayton St
State St
Hour in Day

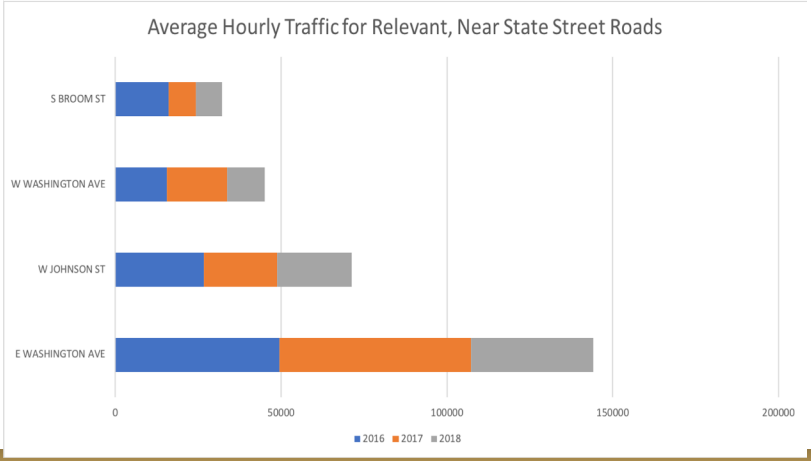
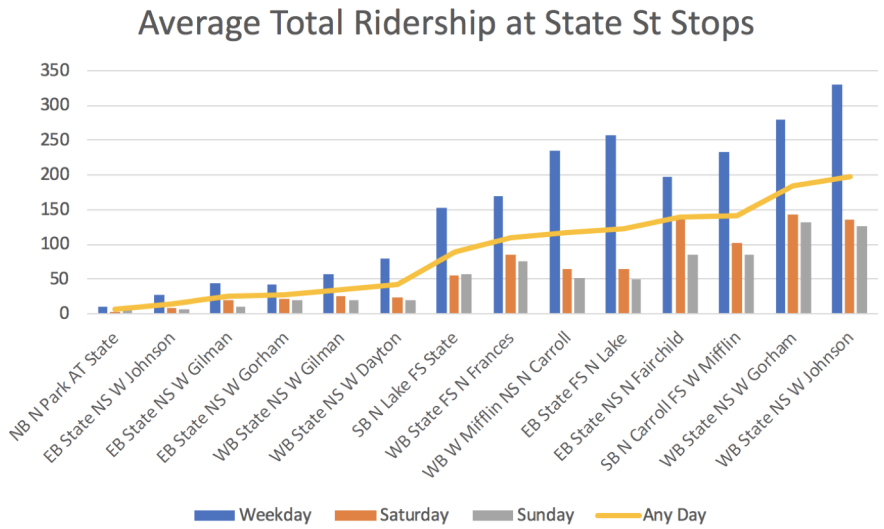

Current Avg Wait Time Mon-Thur
Ped cross State
Ped cross Dayton
Traffic cross State
Traffic cross Dayton
Average Wait Time (Hour)
0
25
50
75
100
125
150
175
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
Hour in Day


Optimized Avg Wait Time Mon-Thur
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
Hour in Day


Current Anger Index Mon-Thur
Ped cross State
Ped cross Dayton
Traffic cross State
Traffic cross Dayton
Anger Index
3.0
2.5
2.0
1.5
1.0
0.5
0.0
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
Hour in Day


Optimized Anger Index Mon-Thur
00:00:00
01:00:00
02:00:00
03:00:00
04:00:00
05:00:00
06:00:00
07:00:00
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
Hour in Day


cur_ped
opt_ped
cur_traffic
opt_traffic
Total Waiting Time (Hours)
600
500
400
300
200
100
0
Dayton
Johnson
Gorham

Other Considerations Going Forward

1. Bus Patterns
2. Traffic Patterns