Better Hyde Park & UChicago

CHB Project

Xi Chen, Jie Heng, Chen Bao

Project Overview

Our Goal is to

recommend the safest route for users who commute in Hyde Park.

- Crawl the crime data and conduct informative data analysis

  - Chen Bao

- Design an effective algorithm to find the safest route

  - Xi Chen

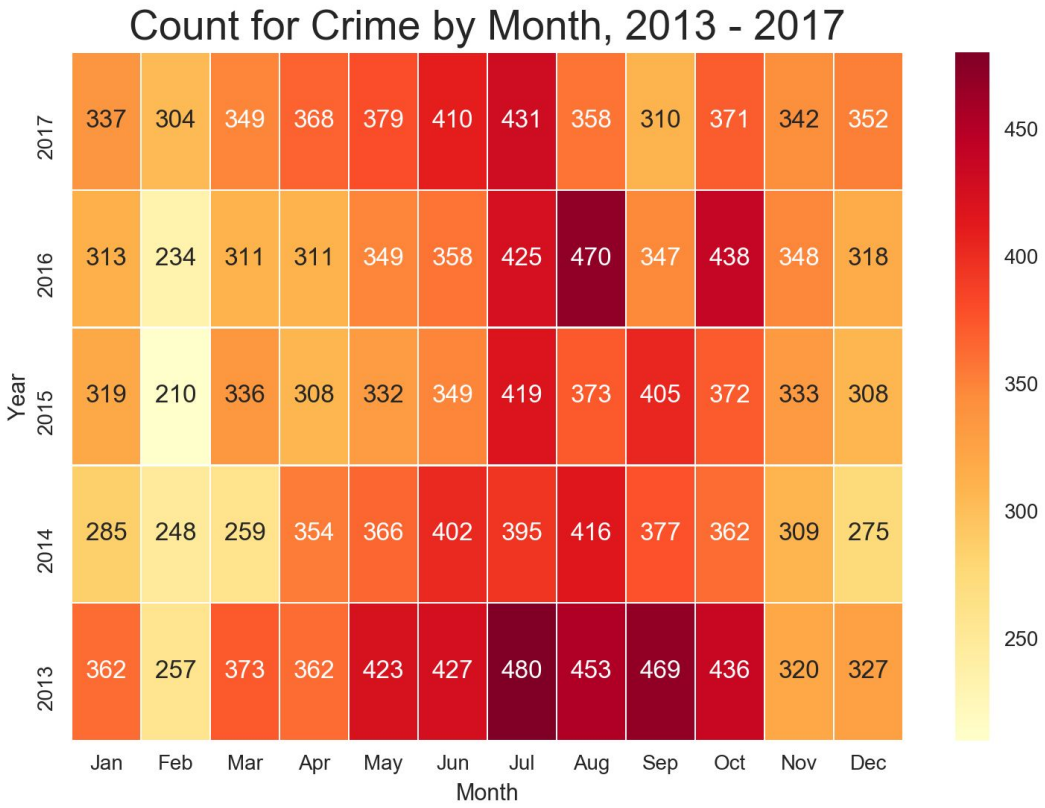
- Build an interactive website and present the analysis results

  - Jie Heng

Hyde Park Crime at a Glance

	Date	Time	PrimaryType	Latitude	Longitude	Location
11413	20130101	0	DECEPTIVE PRACTICE	41.795837911	-87.58542939700001	(41.795837911, -87.585429397)
13930	20130101	0	OTHER OFFENSE	41.781499104	-87.60595585600002	(41.781499104, -87.605955856)
11573	20130101	1	OFFENSE INVOLVING CHILDREN	41.804053685999996	-87.608018817	(41.804053686, -87.608018817)
12589	20130101	1	OFFENSE INVOLVING CHILDREN	41.781424991	-87.60595302700001	(41.781424991, -87.605953027)
14586	20130101	1	THEFT	41.784157052	-87.597140631	(41.784157052, -87.597140631)
11742	20130101	30	BATTERY	41.802022849000004	-87.59508400899998	(41.802022849, -87.595084009)
11739	20130101	200	BATTERY	41.802842875	-87.596714044	(41.802842875, -87.596714044)
11746	20130101	200	BURGLARY	41.783455232	-87.613274211	(41.783455232, -87.613274211)
11792	20130101	200	THEFT	41.785197778000004	-87.613262047	(41.785197778, -87.613262047)
11748	20130101	300	THEFT	41.805322323	-87.603808532	(41.805322323, -87.603808532)
11743	20130101	400	BATTERY	41.808714985	-87.60435692200001	(41.808714985, -87.604356922)
11740	20130101	444	BATTERY	41.783455232	-87.613274211	(41.783455232, -87.613274211)
11741	20130101	500	BATTERY	41.784017858	-87.608046681	(41.784017858, -87.608046681)
11932	20130101	800	OTHER OFFENSE	41.802137533	-87.58650411	(41.802137533, -87.58650411)
11525	20130101	900	DECEPTIVE PRACTICE	41.798822549	-87.595010719	(41.798822549, -87.595010719)
12158	20130101	900	THEFT	41.782291434	-87.60065247799999	(41.782291434, -87.600652478)

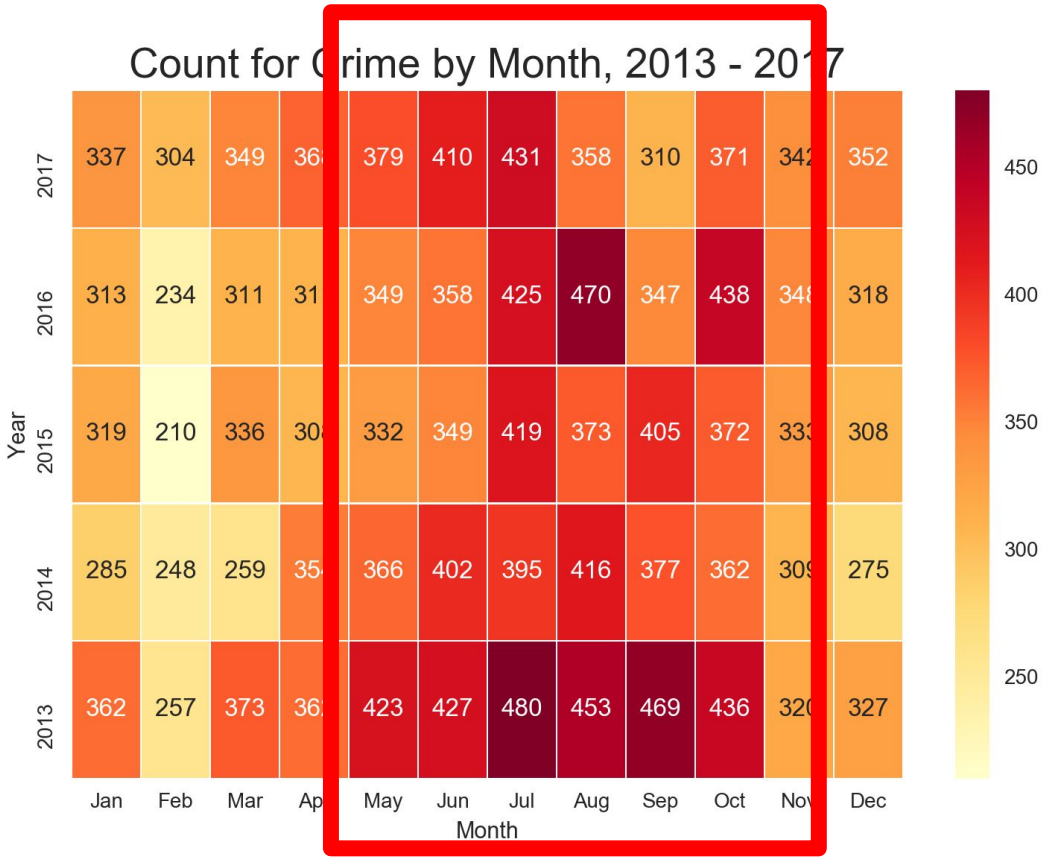
Primary Type: outdoor only & relevant to commute
Year: 2013 - 2018
Total crimes: 20000+
Date and Time: integer, eliminate minutes



Flat over years

Summer

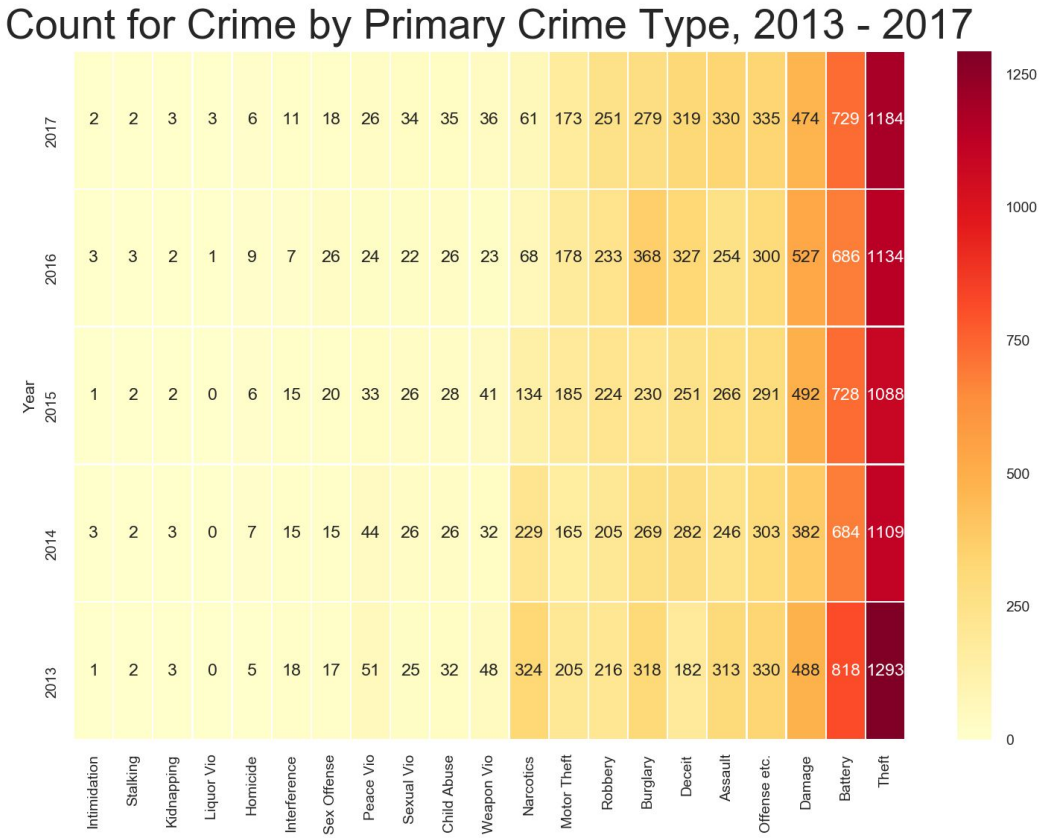
Mid Autumn



Flat over years

Summer

Mid Autumn

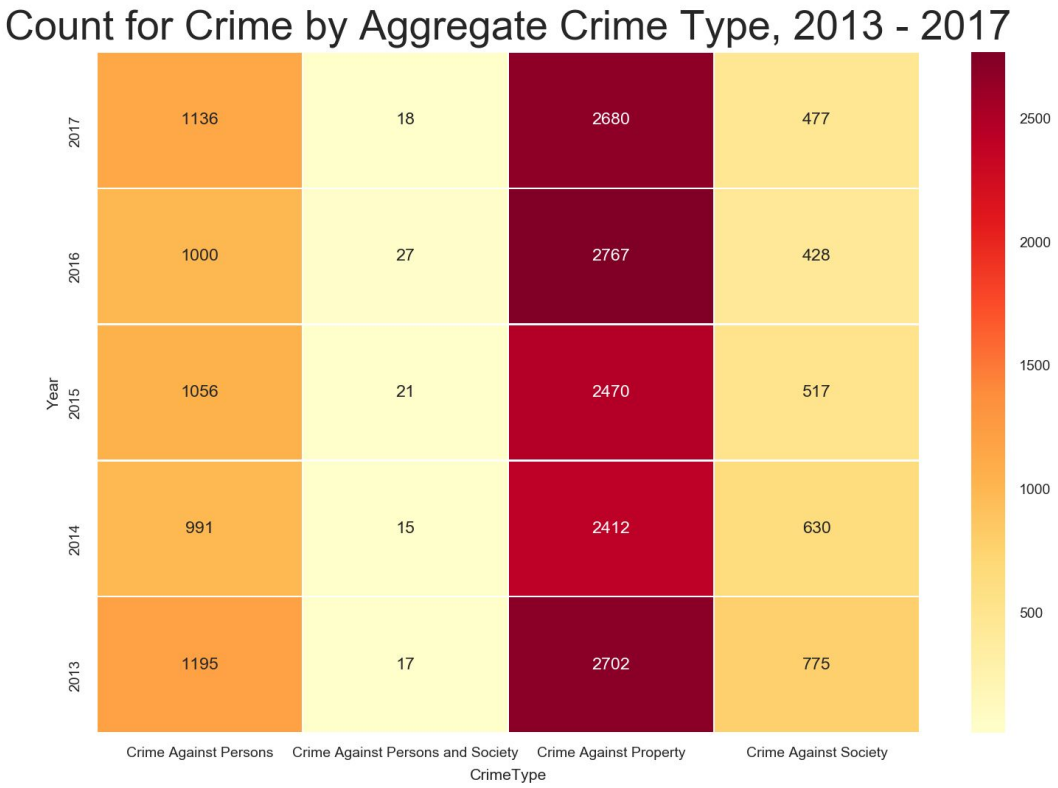


Theft
Battery
Criminal damage.

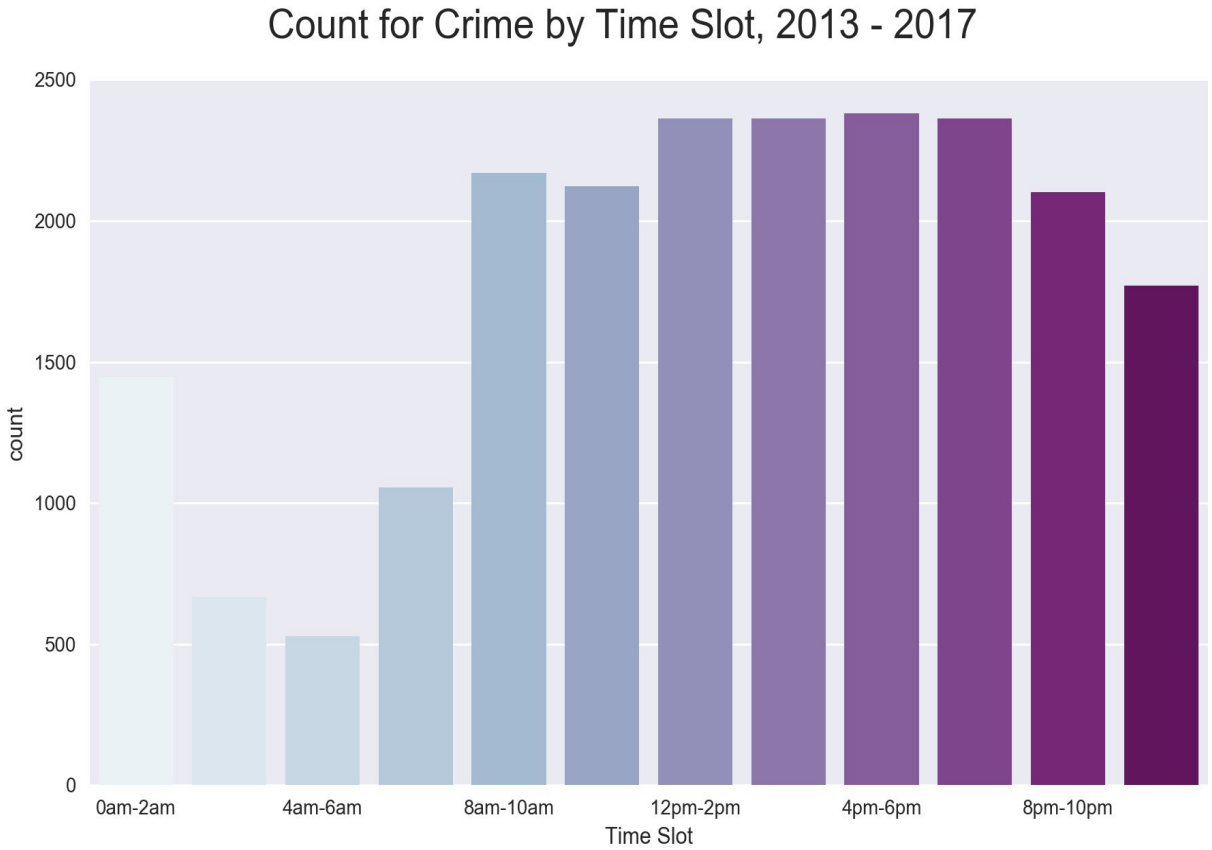
Eliminated < 2

Aggregate Crime Type

Persons and society	Obscenity, Public indecency, Sex offense, Human trafficking
Persons	Stalking, Criminal sexual assault, Murder, Homicide, Battery, Offense involving children, Assault
Society	Other offense, Interference with public officer, Public peace violation, Liquor law violation, Concealed carry license violation, Narcotics, Intimidation, Weapons Violation, Kidnapping
Property	Deceptive practice, Criminal damage, Theft, Robbery, Burglary, Motor vehicle theft



Against Property
Against Persons

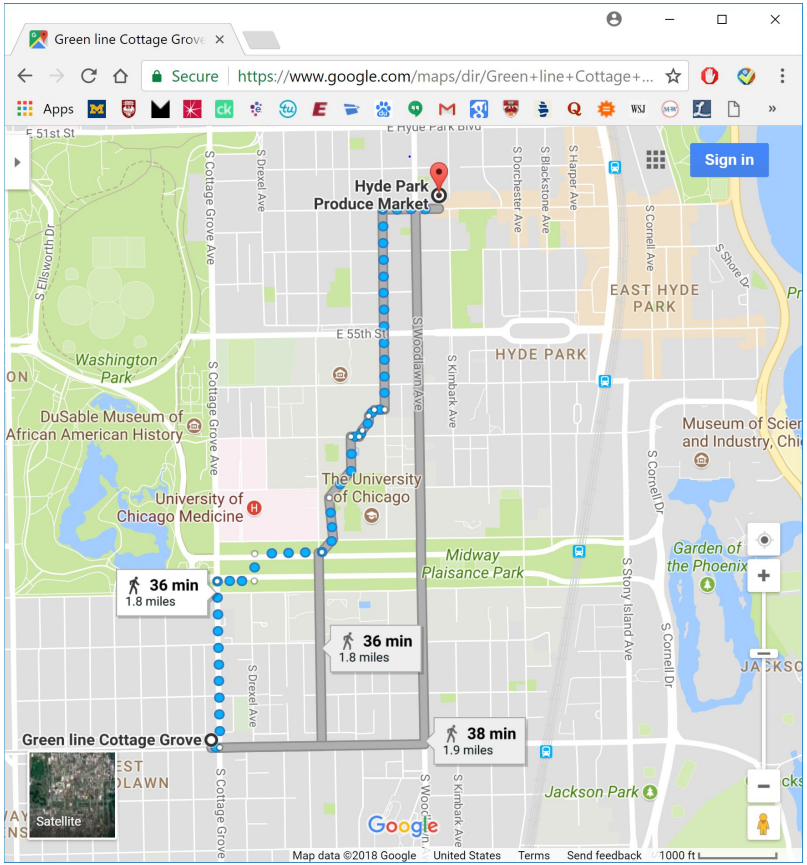


12 time slots
noon to midnight

Algorithm - Goals

Goal 1:

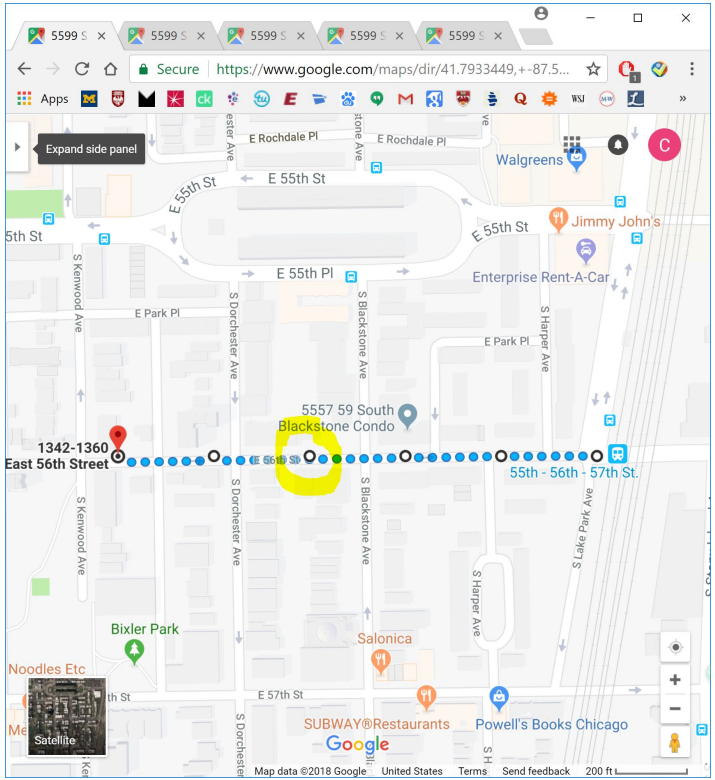
Find the safest route out of all the choices returned from the Google Map API.

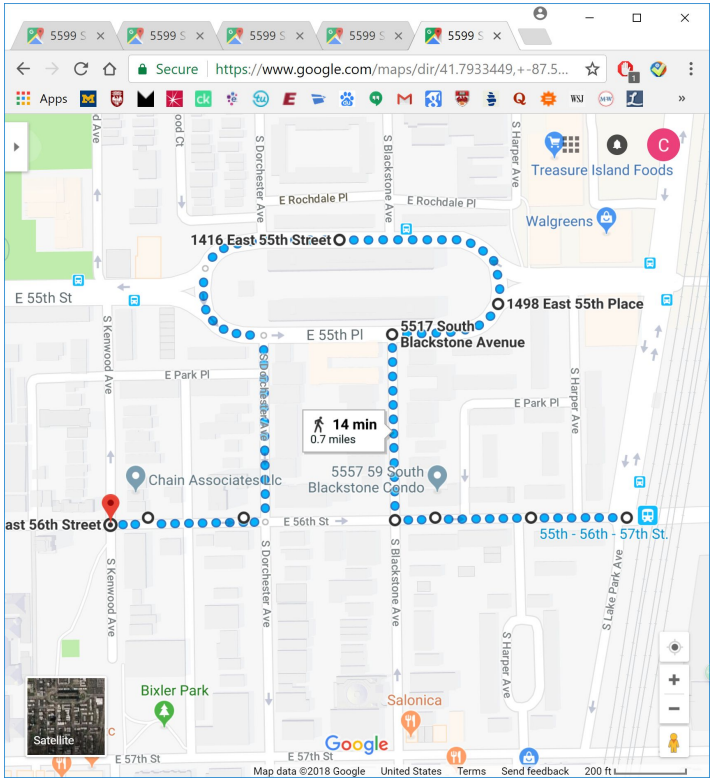


Algorithm - Goals

Goal 2:

Replace the dangerous part(s) of the chosen route with alternative safer routes.





Algorithm - Overview

I. Compute dangerous weights

II. Divide the crime dataset by hours

III. Choose the safest route as the baseline

IV. Replace the dangerous part(s)

V. Finalize a list of safe locations

Algorithm Step I

Compute dangerous weights for each crime location

1. *Crime Type*
   - According to different degrees of seriousness in crime, a type_related weight would be assigned to each crime location.

2. *Crime Date*
   - For a crime that happened a long time ago, its date-related weight is lower than the weight for a crime that happened quite recently.

3. Final weight = Crime weight * Date weight

Algorithm Step II

Divide the crime dataset into twenty-four hourly subsets

✔ *Crime Type*

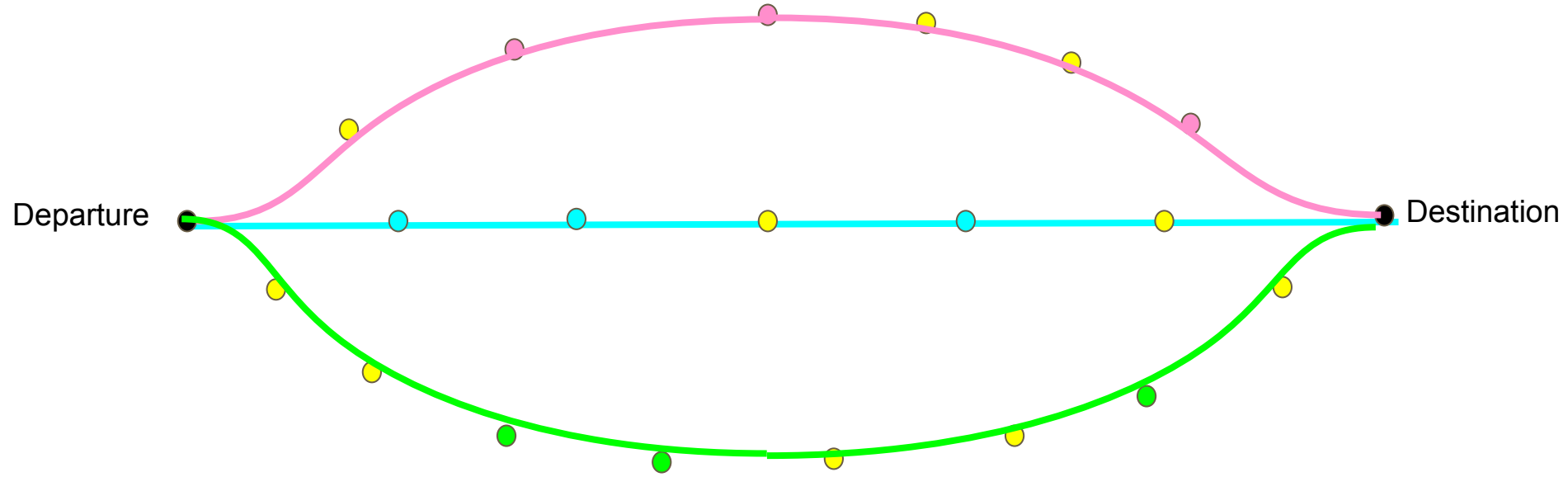
✔ *Crime Date*

→ *Crime Time*

For example, if the user enters the departure time is “8:30 pm”, the algorithm will use the specific data subset which includes all the crimes that happened between 8:00 pm to 9:00 pm.

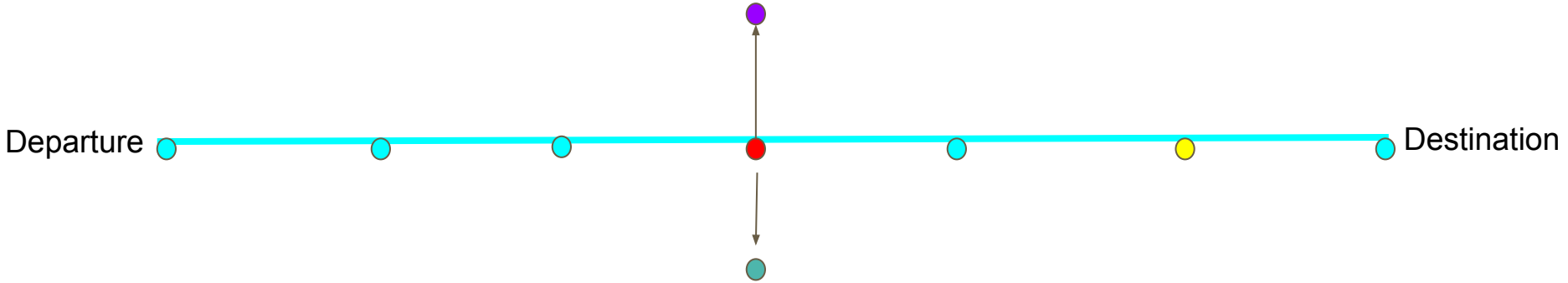
Algorithm Step III

Choose the safest route out of all the choices returned from Google API



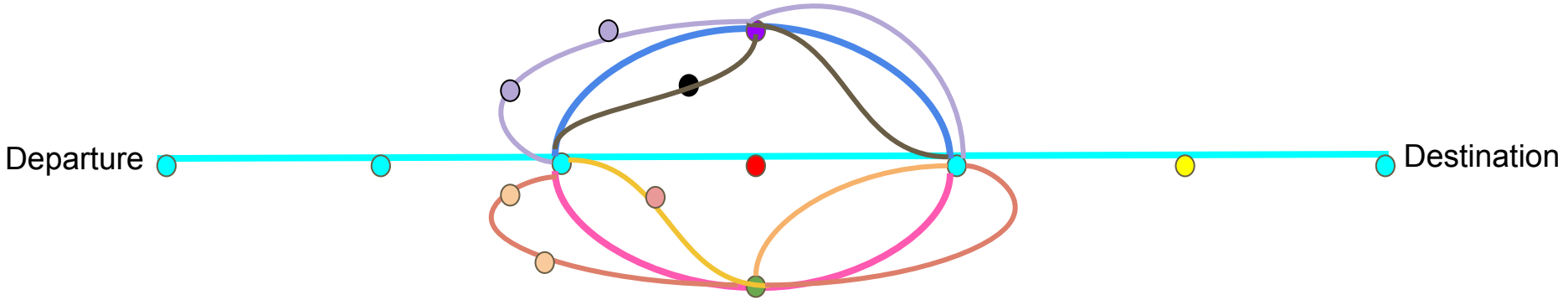
Algorithm Step IV

Replace the dangerous part(s) of the chosen route with safer alternatives



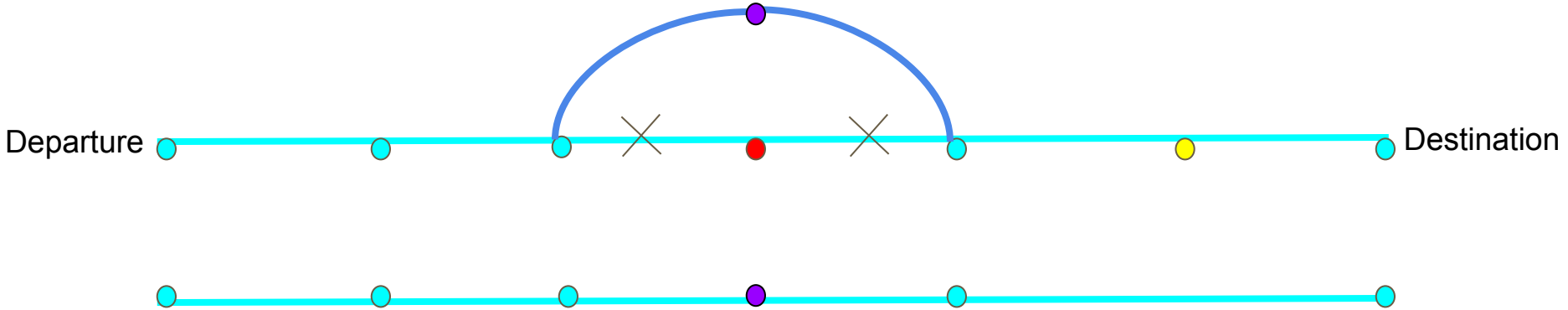
Algorithm Step IV

Replace the dangerous part(s) of the chosen route with safer alternatives



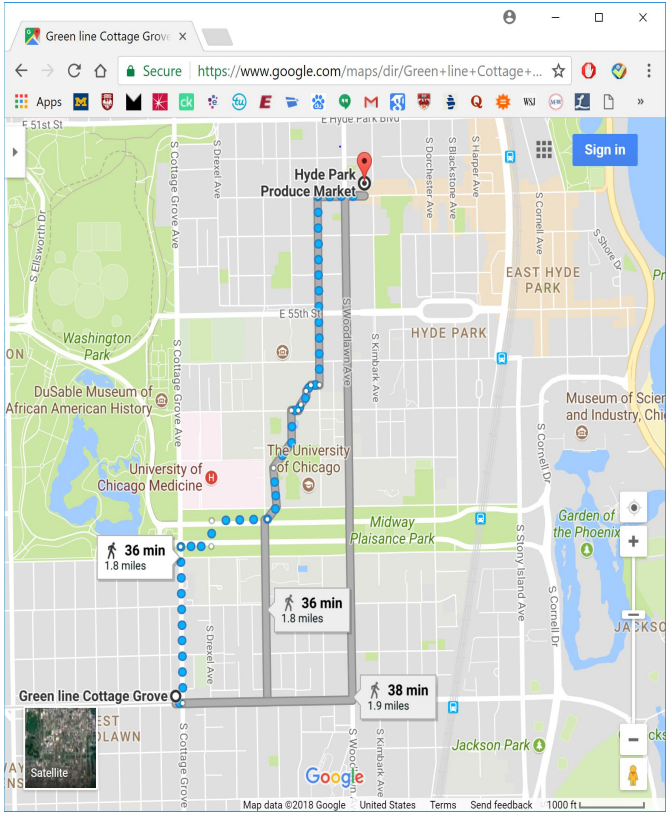
Algorithm Step V

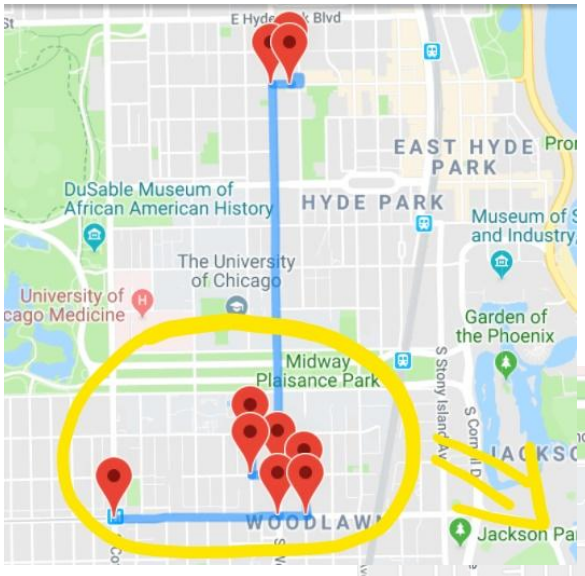
Finalize a list of safe locations which can be clearly presented as a route

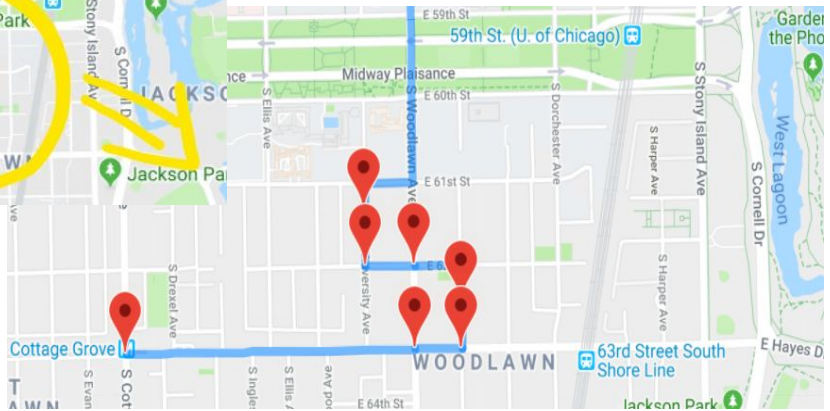


The final list of locations displaying on the map would not include the yellow circles, because the yellow circles are self-enriched mid-points which may not be valid locations on the routes.

Algorithm - Example







Let’s have a tour to our website!