

CRIME DATA ANALYSIS AND MAPPING

BEN CARLETON

$(UV' - U'V) / U'V$
 $U = X$
 $L = R \times R$ $\boxed{f(z)}$
 $\lim_{x \rightarrow 0} f(x+H)$
 $f(x+iy) = u + H$
 $z = \sqrt{z}(x, y)$
 $\frac{2k+1}{2}$
 $x = 2$
 $Z = \cos \theta + i \sin \theta$
 $(Z - z - Z_1 - 1)$
 N



```
[sd=> select id, date_time, lat, lon, incident_type_id, narrative, import_source from spatial_incident limit 1000;
+-----+-----+-----+-----+-----+-----+
| id   | date_time          | lat    | lon    | incident_type_id | narrative
+-----+-----+-----+-----+-----+-----+
| 1    | 2015-10-14 20:12:38-04 | 38.899416 | -77.050960 | 1 | Robbery Unarmed,2 Vics,Susp Fled
| 2    | 2015-10-25 12:48:19-04 | 38.898998 | -77.042549 | 2 | Fraud by Deception
| 3    | 2015-10-25 12:52:09-04 | 38.899316 | -77.047269 | 1 |
| 243685 | 2015-10-30 23:00:00-04 | 41.821094 | -87.628547 | 2 | Battery Domestic Battery Simple
| 243686 | 2015-10-30 23:00:00-04 | 41.801122 | -87.747875 | 2 | Theft $500 And Under
| 243687 | 2015-10-30 23:00:00-04 | 41.962233 | -87.776346 | 2 | Theft $500 And Under
| 243688 | 2015-10-30 23:00:00-04 | 41.920988 | -87.648607 | 2 | Criminal Damage To Property
| 243689 | 2015-10-30 22:58:00-04 | 41.881218 | -87.740108 | 1 | Prostitution Solicit On Public Way
| 243690 | 2015-10-30 22:55:00-04 | 42.013128 | -87.684983 | 2 | Battery Domestic Battery Simple
| 243691 | 2015-10-30 22:55:00-04 | 41.879148 | -87.740568 | 1 | Prostitution Solicit On Public Way
| 243692 | 2015-10-30 22:50:00-04 | 41.814355 | -87.703815 | 2 | Burglary Forcible Entry
| 243693 | 2015-10-30 22:50:00-04 | 41.726253 | -87.623856 | 2 | Robbery Aggravated Vehicular Hijacking
| 243694 | 2015-10-30 22:45:00-04 | 41.773181 | -87.660398 | 2 | Battery Domestic Battery Simple
| 243695 | 2015-10-30 22:45:00-04 | 41.862988 | -87.703566 | 2 | Criminal Damage To Property
| 243696 | 2015-10-30 22:33:00-04 | 41.732032 | -87.638641 | 2 | Battery Aggravated: Other Dang Weapon
| 243697 | 2015-10-30 22:30:00-04 | 41.884321 | -87.647434 | 2 | Assault Simple
| 243698 | 2015-10-30 22:30:00-04 | 41.910537 | -87.674193 | 1 | Criminal Damage To Property
| 243699 | 2015-10-30 22:29:00-04 | 41.873613 | -87.712060 | 1 | Liquor Law Violation Liquor License Violation
| 243700 | 2015-10-30 22:26:00-04 | 41.986089 | -87.699257 | 2 | Battery Simple
| 243701 | 2015-10-30 22:25:00-04 | 41.919428 | -87.757241 | 2 | Battery Domestic Battery Simple
| 243702 | 2015-10-30 22:20:00-04 | 41.750873 | -87.557726 | 2 | Other Offense Probation Violation
| 243703 | 2015-10-30 22:20:00-04 | 41.885488 | -87.726422 | 2 | Robbery Strongarm - No Weapon
| 243704 | 2015-10-30 22:20:00-04 | 41.887058 | -87.647515 | 2 | Theft From Building
| 243705 | 2015-10-30 22:11:00-04 | 41.767451 | -87.619586 | 1 | Assault Agg Po Hands No/Min Injury
| 243706 | 2015-10-30 22:06:00-04 | 41.890778 | -87.634580 | 2 | Robbery Strongarm - No Weapon
| 243707 | 2015-10-30 22:05:00-04 | 41.911559 | -87.796067 | 2 | Battery Domestic Battery Simple
| 243708 | 2015-10-30 22:02:00-04 | 41.753367 | -87.642893 | 1 | Criminal Trespass To Land
| 243709 | 2015-10-30 22:01:00-04 | 41.955235 | -87.748135 | 2 | Robbery Armed: Handgun
| 243710 | 2015-10-30 22:00:00-04 | 41.847319 | -87.692866 | 
| 243711 | 2015-10-30 22:00:00-04 | 41.653735 | -87.595301 | 
| 243712 | 2015-10-30 22:00:00-04 | 41.792676 | -87.765433 | 
| 243713 | 2015-10-30 22:00:00-04 | 41.812041 | -87.686333 | 
| 243714 | 2015-10-30 22:00:00-04 | 41.883830 | -87.647421 | 
| 243715 | 2015-10-30 22:00:00-04 | 41.963313 | -87.676425 | 
| 243716 | 2015-10-30 22:00:00-04 | 41.761886 | -87.570074 | 
| 243717 | 2015-10-30 22:00:00-04 | 41.935387 | -87.652705 | 
| 243718 | 2015-10-30 22:00:00-04 | 41.821173 | -87.615042 | 
| 243719 | 2015-10-30 21:56:00-04 | 41.767178 | -87.726820 | 
| 243720 | 2015-10-30 21:55:00-04 | 41.944386 | -87.660347 | 
| 243721 | 2015-10-30 21:50:00-04 | 41.747902 | -87.647605 | 
| 243722 | 2015-10-30 21:50:00-04 | 41.800429 | -87.689101 | 
| 243723 | 2015-10-30 21:50:00-04 | 41.950130 | -87.661676 | 
| 243724 | 2015-10-30 21:47:00-04 | 41.912271 | -87.765612 | 
| 243725 | 2015-10-30 21:45:00-04 | 41.939073 | -87.788522 | 
| 243726 | 2015-10-30 21:45:00-04 | 41.903382 | -87.628664 | 
| 243727 | 2015-10-30 21:44:00-04 | 41.896923 | -87.775206 | 
| 243728 | 2015-10-30 21:39:00-04 | 41.912661 | -87.766141 | 
| 243729 | 2015-10-30 21:35:00-04 | 41.755145 | -87.584070 | 
| 243730 | 2015-10-30 21:35:00-04 | 41.939974 | -87.649697 | 
| 243731 | 2015-10-30 21:30:00-04 | 41.942024 | -87.649334 | 
| 243732 | 2015-10-30 21:30:00-04 | 41.941522 | -87.750231 | 
| 243733 | 2015-10-30 21:30:00-04 | 41.685785 | -87.687105 | 
| 243734 | 2015-10-30 21:30:00-04 | 41.786083 | -87.774254 | 

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1970's-80's



CLEAR

Display # 1 Message # 2

EVENT RETURNED: 11/11/2004 15:28:56

Event: 0405070001 **Date/Time:** 05/07/2004 10:16:45
Agency: ANY **Call Source:** P
Call Type: 5311 - Disorderly Conduct **Priority:** 0
Location: 128 W MAPLE RD
128 MAPLE
Beat: 04 **Sector:** DELTA **District:** 32

Description: TWO MALES FIGHTING IN THE PARKING LOT NEXT TO THE MINI MART. CLERK STATES THAT THE SUBJECT WERE ARGUING AS THEY WERE LEAVING THE STORE. UNKNOWN IF ANY OTHER SUBJECTS OR WEAPONS ARE INVOLVED OR IN THE AREA.

S#1 WMA,6-0,200,BRO,BRO - BLUE JEANS / BROWN TSHIRT
S#2 WMA 5-8,185,BRO,BOR - BLK PANTS / RED SHIRT

RP: SMITH,JANICE DOB: 06/13/1965

RP Location: 128 W MAPLE RD

RP Phone: 788-2451 **Req Contact:** YES

Dispatcher: ADMIN **Incident #:** 04-001355

Dispo: 01 **Call Status:** A

Dispo Cmnt: UNIT 100 HAS TWO IN CUSTODY, ENROUTE TO LOWER BOOKING

**QRY****ADM****PREV****NEXT**

MDC # 0000 Unit ID: 1009

DISP:0405070001

NO MESSAGES

CMDL**DISP****ENR****ARV****CLR****VEHS****MISC****FREE**

Today

Display # 1

Display # 2

Status Monitor

Map

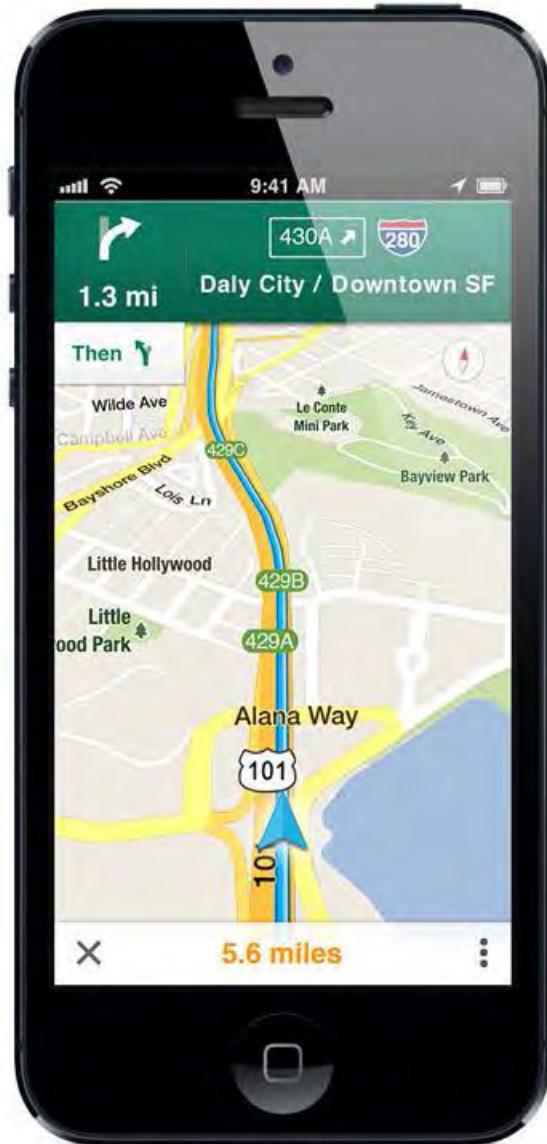
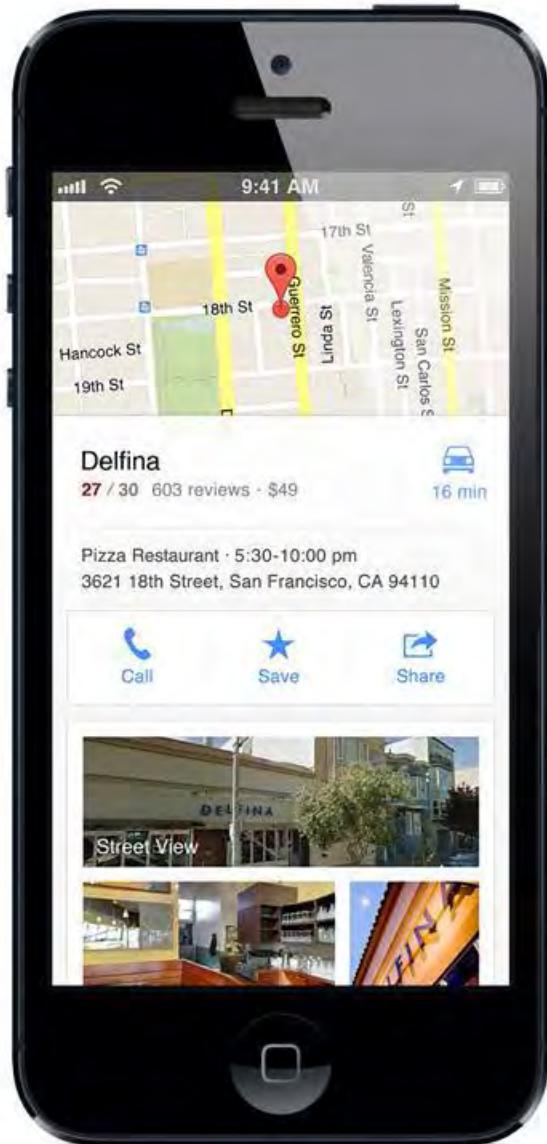
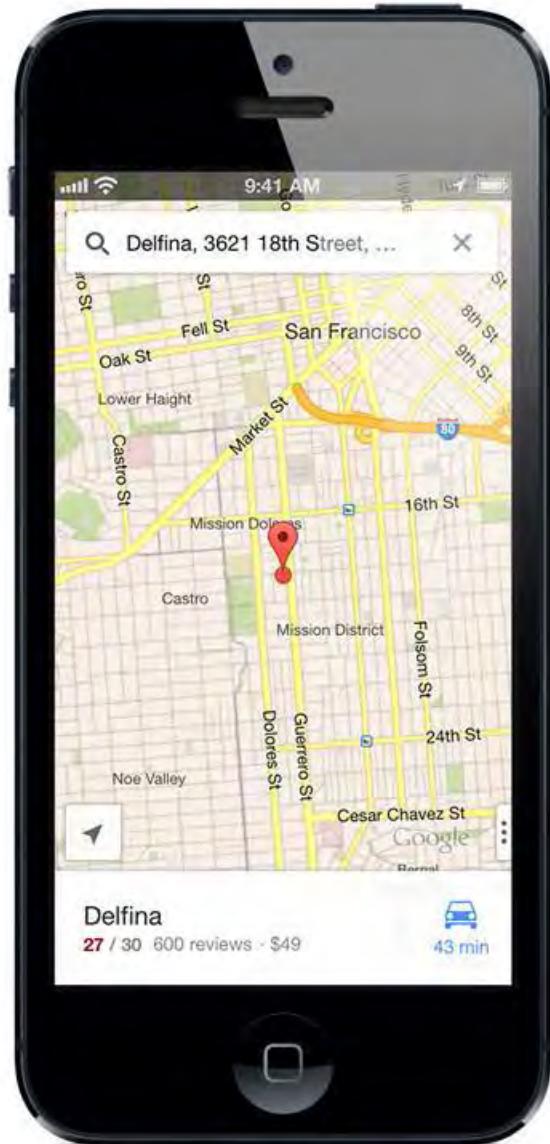
LIN	LOCATION	AREA..	NAT.	TAC	TIME.	TRUCKS
1	19569 JOHN HAMILTON RD	5-6	HF	6D	18:54	W5 W2 W1 W4 W12 TL2 T1 TW1 TW4 TW12 A17-1 BC602
2	251 WAXPOOL DR SW-LB #D	1-10	10C1	6B	17:33	A13-4 302 1376
3	910 WASHINGTON ST W-MB	3-9	FILL	6B	17:11	E2
4	21730 RED RUM DR-AB #117	23-2	FILL	6B	16:24	RE6 E6
5	43216 DEFENDER DR-CH	19-2	FILL	6B	15:26	E415 M415 E438 M438 E436 M440 E415 M415
6	39459 JOHN MOSBY HWY-AL	7-11	FILL	6B	14:29	W1 RE23 ER1 ER1
7	JOHN MOSBY HWY-MB/SALLS R	7-6	HF	6C	14:10	W7 W3 ER9 W8 E19 T1 E515 TW7 TW3 TW8 A7 BC603 S0601 CH8 FM608 QW4 TW515 QTW4 TW1 BC501 BC602 TW5 L-6 SPT9 SV7 974 A13-4 302 1376 A13-5 9933 W1 QE5 W5 ER1 QW5 A3-1 9906 RE23 FM602 A13-2 SV9 FM312 906 972 A3-1 9906

1411 STATION WAY NE-LB 1-9 1

18:55 17B3-FALL UNKNOWN PATIENT

ENTER: STAT
CQ

Today



PROBLEM

- How to turn historical data into actionable information for law enforcement agencies?
- How to do so in a way that's relatable and user-friendly across the agency?

SPATIAL AUTOCORRELATION

- Given trends and an area of interest, identify “hotspots” in the data, i.e. where the crime is
- Visual indication of where the crime is happening on a map

Waldo Tobler’s “First Law of Geography”:

“Everything is related to everything else, but near things are more related than distant things.”

Start Date:

End Date:

Interval

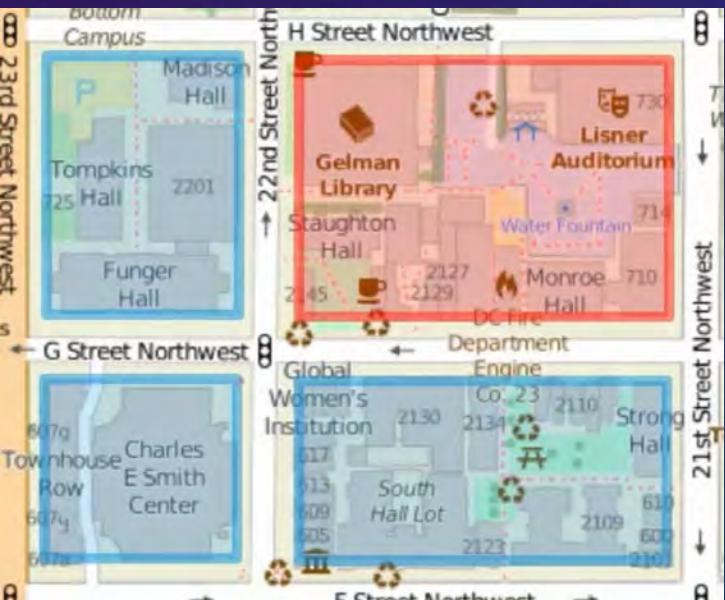
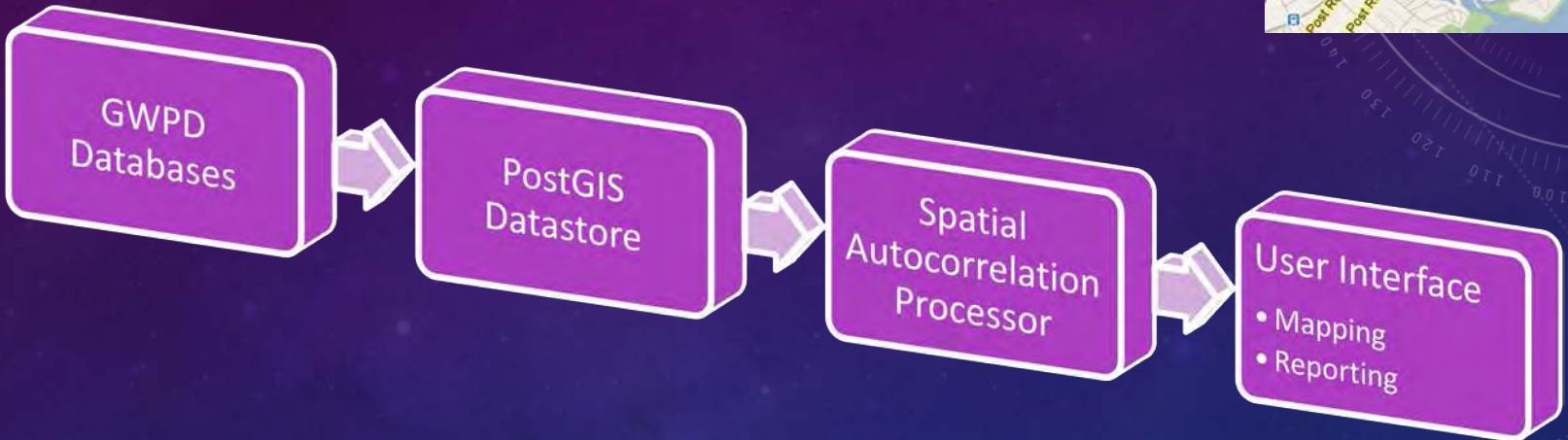
Crime Type: 



TARGETED TO SMALLER LAW ENFORCEMENT AGENCIES

- Focusing on integration with existing data sources
- Functionality adapted to smaller geographic areas of responsibility

SPATIAL DATA PROCESSING PIPELINE



Product Sales				
Sales Date	Subcategory	Product	Quantity	Sales
January 05, 2009	Accessories	Carrying Case	68	\$9,224.60
		Mini Battery Charger	44	\$1,056.00
	Digital		112	\$10,980.60
		Slim Digital	44	\$8,357.80
			44	\$8,357.80
			156	\$19,338.40
January 11, 2009	Accessories	Lens Adapter	17	\$1,147.50
			17	\$1,147.50
	Digital	Advanced Digital	39	\$7,234.50
			39	\$7,234.50
		Total	56	\$8,382.00
			576	\$106,920.40