

Locating the Safest Apartments in Chicago

MACS 30122 Winter 22
Final Project

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Outline

Introduction

Data Collection

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Rent and Crime Data Visualization Project

- Backgrounds:
 - Accessing multiple websites for rental data and local crime rate
 - Lack of crime information around properties on the rental website
 - Credibility of data source
- Purpose of this project:
 - Aggregated rental data and crime rate data visualization via heat map
 - User-friendly Interface

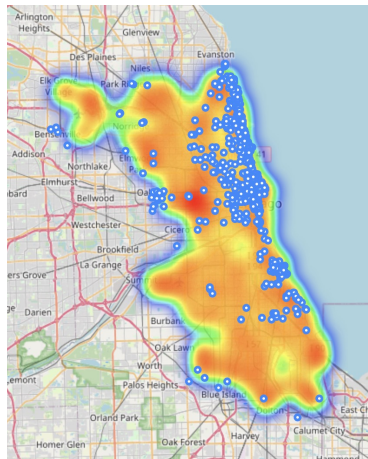
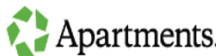


Figure: Heat Map of Crime with Apartments Listed

Data Sources

- **Apartments** (www.apartments.com)
Leading online apartment listing website; Offering renters access to information on more than 1,000,000 available units for rent.
- **Domu** (www.domu.com/chicago/neighborhoods)
The largest apartment listing site to focus on Chicago's rental market. Founded by two brothers who grew up in rented apartments in Chicago.
- **Chicago's Open Data Portal** (data.cityofchicago.org)
Freely download the municipal data for your own analysis. Daily updated datasets with API provided.



Data: Scrapping Apartments.com

- Step 1: Collect all single property links in Chicago, IL²³
 - Start from first listing page for Chicago → Collect all links within current page → Until last listing page
- Step 2: Retrieve all information for a single property
 - Property name, address, latitude, longitude, price, bedroom, bathroom, amenities
- Step 3: Write data to csv file for later use

property_name	address	latitude	longitude	price_range	bedroom	bathroom	room_area	amenities
The Residences at NewCity	1457 N Halsted St, Chicago IL 60642	41.90801	-87.64773	\$2,126 - \$4,215	Studio - 2 bd	1 - 2 ba	590 - 1,315 sq ft	Pool, Fitness Center, Elevator, Clu
Elevate	930 W Altgeld St, Chicago IL 60614	41.9276	-87.65243	\$1,910 - \$14,435	Studio - 3 bd	1 - 2.5 ba	464 - 2,616 sq ft	Pool, Fitness Center, Elevator, Clu
1407 On Michigan	1407 S Michigan Ave, Chicago IL 60605	41.86377	-87.6236	\$1,750 - \$5,650	Studio - 3 bd	1 - 2 ba	446 - 1,687 sq ft	Pool, Fitness Center, Elevator, Doc
The Pavilion	5441 NE East River Rd, Chicago IL 60656	41.97831	-87.84335	\$1,115 - \$2,420	Studio - 4 bd	1 - 3 ba	502 - 2,317 sq ft	Pool, Fitness Center, Controlled A
Gild	1206-1212 N State Pky, Chicago IL 60610	41.90423	-87.62905	\$2,260 - \$6,322	Studio - 2 bd	1 - 2 ba	463 - 1,272 sq ft	Fitness Center, Elevator, Concierge
Residences at 8 East Huron	8 E Huron St, Chicago IL 60611	41.89508	-87.62791	\$3,050 - \$6,895	1 - 3 bd	1 - 3.5 ba	540 - 2,680 sq ft	Pool, Fitness Center, Concierge, Cl
Optima Signature	220 E Illinois St, Chicago IL 60611	41.8914	-87.62163	\$2,485 - \$9,614	Studio - 3 bd	1 - 2 ba	571 - 1,642 sq ft	Pool, Fitness Center, Elevator, Cor
Union West	939 W Washington Blvd, Chicago IL 60607	41.88281	-87.65139	\$2,035 - \$6,000	Studio - 2 bd	1 - 2 ba	482 - 1,122 sq ft	Pool, Fitness Center, Business Cen
The Bernardin	747 N Wabash Ave, Chicago IL 60611	41.8965	-87.62655	\$2,895 - \$5,067	Studio - 2 bd	1 - 2.5 ba	546 - 2,031 sq ft	Pool, Fitness Center, Elevator, Doc
Emme Chicago	165 N Desplaines St, Chicago IL 60661	41.88507	-87.64346	\$2,166 - \$3,907	Studio - 2 bd	1 - 2 ba	460 - 965 sq ft	Pool, Fitness Center, Elevator, Pet
Milieu	205 S Peoria, Chicago IL 60607	41.87898	-87.64927	\$2,060 - \$4,230	Studio - 2 bd	1 - 2 ba	561 - 1,274 sq ft	Pool, Fitness Center, Clubhouse, C
One Chicago	14 W Superior St, Chicago IL 60654	41.89625	-87.62875	\$2,314 - \$10,945	Studio - 3 bd	1 - 2.5 ba	525 - 2,211 sq ft	Fitness Center, Elevator, Concierge

Figure: Apartments.com Data

²<https://www.apartments.com/chicago-il/>

³<https://www.domu.com/>

Data: Crime

- Chicago 2021 Crime Dataset
 - Crime case number, case description
 - Latitude, longitude (most important!)

CASE#	DATE OF OC/BLOCK	IUCR	PRIMARY DESCRIPTION	SECONDARY LOCATION	DARREST	DOMESTIC	BEAT	WARD	FBI CD	X COORDINATE	Y COORDINATE	LATITUDE	LONGITUDE
JF121694	12/07/2021 052XX S BLAI	820	THEFT	\$500 AND U1 STREET	N	N	234	4	6				
JF104823	12/30/2021 017XX N CICI	1206	DECEPTIVE PRACTICE	THEFT BY LES COMMERCIA	N	N	2533	37	11				
JE266628	06/15/2021 080XX S DRE	820	THEFT	\$500 AND U1 STREET	N	N	631	8	6	1183633	1851786	41.748486	-87.60268
JE266536	06/15/2021 042XX W MA	560	ASSAULT	SIMPLE SIDEWALK	N	N	1115	28 08A		1148227	1899678	41.880661	-87.73119
JE266663	06/15/2021 044XX N ART	1153	DECEPTIVE PRACTICE	FINANCIAL IDENTITY THEF	N	N	1911	47	11				
JE267466	06/15/2021 007XX S KED 051B		ASSAULT	AGGRAVATE/SIDEWALK	Y	N	1134	24 04A		1155154	1896404	41.871154	-87.70584
JE266473	06/15/2021 062XX S MOI	110	HOMICIDE	FIRST DEGREE/APARTMENT	N	N	712	16 01A		1170714	1863474	41.780851	-87.64967
JE267222	06/15/2021 015XX S KEN	4386	OTHER OFFENSE	VIOLATION C/APARTMENT	N	Y	1012	24	26	1146970	1892136	41.859989	-87.73599
JE266604	06/15/2021 013XX W AN	430	BATTERY	AGGRAVATE/STREET	N	N	1215	1 04B		1167362	1904648	41.893909	-87.66078
JE266568	06/15/2021 055XX N MC	810	THEFT	OVER \$500 STREET	N	N	1622	45	6	1134905	1936579	41.982167	-87.77923
JE267023	06/15/2021 082XX S STO	460	BATTERY	SIMPLE STREET	N	N	411	8 08B		1188236	1850761	41.745505	-87.58584
JE267234	06/15/2021 107XX S GRE	486	BATTERY	DOMESTIC B/RESIDENCE	N	Y	2233	34 08B		1172556	1833609	41.698857	-87.64398
JE267494	06/15/2021 052XX S ART	110	HOMICIDE	FIRST DEGREE/STREET	N	N	923	14 01A		1160923	1869959	41.798855	-87.68539
JE267500	06/15/2021 040XX W 111	1320	CRIMINAL DAMAGE	TO VEHICLE /APARTMENT	N	N	2211	19	14	1151309	1828012	41.683938	-87.72174

Figure: Chicago 2021 Crime Data

Data Cleaning: Housing

- Apartments Data:
 - Replace all zero values to "Not Available" for display purposes
- Domu Data:
 - Change Apartments data and Domu data into consistent formatting
 - Use record linkage to identify same properties
 - Aggregate final combined housing data

Data Cleaning: Crime

- Crime Data:
 - Computing crime severity weights using *Cambridge Crime Harm Index*
 - Map each crime category to a weight score and add to data set
 - Display crime severity weights in heat map

```
CHI_SCORES = {  
    'Murder': 5475,  
    'Manslaughter': 3825,  
    'Attempted Murder': 1460,  
    'Robbery (Business)': 365,  
    'Recent Sexual Assault': 365,  
    'Robbery (Non-Business)': 365,  
    'Historical Sexual Assault': 365,  
    'Deprivation of Liberty': 84,  
    'Damage (Arson)': 33,  
    'Domestic Assault': 20,  
    'Dwelling Burglary': 20,  
    'Non-Dwelling Burglary': 20,  
    'Motor Vehicle Theft': 20,  
    'Threatening Behaviour': 10,  
    'Damage (Property)': 2,  
    'Theft': 2,  
    'Non Crime Incident': 0.1  
}
```

Figure: CHI Score

Side note: Cambridge Crime Harm Index is developed by UChicago Social Science Graduates!⁴ Paper available here.⁵

⁴https://en.wikipedia.org/wiki/Crime_harm_index

⁵<https://link.springer.com/article/10.1007/s41887-020-00043-2>

Data Visualization

- Heat Map
 - Neighborhood crime in the last year
 - Weight depends on the type of crime
 - Our heat map is here⁶
- Housing Markets
 - Properties for rent
 - Information Displayed: Property name, address, bedroom, bathroom, amenities

As it might be offensive and conflict interests of the property owners, we decided to create a heat map for security in the neighborhood rather than assign a security level score for each property.

⁶<https://github.com/cs-ssa-w22/final-project-none/blob/master/mapping.html>

Implications for Social Science

- Why Is It Important?
 - Crimes in Chicago city is becoming more concerning. Safety will also be an important factor for tenants' decision making.
 - Most of the apartment rental websites do not provide specific safety information due to conflict of interests.
 - Heat map provides an intuitive observation to renters who concern about community safety. Users can get the features of properties by one clicking on the map
 - Reduced the time and difficulty to access reliable rental data from multiple sites
- How Is It Relevant to Social Science?
 - Provide useful tools for future social science research on neighborhood security's influence on renters' decision making process
 - Apply research in crime statistics to quantity community security status

Future Improvements

- The whole web-scraping process takes about 1 to 2 seconds per page, resulting in a total of 15 minutes to write the csv file for apartments.
- Because housing data online is changing all the time, the current map can be outdated.
- The current interactive map is not very user-friendly. Future improvements can include richer information (e.g., property pictures, customer comments) and implement searching/filtering functions.

Q&A

Any questions for us?

Thank You!