Locating the Safest Apartments in Chicago

MACS 30122 Winter 22
Final Project

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Outline

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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
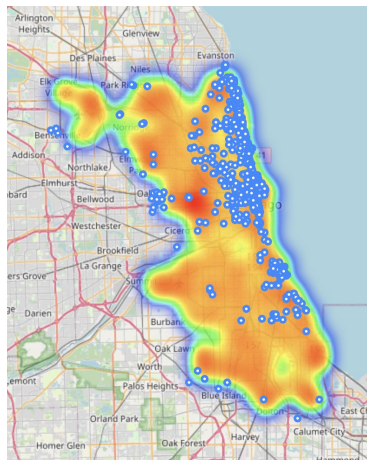   - User-friendly Interface

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: Scraping Apartments.com

- Step 1: Collect all single property links in Chicago, IL[2]
  - 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 NEast 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, Concierg
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	41.89655	-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, G
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, Concierg

Figure: Apartments.com Data

Data: Crime

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

Figure: Chicago 2021 Crime Data

Data Cleaning

- Housing Data:
  - Replace all zero values to "Not Available" for display purposes
- 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![3] Paper available here.[4]

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[3] https://en.wikipedia.org/wiki/Crime_harm_index

[4] 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 here[5]
- 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.

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[5]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!