

## SafetyFirst: Milestone 2

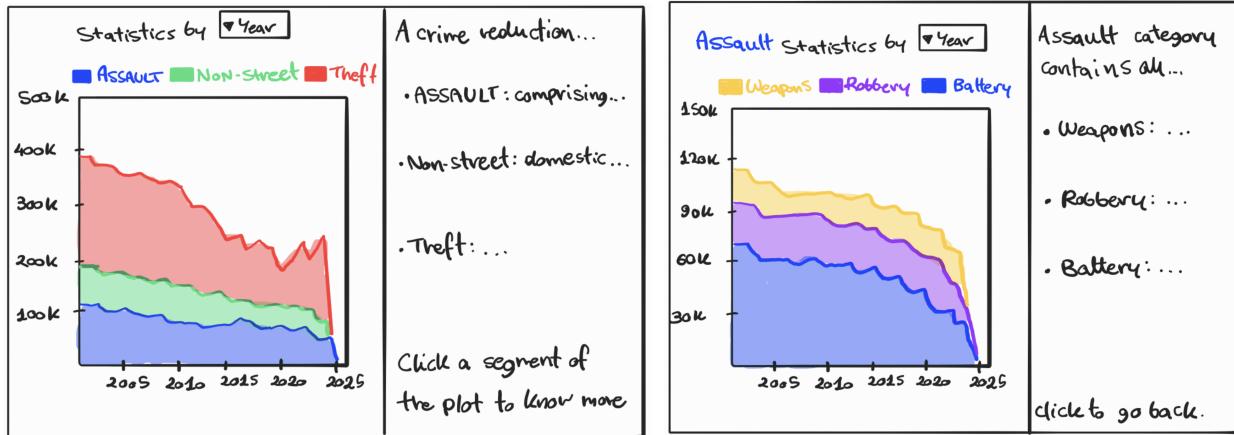
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*SafetyFirst* is an interactive web application that transforms historical crime data into actionable **safety insights for urban travelers**. Using interactive maps and dynamic visualizations, it raises awareness of high-risk areas in Chicago and provides personalized safe travel routes. Our target users are mainly *university students* (especially exchange students) and *tourists*. The website comprises two parallel **Data-Stories**, employing interactive visualizations to raise users' awareness about the historical crime incidence, and a **SafeRoute Tool** that computes safe paths, reducing the crime risk while traveling in the city.

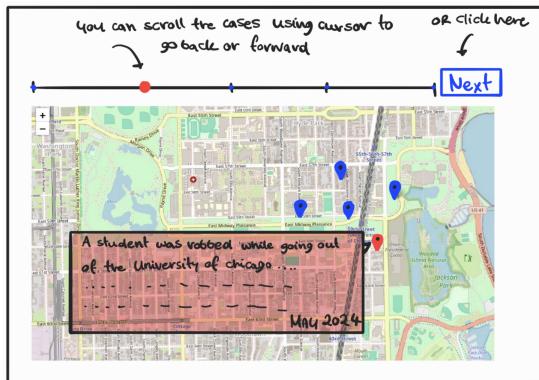
**Home.** The website introductory section prompts users to indicate whether they are university students or tourists. This selection directs users to their respective data stories, although they also have the option to scroll directly to the safe-route tool.

**Data-Story: statistics charts.** The first visualization in the data stories features a dual-column layout (figure 1a). On the left is a stacked statistical plot illustrating the frequency of various crime types, while the right column presents a textual description that explains the different categories. Users can toggle between visualizing crime trends over years and over time-of-day. Moreover, upon clicking any crime category, the plot updates and displays crime subcategories in the same format and updated descriptions (see figure 1b).

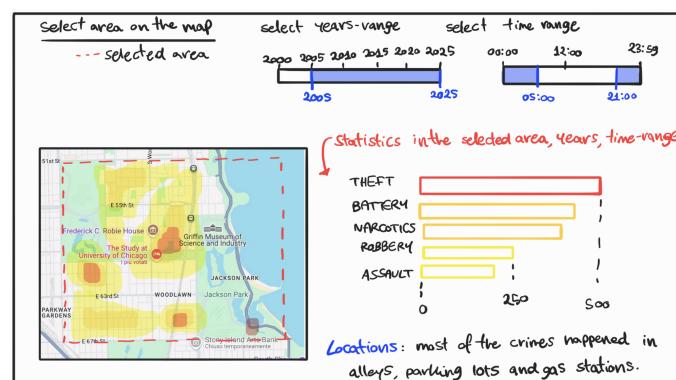


**Data-Story: Showcases.** Next, newspaper articles are showcased (figure 2a). Depending on the user's choice, the crime victims in the articles will be students or tourists. This section highlights crime locations, with possibly some accompanying images and a brief summary of the incident as reported in the news.

**Data-Story: Interactive Crime Map.** The user is presented with a density map of crimes over a specified period (See figure 2b). For students, the default view focuses on the University of Chicago and Jackson Park, while a tailored view is offered for tourists. Users can interact with the map by selecting a rectangle-shaped area, choosing a year and time range. The tool highlights zones with higher crime density and displays a complementary



(a) Newspaper article showcases.



(b) Interactive crime density map.

plot showing crime type frequencies along with a brief summary of typical crime locations (e.g., street, parking lot, bus stop, alley, supermarket).

**SafeRoute Tool.** It allows to compute safe paths within the city (figure on the right). Users choose a starting point, destination, and preferred mode of travel (on foot, by car, or via public transport). The tool retrieves the primary route from the Google Maps API, calculates its risk score using historical crime data, and then identifies an alternative route that reduces risk while remaining similar to the original path. It displays the original and the safe route's risk scores.



**Tools and Technologies.** Our application is built on `React.js` (React 19) for its component-based architecture and efficient rendering. We use `Plotly.js` for interactive visualizations and the `Google Maps API` for geospatial route planning. More, `React-Leaflet` offers an alternative mapping approach, while `Three.js` enables potential 3D visualizations of crime hotspots. Simpler charts are generated with `Recharts`, and the interface is styled with `TailwindCSS`, with animations provided by `Framer Motion`.

The relevant course lectures for SafetyFirst are: [4] to guide our map visualizations; [2] and [3] shape our interface for an intuitive user experience; [1] informs our interactive elements; and [5] to keep users engaged while raising awareness about urban travel safety.

### Extra Features Ideas.

1. Add a time slider to the density map, allowing users to see an animation view about how crime concentrations in the selected area evolved over time.
2. Extend SafeRoute to display contextual descriptions and statistical summaries of crime hot-spots along the paths suggested by Google Maps, with alerts for recent incidents.
3. As a further SafeRoute refinement, integrate a Large Language Model API to generate detailed descriptions of crime patterns in such hotspots from historical data and by searching on the web for specific news.

## References

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