CRASHMAPPER

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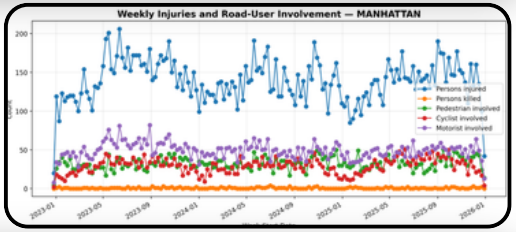
Research Question: How can we analyze street design via existing crash data and computer vision in order to make the community safer?

Motivation

- Current data collection methods are naturally skewed towards traffic-dense areas and are very vague in terms of classification.
- This causes unequal representation of different road-user groups (which are Pedestrians, Cyclists, or Motorists) in crash reports.
- Near misses go un-reported and are not accounted for.

Crash Hotspot Map





Crashmapper

Crashmapper is an app based on the crashmapper database that we are building to carry out data analysis. It can perform AI object detection and tracking that allows for more nuanced and in depth analytics on road behavior and accidents.





Methodology

- Analyzed and interpreted previous crash dataset from 2023-2025 using the crashmapper database and Python
- Utilized AI object detection to automatically identify the road-user groups present in street photos taken from traffic cameras
- Employed multi-object tracking in the Crashmapper App to convert street traffic videos into readable datasets
- Performed path extraction to model the trajectory of pedestrians and vehicles
- Surveyed and interviewed city residents to better understand behavioral trends and community sentiments

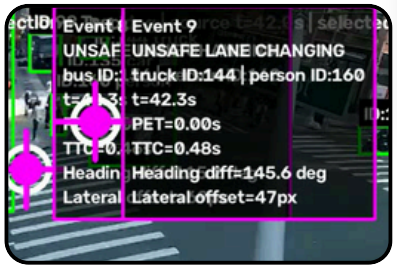
Findings

- Motorists (4-wheeled vehicles) were the **most involved** in crashes
- Cyclists were the **most complained about** during our surveys and interviews regarding traffic safety
- **Rush hours, Midnight, and 3 PM** were the **most frequent** crash times
- Common locations: Long Island Expressway **(Queens)**, Major Deegan Expressway **(Bronx)**, FDR Drive **(Manhattan)**, Eastern Parkway & Buffalo Ave **(Brooklyn)**

Near-crash analysis over a 1-minute time interval



Near-crash event modeling



AI model: YOLOv8m | Image Size: 480px

Pairs checked	Near-miss pairs	Important events
6890	27	20

AI model: YOLOv8n | Image Size: 960px

Pairs checked	Near-miss pairs	Important events
6825	27	20

AI model: YOLOv8m | Image Size: 960px

Pairs checked	Near-miss pairs	Important events
7626	50	20

Model Limitations

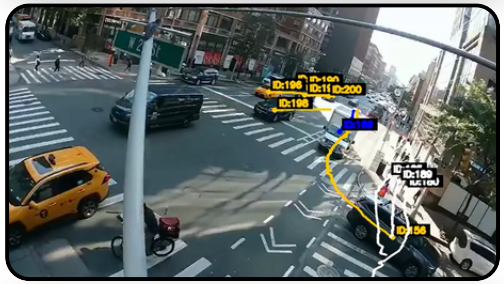
- Larger AI models require more hardware processing power to perform analysis in the same time frame as a smaller model
- Devices with more processing power are both expensive and not easily accessible
- Object detection and multi-object tracking is prone to error when using smaller-scale AI models
  - The AI may incorrectly identify objects as something unrelated, or not identify the object at all
- Increasing image size reduces errors in AI model analysis, but drastically increases the time required to produce a result

Findings in Context

- Bike lanes → often obstructed by construction or absent, leading bikers to seek roads
- Bus lanes → cars often double park in bus lanes, and both motorists and cyclists violate areas designated for buses
- Daylighted streets (sometimes enforced with cinder blocks) → require sharper turns. As cars slow down to turn, adjacent cars may adopt wider trajectories to get around the turning car

→ This endangers oncoming traffic and cyclists

- Cars parked on crosswalks → decrease road visibility for pedestrians crossing the streets



Considerations

- Parking prices not being standardized created an issue in terms of inconsistent behavior.
- Those parking inconsistencies led to illegal and double parked cars which blocked vision.
- The blocked vision was represented in our interviews through the idea that pedestrians, and more commonly bikes, would “come out of nowhere”.
- It’s likely that the ease to get a license in the city creates uneducated drivers, which creates grey areas in terms of behavior - this is commonly represented in a common dislike of bikers due to unclear rules and etiquette.