Tallahassee Crime Map

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Outline

Project At A Glance

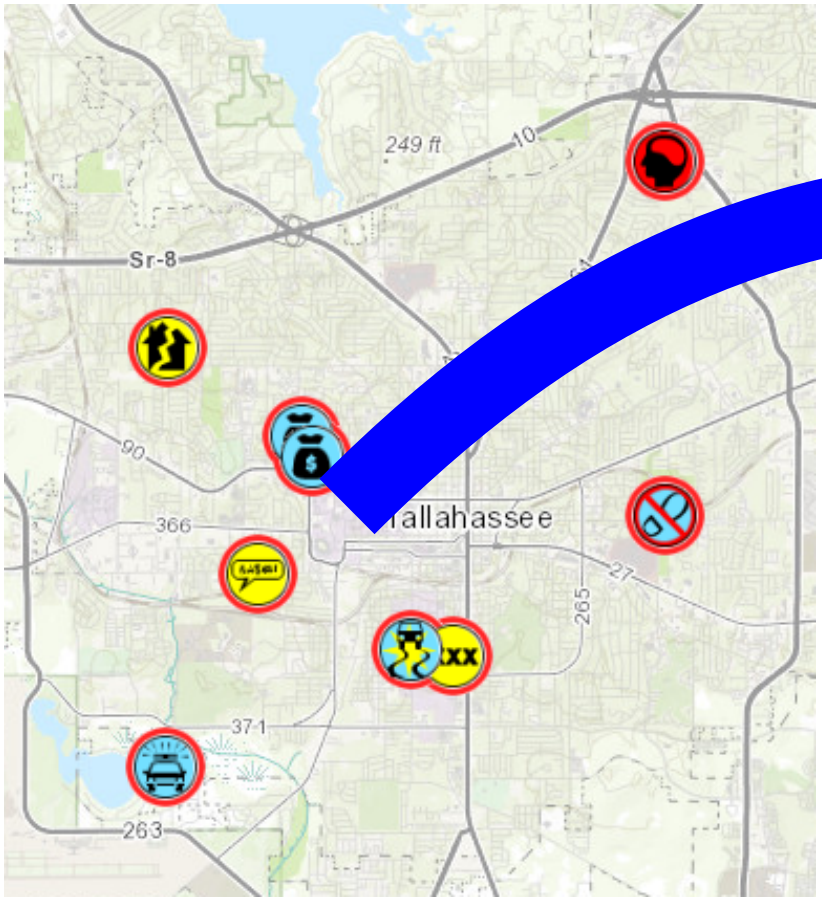
Goal: Develop a generative AI that outputs a crime distribution given a geographical map.

Why: To provide a tool for city planners to see potential crime risks with their plans.

Technology: Generative Adversarial Network (pix2pix)

Figure: Geographical Map to Crime Map(Adapted from He, Zheng 2021)

TOPS Data Collection



A tabular data

The table contains the following columns:

- Time of the crime report
- Crime type
- Location
- Geographical coordinates

Figure: Tallahasse Police Statistics Homepage

Data Processing

Write a short description about how we create our map dataset

Categorical Analysis

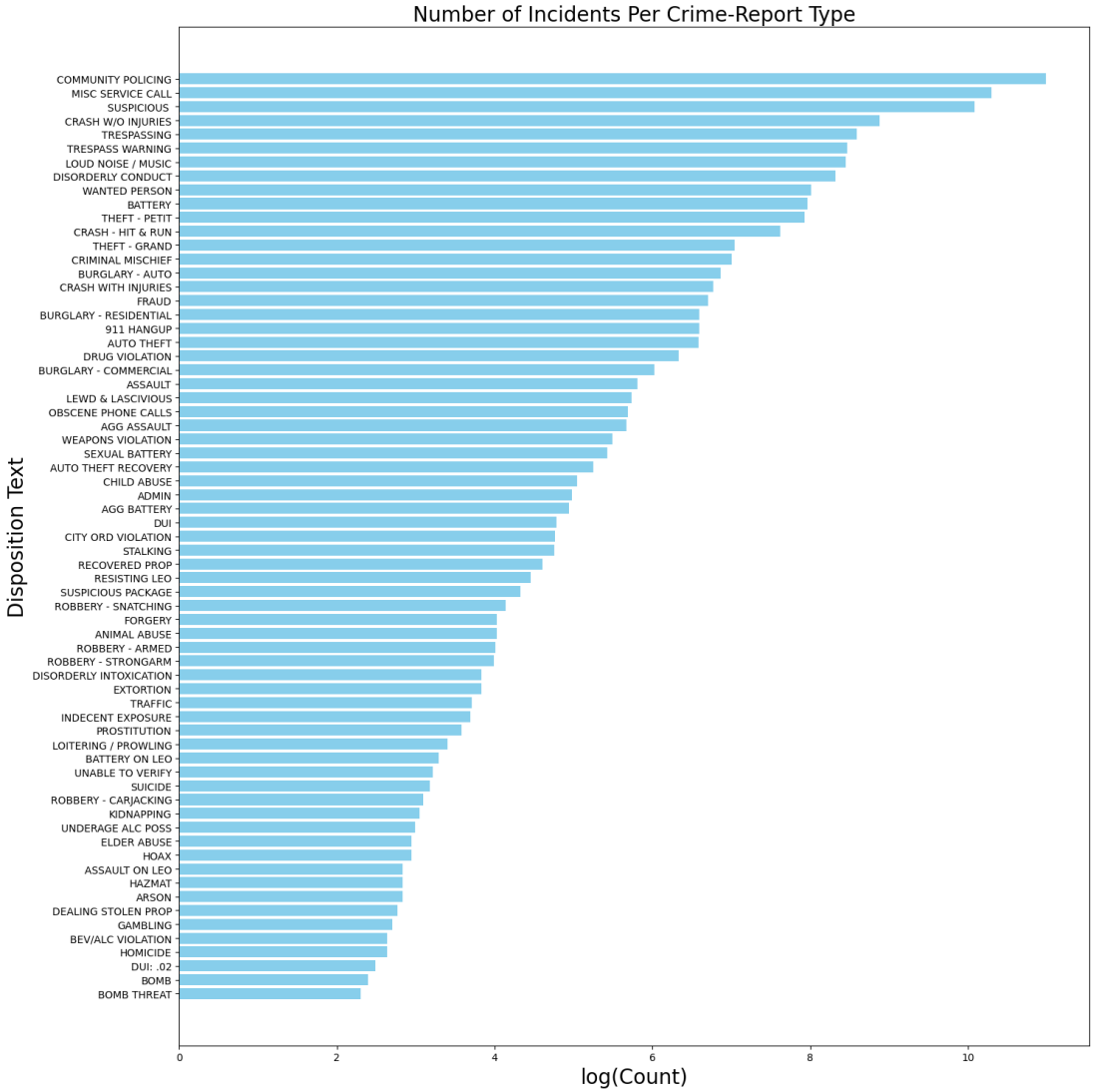


Figure: A bar chart for each type of crime report.

- The values on the x-axis correspond to the log of the actual count for visual purposes.
- On the y-axis all different types of crime reports are listed.
- There are 67 types of reports.
- We will filter out some from our analysis. For example, community policing occurs most often and it is not of interest for our purposes.

Temporal Analysis

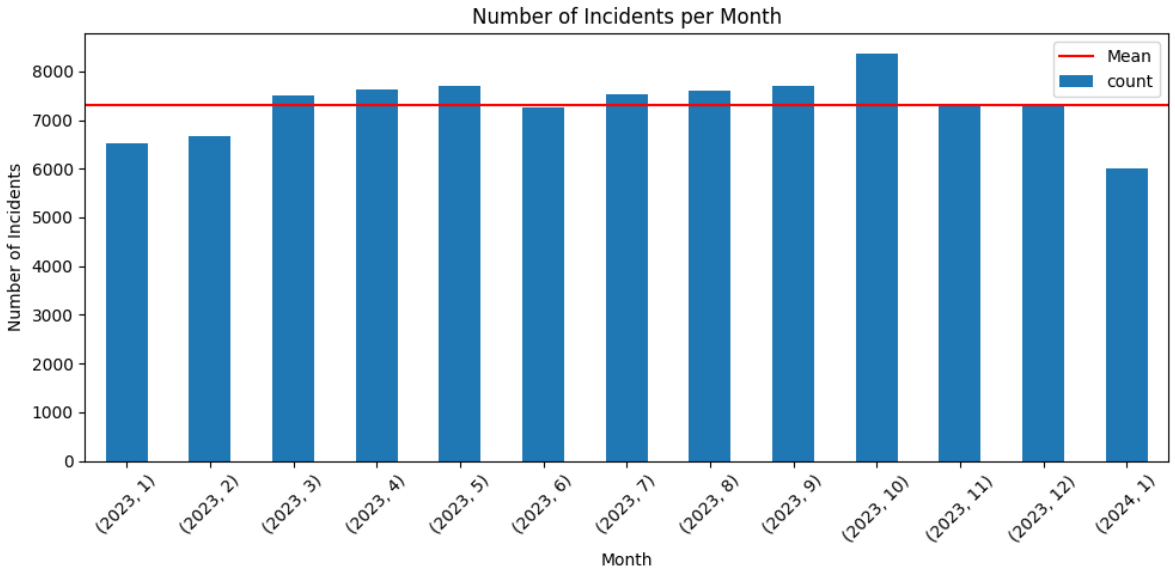
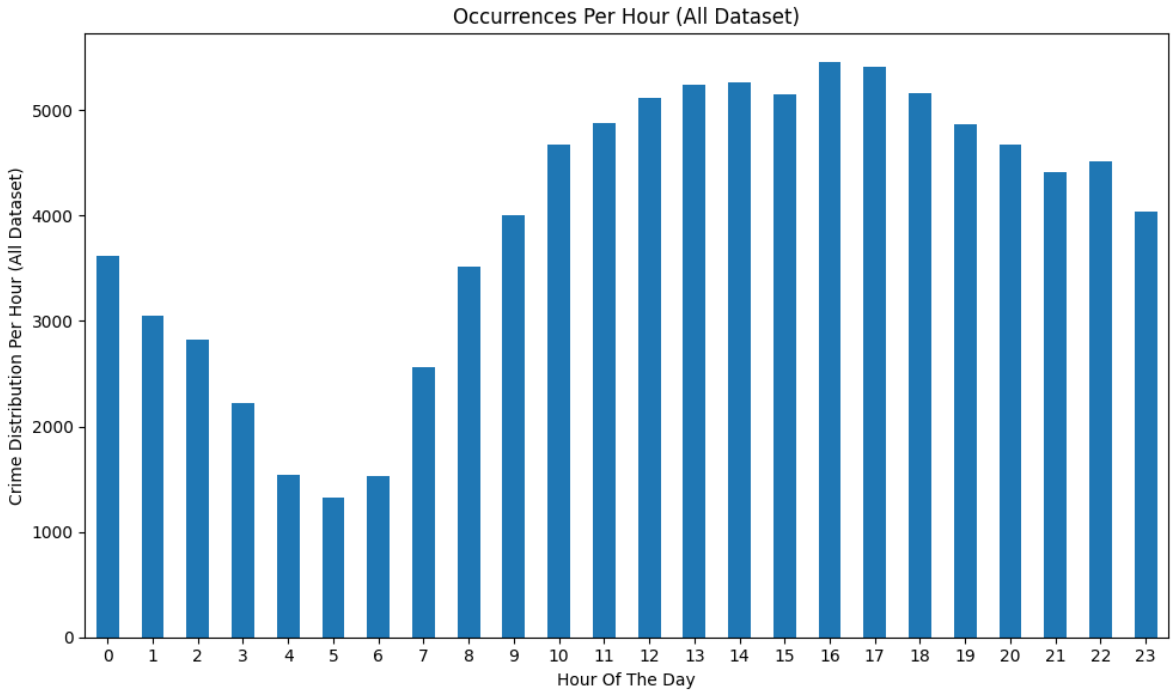


Figure: Crime Distribution Per Month

- Average # of reported crimes per month is 7311.
- Data includes all of 2023 and the first month of 2024.

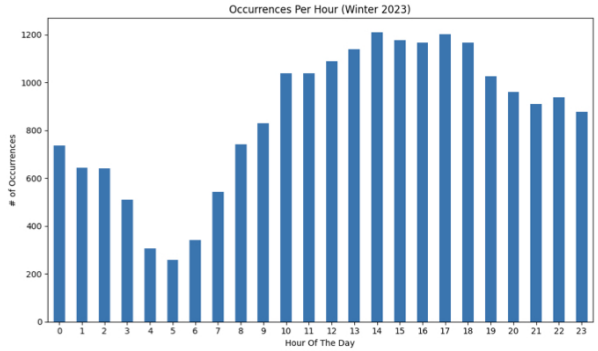
Temporal Analysis

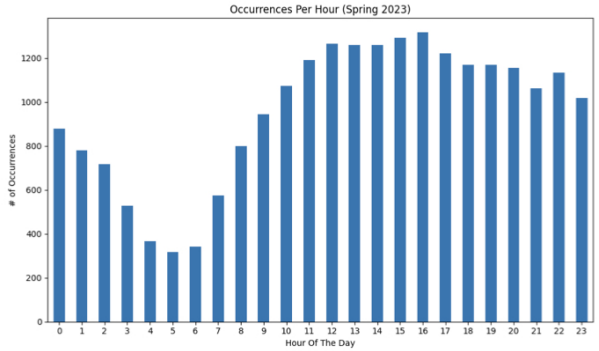


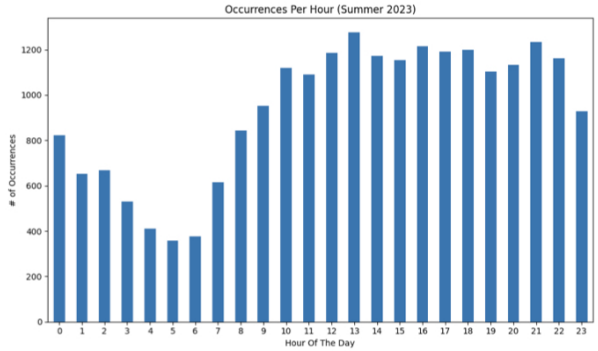
- Hourly analysis of the data reveals a fluctuating trend with peak hours.
- Data includes all of 2023.

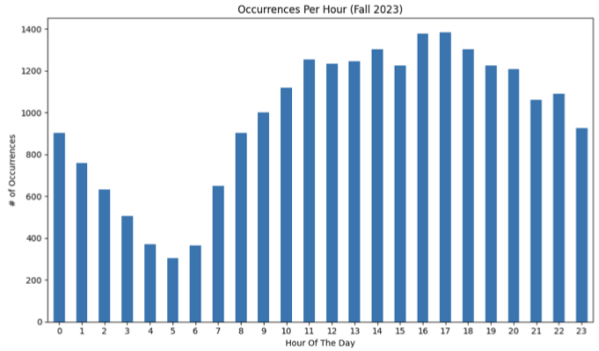
Figure: Crime Distribution Per Hour – All 2023

Temporal Analysis



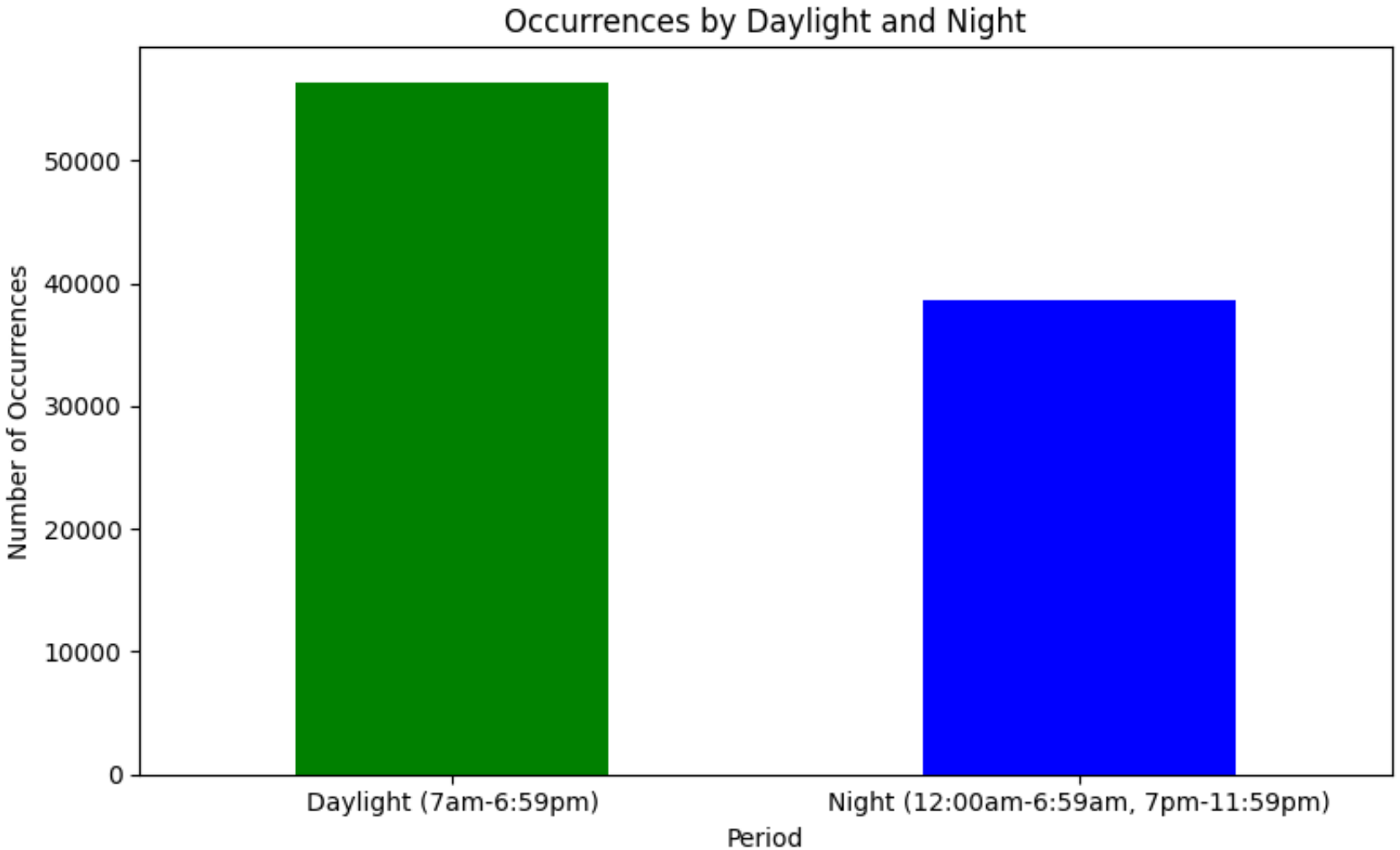






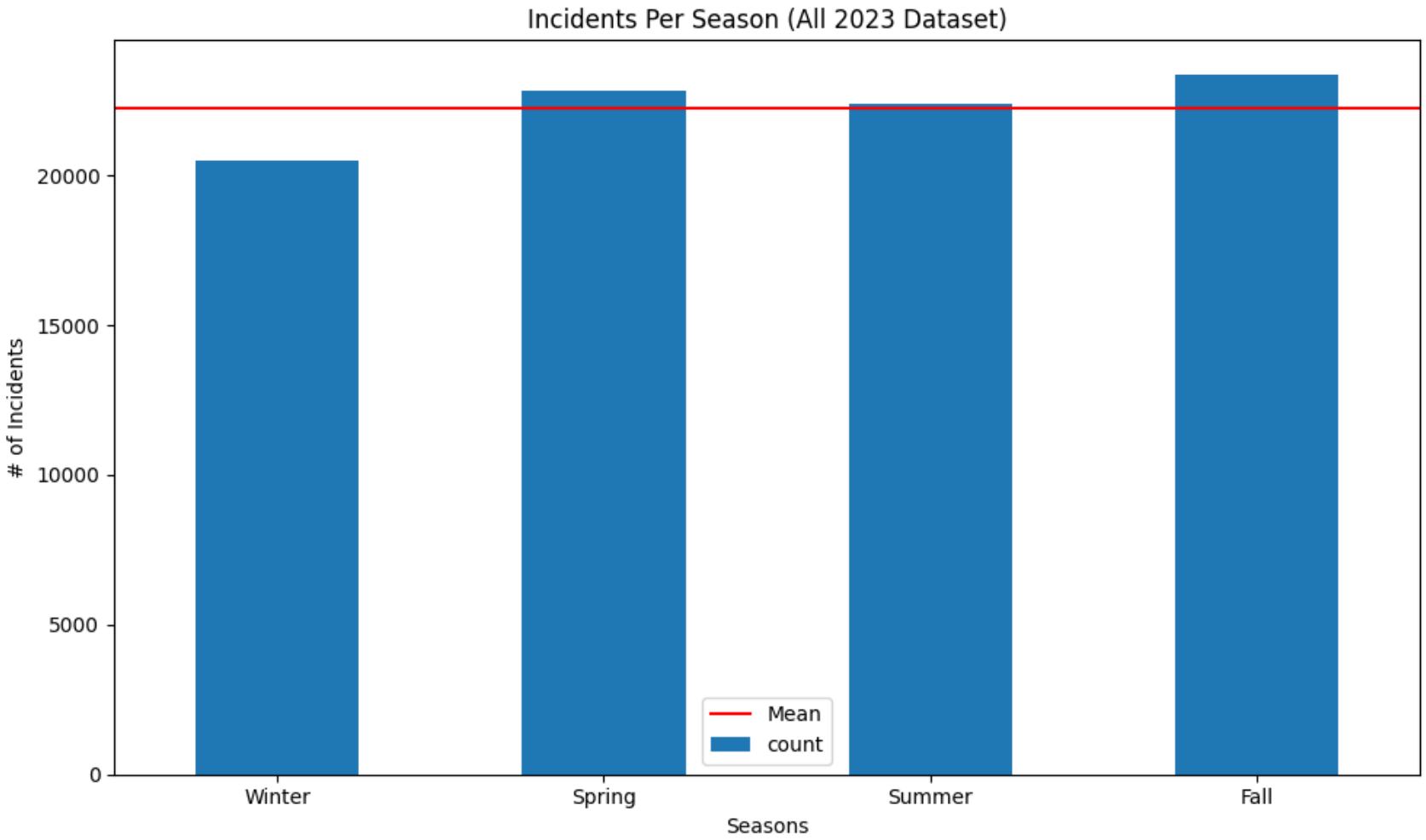
- Hourly crime distribution using portions of the data.
- Same trend across different seasons of the year 2023.

Temporal Analysis



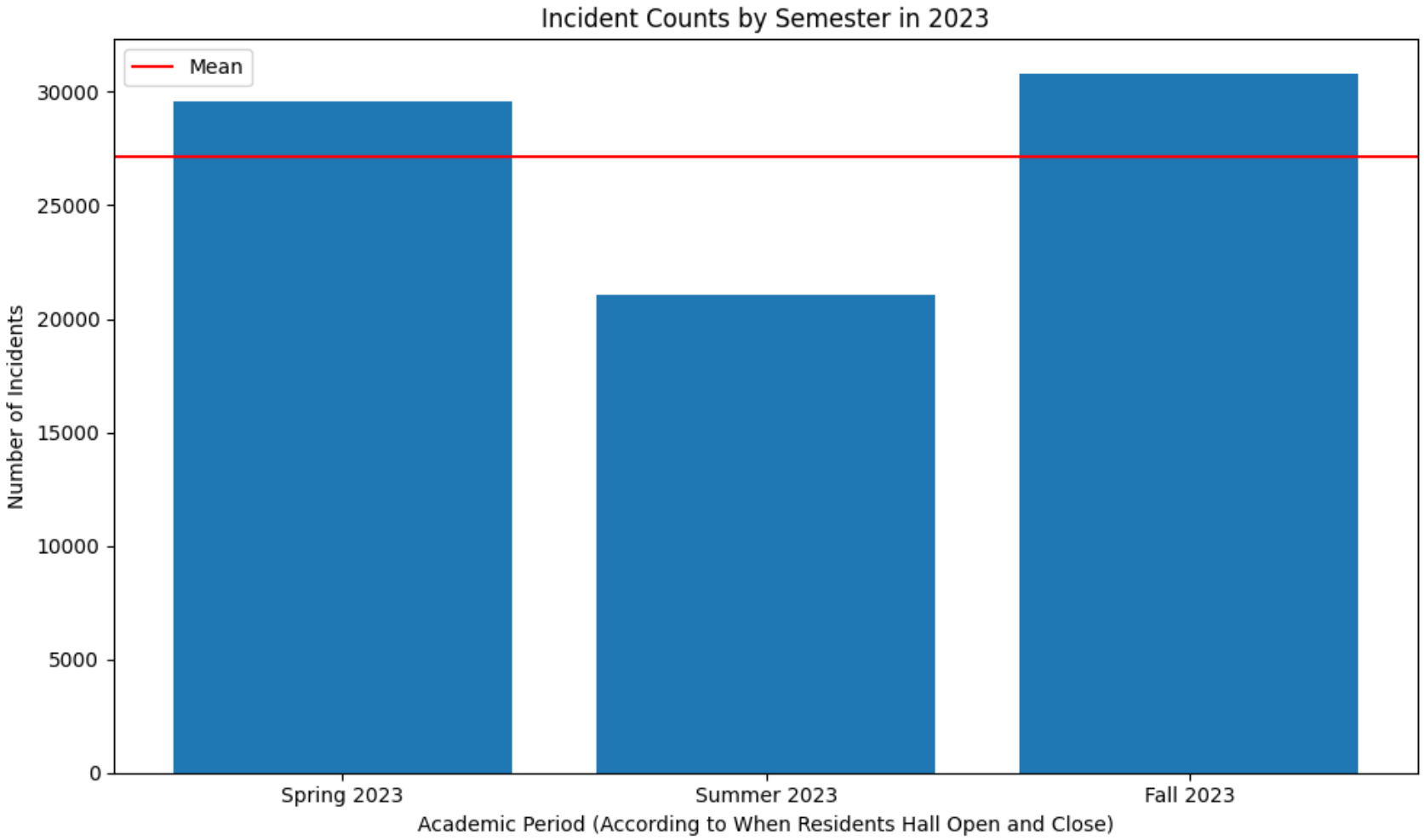
- Daylight vs no daylight. When is an incident more likely to occur?

Temporal Analysis



- Crime-report distribution based on seasons.

Temporal Analysis



- Tallahassee is a college town. (FSU & FAMU & TCC)
- Do students affect the number of crime reports?

What is Generative Adversarial Network-GAN?

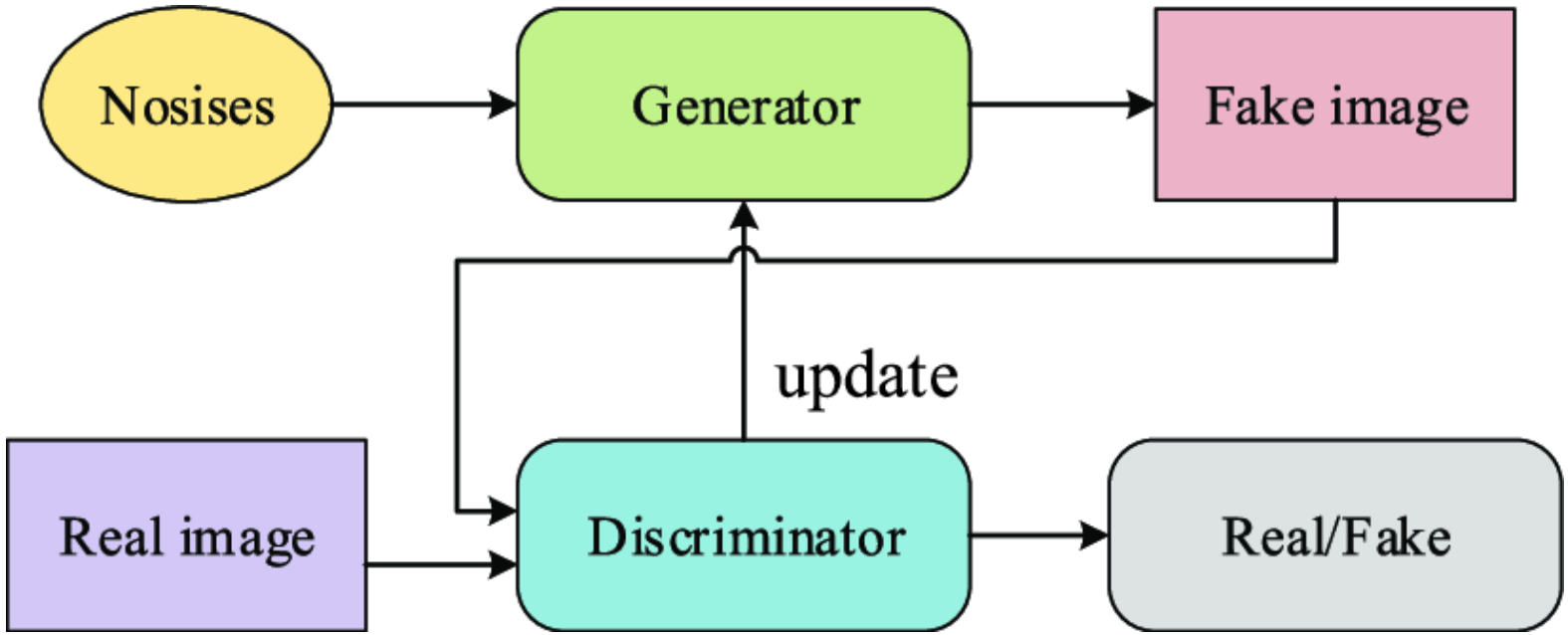


Figure: GAN

In the training, G and D try to beat each other (hence the word "adversarial").
The training stops when D can no longer discriminate fake samples.

Conditional GAN (Pix2pix)

What do we do if we want a G network that takes a geographical map and outputs a crime map?

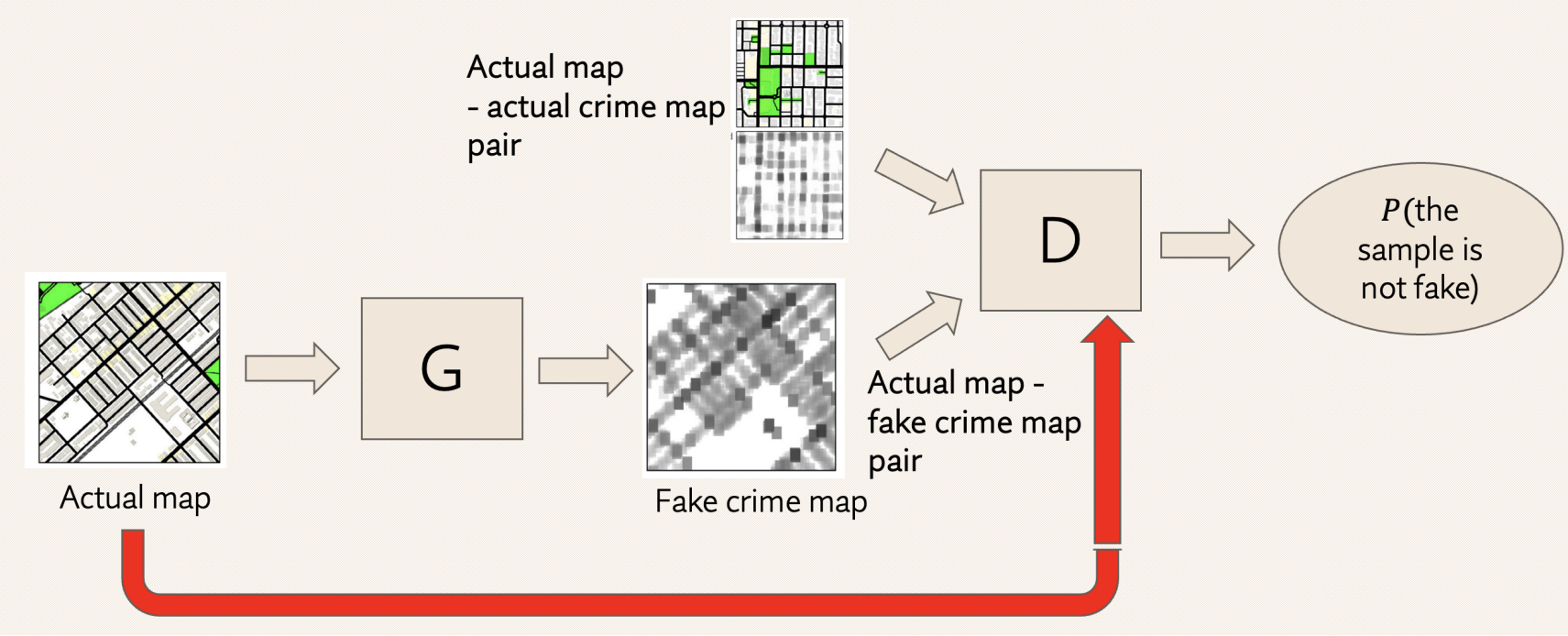


Figure: pix2pix

After training, a crime map generator is born.

Results

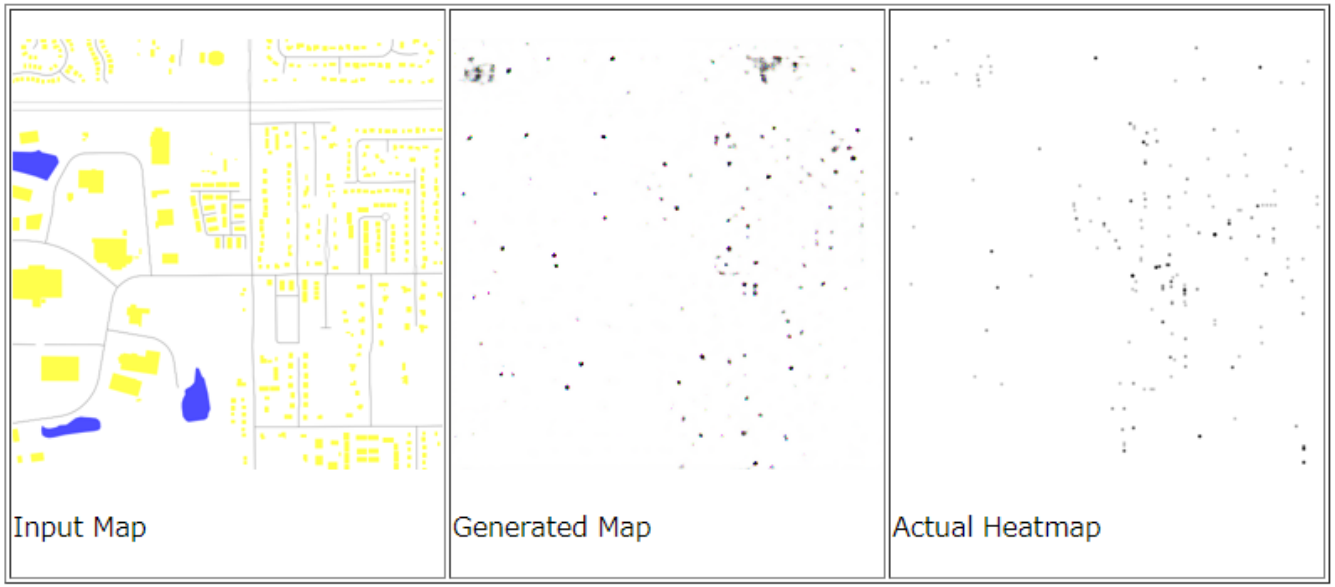


Figure: Generated heatmaps. We observe that the spatial pattern is somewhat similar to the real data.

	Baseline (Random Points)	pix2pix
Average MSE	3.9543179869651794	0.9491354823112488

Conclusion

- The data shows interesting trends in both spatial and temporal dimensions.
- In particular, the absense of students during the summer months is reflected in the crime reports.
- Using pix2pix, we were able to generate heatmaps that resemble the real data.
- In future, we can do:
- Better training of the model
- Implement a user-friendly editor for georaphical maps for hypothetical maps
- Implement a web-app for the tool

Thank You!