Image of Lady of Justice removed due to copyright restrictions.

The Analytical Policeman

Visualization for Law and Order

15.071x – The Analytics Edge

The Analytical Policeman

- The explosion of computerized data affects all parts of society, including law and order
- In the past, human judgment and experience was the only tool in identifying patterns in criminal behavior
- Police forces around the US and the world are augmenting human judgment with analytics – sometimes described as **"predictive policing"**

Example: Los Angeles Police Dept.

"I'm not going to get more money. I'm not going to get more cops. I have to be better at using what I have, and that's what **predictive policing** is about… If this old street cop can change the way that he thinks about this stuff, then I know that my [officers] can do the same."

- Los Angeles Police Chief Charlie Beck

Role of Analytics

- The analytical tools you have learned in this class can be used to make these "predictive policing" models

- However, **communicating** the results of these models is essential – a **linear regression** output table will not be of use to a **policewoman on patrol**

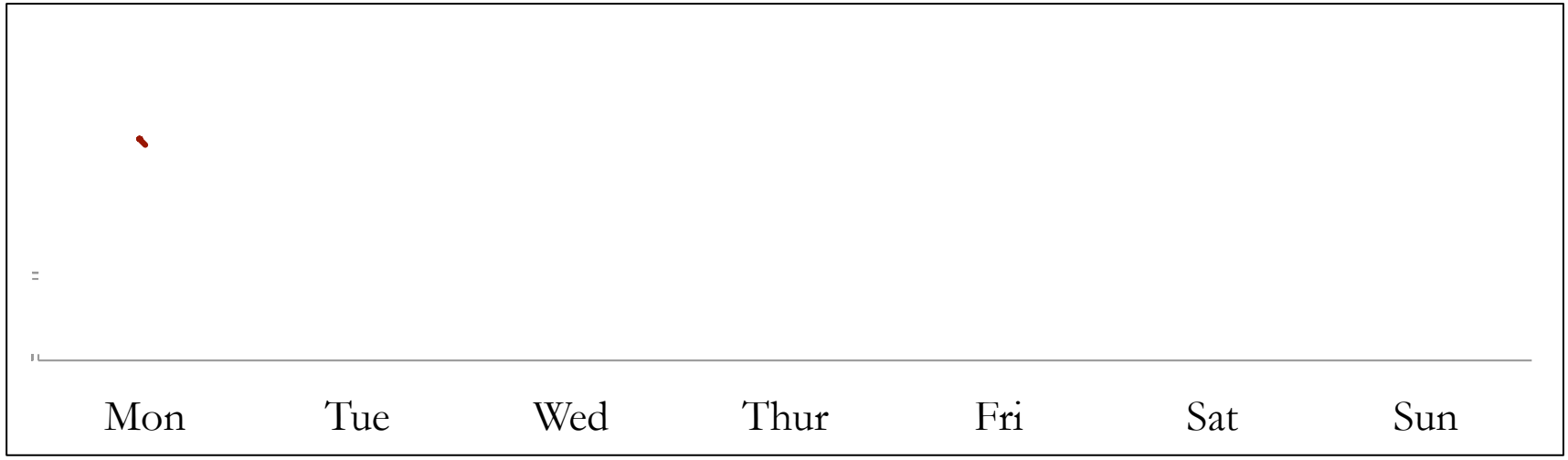
- Visualization bridges the gap between **the data and mathematics** and the **end user**

Understanding the Past

- Before we even consider a predictive model, we should try to understand the historical data
- Many cities in the US and around the world provide logs of reported crimes, usually including the time, location, and nature of the event
- We will use data from Chicago about motor vehicle thefts

Crime Over Time

- Suppose we wanted to communicate crime patterns over the course of an average week
- We could display daily averages using a line graph, but this does not seem like it would be too useful



Crime Over Time

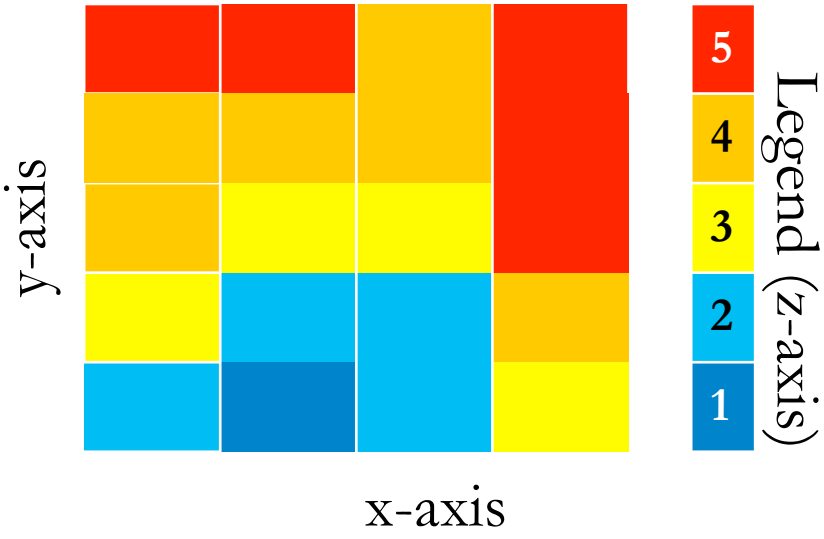
- We can replace our **x-axis** with the **hour of the day**, and have a different **line for every day of the week**, but this would be a jumbled mess with **7 lines**!
- We could use no visualization at all, and instead present the information in a table
- This is valid, but how can we make the table more interesting and usable?

	MO	TU	WE	TH
03:00	34	32	31	…
04:00	15	24	22	…
05:00	22	10	33	…
06:00	13	14	19	…
…	…	…	…	…

Heatmaps

- **Heatmaps** are a way of visualizing data using three attributes. The **x-axis** and **y-axis** are typically displayed horizontally and vertically

- The **third attribute** is represented by shades of color. For example, a **low** number might be **blue**, and a **high** number might be **red**



Heatmaps

- We can pick **different color schemes** based on the **type of data** to convey different messages

- The x-axis and y-axis don't need to be continuous – they can be **categorical**
- We could even combine a heatmap with a **geographical map** – we will discuss this later in the class

A Chicago Crime Heatmap

- We will use Chicago motor vehicle theft data to explore patterns of crime:
  - Over days of the week
  - Over hours of the day
- We're interested in the total number of car thefts that occur in any particular hour of a day of the week over the whole data set

Eye on Crime

- Criminal activity-related data often has both components of time and location
- Sometimes all that is required is a line chart, but heatmaps can visualize data that would be too big for a table
- Plotting data on maps is much more effective than a table for location based data, and is eye-catching

Predictive Policing

- Many police forces are exploiting their databases to focus finite resources on problem areas
- Not only do analytics help improve policework, the outputs are also good communication tools to decision makers in government and to the wider public
- The application of analytics to data like this is new and growing, with companies like PredPol and Palantir leading the effort

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