Hurricane Harvey Weather Event

Table of Contents

Background and Scope

This report provides insight into the damages caused by hurricane Harvey in the summer of 2017. The objective is to identify the areas most impacted by the hurricane as well as the total property damage.

Import data from text file

Script for importing data from the following text file:

```
filename: C:\DataScience\Exploratory Data Analysis\StormEvents\StormEvents_2017_finalProject.csv
```

Setup the Import Options and import the data:

```
opts = delimitedTextImportOptions("NumVariables", 24);
```

Specify range and delimiter

```
opts.DataLines = [2, Inf];
opts.Delimiter = ",";
```

Specify column names and types

```
opts.VariableNames = ["EpisodeID", "Event_ID", "State", "Year", "Month", "Event_Type", "CZ_Name
opts.VariableTypes = ["double", "double", "categorical", "double", "categorical", "categorical"
```

Specify file level properties

```
opts.ExtraColumnsRule = "ignore";
opts.EmptyLineRule = "read";
```

Specify variable properties

```
opts = setvaropts(opts, "Event_Narrative", "WhitespaceRule", "preserve");
opts = setvaropts(opts, ["State", "Month", "Event_Type", "CZ_Name", "Episode_Narrative", "Event
opts = setvaropts(opts, "Begin_Date_Time", "InputFormat", "yyyy-MM-dd HH:mm:ss");
opts = setvaropts(opts, "End_Date_Time", "InputFormat", "yyyy-MM-dd HH:mm:ss");
opts = setvaropts(opts, ["Timezone", "Damage_Property", "Damage_Crops"], "TrimNonNumeric", true
opts = setvaropts(opts, ["Timezone", "Damage_Property", "Damage_Crops"], "ThousandsSeparator",
```

Import the data

```
StormEvents = readtable("C:\DataScience\Exploratory Data Analysis\StormEvents\StormEvents_2017_
```

Clear temporary variables

```
clear opts
```

Property Damage by State

Filter data for:

- The relevant dates for weather events related to hurricane Harvey
- The states affected by hurricane Harvey

```
Start = datetime("2017-08-16 23:59:59");
Finish = datetime("2017-09-04 00:00:00");
AllStateIdx = StormEvents.Begin_Date_Time > Start & StormEvents.End_Date_Time < Finish & (Storm
StormEventsStates = StormEvents(AllStateIdx,:);
StateCost = groupsummary(StormEventsStates,"State",'sum','Property_Cost');
StateCost = sortrows(StateCost,"sum_Property_Cost","descend")
```

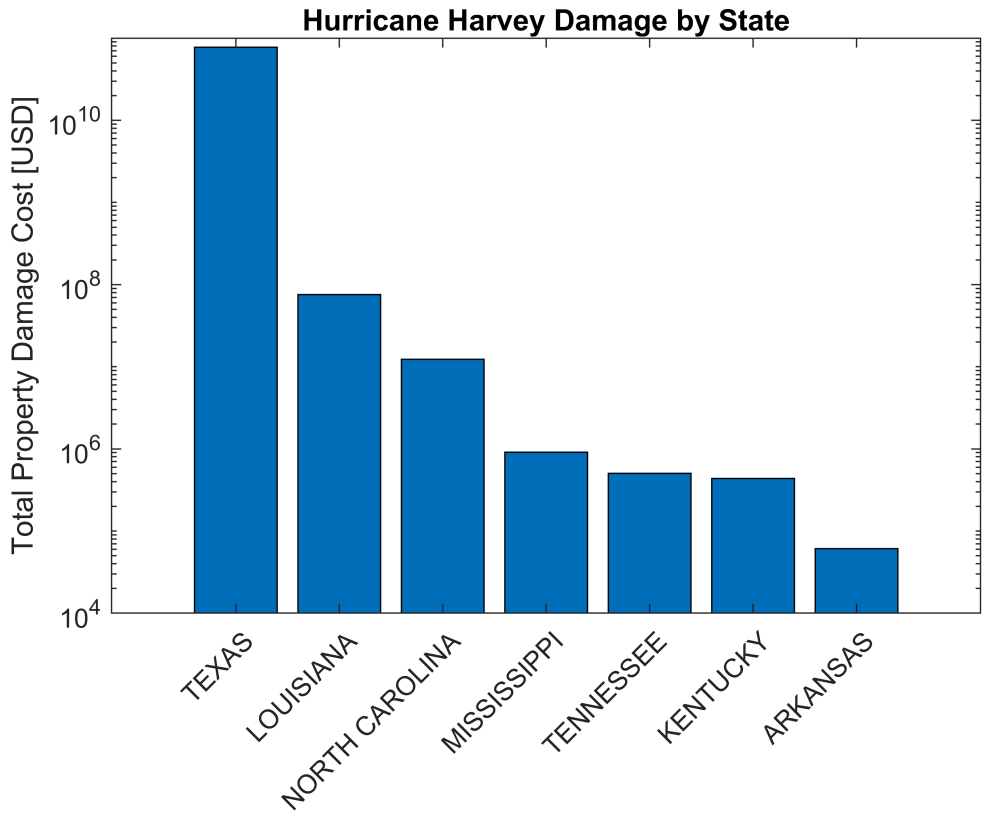
StateCost = 7×3 table

	State	GroupCount	sum_Property_Cost
1	TEXAS	272	7.7427e+10
2	LOUISIANA	85	75277000
3	NORTH CA...	59	12338500
4	MISSISSI...	39	915000
5	TENNESSEE	46	504000
6	KENTUCKY	20	435000
7	ARKANSAS	52	61000

This bar plot shows the total property damage cost by state for the states affected by the hurricane:

```
figure
bar(StateCost.sum_Property_Cost)
set(gca,'XTick',1:7,'XTickLabel',StateCost.State,'YScale','log')
```

```
xtickangle(45)
ylabel('Total Property Damage Cost [USD]')
title('Hurricane Harvey Damage by State')
```



The bar plot shows that Texas and Louisiana sustained the highest total property damage costs.

Events for Texas and Louisiana

This section identifies the types of weather events with the highest number of occurrences in the two states with the highest total property damage cost.

```
Start = datetime("2017-08-16 23:59:59");
Finish = datetime("2017-09-04 00:00:00");
TXLAIdx = StormEvents.Begin_Date_Time > Start & StormEvents.End_Date_Time < Finish & (StormEver
StormEventsTXLA = StormEvents(TXLAIdx,:);
StormEventsTXLAs = groupsummary(StormEventsTXLA,"Event_Type",'sum','Property_Cost');
StormEventsTXLAs = sortrows(StormEventsTXLAs,"GroupCount","descend")
```

StormEventsTXLAs = 11×3 table

	Event_Type	GroupCount	sum_Property_Cost
1	Flash Flood	179	4.3615e+10
2	Tropical Storm	44	2.9117e+10
3	Tornado	33	7827500
4	Heat	30	0
5	Thunderstorm Wind	27	65500

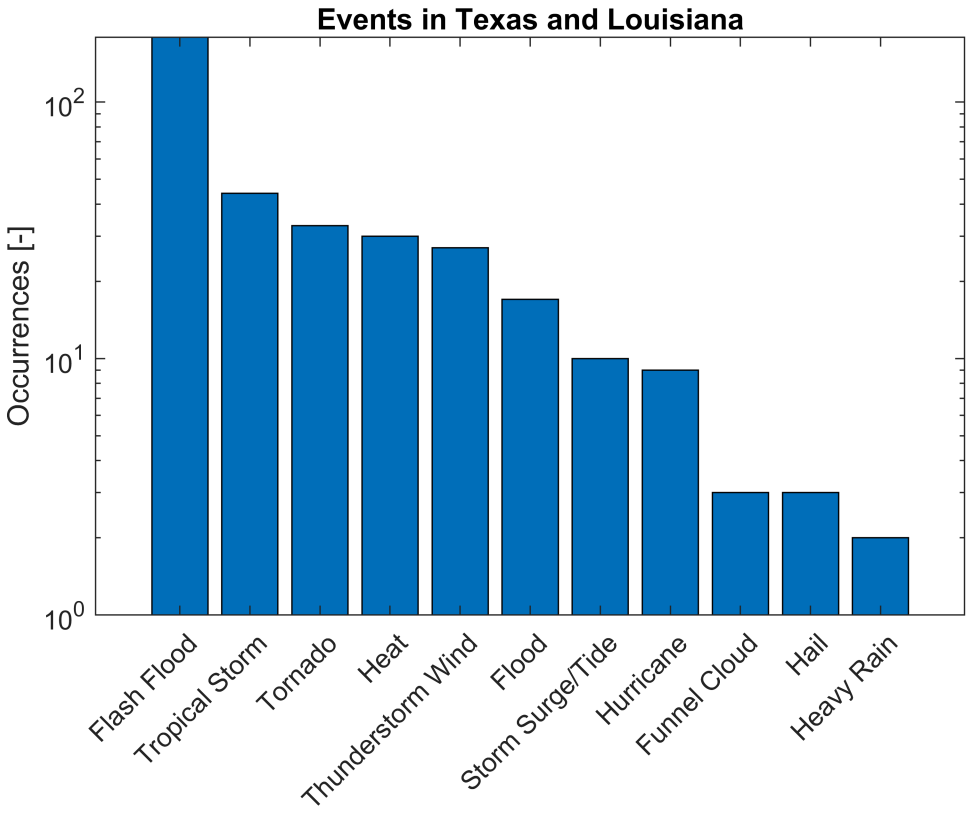
	Event_Type	GroupCount	sum_Property_Cost
6	Flood	17	88750000
7	Storm Surge/Tide	10	532020000
8	Hurricane	9	4.1411e+09
9	Funnel Cloud	3	0
10	Hail	3	0
11	Heavy Rain	2	0

By far the most widespread weather event during the hurricane was flash flooding.

Visualizations

Event Occurrences

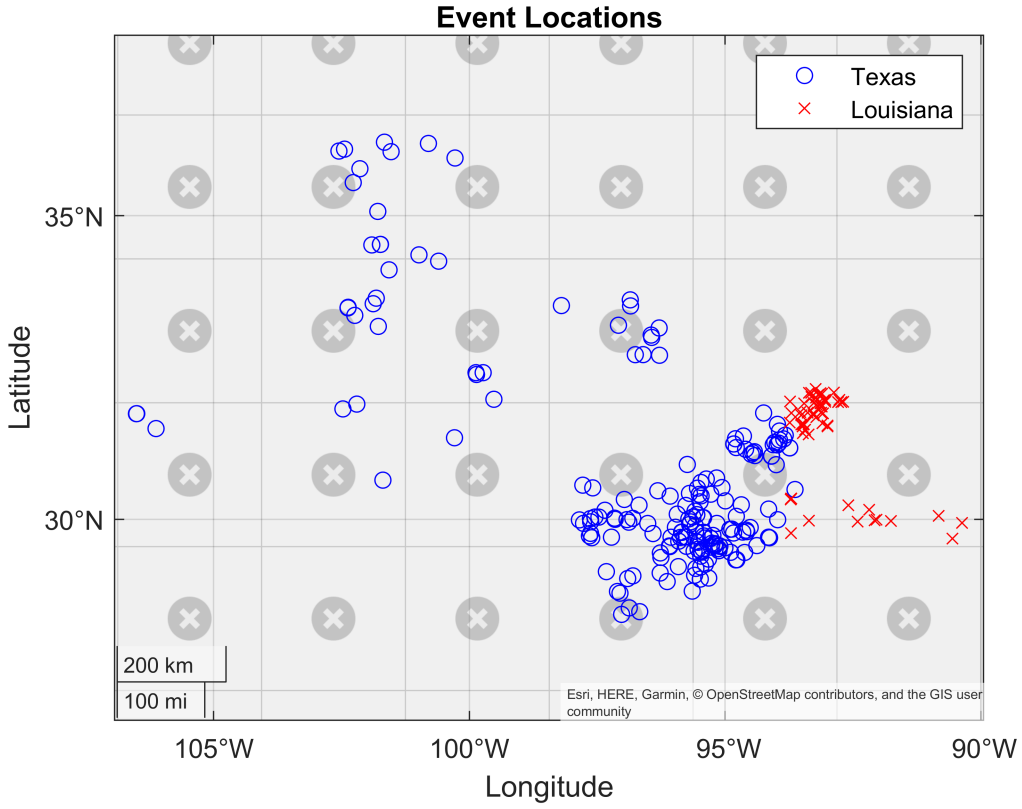
```
bar(StormEventsTXLAs.GroupCount)
set(gca,'XTick',1:height(StormEventsTXLAs),'XTickLabel',StormEventsTXLAs.Event_Type,'YScale','l
xtickangle(45)
ylabel('Occurrences [-]')
title('Events in Texas and Louisiana')
```



Event Locations

This section graphically shows where weather events occurred in the two states with the highest total property damage cost.

```
StormEventsTXLA.meanLat = (StormEventsTXLA.Begin_Lat + StormEventsTXLA.End_Lat)/2;
StormEventsTXLA.meanLon = (StormEventsTXLA.Begin_Lon + StormEventsTXLA.End_Lon)/2;
StormEventsTX = StormEventsTXLA((StormEventsTXLA.State == "TEXAS"),:);
StormEventsTXflood = StormEventsTXLA((StormEventsTXLA.State == "TEXAS" & (StormEventsTXLA.Event
StormEventsLA = StormEventsTXLA((StormEventsTXLA.State == "LOUISIANA"),:);
figure
geobasemap satellite
geoscatter(StormEventsTX.meanLat,StormEventsTX.meanLon,'bo')
hold on
geoscatter(StormEventsLA.meanLat,StormEventsLA.meanLon,'rx')
title('Event Locations')
legend('Texas','Louisiana')
```



Analysis

Property Damage by County

This section identifies the three counties in each state with:

- The highest number of weather events
- The highest total property damage cost

Counties in Louisiana with the highest number of weather events:

```
LACountiesEvents = sortrows(groupsummary(StormEventsLA,"CZ_Name",'sum',"Property_Cost"),"GroupC
LACountiesEventsTop = LACountiesEvents(1:3,:)
```

LACountiesEventsTop = 3×3 table

	CZ_Name	GroupCount	sum_Property_Cost
1	NATCHITOC...	21	0
2	SABINE	15	0
3	RED RIVER	9	0

Counties in Louisiana with the highest total property damage cost:

```
LACountiesCosts = sortrows(groupsummary(StormEventsLA,"CZ_Name",'sum','Property_Cost'),"sum_Pro
LACountiesCostsTop = LACountiesCosts(1:3,:)
```

LACountiesCostsTop = 3×3 table

	CZ_Name	GroupCount	sum_Property_Cost
1	CALCASIEU	1	60000000
2	BEAUREGARD	1	15000000
3	ACADIA	1	200000

Counties in Texas with the highest number of weather events:

```
TXCountiesEvents = sortrows(groupsummary(StormEventsTX,"CZ_Name",'sum',"Property_Cost"),"GroupC
TXCountiesEventsTop = TXCountiesEvents(1:3,:)
```

TXCountiesEventsTop = 3×3 table

	CZ_Name	GroupCount	sum_Property_Cost
1	HARRIS	21	1.0001e+10
2	GALVESTON	17	2.0000e+10
3	FORT BEND	13	1.6004e+10

Counties in Texas with the highest total property damage cost:

```
TXCountiesCosts = sortrows(groupsummary(StormEventsTX,"CZ_Name",'sum','Property_Cost'),"sum_Pro
TXCountiesCostsTop = TXCountiesCosts(1:3,:)
```

TXCountiesCostsTop = 3×3 table

	CZ_Name	GroupCount	sum_Property_Cost
1	GALVESTON	17	2.0000e+10
2	FORT BEND	13	1.6004e+10
3	MONTGOMERY	6	1.4000e+10

Conclusions

The insurance company should send more people to Texas than Louisiana. There were a small number of weather events in Louisiana resulting in a large amount of property damage. The counties in Louisiana with the largest number of events actually did not experience any property damage.

Galveston and Fort Bend counties in Texas made both the highest occurrence and highest damage lists. A larger number of people should be sent to these two counties.