Image source:f3news
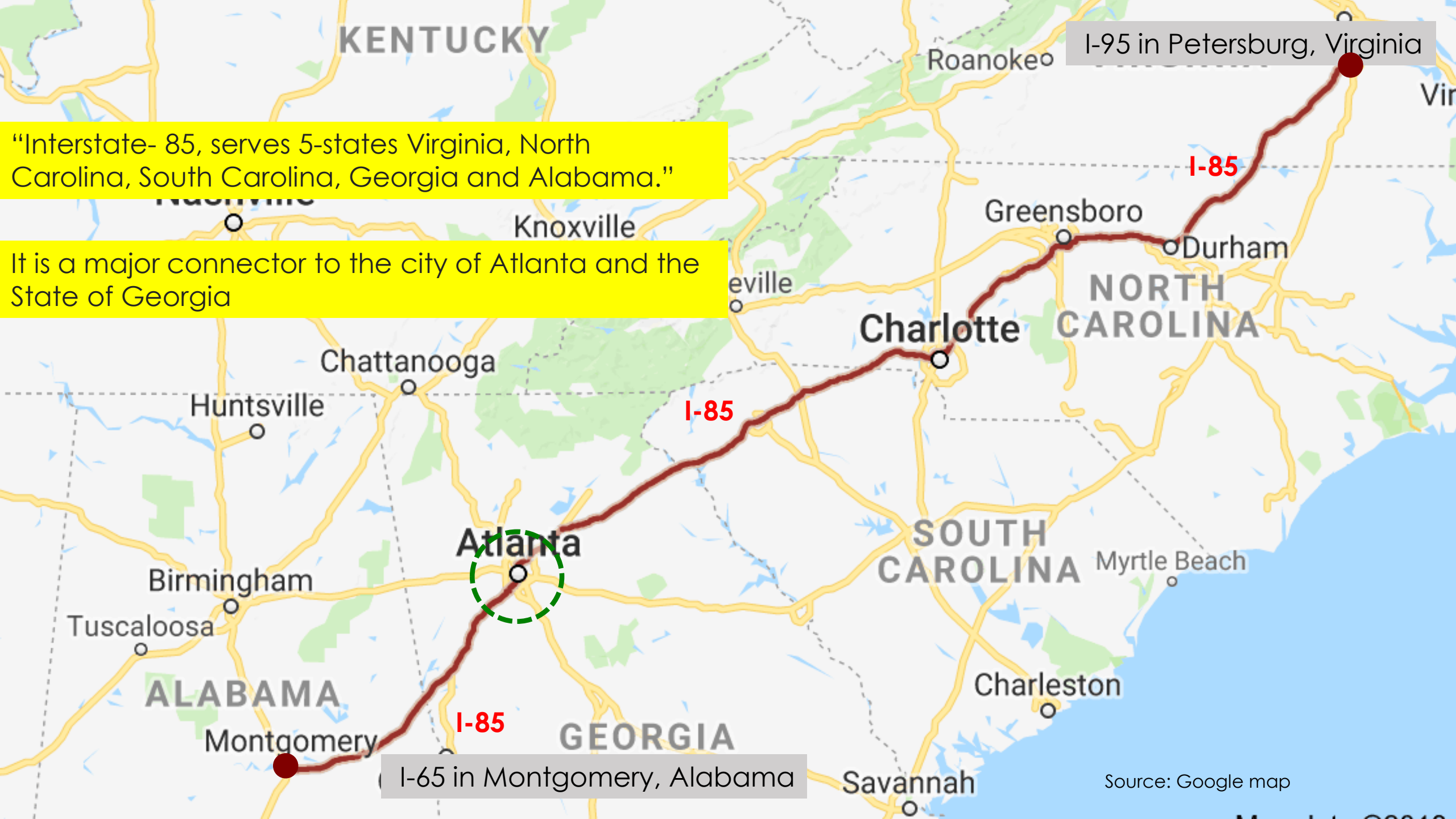
ACSP 2018

Assessing "Citizen's Affect" during I-85 bridge collapse incident through social media mining

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I-95 in Petersburg, Virginia

"Interstate- 85, serves 5-states Virginia, North Carolina, South Carolina, Georgia and Alabama."

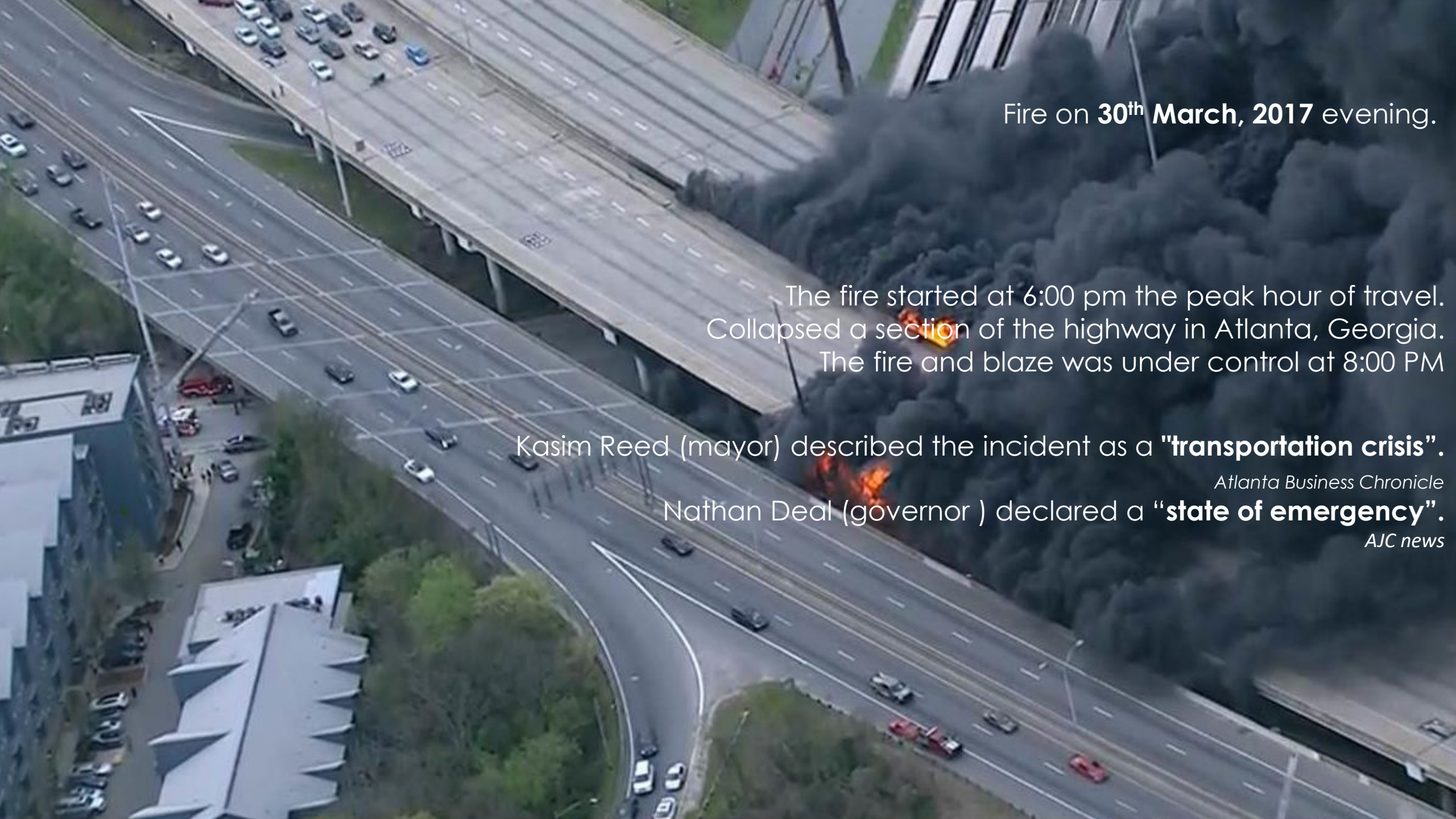It is a major connector to the city of Atlanta and the State of Georgia

I-85

I-85

I-85

I-65 in Montgomery, Alabama

Source: Google map

Fire on **30**th **March**, **2017** evening.

The fire started at 6:00 pm the peak hour of travel.
Collapsed a section of the highway in Atlanta, Georgia.
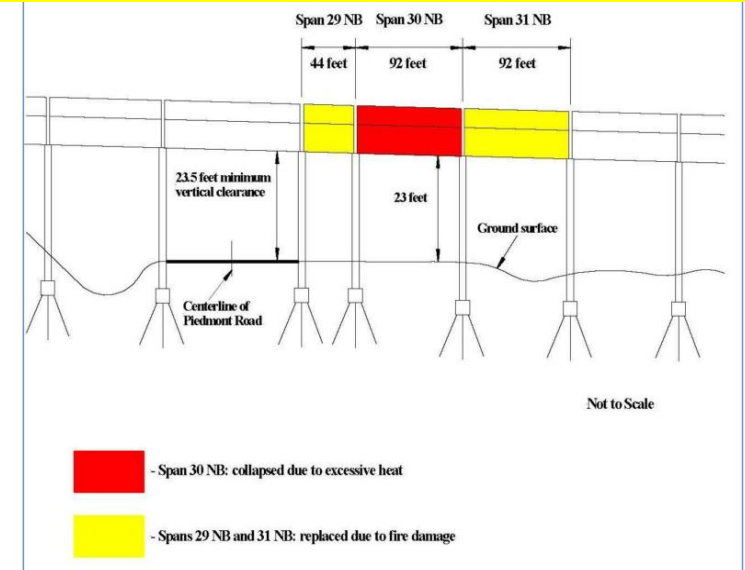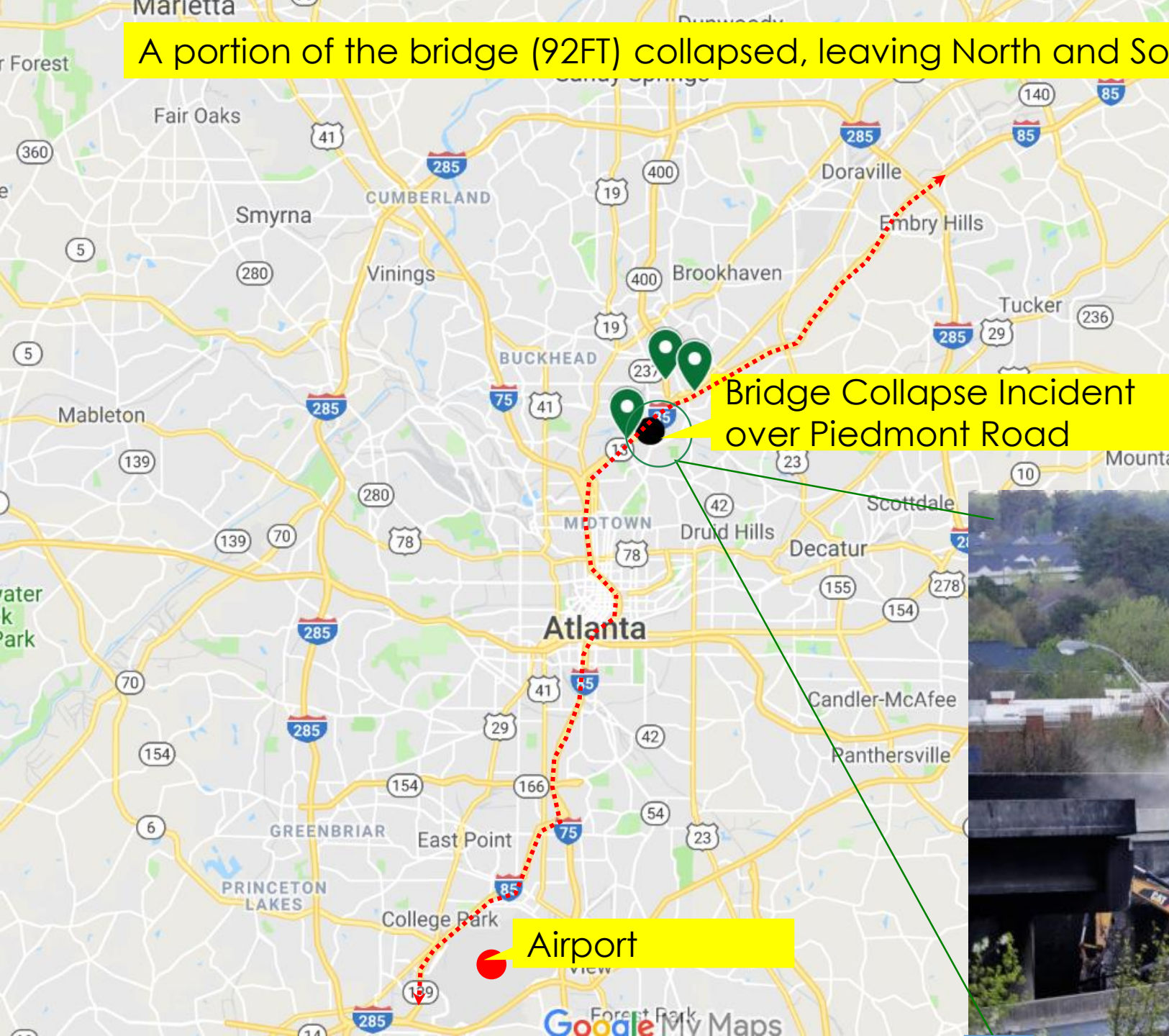The fire and blaze was under control at 8:00 PM

Kasim Reed (mayor) described the incident as a **"transportation crisis"**.
Atlanta Business Chronicle

Nathan Deal (governor) declared a "**state of emergency**".
AJC news

A portion of the bridge (92FT) collapsed, leaving North and South bound traffic through GA disrupted
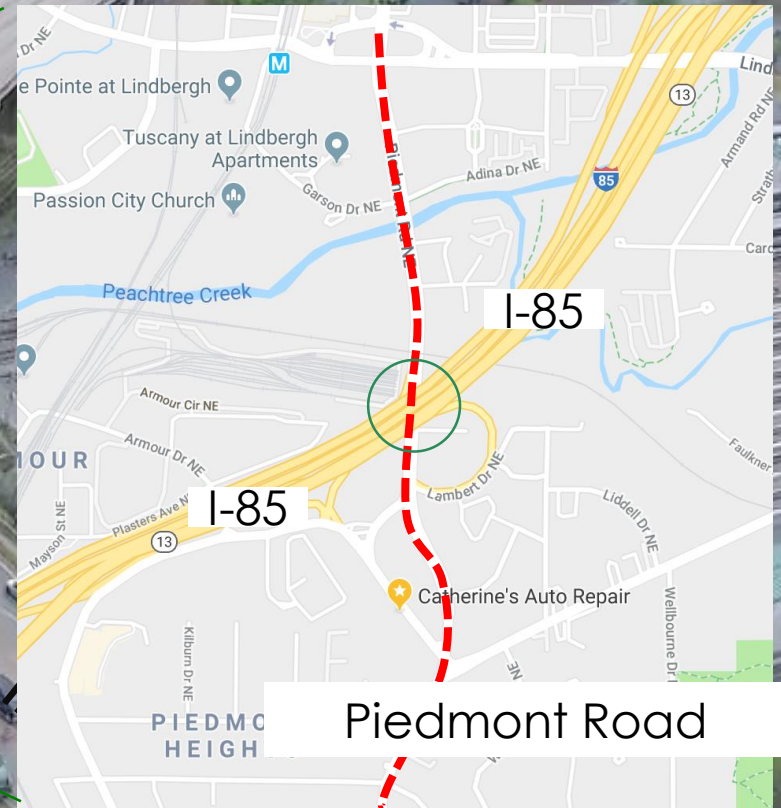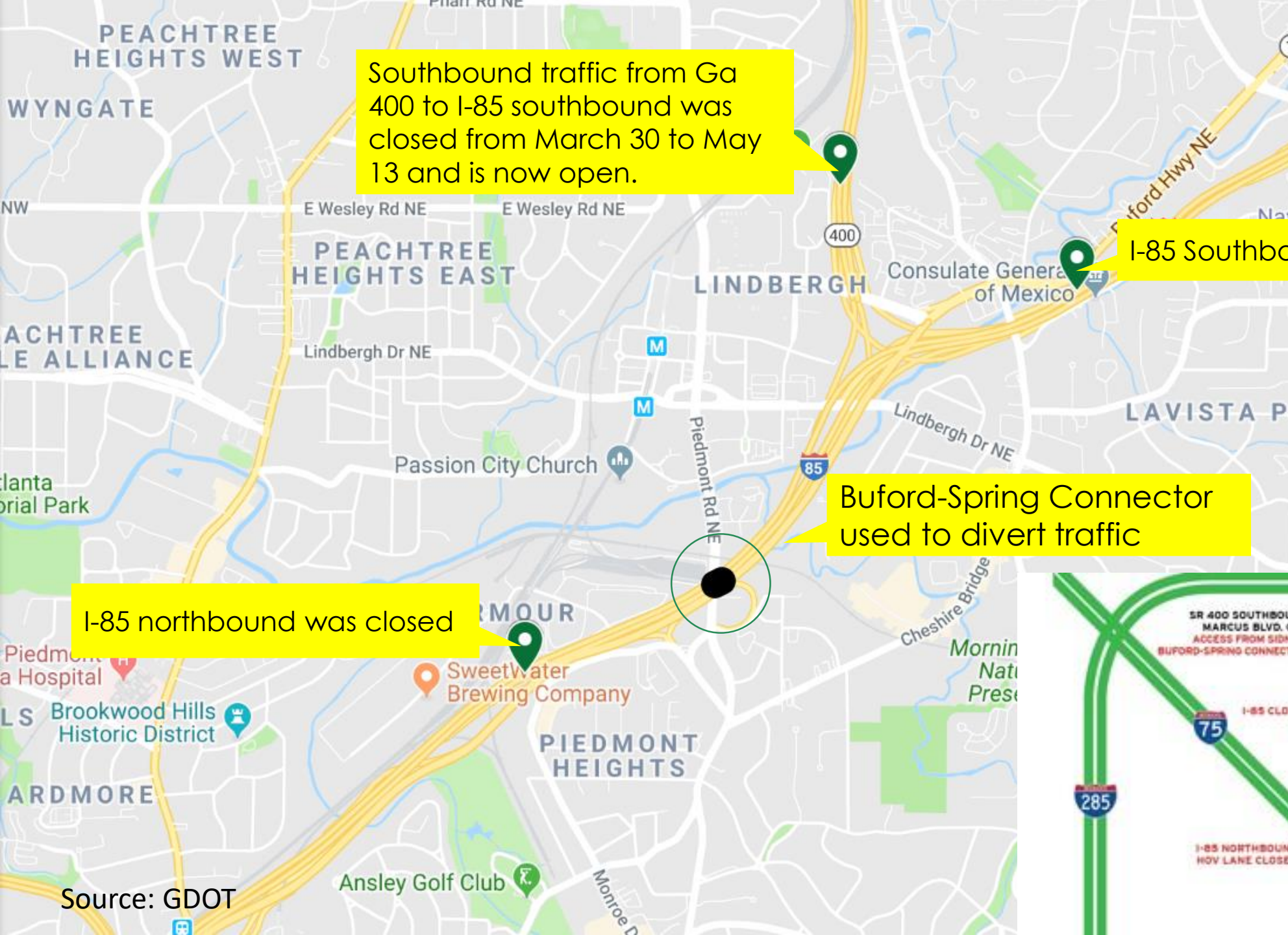
Bridge Collapse Incident over Piedmont Road

Airport

Span 29 NB Span 30 NB Span 31 NB

44 feet   92 feet   92 feet

23.5 feet minimum vertical clearance

23 feet

Ground surface

Centerline of Piedmont Road

Not to Scale

- Span 30 NB: collapsed due to excessive heat

- Spans 29 NB and 31 NB: replaced due to fire damage

Source: GDOT

Atlanta bridge collapse: Officials expect traffic nightmare while repairs take place

foxnews.com **3/31/2017** Ryan Gaydos

How did the collapse affect people?

Were they more stressed than usual during that period?

What were their coping mechanisms?

Were there differences in the sentiments expressed by locals vs. those from other areas?

"Interstate 85, which carries **250,000 cars per day**, is a major artery for the U.S. South and a thoroughfare for traffic heading north and south through Atlanta." - Ryan Gaydos F3News

John Spink / ajc.com

Image source: ajc.com

Were people outside of Georgia also affected ?

Did people think about alternative modes of transportation ?

Image source : Ajc.com

DATA COLLECTION

Twitter Data is collected using Python's *Tweepy* module.

The Tweets were between the time frame from **Feb 28, 2017, to Jun 15, 2017**, within a **200-mile radius** of Atlanta, USA.

Over 1.2 million tweets used.

date	retweets	favorites	text	geo	mentions	hashtags	id	permalink	label
4/4/17 13:57	0	0	Slow traffic in #Hoover on Hwy 280 EB between Cahaba River Rd and Hwy 119 - Cahaba Valley Rd, c			#Hoover #traffic	8.49E+17	https://twi	traffic
4/4/17 11:14	0	0	Stopped traffic in #Irondale on I-459 SB between I-20 and Grants Mill Rd, delay of 8 mins #traffic ht			#Irondale #traffic	8.49E+17	https://twi	traffic
4/11/17 16:04	0	0	Stop and go traffic in #Jefferson on Pkwy E SB between Huffman Rd and Springville Rd, delay of 1 m			#Jefferson #traffic	8.52E+17	https://twi	traffic
3/31/17 11:11	0	0	#Repost @Siriusknows ãƒ»ãƒ»ãƒ» #Repost @freedomsfaction ãƒ»ãƒ»ãƒ» A human traffic		@Siriuskno	#Repost #Repost	8.48E+17	https://twi	traffic
4/3/17 8:02	0	0	Disabled vehicle, caution in #Summerville on I 26 WB at US-17-Alt #traffic http:// bit.ly/10EZuoi			#Summerville #tra	8.49E+17	https://twi	traffic
4/11/17 16:40	0	0	Snacks and all!!! @Atlanta Traffic https://www. instagram.com/p/BSwq_vnDUWHt 8pS	@Atlanta			8.52E+17	https://twi	traffic

KEY CONTRIBUTIONS

- Historic Event Analysis
- Use non-Geo tagged Tweets
- Feature Engineering specific to Tweet Topic Assessment
- Predictive modeling of Sentiments ("affect")

Classify Tweets
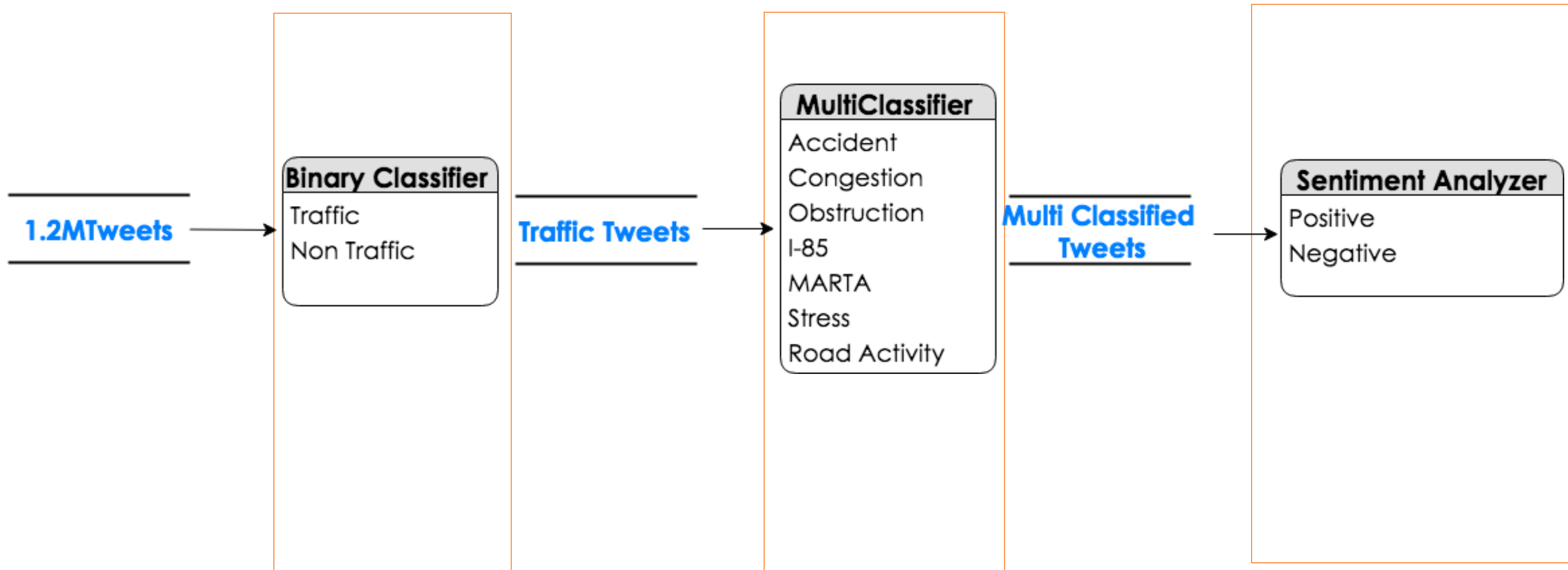
Classified Tweets

Multi-Class	SVM	Decision Tree	Naive Bayes	Random Forest	XGBoost
Accident	0.852	0.781	0.821	0.832	0.882
Congestion	0.831	0.843	0.732	0.833	0.912
Obstruction	0.745	0.754	0.773	0.782	0.812
Fire	0.870	0.875	0.824	0.792	0.854
i85	0.864	0.876	0.852	0.811	0.923
Marta	0.754	0.872	0.765	0.711	0.874
Stress	0.730	0.786	0.721	0.710	0.810
Non Stress	0.680	0.719	0.711	0.729	0.801
Road Activity	0.871	0.812	0.811	0.822	0.891

Precision score of the different model output tested

time	#tags	Tweet Text	location	Binary	Muticlass	Sentiment
11:04 PM	#AtlantaTraffic #MartaIsSmarter #TimeToBuyABike	Today will go down in #AtlantaTraffic history! #MartaIsSmarter #TimeToBuyABike	Atlanta,GA	traffic	marta	negative
6:01 AM	#rideMARTA #martaviews #MARTA	I hope a lot of these get purchased today!! #rideMARTA #martaviews #MARTA @Marta Mansell Park	Atlanta,GA	traffic	marta	positive
1:41AM	#atlantai85collapse #I85 #atlanta	I-85 Fire Collapsed Bridge. Morning commute will be like.... #atlantai85collapse #I85 #atlanta	Atlanta,GA	traffic	stress_i85	negative
3:43 AM		i-85 morning commute alternate route suggestion... I'm not saying this wouldn't work, after all	Sugar Hill, GA	traffic	i85	positive
10:31 AM	#Atlanta #stilts	85 Bridge collapse got you down #Atlanta ? Don't worry, MARTA is here to get you around! #stilts '	Atlanta,GA	traffic	marta	positive
5:31AM	#marta #i85	Tell me more about how everyone is using #marta as a result of #i85 's collapse.	Atlanta,GA	traffic	marta	positive
7:29PM		My heart goes out to the folks living up North. It's gonna be a mess to commute. Thank goodness I live down South!	Atlanta,GA	traffic	stress	negetive
3:48PM	#hotpot #crispypork #chongqinghotpot #chinatown	Hoping your commute isn't a hot mess	Chamblee, GA	traffic	stress	negative
8:28 PM	#ATL #publictransportation #commuter #options #i85	This is why #ATL needs #publictransportation #commuter #options #i85	Atlanta,GA	traffic	stress	negative
8:55 PM	#wine #atlanta #untiljune #cheers	Here's #wine to that horrible #atlanta commute (especially now)! #untiljune #cheers	Brookhaven, GA	traffic	stress	negative
10:36PM		It's going to be a slightly longer commute to visit Carleen next	Athens, GA	traffic	stress	negative
8:01AM		The Atlanta Commute this morning @toddwalkernews ewscrippsco @I-85 and Ga 400 @Buckhead (Atlanta)	Atlanta,GA	traffic	i85	negetive
11:56 AM	#commutewin	Another day, another MARTA station. Sandy Springs is closer to home #commutewin @Sandy Springs'	Sandy Springs, GA	traffic	marta	positive
9:31 AM		COMMUTERS: Expect traffic going into Concord via I-85 & Poplar Tent Rd from 9a-4p this month. Delays due to adding	CharlotteCP	traffic	congestion	negetive

Tweet Volume in Differnt Category In Georgia

| | before | during | after |
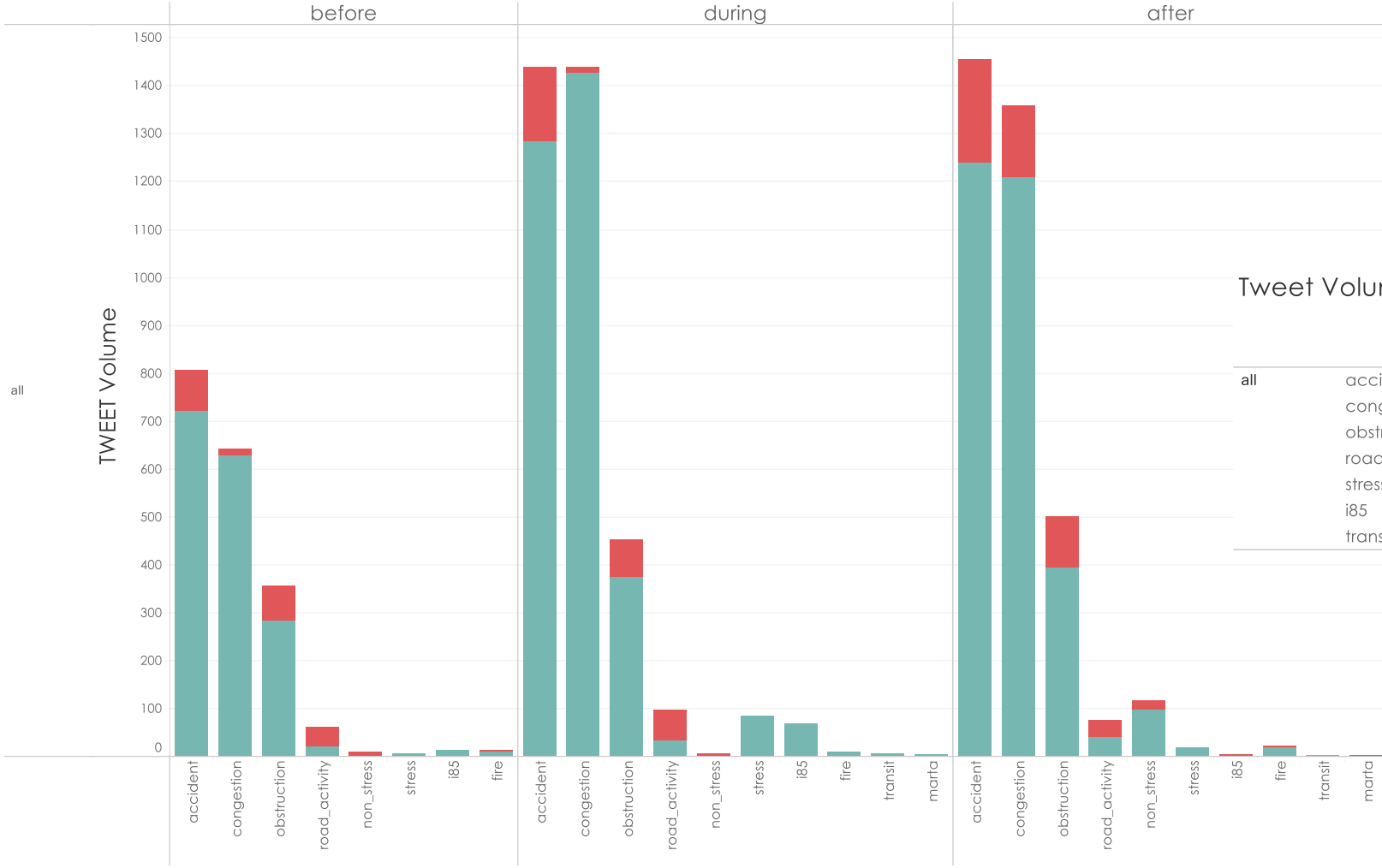
Sentiment (group)
- positive
- negative & neutral

Tweet Volume in Differnt Category In Outside Georgia

|		before		during		after	
		positive	negative	positive	negative	positive	negative
all	accident	84	722	153	1,286	215	1,240
	congestion	14	628	12	1,428	150	1,211
	obstruction	74	283	78	374	106	396
	road_activity	42	20	62	35	36	40
	stress		6		85		19
	i85		14		69	1	4
	transit				6		2

Number of Records: 1 – 1,428

Probability of Negative sentiments in Traffic Tweets

"Heavier traffic on along the northwest section of I-285, as well as in midtown and along smaller streets near midtown/downtown as commuters adjust their routes to work." - ARC'S Finding using INRIX data

83.87%	87.52%	81.23%	88.43%	91.16%	86.42%
before	during	after	before	during	after
	InGA			OutsideGA	
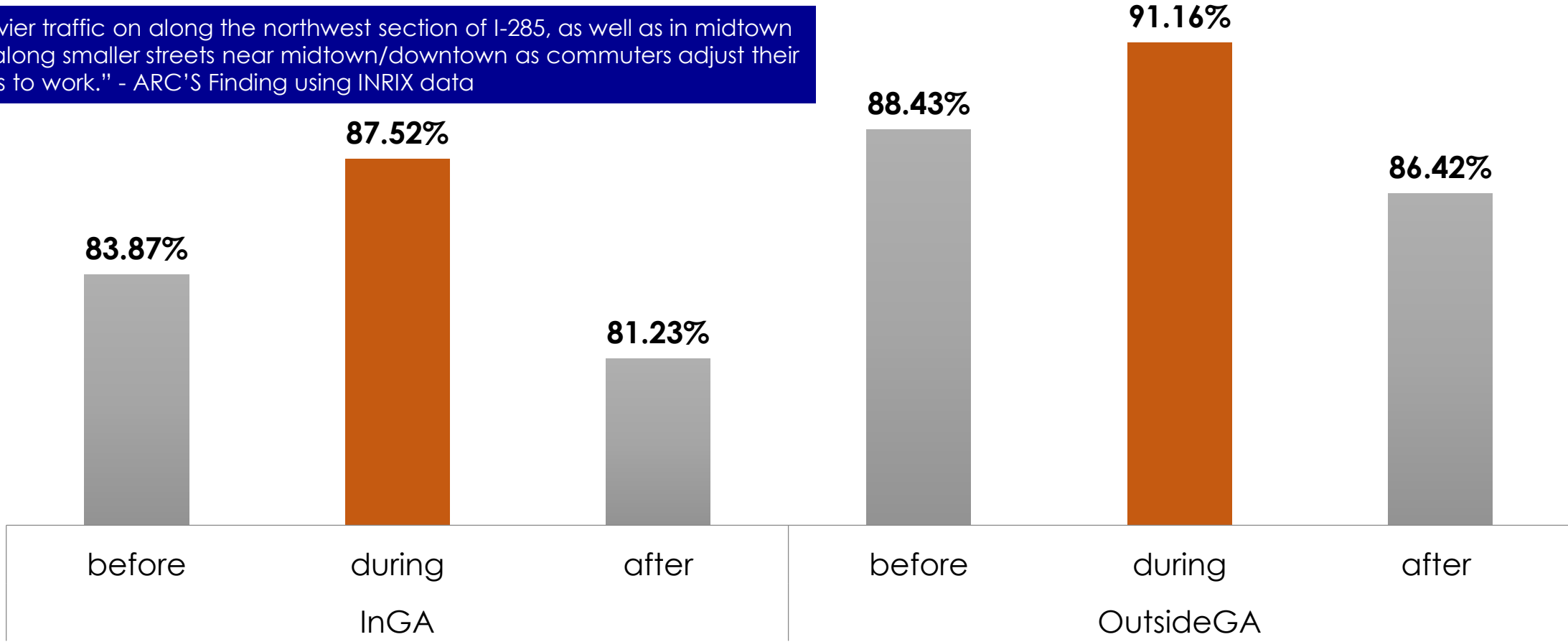
While people in Atlanta and Georgia show increased levels of stress due to traffic during I-85 collapse, people **outside of Georgia** in the adjacent states also experience **increased level of stress** due to traffic.
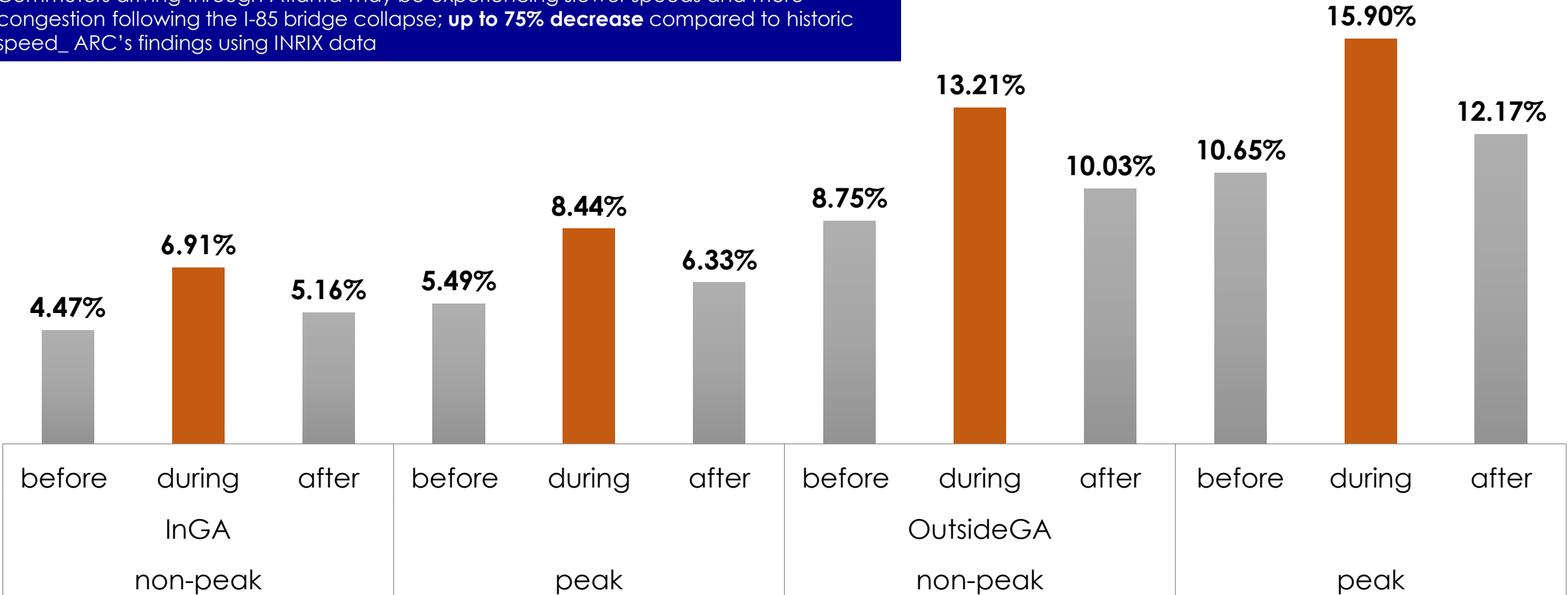
Probability of Traffic Stress expressed in Tweets
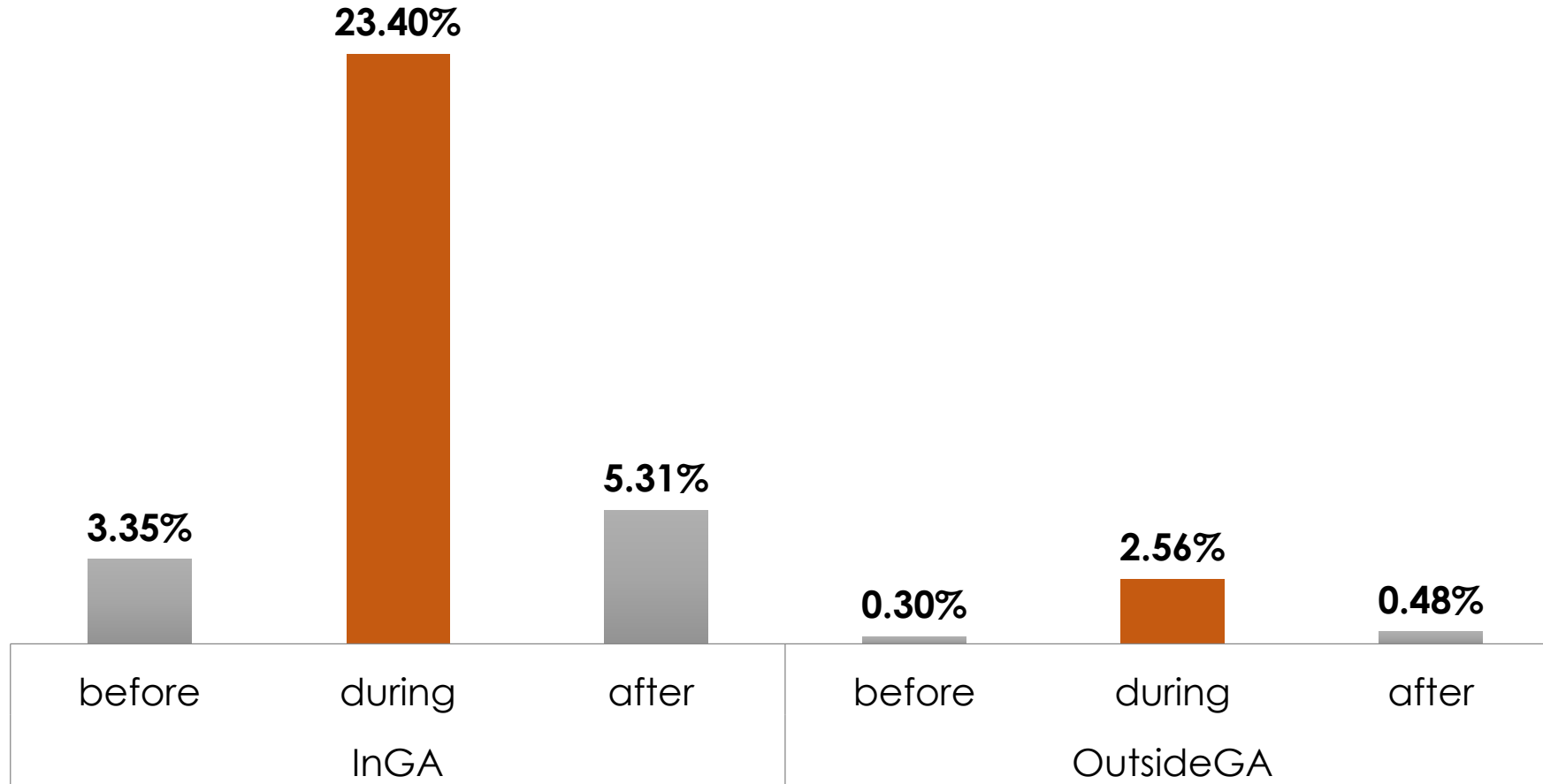
Overall Stress experienced by people due to traffic related issues during the I-85 collapse is independent of the peak hours of travel (i.e. 6-9am, and 4-8pm)

Probability of Congestion Reported in Tweets

Commuters driving through Atlanta may be experiencing slower speeds and more congestion following the I-85 bridge collapse; **up to 75% decrease** compared to historic speed_ ARC's findings using INRIX data

	InGA non-peak			peak			OutsideGA non-peak			peak	
before	during	after	before	during	after	before	during	after	before	during	after
4.47%	6.91%	5.16%	5.49%	8.44%	6.33%	8.75%	13.21%	10.03%	10.65%	15.90%	12.17%

Stress experienced by people due to **congestion** (reported road blockage , obstacles , accidents , traffic slowing down) is **higher during peak hours** of travel both in and out of Georgia.

Probability of Marta use reported in Tweets
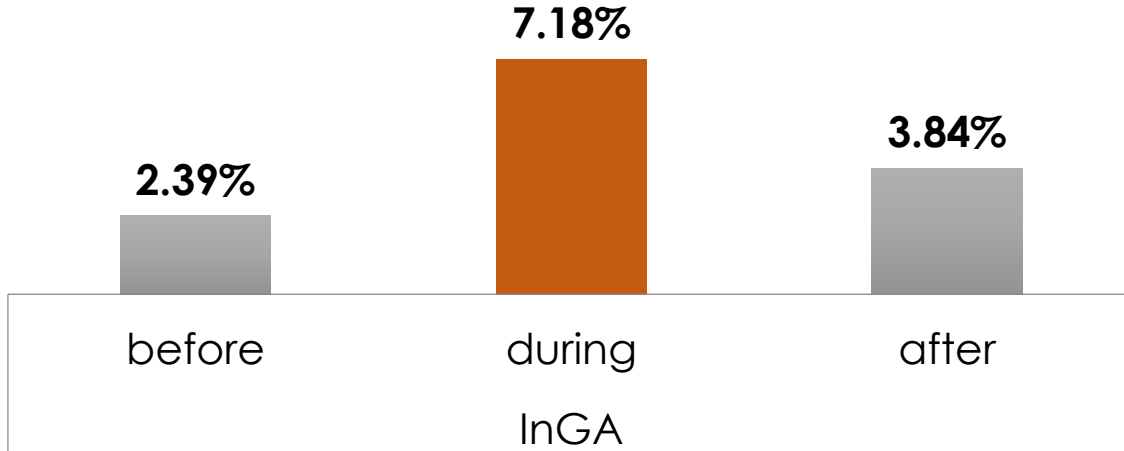
People **appreciated the importance of public transportation** in Atlanta and several tweets indicate that people used Marta for commuting. More use was reported by riders from North (Sandy Spring, Brookhaven).

Marta ridership that increased during the I-85 collapse period **did not last**.

Bike ridership increased during the I-85 collapse period although results are not statistically significant

Change in the average number of riders boarding stations on weekdays during March 31 – April 29 (after the collapse) is compared to the average number of riders during weekdays March 24-31 (before the collapse). Ridership for the stations in the North of Atlanta **increased up to 67%** – ARC's finding

Policy Implications

The findings emphasize the **necessity of alternative transportation infrastructure** to efficiently reroute traffic both local and from other areas going through Atlanta when a major interstate is dysfunctional.

The conversation about use of MARTA and biking is limited to the central areas in Atlanta. **Increasing MARTA's reach** is the key.

Bike paths and street design conducive to safe biking is a necessity to deal with travel disruptions

Benefits of using Social media

Social media analysis allows planners and policy makers to gauge people's experience during crisis. **Reduce cost and time for analysis**

The analysis captures specific nuances such as **people's perception** and **preference** during a crisis incident. This is often overlooked when dealing with only traffic data.

Most findings matched with the results available from traffic data . As such social media can be considered a reliable source of data when used as an alternative to enrich the finding of a crisis event.