Exploring spatiotemporal patterns in hurricane evacuation using crowdsourced location updates

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Mapbox
We build tools that make it easy for app developers to embed location-based services into their apps.
Floridians jam highways to flee wrath of Hurricane Irma

By Ralph Ellis and Eric Levenson, CNN
Updated 1:31 PM ET, Fri September 8, 2017

Florida Gov. Rick Scott tells residents:
'You need to go right now'

By Ralph Ellis, Joe Sterling and Dakin Andone, CNN
Updated 4:17 PM ET, Sat September 9, 2017
Questions

• *When* do people evacuate from hurricanes?
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• What **routes** do people use during evacuation?
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• **When** do people evacuate from hurricanes?
• What **routes** do people use during evacuation?
• Are the **similarities** among different storm events?
10 billion location updates per day
Location Update
Location Update -> Aggregation
Location Update → Aggregation → Anonymization → Post Processing → Speed

Post Processing → Volume
Live and historical traffic
Mapbox Location Data Coverage

44 countries
Bias

• Representation bias for a smartphone-based dataset
Bias

- Analysis is done in San Francisco
before landfall

12 hours before landfall
Regional aggregated traffic volumes for three 2018 Atlantic Storm events.

Aggregated to 2.8x2.8 degree grid
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Observation I: Many people evacuate after work hours.
What routes are used during evacuation?
What routes are used during evacuation?

Houston
San Antonio
Corpus Christi

Interstate 37
5pm
August 24th

Evacuation
Fraction of change in volumes on various road categories during evacuation of Hurricane Harvey.
Fraction of change in volumes on various road categories during evacuation of Hurricane Harvey.

Observation II: Lower capacity roads experience large increases in volume.
Hurricane Irma
South Florida, 2017

Difference from Baseline

Road Classification

Motorway
Primary
Residential
Secondary
Tertiary
Trunk
Implications for the real world

• Encourage employers to let employees leave work when a hurricane is approaching.
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• Plan for increased traffic on low-capacity roads.
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Project Future

• Gather more data
  • Location data is consistent across time and space
• Build a model to predict which roads will be most congested and when.
• Communicate results with federal and local agencies
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