Geofence and Location Data Flaws

Case Study: Leveraging wireless signal information to address location data inaccuracy and inconsistency.

Qualifying Location (In)Accuracy

Mobile marketers need reliable location data. Yet each real-world location presents challenges – poor cell service, urban canyoning, density, or traffic patterns – that impact collection and data quality.

As a result, it is common practice to assess and clean commercially acquired data. But even within the same dataset, quality varies across each individual location, making bulk error normalization inadequate.

This case study uses SignalFrame’s signal-based location verification to measure error variability in commercially available lat/lon data for 36 steakhouses around Houston, TX.

Using WiFi to Address Location Inaccuracies

SignalFrame gathers WiFi signals around a mobile device to determine which network routers are in its immediate proximity (regardless of whether the device is connected to a specific WiFi network).

Commercial businesses tend to have WiFi detectable within 50 to 150 feet, so a phone that picks up a steakhouse signal is most likely located at the restaurant.

Blue dots: Phones reporting steakhouse WiFi
Red crosses: Phones not reporting steakhouse WiFi
(Demonstrative only.)
Verified Polygon Visits

For polygons created around LongHorn, Outback, and Saltgrass steakhouses, commercial location-only data suggested an average of 1,593 visits per location.

Each visit was then analyzed by focusing on the WiFi signals around mobile devices as they broke a restaurant’s geofence. For devices inside the geofence that detected WiFi signals tied to that restaurant (e.g., "Outback Steakhouse Free WiFi"), the visit was considered verified. Only about half of the visits reported within the geofence were actually verified.

False Positives

The actual geolocations of the remaining 48.1% of phones that were reported in the polygon but did not detect a steakhouse WiFi signal were determined by focusing on the other signals those devices did see.

For example, devices that reported locations within the Saltgrass geofence but did not detect the restaurant’s WiFi network ("Saltgrass steakhouse") were visitors to other nearby businesses or just passing by. Those that detected "El Tiempo Guest" WiFi were at a Mexican restaurant. "Guest - Mazda of Clear Lake" and "Employee-Mazda of Clear Lake" are networks detected at a Mazda dealership a third of a mile away, and the networks "511-Devices" and "511-Retail" belong to a retail store even further away.
False Negatives

False positives (locations inaccurately reported as inside steakhouses) suggest the possibility of false negatives. These would be phones that did not report a lat/lon within a steakhouse polygon, but were in the presence of a steakhouse WiFi router.

In fact, WiFi detections from mobile devices around the Houston area in the same timeframe revealed an average of 458 additional visits to each steakhouse. So nearly a third of total steakhouse visits were not captured by location data.

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Findings: Each steakhouse is different

Effectively, the likelihood that a SignalFrame-verified visit matched a location-only datapoint varied significantly from steakhouse to steakhouse. The results highlight inconsistencies in location data quality and reliability — by location.

SH-1 is the Longhorn Steakhouse at 26805 I-45, TX
SH-2 is the Longhorn at 2809 Business Center Dr, TX
SH-3 is the Outback Steakhouse at 7070 Hwy 6 N, TX

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