Big Data for Better Trails

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What is Strava?

The social network for cyclists and runners.
The Heart of Strava: Community
Just use the heatmap?

Not so fast!

- No temporal scale
- Point Saturation not Use Saturation
- Large cropping of ride start and ends
- Mix of ride types

What is it good for?

- Showing that people ride bikes
- Starting dialogues with city councils
- Keeping track of where you rode this year
- Editing your basemap / finding missing geometry
What is Strava Metro?

Data-Driven Bike and Pedestrian Planning

Aggregated, anonymized activity data from millions of Strava’s users

Analyze popular or avoided routes, peak commute times, intersection crossing times, and origin/destination zones

Processed for compatibility with geographic information system (GIS) environments
How Do We Protect Users’ Privacy?

User privacy as the foremost concern

- Focused on streets and trails, not individuals
- No way to bring a Metro record back to Strava
- Opt out switches on Strava (less than 0.01%)
Big Data
Strava By The Numbers

- Over 13 million activities uploaded per week
- Tens of Millions of Active Users
- Almost 20 activities uploaded every second
- 5 Trillion+ second-by-second GPS points globally
Key Best Practices When Working with Big Data
Things to keep in mind when working with Metro

- Isolate what you are looking for
- Work in percents
- Point out the bias in the data
- Look out for population back holes
- Use local knowledge to sanity check it
- Blend it with existing data sets
As a custom built product it’s designed to be merged with local datasets: trails counters, tourism surveys, crash points, proposed bike paths, etc.
Strava Metro Data

**Streets**

Minute-by-minute counts across your entire network

**Origin / Destination**

Understand activity starting and ending points, by region

**Intersections**

Activity counts and wait times at every intersection
Street Level Data

- Minute by minute tabular data of cycling behavior
- Preferred route direction
- Unique bike trips
- Unique user counts
- Trip purpose: commute and recreation
- Time/Speed (seconds)
Origin/Destination Polygons

- Polygonal starting and ending points of trips
- Reported by the minute
- Trip purpose flag
- Array of intersected polygon IDs
Intersections

- Crossing times at intersection
- Congregation of users at intersections
- Minute by minute with purpose flag
Slaughter Pen Phase 1 & 2
2016 Strava Numbers

- 2,171 Unique Cyclists
- 11,245 MTB Trips
- Unique Counties: 245
- Unique Countries: 10
Slaughter Pen Extrapolation

Bike counter records 2,347 bike trips in Aug. 2016

<table>
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<tr>
<th>Strava Aug 2016 Bike Trips</th>
<th>Bike Counter</th>
<th>% Penetration</th>
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Slaughter Pen Extrapolated

- Bike Trips: 32,824
- Trips Per Unique Users: 4.2
- Unique Users: 7,741
- Total Miles in the last year: 333,535 miles (13.4 trips around the earth...)
- Total Time Spent in the last 12 months: 41,860 hours
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MTBing Networks Connecting US - Over 660,121 Miles Traveled

Statistical Jump... Take the multiplier of 9.1 and now apply it to traveled distance:

6+ Million Miles
Top 25 Counties Using Slaughter Pen in 2016

USA, ARKANSAS, BENTON COUNTY, 1411
USA, ARKANSAS, WASHINGTON COUNTY, 291
USA, OKLAHOMA, TULSA COUNTY, 97
USA, ARKANSAS, SEBASTIAN COUNTY, 77
USA, ARKANSAS, PULASKI COUNTY, 73
USA, MISSOURI, ST. LOUIS COUNTY, 66
USA, MISSOURI, GREENE COUNTY, 60
USA, TEXAS, TRAVIS COUNTY, 58
USA, MISSOURI, STONE COUNTY, 55
USA, MISSOURI, JACKSON COUNTY, 42
USA, KANSAS, JOHNSON COUNTY, 41
USA, TEXAS, TARRANT COUNTY, 36
USA, OKLAHOMA, OKLAHOMA COUNTY, 31
USA, MISSOURI, JASPER COUNTY, 29
USA, ARKANSAS, FAULKNER COUNTY, 26
USA, MINNESOTA, HENNEPIN COUNTY, 25
USA, TEXAS, HARRIS COUNTY, 25
USA, TEXAS, DALLAS COUNTY, 24
USA, TEXAS, COLLIN COUNTY, 23
USA, MISSOURI, ST. LOUIS CITY, 21
USA, MISSOURI, ST. CHARLES COUNTY, 21
USA, TEXAS, DENTON COUNTY, 20
USA, COLORADO, JEFFERSON COUNTY, 19
USA, COLORADO, BOULDER COUNTY, 18
USA, MINNESOTA, CROW WING COUNTY, 16
Bentonville Post IMBA Event View

Metro Demographics

- Athlete ID Count: 753
- Activity Count: 1,481
- Average Distance: 22,496 (in meters)
- Median Distance: 17,736 (in meters)
- Average Time: 7,480 (in seconds)
- Median Time: 6,140 (in seconds)
- Male Count: 606
- Female Count: 115
Bentonville Post IMBA Event View - Core Trails Used
Kingdom Trails Usage Map via Strava Data

This map shows total use and popularity of the trails in the KT network. The network is built up to be fully routeable using GIS/Mapping tools. The network generated from raw GPS points and is accurate to around 5 meters. Around 30 million GPS points were used to build the heat that includes data from over 7,000 rides and 2,000 unique athletes.

Legend
- VT_Waterlines
- Strava Trail Use

0 0.4 0.8 1.6 Miles
High Level Network Polygon Analysis

Statistical Jump... Take the multiplier of 9.1 and now apply it to traveled distance: 6+ Million Miles
The Power of the Clean Polygon
The Power of the Clean Polygon - Cont
Using the Wrong Polygon Provides Incorrect Results

Strava users: 208
Bike Trips: 1,274
Sum Length = 38,152 miles
Sum Time = 4,619 hours
Managing Networks at the High Level
## Low Hanging Fruit and Quick Insights on a System

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Using Unique User Counts to Locate Primary Trails
Using Diversity to Locate Core Trails
Using Digitization Direction and Time to Locate Trail Flow
Using Intersections to Locate Education Spots
Strava Metro is changing the way the trail managers and groups look at data and makes investments.
Questions?