Utilizing BIG DATA in the Transportation Planning Process

Georgia Planning Association – Fall Conference
Jekyll Island, Georgia

September 5, 2018
Introduction

» Presenting Today

Steve Cote
Rachel Hatcher
Kai Zuehlke

Grant Sparks
Session Agenda

» Introduction
» BIG DATA Overview
» O&D Applications
  – Vehicular / Auto
  – Transit
  – Others
» Other BIG Data Types
» Q&A
BIG DATA in Transportation

Overview

So… Experts

SAY THREE QUINTILLION BYTES OF DATA ARE CREATED EVERY DAY.

IT COMES FROM EVERYWHERE. IT KNOWS ALL.

ACCORDING TO THE BOOK OF WIKIPEDIA, ITS NAME IS “BIG DATA.”

BIG DATA LIVES IN THE CLOUD. IT KNOWS WHAT WE DO.
BIG DATA in Transportation

» Technology Changes = Opportunities
» Many Applications in Transportation Planning
» Volume of Data is Not Critical, but **HOW IT USED** is!
Utilizing BIG DATA in the Transportation Planning Process

**Transportation Context**

» Origin and Destination (O&D)
  – Locations
  – Traveler / Trip Information

» Travel Performance
  – Travel Time, Speed & Reliability

» Transportation Systems Management and Operations (TSMO)
  – Coordinated Incident Response
  – Traveler Information Services
Supplementing Traditional Methods

- Validate Existing Conditions
- Visualize Real-Time
  - Operations
  - Congestion
- Other?
  - Evacuation Planning
### Evolving Methods

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Yesterday</th>
<th>Today</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Origin and Destination</strong></td>
<td>License Plate Recognition</td>
<td>• Vehicular Navigation Systems</td>
</tr>
<tr>
<td></td>
<td>Roadside, Paper and/or Online Surveys</td>
<td>• Smart Phone and Tablet Apps</td>
</tr>
<tr>
<td><strong>Travel Time and Speeds</strong></td>
<td>Floating Car Studies</td>
<td><strong>O&amp;D</strong></td>
</tr>
<tr>
<td></td>
<td>Radar Studies</td>
<td>• 15–25% of adults(^1)</td>
</tr>
<tr>
<td></td>
<td>Up to 1% (if we were lucky)</td>
<td>• 1-3% vehicles(^2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 10-12% trucks</td>
</tr>
<tr>
<td><strong>Capture Rates</strong></td>
<td>Up to 1% (if we were lucky)</td>
<td><strong>Congestion</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 100%</td>
</tr>
</tbody>
</table>

\(^1\) Location-Based Services (LBS)  
\(^2\) Global Positioning System (GPS)
Sample List of Sources / Vendors

**Performance Data Sources**

- TomTom
- ATRI
- StreetLight
- INRIX*
- HERE*
- AirSage

*National Performance Research Data Set (NPMRDS)
Sample List of Sources / Vendors

O&D Data Sources

- TomTom
- ATRI
- StreetLight
- HERE*
- INRIX*
- AirSage

*National Performance Research Data Set (NPMRDS)
Utilizing O&D Data
Technology Sources

**GPS Vehicular Data**

(1) Data Point

**Location-Based-Service (LBS) Data**

Multiple Data Points
Data Types

**Locational**
- GPS Vehicular Data
- Location-Based-Service (LBS) Data

**Contextual**
- US Census
- Local Parcel-level
- Road Network

**INTRODUCTION**
- BIG DATA OVERVIEW
- VEHICULAR PLANNING
- TRANSIT PLANNING
- OTHER APPLICATIONS
- Q&A
Analysis Type 1: 
**O&D Matrix Development**

» Between Locations
  - Volumes
  - Travel Times
  - Personal vs. Commercial trips

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>51</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>0</td>
<td>86</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>84</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>D</td>
<td>59</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>E</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>27</td>
<td>0</td>
</tr>
</tbody>
</table>
Analysis Type 2: *O&D with Destination “Pass-Through”*

- Volumes
- Travel Times
- Example
  - Assess trips from zone 1 to zone 12 passing through **Gate A**
Analysis Type 3: O&D with Zonal Analysis

» Volumes or
» Travel Times
  1) Originate in
  2) Destined for, or
  3) Pass through

» Example
  – Assess trips associated with Zone 3
Example

Step 1a  
*Develop Gates*

» Gates

- Similar to Laying “Traffic Tubes”
- Generally Correspond to Roadway
- Accuracy: **5 m (16 ft)**
- Bi-directional data available
Example

Step 1b

**Developing Zones**

» Zone Development

– Zones Depend Upon Specific Analysis
  • Small such as a parcel
  • Large: County, City, Census Block Group, Block, etc...

– Data Accuracy **5m (16 ft)**
Example

Steps 2 & 3

Analysis and Results

» Run Analyses

» Download Data Analyze Data
  – .CSV files

» Develop O&D Matrices
  – Excel
  – Pivot Tables

» Present Results
  – Graphically
  – Tabular Format
BIG DATA for

Vehicular Planning
Analysis Criteria Options

» Vehicular Trip Attributes
  – Trip duration
  – Trip length
  – Trip speed
  – Trip circuity

» Truck and Freight Classifications
  – Heavy Duty (>26,000 lbs) vs.
  – Medium Duty (14,000 – 26,000 lbs)

» Vendor Results from presented as Indices
  – Separate for Auto / truck trips

» Compare Against AADTs / Daily Volumes
PCIDs Case Study

» Major Atlanta Activity/Employment Center
» Self-Taxing Business District
» Three (3) MARTA Heavy Rail Stations
Study Purpose

O&D Analysis for CIDs

- Analyze Existing Trip O&Ds for AM and PM Peak Periods using StreetLight Data
- Better Understand Travel Patterns
- Several Ongoing Major GDOT Investment Projects
O&D Data

Technical Specifics

» Data Coverage:
   – January 2017 – December 2017

» Data Type:
   – GPS Navigation Data

» Periods Analyzed
   – Peak AM (6am-10am)
   – Peak PM (3pm-7pm)

» Focus Areas
   – Personal Vehicle Travel
   – Average Weekday
   – AM Peak Inbound
   – PM Peak Outbound

» Utilized GDOT Traffic Counts to Estimate Trips

Zone I – Concourse (King and Queen Buildings);
includes Westin Hotel and Remaining Office Campus
Utilizing BIG DATA in the Transportation Planning Process

### Zone Development

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Glenlake</td>
</tr>
<tr>
<td>B</td>
<td>North</td>
</tr>
<tr>
<td>C</td>
<td>Perimeter Place</td>
</tr>
<tr>
<td>D</td>
<td>East</td>
</tr>
<tr>
<td>E</td>
<td>Perimeter Mall</td>
</tr>
<tr>
<td>F</td>
<td>Central</td>
</tr>
<tr>
<td>G</td>
<td>Barfield</td>
</tr>
<tr>
<td>H</td>
<td>North Glenridge</td>
</tr>
<tr>
<td>I</td>
<td>Concourse</td>
</tr>
<tr>
<td>J</td>
<td>South Dunwoody</td>
</tr>
<tr>
<td>K</td>
<td>Lake Hearn</td>
</tr>
<tr>
<td>L</td>
<td>St Joseph’s Hospital</td>
</tr>
<tr>
<td>M</td>
<td>Northside Hospital</td>
</tr>
<tr>
<td>N</td>
<td>Children’s Hospital</td>
</tr>
<tr>
<td>O</td>
<td>South Glenridge</td>
</tr>
<tr>
<td>P</td>
<td>West Glenridge</td>
</tr>
</tbody>
</table>

Source: StreetLight Data (Jan-Dec 2017)
Gate Development

<table>
<thead>
<tr>
<th>Gate Number</th>
<th>Gate Description</th>
<th>Outbound Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>G51</td>
<td>Peachtree Dunwoody Rd (North)</td>
<td>NB</td>
</tr>
<tr>
<td>G52</td>
<td>Mount Vernon Hwy (East)</td>
<td>EB</td>
</tr>
<tr>
<td>G53</td>
<td>Ashford Dunwoody Rd (North)</td>
<td>NB</td>
</tr>
<tr>
<td>G54</td>
<td>Ashford Center Pkwy</td>
<td>EB</td>
</tr>
<tr>
<td>G55</td>
<td>Valley View Rd</td>
<td>EB</td>
</tr>
<tr>
<td>G56</td>
<td>I-285 EB On-Ramp at Ashford Dunwoody Rd</td>
<td>EB</td>
</tr>
<tr>
<td>G57</td>
<td>I-285 WB On-Ramp at Ashford Dunwoody Rd</td>
<td>WB</td>
</tr>
<tr>
<td>G58</td>
<td>Ashford Dunwoody Rd (South)</td>
<td>SB</td>
</tr>
<tr>
<td>G59</td>
<td>Old Johnson Ferry Rd</td>
<td>SB</td>
</tr>
<tr>
<td>G60</td>
<td>Johnson Ferry Rd</td>
<td>SB</td>
</tr>
<tr>
<td>G61</td>
<td>Peachtree Dunwoody Rd (South)</td>
<td>SB</td>
</tr>
<tr>
<td>G62</td>
<td>GA 400 SB On-Ramp at Glenridge Connector</td>
<td>SB</td>
</tr>
<tr>
<td>G63</td>
<td>High Point Rd</td>
<td>SB</td>
</tr>
<tr>
<td>G64</td>
<td>Glenridge Dr (South)</td>
<td>WB</td>
</tr>
<tr>
<td>G65</td>
<td>I-285 WB On-Ramp at Glenridge Dr/Connector</td>
<td>WB</td>
</tr>
<tr>
<td>G66</td>
<td>Glenforest Rd</td>
<td>WB</td>
</tr>
<tr>
<td>G67</td>
<td>Glenridge Dr (Central)</td>
<td>NB</td>
</tr>
<tr>
<td>G68</td>
<td>Hammond Dr</td>
<td>WB</td>
</tr>
<tr>
<td>G69</td>
<td>Mount Vernon Hwy (West)</td>
<td>WB</td>
</tr>
<tr>
<td>G70</td>
<td>GA 400 SB On-Ramp at Abernathy Rd</td>
<td>SB</td>
</tr>
<tr>
<td>G71</td>
<td>GA 400 NB On-Ramp at Abernathy Rd</td>
<td>NB</td>
</tr>
<tr>
<td>G72</td>
<td>Abernathy Rd</td>
<td>WB</td>
</tr>
<tr>
<td>G73</td>
<td>Glenridge Dr (North)</td>
<td>NB</td>
</tr>
<tr>
<td>G74</td>
<td>GA 400 NB On-Ramp at Hammond Dr</td>
<td>NB</td>
</tr>
<tr>
<td>G75</td>
<td>I-285 EB On-Ramp at Peachtree Dunwoody Rd</td>
<td>EB</td>
</tr>
<tr>
<td>G76</td>
<td>GA 400 NB On-Ramp at Glenridge Connector</td>
<td>NB</td>
</tr>
<tr>
<td>G78</td>
<td>Glenridge Dr (South of Abernathy)</td>
<td>SB</td>
</tr>
</tbody>
</table>
## Development of O&D Matrices

<table>
<thead>
<tr>
<th>Gate</th>
<th>Gate Description</th>
<th>Inbound Direction</th>
<th>Glenlake</th>
<th>North</th>
<th>Perimeter Place</th>
<th>East</th>
<th>Perimeter Mall</th>
<th>Central</th>
<th>Barfield</th>
<th>North Glenridge</th>
<th>South Dunwoody</th>
<th>Concours e</th>
<th>South Dunwoody</th>
<th>St Joseph’s Hospital</th>
<th>Northside Hospital</th>
<th>Children’s Hospital</th>
<th>South Glenridge</th>
<th>West Glenridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>Peachtree Dunwoody Rd (North)</td>
<td>SB</td>
<td>0%</td>
<td>8%</td>
<td>0%</td>
<td>1%</td>
<td>2%</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>G2</td>
<td>Mount Vernon Hwy (East)</td>
<td>WB</td>
<td>2%</td>
<td>19%</td>
<td>1%</td>
<td>0%</td>
<td>4%</td>
<td>8%</td>
<td>8%</td>
<td>6%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>G3</td>
<td>Ashford Dunwoody Rd (North)</td>
<td>SB</td>
<td>0%</td>
<td>0%</td>
<td>26%</td>
<td>10%</td>
<td>9%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>4%</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>G4</td>
<td>Ashford Center Plwy</td>
<td>WB</td>
<td>2%</td>
<td>0%</td>
<td>11%</td>
<td>4%</td>
<td>4%</td>
<td>2%</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G5</td>
<td>Valley View Rd</td>
<td>WB</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G6</td>
<td>I-285 WB Off-Ramp at Ashford Dunwoody Rd</td>
<td>WB</td>
<td>2%</td>
<td>4%</td>
<td>10%</td>
<td>23%</td>
<td>14%</td>
<td>14%</td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
<td>17%</td>
<td>22%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>G7</td>
<td>I-285 EB Off-Ramp at Ashford Dunwoody Rd</td>
<td>EB</td>
<td>0%</td>
<td>1%</td>
<td>15%</td>
<td>30%</td>
<td>11%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>27%</td>
<td>32%</td>
<td>1%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G8</td>
<td>Ashford Dunwoody Rd (South)</td>
<td>NB</td>
<td>2%</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G9</td>
<td>Old Johnson Ferry Rd</td>
<td>NB</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G10</td>
<td>Johnson Ferry Rd</td>
<td>NB</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>3%</td>
<td>5%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G11</td>
<td>Peachtree Dunwoody Rd (South)</td>
<td>NB</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
<td>3%</td>
<td>4%</td>
<td>1%</td>
<td>7%</td>
<td>10%</td>
<td>12%</td>
<td>2%</td>
<td>10%</td>
<td>6%</td>
<td>12%</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>G12</td>
<td>GA 400 NB Off-Ramp at Glenridge Connector</td>
<td>NB</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>3%</td>
<td>10%</td>
<td>10%</td>
<td>2%</td>
<td>6%</td>
<td>15%</td>
<td>11%</td>
<td>12%</td>
<td>18%</td>
</tr>
<tr>
<td>G13</td>
<td>High Point Rd</td>
<td>NB</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>G14</td>
<td>Glenridge Dr (South)</td>
<td>EB</td>
<td>0%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>5%</td>
<td>10%</td>
<td>15%</td>
<td>12%</td>
</tr>
<tr>
<td>G15</td>
<td>I-285 EB Off-Ramp at Glenridge Dr/Connector</td>
<td>EB</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
<td>6%</td>
<td>7%</td>
<td>4%</td>
<td>0%</td>
<td>1%</td>
<td>9%</td>
<td>14%</td>
<td>11%</td>
<td>7%</td>
</tr>
<tr>
<td>G16</td>
<td>Glenforest Rd</td>
<td>EB</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G17</td>
<td>Glenridge Dr (Central)</td>
<td>SB</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G18</td>
<td>Hammond Dr</td>
<td>EB</td>
<td>1%</td>
<td>1%</td>
<td>3%</td>
<td>4%</td>
<td>6%</td>
<td>10%</td>
<td>16%</td>
<td>13%</td>
<td>19%</td>
<td>10%</td>
<td>4%</td>
<td>4%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G19</td>
<td>Mount Vernon Hwy (West)</td>
<td>EB</td>
<td>2%</td>
<td>6%</td>
<td>5%</td>
<td>1%</td>
<td>3%</td>
<td>6%</td>
<td>6%</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G20</td>
<td>GA 400 NB Off-Ramp at Abernathy Rd EB</td>
<td>NB</td>
<td>5%</td>
<td>20%</td>
<td>7%</td>
<td>1%</td>
<td>10%</td>
<td>10%</td>
<td>5%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G21</td>
<td>GA 400 SB Off-Ramp at Abernathy Rd</td>
<td>SB</td>
<td>20%</td>
<td>17%</td>
<td>7%</td>
<td>4%</td>
<td>12%</td>
<td>23%</td>
<td>4%</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G22</td>
<td>Abernathy Rd</td>
<td>EB</td>
<td>11%</td>
<td>13%</td>
<td>2%</td>
<td>6%</td>
<td>9%</td>
<td>8%</td>
<td>24%</td>
<td>2%</td>
<td>5%</td>
<td>2%</td>
<td>2%</td>
<td>4%</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>G23</td>
<td>Glenridge Dr (North)</td>
<td>SB</td>
<td>20%</td>
<td>20%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G24</td>
<td>GA 400 SB Off-Ramp at Hammond Dr</td>
<td>SB</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>G25</td>
<td>I-285 WB Off-Ramp at Peachtree Dunwoody Rd</td>
<td>WB</td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>5%</td>
<td>3%</td>
<td>5%</td>
<td>15%</td>
<td>0%</td>
<td>0%</td>
<td>16%</td>
<td>13%</td>
<td>10%</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>G26</td>
<td>GA 400 SB Off-Ramp at Glenridge Connector</td>
<td>NB</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>5%</td>
<td>10%</td>
<td>21%</td>
<td>12%</td>
</tr>
<tr>
<td>G27</td>
<td>GA 400 NB Off-Ramp at Abernathy Rd WB</td>
<td>NB</td>
<td>17%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>G28</td>
<td>Glenridge Dr (North of Abernathy)</td>
<td>NB</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

| Zone | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
|------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sum  | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

INTRODUCTION

BIG DATA OVERVIEW

VEHICULAR PLANNING

TRANSIT PLANNING

OTHER APPLICATIONS

Q&A
Utilizing BIG DATA in the Transportation Planning Process

**Results**

**Origins by Zone**

**PM Outbound Trips from Zones**

- **F**: Central
- **D**: East
- **I**: Concourse
- **B**: North
- **E**: Perimeter Mall
- **C**: Perimeter Place
- **A**: Glenlake
- **L**: St Joseph’s Hospital
- **K**: Lake Hearn
- **M**: Northside Hospital
- **O**: South Glenridge
- **N**: Children’s Hospital
- **P**: West Glenridge
- **G**: Barfield
- **J**: South Dunwoody
- **H**: North Glenridge

<table>
<thead>
<tr>
<th>Zone</th>
<th>Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>28,000</td>
</tr>
<tr>
<td>D</td>
<td>20,000</td>
</tr>
<tr>
<td>I</td>
<td>15,000</td>
</tr>
<tr>
<td>B</td>
<td>12,000</td>
</tr>
<tr>
<td>E</td>
<td>12,000</td>
</tr>
<tr>
<td>C</td>
<td>12,000</td>
</tr>
<tr>
<td>A</td>
<td>12,000</td>
</tr>
<tr>
<td>L</td>
<td>10,000</td>
</tr>
<tr>
<td>K</td>
<td>10,000</td>
</tr>
<tr>
<td>M</td>
<td>10,000</td>
</tr>
<tr>
<td>O</td>
<td>10,000</td>
</tr>
<tr>
<td>N</td>
<td>10,000</td>
</tr>
<tr>
<td>P</td>
<td>10,000</td>
</tr>
<tr>
<td>G</td>
<td>10,000</td>
</tr>
<tr>
<td>J</td>
<td>10,000</td>
</tr>
<tr>
<td>H</td>
<td>10,000</td>
</tr>
</tbody>
</table>

**PM Peak Outbound Trips from Zones**

---

**Source:** StreetLight Data (Jan-Dec 2017)
Results

PM Trips By Gate

PM Outbound Trips through Gates

G71: GA 400 NB On-Ramp at Abernathy Rd
G62: GA 400 SB On-Ramp at Glenridge Connector
G72: Abernathy Rd WB
G70: GA 400 SB On-Ramp at Abernathy Rd
G74: GA 400 NB On-Ramp at Hammond Dr
G53: Ashford Dunwoody Rd (North) NB
G61: Peachtree Dunwoody Rd (South) SB
G69: Mount Vernon Hwy (West) WB
G64: Glenridge Dr (South) WB
G52: Mount Vernon Hwy (East) EB
G58: Ashford Dunwoody Rd (South) SB
G75: I-285 EB On-Ramp at Peachtree... G65: I-285 WB On-Ramp at Glenridge...
G68: Hammond Dr WB
G60: Johnson Ferry Rd SB
G67: Glenridge Dr (Central) NB
G51: Peachtree Dunwoody Rd (North) NB
G54: Ashford Center Pkwy EB
G76: GA 400 NB On-Ramp at Glenridge...
G63: High Point Rd SB
G73: Glenridge Dr (North) NB
G55: Valley View Rd EB
G59: Old Johnson Ferry Rd SB
G78: Glenridge Dr (South of Abernathy) SB
G66: Glenforest Rd WB
54% of the trips on the GA 400 southbound off-ramp at Abernathy Road are destined for the Central Perimeter... specifically Zone F
Results
Trip Routes to Destination

» What are the primary routes used in the AM Peak period for trips destined to the Central Perimeter Zone F
  – 23%: GA 400 SB at Abernathy Road
  – 3%: GA 400 SB at Hammond Drive
Study Purpose
Gainesville, GA Case Study

» Excessive Congestion
» Rapid Development
» Benefit of New Connections
O&D Analysis
Zone and Gate Development

» Three (3) Gates
» Zones Specific to Development
## Develop O&D Matrices

<table>
<thead>
<tr>
<th>Location</th>
<th>Days of Week</th>
<th>Direction</th>
<th>Time Period</th>
<th>Personal</th>
<th></th>
<th>Commercial</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>Core Com.</td>
</tr>
<tr>
<td>A:</td>
<td>Weekday</td>
<td>Southbound</td>
<td>All Day (12am-12am)</td>
<td>59%</td>
<td>20%</td>
<td>12%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Southbound</td>
<td>Peak AM (6am-10am)</td>
<td>70%</td>
<td>17%</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Southbound</td>
<td>Mid-Day (10am-3pm)</td>
<td>53%</td>
<td>22%</td>
<td>16%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Southbound</td>
<td>Peak PM (3 pm-7pm)</td>
<td>52%</td>
<td>24%</td>
<td>14%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Northbound</td>
<td>All Day (12am-12am)</td>
<td>45%</td>
<td>22%</td>
<td>21%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Northbound</td>
<td>Peak AM (6am-10am)</td>
<td>56%</td>
<td>24%</td>
<td>8%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Northbound</td>
<td>Mid-Day (10am-3pm)</td>
<td>44%</td>
<td>20%</td>
<td>24%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Northbound</td>
<td>Peak PM (3 pm-7pm)</td>
<td>44%</td>
<td>23%</td>
<td>21%</td>
<td>7%</td>
</tr>
<tr>
<td>B:</td>
<td>Weekday</td>
<td>Southbound</td>
<td>All Day (12am-12am)</td>
<td>40%</td>
<td>13%</td>
<td>38%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Southbound</td>
<td>Peak AM (6am-10am)</td>
<td>44%</td>
<td>20%</td>
<td>26%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Southbound</td>
<td>Mid-Day (10am-3pm)</td>
<td>30%</td>
<td>13%</td>
<td>48%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Southbound</td>
<td>Peak PM (3 pm-7pm)</td>
<td>33%</td>
<td>13%</td>
<td>44%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Northbound</td>
<td>All Day (12am-12am)</td>
<td>44%</td>
<td>12%</td>
<td>33%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Northbound</td>
<td>Peak AM (6am-10am)</td>
<td>69%</td>
<td>13%</td>
<td>11%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Northbound</td>
<td>Mid-Day (10am-3pm)</td>
<td>35%</td>
<td>11%</td>
<td>42%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Northbound</td>
<td>Peak PM (3 pm-7pm)</td>
<td>51%</td>
<td>11%</td>
<td>28%</td>
<td>1%</td>
</tr>
<tr>
<td>C:</td>
<td>Weekday</td>
<td>Westbound</td>
<td>All Day (12am-12am)</td>
<td>32%</td>
<td>21%</td>
<td>37%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Westbound</td>
<td>Peak AM (6am-10am)</td>
<td>25%</td>
<td>58%</td>
<td>11%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Westbound</td>
<td>Mid-Day (10am-3pm)</td>
<td>30%</td>
<td>20%</td>
<td>39%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Westbound</td>
<td>Peak PM (3 pm-7pm)</td>
<td>28%</td>
<td>20%</td>
<td>42%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Eastbound</td>
<td>All Day (12am-12am)</td>
<td>33%</td>
<td>28%</td>
<td>28%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Eastbound</td>
<td>Peak AM (6am-10am)</td>
<td>24%</td>
<td>43%</td>
<td>21%</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Eastbound</td>
<td>Mid-Day (10am-3pm)</td>
<td>29%</td>
<td>24%</td>
<td>33%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>Weekday</td>
<td>Eastbound</td>
<td>Peak PM (3 pm-7pm)</td>
<td>44%</td>
<td>22%</td>
<td>25%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Weekday Dawsonville Highway
Personal and Commerical Trips

- A
- B
- C

Personal AM
69%

Commercial AM
79%

Weekday McEver Road (C) - Dawsonville Highway South (B)
Personal and Commerical Trips

- A
- B
- C

Personal All Day
21-28%

Commercial All Day
15-19%
## Results

### Weekday Personal Vehicle Trips

<table>
<thead>
<tr>
<th>Road</th>
<th>Category</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dawsonville Highway</td>
<td>Southbound commuters</td>
<td>70% of AM trips travel south from (A) to (B)</td>
</tr>
<tr>
<td></td>
<td>Northbound commuters</td>
<td>69% of AM trips travel north from (B) to (A)</td>
</tr>
<tr>
<td>McEver Road</td>
<td>Traveling to Dawsonville Highway north</td>
<td>33% of all-day trips between (C) and (A)</td>
</tr>
</tbody>
</table>

![AM trips flow](image1.png)
![AM trips flow](image2.png)
![All Day flow](image3.png)
Results

» O&D Results Informed Future Traffic Forecast

» Calculation of Benefits for New Connection
BIG DATA

for Transit Planning
Utilizing BIG DATA in the Transportation Planning Process

BIG DATA for Transit Planning

» Big Data and Transit
  - Origin/Destination
    • Cumulative from / to all zones
    • Passing through areas / zones
    • Specific from / to select zones
  - Trip purpose
    • (Home-based, work-based, combinations etc)
    • Simple Trip purpose (Residential-based, Commercial-based)
    • Other-based combinations
  - Global view of network performance
    • Congestion / Delay
    • Speed
Transit Planning

**Traveler Information**

» Traveler Attribute Data
  - Demographics of Travelers
    • Household income
    • Race
    • Education level of head of household
    • Family status
  - Local Distribution of Home and Work Places
  - Regional / National Distribution of Tourists
    • Out of town visitors
    • Origin Locations of visitors (state and/or MSA)
Case Study
Chatham Area Transit (CAT)

» Background
– Oldest Transit System in Georgia
– 2nd Largest Transit Authority in the State

» System Operations
– Serving City of Savannah & Parts of Unincorporated Chatham Co.
– Fixed Route, Demand-response, CAT Freedom, & Bike Share
– Free Downtown Shuttle & Ferry Service

69 Buses
26 ADA Vehicles
4 Ferry Vessels
1,300 Bus Stops
4.25M Passengers Per Year
Study Purpose

**Decreasing System Ridership**

3 Year: Fixed Route Ridership

-13%
Study Purpose

- **Why** is Ridership Decreasing When Population & Local Economy is Growing?
  - Failing equipment
  - Decreased reliability
  - Changing demographics
  - Lower fuel costs
  - TNCs

- Should Routes Be Redesigned? If so, **How**?
  - Collect and analyze data (Origin-Destination Study)
  - Solicit community input
  - Identify new service areas, markets, and modal options
Changing Focus

Transit in Georgia

- Changing Statewide focus on Regional Transit Partnerships
  - HB 848: House Commission on Transit Governance & Funding
  - HB 930: Unified transit governance and funding structure in Metro Atlanta region; creates the ATL as the new designated recipient of federal funds.
  - Anticipated legislation for the remainder of the State
Transit Challenges

**Trending Urban**

- Census anticipates growing / expanding UZAs
- Serving historically suburban and rural areas presents challenges

Source: Dr. Laurie Garrow, Dr. Thomas Douthat, Anna Nord, Sara Douglass, and Georgia Tech
Study Approach

Data Sources

- **Travel Patterns**
  - AirSage travel patterns
  - Census household/employment data
  - CAT ridership data (stop & route level)

- **CORE Data Sources**
  - CORE Congestion Management Process
  - CAT Origin Destination Analysis
  - NPMRDS

- **Other Sources**
  - Georgia Department of Transportation

---

**INTRODUCTION**

**BIG DATA OVERVIEW**

**VEHICULAR PLANNING**

**TRANSIT PLANNING**

**OTHER APPLICATIONS**

**Q&A**
### Study Approach

**O&D Data**

#### Study Approach

The study approach involves utilizing BIG DATA in the transportation planning process. **O&D Data** refers to Origin and Destination Data, which are crucial for understanding travel patterns and optimizing transportation systems.

#### AirSage Wireless Signal Extraction (WISE) Technology Platform

- **Wireless Network Operators**
- **Signaling Data**
- **ANONYMING Data**
- **Firewall**

#### AirSage WISE Analytical Platform

The platform allows for various applications such as:
- **Target Marketing**
- **Out-of-Home Media**
- **Tourism Studies**
- **Public Safety**
- **Insurance Analytics**
- **Real Estate Site Selection**
- **Transportation Planning**

#### Study Data Table

<table>
<thead>
<tr>
<th>Origin Zone</th>
<th>Destination</th>
<th>Start Date</th>
<th>End Date</th>
<th>Aggregation</th>
<th>Subscriber Purpose</th>
<th>Time of Day</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>94</td>
<td>37</td>
<td>20130702</td>
<td>20130731 WD</td>
<td>WD</td>
<td>Visitor (OO)</td>
<td>H00:00</td>
<td>5.08</td>
</tr>
<tr>
<td>420</td>
<td>343</td>
<td>20130702</td>
<td>20130731 WD</td>
<td>WD</td>
<td>Resident (HW)</td>
<td>H00:00</td>
<td>1.49</td>
</tr>
<tr>
<td>548</td>
<td>33</td>
<td>20130702</td>
<td>20130731 WD</td>
<td>WD</td>
<td>Resident (WO)</td>
<td>H00:00</td>
<td>5.01</td>
</tr>
<tr>
<td>68</td>
<td>164</td>
<td>20130702</td>
<td>20130731 WD</td>
<td>WD</td>
<td>Resident (OO)</td>
<td>H00:00</td>
<td>4.96</td>
</tr>
<tr>
<td>256</td>
<td>400</td>
<td>20130702</td>
<td>20130731 WD</td>
<td>WD</td>
<td>Resident (HO)</td>
<td>H00:00</td>
<td>5.97</td>
</tr>
<tr>
<td>498</td>
<td>62</td>
<td>20130702</td>
<td>20130731 WD</td>
<td>WD</td>
<td>Resident (HW)</td>
<td>H00:00</td>
<td>4.37</td>
</tr>
</tbody>
</table>
Methodology

- 73 Trip purpose and subscriber type data combinations mapped and assessed
- Travel behaviors layered with transit and census data.
Analysis

Travel Time and Type of Traveler:
• Morning (7:00 AM – 10:00 AM)
• “Home” Based “Work”
• “Resident Worker”

Origins and Desire Lines

Dataset: April 2016
Analysis

Travel Time and Type of Traveler
• Morning (7:00 AM – 10:00 AM)
• “Home” Based “Work”
• “Resident Worker”

Destinations and Desire Lines

Dataset: April 2016
Analysis

- Applying the Data to Route Analysis
  - Ridership
  - Key Areas Served
  - High Demographic Propensity
  - Connecting Route Structure
  - Origins / Destinations
Travel Time and Type of Traveler
- Morning (7:00 AM – 10:00 AM)
- “Home” Based “Work”
- “Inbound Commuter”

Destinations and Desire Lines

Dataset: April 2016
Utilizing BIG DATA in the Transportation Planning Process

INTRODUCTION

BIG DATA OVERVIEW

VEHICULAR PLANNING

TRANSIT PLANNING

OTHER APPLICATIONS

Q&A

BIG DATA for Regional Transit Service Analysis

- Identify Regional Travel Behaviors (Origins / Destinations)
- Analyze Characteristics of Population / Employment Associated with Most Active Origins and Destinations
- Utilize Parcel Data to Identify Suitable Park-and-Ride Locations Within Catchment Area of Trip Origins
- Analyze Roadway Conditions for Surrounding Transportation Network
- Screen Population and Transportation Network for Potential Express Service Criteria
Utilizing BIG DATA in the Transportation Planning Process

» Primary Factors for Regional Express Service
  - Location
  - Densities
  - Roadway Features
BIG DATA for Transit

What Comes Next?

» We have BIG DATA, now what?

» Owning and Analyzing the Data:
  – Data quality control
  – Readiness
  – Storage
  – Training
  – Local data sets
  – Staff, timing, resources

» Next Steps and Ongoing Uses:
  – Regional Analysis for adjoining counties
  – Funding and Implementation?
Other BIG DATA in Transportation
Other BIG DATA in Transportation Performance / Operations

» Vehicle Probe Data
  – HERE
  – INRIX
  – TomTom

» MAP-21 / FAST ACT
  – Regional Integrated Transportation Information System (RITIS)
  – FHWA's National Performance Research Data Set (NPMRDS)
Other BIG DATA in Transportation

Performance / Operations

Speed on GA-21 using NPMRDS from HERE (Trucks and passenger vehicles) data
Averaged by 1 hour for 2017

INTRODUCTION
BIG DATA OVERVIEW
VEHICULAR PLANNING
TRANSIT PLANNING
OTHER APPLICATIONS
Q&A
Other BIG DATA

On the Horizon

» Multimodal / Non-motorized
» Dockless Alternatives
» Autonomous and Connected Vehicles
» Predictive Analytics
» Freight Distribution
For More Information

Steve Cote
steve.cote@rsandh.com
678-528-7220

Rachel Hatcher
rachel.hatcher@rsandh.com
678-528-7231

Kai Zuehlke
kai.zuehlke@rsandh.com
678-528-7217
Thank You!