



# INTERNATIONAL TELEMATICS

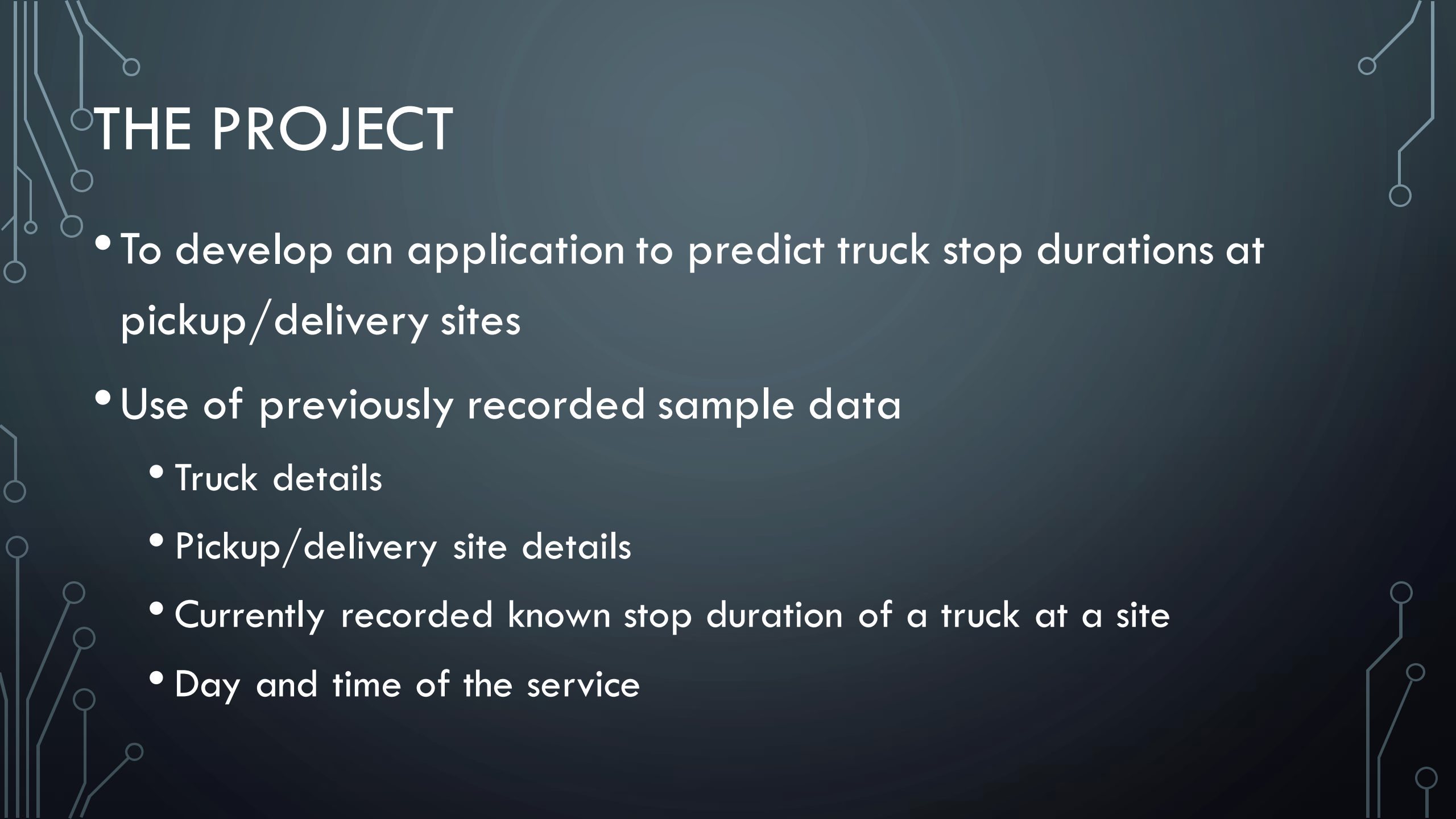
INVESTIGATION OF LOCATION BASED SERVICES AND ANALYTICS

NIZAM SHAIK - 5695040  
BTECH 451  
MID-YEAR PRESENTATION

# INTERNATIONAL TELEMATICS LTD.

- Specialises in designing and manufacturing of Telematic solutions for companies with remote assets such as road vehicles
- Ibright – Telematic Computer for Fleet Managers
  - GPS
  - Engine Management Interface
  - Driver Behaviour Monitoring (Swerving, Braking, etc.)





# THE PROJECT

- To develop an application to predict truck stop durations at pickup/delivery sites
- Use of previously recorded sample data
  - Truck details
  - Pickup/delivery site details
  - Currently recorded known stop duration of a truck at a site
  - Day and time of the service

# NODE.JS AND MONGODB

- What is Node.js?
  - Platform built on Chrome's JavaScript runtime
  - Event-driven and non-blocking I/O model
- What is MongoDB?
  - Open source NoSQL database
  - Document database
  - High performance and easy scalability

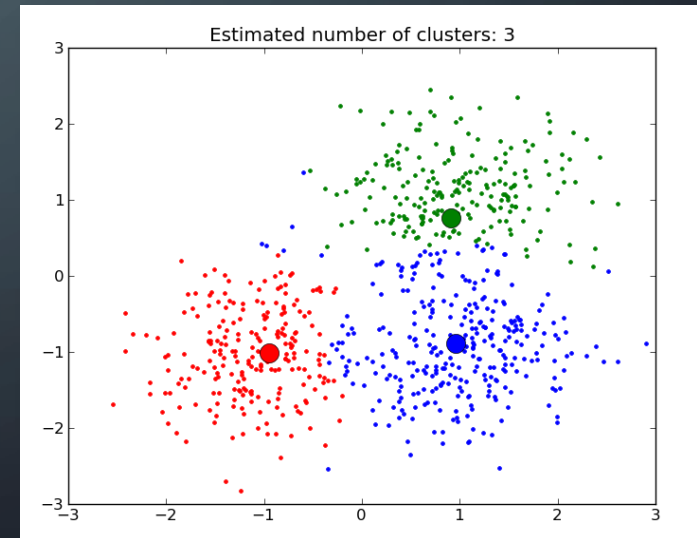


# PREDICTION TECHNIQUES

- Data Mining Techniques
  - Supervised Learning
  - Unsupervised Learning
- Cluster Analysis (Unsupervised)
  - Unsure about the data structure
  - Possibility of no error/reward signals to evaluate a solution.
  - Adaptable to changes

# CLUSTER ANALYSIS

- Divides data into groups based on relational information in the data
- K-Means Clustering Algorithm
  - Initially choose K number of total clusters/centroids
  - Assign each data object to its nearest cluster/centroid



# IMPLEMENTATION METHOD

- Partition the data based on the different Geofences (locations of stops) recorded in the sample data
- Randomly select 5 points in each Geofence Partition – Centroids
- Assign the data objects in each partition to its nearest centroid to form clusters around the centroid
  - Nearest centroids found using Euclidean Distance

# IMPLEMENTATION TECHNIQUES

- Euclidean Distance

- Measure the distance of similarity of two data entries.
- Each attribute of a data entry has a specific weight of importance
- Boolean used to measure similarity of non numerical data

- Internal Cluster Validation

- Silhouette Measure (Average inter-cluster distance measure)

- Final Prediction Evaluation

- 10-Fold Cross Validation



# EUCLIDEAN DISTANCE

- $d(A, B) = \sqrt{w_1(A_1 - B_1)^2 + w_2(A_2 - B_2)^2 \dots + w_n(A_n - B_n)^2}$

Example - Data attributes are VehicleID, Month, and Duration (500s max)

- $A = (\text{"1001"}, \text{June}, 400)$  and  $B = (\text{"1001"}, \text{July}, 150)$

$$\rightarrow \sqrt{0.25(1001 == 1001)^2 + 0.25(\text{June} == \text{July})^2 + 0.5(0.8 - 0.3)^2}$$

$$\rightarrow \sqrt{0.25(0)^2 + 0.25(1)^2 + 0.5(0.5)^2}$$

$$\rightarrow \sqrt{0 + 0.25 + 0.125}$$

$$\rightarrow d(A, B) = 0.61 = \text{Distance between data entry A and data entry B}$$

# INTERNAL CLUSTER VALIDATION

- Silhouette Measure

- $s(i) = \frac{b(i) - a(i)}{\max\{a(i), b(i)\}}$  ,  $-1 \leq s(i) \leq 1$

- $a(i)$  = The average distance of  $i$  to all other data entries in its cluster

- $b(i)$  = The distance between  $i$  and closest neighbouring cluster

- A positive value of  $s(i)$  means that the data entry is appropriately clustered, where a negative values means it is not

# MY APPLICATION

BTECH 451

Stop Duration Prediction

STOP DURATION

Vehicle ID:  
Geofence ID:  
Month:  
Time Period:  
Stop Duration Prediction: ---

Generate

Stop Information

Data Entry	Vehicle ID	Geofence ID	Geogence Category	Arrival Time (NZT)	Departure Time (NZT)	Duration	
<a href="#">1</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	983055C6-F559-DD11-AF49-001D091BD8DE	Load/Unload	1/06/2013 7:50	1/06/2013 8:01	689	<a href="#">Delete</a>
<a href="#">2</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	B064F76C-8177-E111-AAA3-782BCB2814F2	Load/Unload	1/06/2013 7:50	1/06/2013 8:01	681	<a href="#">Delete</a>
<a href="#">3</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	4936C7E9-C93C-DD11-AF49-001D091BD8DE	Load/Unload	1/06/2013 7:51	1/06/2013 8:01	596	<a href="#">Delete</a>
<a href="#">4</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	983055C6-F559-DD11-AF49-001D091BD8DE	Load/Unload	1/06/2013 8:34	1/06/2013 8:51	1022	<a href="#">Delete</a>
<a href="#">5</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	B064F76C-8177-E111-AAA3-782BCB2814F2	Load/Unload	1/06/2013 8:34	1/06/2013 8:50	976	<a href="#">Delete</a>
<a href="#">6</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	BF862EE0-A6D4-DE11-9922-001D091BD8DE	Load/Unload	1/06/2013 8:34	1/06/2013 8:42	514	<a href="#">Delete</a>
<a href="#">7</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	4A36C7E9-C93C-DD11-AF49-001D091BD8DE	Load/Unload	1/06/2013 8:34	1/06/2013 8:44	582	<a href="#">Delete</a>
<a href="#">8</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	4936C7E9-C93C-DD11-AF49-001D091BD8DE	Load/Unload	1/06/2013 8:44	1/06/2013 8:50	371	<a href="#">Delete</a>
<a href="#">9</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	16683F4A-7325-DF11-94E2-001D091BD8DE	Service Centre	1/06/2013 9:05	1/06/2013 9:17	724	<a href="#">Delete</a>
<a href="#">10</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	798A01BE-E76F-DE11-9922-001D091BD8DE	Load/Unload	4/06/2013 5:07	4/06/2013 6:46	5952	<a href="#">Delete</a>
<a href="#">11</a>	545B1611-7C38-E011-A912-00505681613D	9E839BCD-DOB5-DD11-AF49-001D091BD8DE	Load/Unload	4/06/2013 5:47	4/06/2013 6:12	1490	<a href="#">Delete</a>
<a href="#">12</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	8D1CF87C-579D-E211-80E0-782BCB2814F2	Queue	4/06/2013 6:46	4/06/2013 7:00	853	<a href="#">Delete</a>
<a href="#">13</a>	1CE8212F-4701-48AD-A344-951AF1019535	16683F4A-7325-DF11-94E2-001D091BD8DE	Service Centre	4/06/2013 7:28	4/06/2013 7:31	196	<a href="#">Delete</a>
<a href="#">14</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	8D1CF87C-579D-E211-80E0-782BCB2814F2	Queue	4/06/2013 8:02	4/06/2013 8:30	1647	<a href="#">Delete</a>
<a href="#">15</a>	B7A70A11-2A45-E011-B112-00505681613D	8D1CF87C-579D-E211-80E0-782BCB2814F2	Queue	4/06/2013 8:38	4/06/2013 11:59	12068	<a href="#">Delete</a>
<a href="#">16</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	8D1CF87C-579D-E211-80E0-782BCB2814F2	Queue	4/06/2013 8:40	4/06/2013 9:07	1670	<a href="#">Delete</a>
<a href="#">17</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	1E135C1D-579D-E211-80E0-782BCB2814F2	Queue	4/06/2013 9:07	4/06/2013 9:16	497	<a href="#">Delete</a>
<a href="#">18</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	B064F76C-8177-E111-AAA3-782BCB2814F2	Load/Unload	4/06/2013 9:10	4/06/2013 9:26	1004	<a href="#">Delete</a>
<a href="#">19</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	A136C7E9-C93C-DD11-AF49-001D091BD8DE	Load/Unload	4/06/2013 9:11	4/06/2013 9:24	806	<a href="#">Delete</a>
<a href="#">20</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	983055C6-F559-DD11-AF49-001D091BD8DE	Load/Unload	4/06/2013 9:28	4/06/2013 10:12	2627	<a href="#">Delete</a>
<a href="#">21</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	B064F76C-8177-E111-AAA3-782BCB2814F2	Load/Unload	4/06/2013 9:28	4/06/2013 10:12	2621	<a href="#">Delete</a>
<a href="#">22</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	4A36C7E9-C93C-DD11-AF49-001D091BD8DE	Load/Unload	4/06/2013 9:31	4/06/2013 9:40	559	<a href="#">Delete</a>
<a href="#">23</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	BF862EE0-A6D4-DE11-9922-001D091BD8DE	Load/Unload	4/06/2013 9:31	4/06/2013 9:40	507	<a href="#">Delete</a>
<a href="#">24</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	B064F76C-8177-E111-AAA3-782BCB2814F2	Load/Unload	4/06/2013 9:39	4/06/2013 10:17	2303	<a href="#">Delete</a>
<a href="#">25</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	4936C7E9-C93C-DD11-AF49-001D091BD8DE	Load/Unload	4/06/2013 9:40	4/06/2013 10:12	1899	<a href="#">Delete</a>
<a href="#">26</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	A136C7E9-C93C-DD11-AF49-001D091BD8DE	Load/Unload	4/06/2013 9:41	4/06/2013 10:17	2171	<a href="#">Delete</a>
<a href="#">27</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	798A01BE-E76F-DE11-9922-001D091BD8DE	Load/Unload	4/06/2013 9:43	4/06/2013 10:04	1273	<a href="#">Delete</a>
<a href="#">28</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	1E135C1D-579D-E211-80E0-782BCB2814F2	Queue	4/06/2013 10:05	4/06/2013 10:11	384	<a href="#">Delete</a>
<a href="#">29</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	A3B5ED67-AE00-DF11-9CEB-001D091BD8DE	Load/Unload	4/06/2013 10:13	4/06/2013 10:28	942	<a href="#">Delete</a>

localhost:3000

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localhost:3000

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BTECH 451

Stop Duration Prediction

STOP DURATION

Vehicle ID:  
Geofence ID:  
Month:  
Time Period:  
Stop Duration Prediction: ---

Generate

The page at localhost:3000 says:

Generate stop predictions?

OKCancel

Stop Information

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<a href="#">13</a>	1CE8212F-4701-48AD-A344-951AF1019535	16683F4A-7325-DF11-94E2-001D091BD8DE	Service Centre	4/06/2013 7:28	4/06/2013 7:31	196	<a href="#">Delete</a>
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## Stop Duration Prediction

## Generate

## Stop Information

Data Entry	Vehicle ID			ence Category	Arrival Time (NZT)	Departure Time (NZT)	Duration	
<a href="#">1</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	4936C7E9-C93C-DD11-AF49-001D091BD8DE: Centroids = 23894,1487,22776,9121,3703		Load/Unload	1/06/2013 7:50	1/06/2013 8:01	689	<a href="#">Delete</a>
<a href="#">2</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	BF862EE0-A6D4-DE11-9922-001D091BD8DE: Centroids = 11349,17220,2648,25561,1276		Load/Unload	1/06/2013 7:50	1/06/2013 8:01	681	<a href="#">Delete</a>
<a href="#">3</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F			Load/Unload	1/06/2013 7:51	1/06/2013 8:01	596	<a href="#">Delete</a>
<a href="#">4</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	4A36C7E9-C93C-DD11-AF49-001D091BD8DE: Centroids = 24900,5448,16240,8506,23114		Load/Unload	1/06/2013 8:34	1/06/2013 8:51	1022	<a href="#">Delete</a>
<a href="#">5</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F			Load/Unload	1/06/2013 8:34	1/06/2013 8:50	976	<a href="#">Delete</a>
<a href="#">6</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	16683F4A-7325-DF11-94E2-001D091BD8DE: Centroids = 14853,14030,1103,9630,8277		Load/Unload	1/06/2013 8:34	1/06/2013 8:42	514	<a href="#">Delete</a>
<a href="#">7</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F			Load/Unload	1/06/2013 8:34	1/06/2013 8:44	582	<a href="#">Delete</a>
<a href="#">8</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	798A01BE-E76F-DE11-9922-001D091BD8DE: Centroids = 10356,3450,20738,20506,7082		Load/Unload	1/06/2013 8:44	1/06/2013 8:50	371	<a href="#">Delete</a>
<a href="#">9</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F			vice Centre	1/06/2013 9:05	1/06/2013 9:17	724	<a href="#">Delete</a>
<a href="#">10</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	9E839BCD-DD85-DD11-AF49-001D091BD8DE: Centroids = 16510,12662,3406,1182,11837		Load/Unload	4/06/2013 5:07	4/06/2013 6:46	5952	<a href="#">Delete</a>
<a href="#">11</a>	545B1611-7C38-E011-A912-00505681613D			Load/Unload	4/06/2013 5:47	4/06/2013 6:12	1490	<a href="#">Delete</a>
<a href="#">12</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	8D1CF87C-579D-E211-80E0-782BCB2814F2: Centroids = 18247,18127,14801,5732,16456		Queue	4/06/2013 6:46	4/06/2013 7:00	853	<a href="#">Delete</a>
<a href="#">13</a>	1CE8212F-4701-48AD-A344-951AF1019535			vice Centre	4/06/2013 7:28	4/06/2013 7:31	196	<a href="#">Delete</a>
<a href="#">14</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	1E135C1D-579D-E211-80E0-782BCB2814F2: Centroids = 15968,23850,21010,4967,5271		Queue	4/06/2013 8:02	4/06/2013 8:30	1647	<a href="#">Delete</a>
<a href="#">15</a>	B7A70A11-2A45-E011-B112-00505681613D			Queue	4/06/2013 8:38	4/06/2013 11:59	12068	<a href="#">Delete</a>
<a href="#">16</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	<div><input type="checkbox"/> Prevent this page from creating additional dialogs.</div> <div>OK</div>		Queue	4/06/2013 8:40	4/06/2013 9:07	1670	<a href="#">Delete</a>
<a href="#">17</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27			Queue	4/06/2013 9:07	4/06/2013 9:16	497	<a href="#">Delete</a>
<a href="#">18</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F			Load/Unload	4/06/2013 9:10	4/06/2013 9:26	1004	<a href="#">Delete</a>
<a href="#">19</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F			Load/Unload	4/06/2013 9:11	4/06/2013 9:24	806	<a href="#">Delete</a>
<a href="#">20</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F			Load/Unload	4/06/2013 9:28	4/06/2013 10:12	2627	<a href="#">Delete</a>
<a href="#">21</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F			Load/Unload	4/06/2013 9:28	4/06/2013 10:12	2621	<a href="#">Delete</a>
<a href="#">22</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F			Load/Unload	4/06/2013 9:31	4/06/2013 9:40	559	<a href="#">Delete</a>
<a href="#">23</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	BF862EE0-A6D4-DE11-9922-001D091BD8DE	Load/Unload	4/06/2013 9:31	4/06/2013 9:40	507	<a href="#">Delete</a>	
<a href="#">24</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	B064F76C-8177-E111-AAA3-782BCB2814F2	Load/Unload	4/06/2013 9:39	4/06/2013 10:17	2303	<a href="#">Delete</a>	
<a href="#">25</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	4936C7E9-C93C-DD11-AF49-001D091BD8DE	Load/Unload	4/06/2013 9:40	4/06/2013 10:12	1899	<a href="#">Delete</a>	
<a href="#">26</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	A136C7E9-C93C-DD11-AF49-001D091BD8DE	Load/Unload	4/06/2013 9:41	4/06/2013 10:17	2171	<a href="#">Delete</a>	
<a href="#">27</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	798A01BE-E76F-DE11-9922-001D091BD8DE	Load/Unload	4/06/2013 9:43	4/06/2013 10:04	1273	<a href="#">Delete</a>	
<a href="#">28</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	1E135C1D-579D-E211-80E0-782BCB2814F2	Queue	4/06/2013 10:05	4/06/2013 10:11	384	<a href="#">Delete</a>	
<a href="#">29</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	A3B5ED67-AE00-DF11-9CEB-001D091BD8DE	Load/Unload	4/06/2013 10:13	4/06/2013 10:28	942	<a href="#">Delete</a>	

The page at localhost:3000 says:

### GEOFENCE PARTITION MICRO-CLUSTER CENTROIDS:

983055C6-F559-DD11-AF49-001D091BD8DE:  
Centroids = 27373,26269,17116,11890,27915

B064F76C-8177-E111-AAA3-782BCB2814F2:  
Centroids = 12568,11727,26152,10769,26967

4936C7E9-C93C-DD11-AF49-001D091BD8DE:  
Centroids = 23894,1487,22776,9121,3703

BF862EE0-A6D4-DE11-9922-001D091BD8DE:  
Centroids = 11349,17220,2648,25561,1276

4A36C7E9-C93C-DD11-AF49-001D091BD8DE:  
Centroids = 24900.5448,16240.8506,23114

16683F4A-7325-DF11-94E2-001D091BD8DE:  
Centroids = 14853,14030,1103,9630,8277

798A01BE-E76F-DE11-9922-001D091BD8DE:  
Centroids = 10356,3450,20738,20506,7082

9E839BCD-DDB5-DD11-AF49-001D091BD8DE:  
Centroids = 16510,12662,3406,1182,11837

8D1CF87C-579D-E211-80E0-782BCB2814F2:  
Centroids = 18247,18127,14801,5732,16456

1E135C1D-579D-E211-80E0-782BCB2814F2:  
Centroids = 15968,23850,21010,4967,5271

☐ Prevent this page from creating additional dialogs.

OK

## Stop Duration Prediction

## Generate

## Stop Information

Data Entry	Vehicle ID	Micro-Cluster 5 = 965	ence Category	Arrival Time (NZT)	Departure Time (NZT)	Duration	
<a href="#">1</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	B064F76C-8177-E111-AAA3-782BCB2814F2:	oad/Unload	1/06/2013 7:50	1/06/2013 8:01	689	<a href="#">Delete</a>
<a href="#">2</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Micro-Cluster 1 = 409	oad/Unload	1/06/2013 7:50	1/06/2013 8:01	681	<a href="#">Delete</a>
<a href="#">3</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Micro-Cluster 2 = 516	oad/Unload	1/06/2013 7:51	1/06/2013 8:01	596	<a href="#">Delete</a>
<a href="#">4</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Micro-Cluster 3 = 940	oad/Unload	1/06/2013 7:51	1/06/2013 8:01	596	<a href="#">Delete</a>
<a href="#">5</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Micro-Cluster 4 = 1148	oad/Unload	1/06/2013 8:34	1/06/2013 8:51	1022	<a href="#">Delete</a>
<a href="#">6</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Micro-Cluster 5 = 551	oad/Unload	1/06/2013 8:34	1/06/2013 8:50	976	<a href="#">Delete</a>
<a href="#">7</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	4936C7E9-C93C-DD11-AF49-001D091BD8DE:	oad/Unload	1/06/2013 8:34	1/06/2013 8:42	514	<a href="#">Delete</a>
<a href="#">8</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Micro-Cluster 1 = 279	oad/Unload	1/06/2013 8:34	1/06/2013 8:44	582	<a href="#">Delete</a>
<a href="#">9</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Micro-Cluster 2 = 490	oad/Unload	1/06/2013 8:44	1/06/2013 8:50	371	<a href="#">Delete</a>
<a href="#">10</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Micro-Cluster 3 = 802	vice Centre	1/06/2013 9:05	1/06/2013 9:17	724	<a href="#">Delete</a>
<a href="#">11</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Micro-Cluster 4 = 111	oad/Unload	1/06/2013 9:05	1/06/2013 9:17	724	<a href="#">Delete</a>
<a href="#">12</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	Micro-Cluster 5 = 684	oad/Unload	4/06/2013 5:07	4/06/2013 6:46	5952	<a href="#">Delete</a>
<a href="#">13</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F		oad/Unload	4/06/2013 5:07	4/06/2013 6:46	5952	<a href="#">Delete</a>
<a href="#">14</a>	545B1611-7C38-E011-A912-00505681613D		oad/Unload	4/06/2013 5:47	4/06/2013 6:12	1490	<a href="#">Delete</a>
<a href="#">15</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F		Queue	4/06/2013 6:46	4/06/2013 7:00	853	<a href="#">Delete</a>
<a href="#">16</a>	1CE8212F-4701-48AD-A344-951AF1019535		vice Centre	4/06/2013 7:28	4/06/2013 7:31	196	<a href="#">Delete</a>
<a href="#">17</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Queue	4/06/2013 8:02	4/06/2013 8:30	1647	<a href="#">Delete</a>
<a href="#">18</a>	B7A70A11-2A45-E011-B112-00505681613D		Queue	4/06/2013 8:38	4/06/2013 11:59	12068	<a href="#">Delete</a>
<a href="#">19</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27		Queue	4/06/2013 8:40	4/06/2013 9:07	1670	<a href="#">Delete</a>
<a href="#">20</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27		Queue	4/06/2013 8:40	4/06/2013 9:07	1670	<a href="#">Delete</a>
<a href="#">21</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Queue	4/06/2013 9:07	4/06/2013 9:16	497	<a href="#">Delete</a>
<a href="#">22</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Load/Unload	4/06/2013 9:10	4/06/2013 9:26	1004	<a href="#">Delete</a>
<a href="#">23</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Load/Unload	4/06/2013 9:11	4/06/2013 9:24	806	<a href="#">Delete</a>
<a href="#">24</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Load/Unload	4/06/2013 9:28	4/06/2013 10:12	2627	<a href="#">Delete</a>
<a href="#">25</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Load/Unload	4/06/2013 9:28	4/06/2013 10:12	2621	<a href="#">Delete</a>
<a href="#">26</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Load/Unload	4/06/2013 9:28	4/06/2013 10:12	2621	<a href="#">Delete</a>
<a href="#">27</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Load/Unload	4/06/2013 9:31	4/06/2013 10:12	2621	<a href="#">Delete</a>
<a href="#">28</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Load/Unload	4/06/2013 9:31	4/06/2013 9:40	559	<a href="#">Delete</a>
<a href="#">29</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Load/Unload	4/06/2013 9:31	4/06/2013 9:40	507	<a href="#">Delete</a>
<a href="#">30</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27		Load/Unload	4/06/2013 9:39	4/06/2013 10:17	2303	<a href="#">Delete</a>
<a href="#">31</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F		Load/Unload	4/06/2013 9:40	4/06/2013 10:12	1899	<a href="#">Delete</a>
<a href="#">32</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27		Load/Unload	4/06/2013 9:41	4/06/2013 10:17	2171	<a href="#">Delete</a>
<a href="#">33</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F		Load/Unload	4/06/2013 9:43	4/06/2013 10:04	1273	<a href="#">Delete</a>
<a href="#">34</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F		Load/Unload	4/06/2013 9:43	4/06/2013 10:04	1273	<a href="#">Delete</a>
<a href="#">35</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F		Queue	4/06/2013 10:05	4/06/2013 10:11	384	<a href="#">Delete</a>
<a href="#">36</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F		Load/Unload	4/06/2013 10:13	4/06/2013 10:28	942	<a href="#">Delete</a>

Micro-Cluster 1 = 409

Micro-Cluster 2 = 516

Micro-Cluster 3 = 940

Micro-Cluster 4 = 1148

Micro-Cluster 5 = 551

4936C7E9-C93C-DD11-AF49-001D091BD8DE:

Micro-Cluster 1 = 279

Micro-Cluster 2 = 490

Micro-Cluster 3 = 802

Micro-Cluster 4 = 111

Micro-Cluster 5 = 684

Prevent this page from creating additional dialogs.

OK

×

983055C6-F559-DD11-AF49-001D091BD8DE:  
Micro-Cluster 1 = 547  
Micro-Cluster 2 = 130  
Micro-Cluster 3 = 430  
Micro-Cluster 4 = 697  
Micro-Cluster 5 = 965

B064F76C-8177-E111-AAA3-782BCB2814F2:  
Micro-Cluster 1 = 409  
Micro-Cluster 2 = 516  
Micro-Cluster 3 = 940  
Micro-Cluster 4 = 1148  
Micro-Cluster 5 = 551

4936C7E9-C93C-DD11-AF49-001D091BD8DE:  
Micro-Cluster 1 = 279  
Micro-Cluster 2 = 490  
Micro-Cluster 3 = 802  
Micro-Cluster 4 = 111  
Micro-Cluster 5 = 684

☐ Prevent this page from creating additional dialogs.

OK



BTECH 451

Stop Duration Prediction

STOP DURATION

Vehicle ID:  
Geofence ID:  
Month:  
Time Period:  
Stop Duration Prediction: ---

Generate

Stop Information

Data Entry	Vehicle ID	Prognosis Category	Arrival Time (NZT)	Departure Time (NZT)	Duration	
<a href="#">1</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	1/06/2013 7:50	1/06/2013 8:01	689	<a href="#">Delete</a>
<a href="#">2</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	1/06/2013 7:50	1/06/2013 8:01	681	<a href="#">Delete</a>
<a href="#">3</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	1/06/2013 7:51	1/06/2013 8:01	596	<a href="#">Delete</a>
<a href="#">4</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	1/06/2013 8:34	1/06/2013 8:51	1022	<a href="#">Delete</a>
<a href="#">5</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	1/06/2013 8:34	1/06/2013 8:50	976	<a href="#">Delete</a>
<a href="#">6</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	1/06/2013 8:34	1/06/2013 8:42	514	<a href="#">Delete</a>
<a href="#">7</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	1/06/2013 8:34	1/06/2013 8:44	582	<a href="#">Delete</a>
<a href="#">8</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	1/06/2013 8:44	1/06/2013 8:50	371	<a href="#">Delete</a>
<a href="#">9</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Service Centre	1/06/2013 9:05	1/06/2013 9:17	724	<a href="#">Delete</a>
<a href="#">10</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	Load/Unload	4/06/2013 5:07	4/06/2013 6:46	5952	<a href="#">Delete</a>
<a href="#">11</a>	545B1611-7C38-E011-A912-00505681613D	Load/Unload	4/06/2013 5:47	4/06/2013 6:12	1490	<a href="#">Delete</a>
<a href="#">12</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	Queue	4/06/2013 6:46	4/06/2013 7:00	853	<a href="#">Delete</a>
<a href="#">13</a>	1CE8212F-4701-48AD-A344-951AF1019535	Service Centre	4/06/2013 7:28	4/06/2013 7:31	196	<a href="#">Delete</a>
<a href="#">14</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Queue	4/06/2013 8:02	4/06/2013 8:30	1647	<a href="#">Delete</a>
<a href="#">15</a>	B7A70A11-2A45-E011-B112-00505681613D	Queue	4/06/2013 8:38	4/06/2013 11:59	12068	<a href="#">Delete</a>
<a href="#">16</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	Queue	4/06/2013 8:40	4/06/2013 9:07	1670	<a href="#">Delete</a>
<a href="#">17</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	Queue	4/06/2013 9:07	4/06/2013 9:16	497	<a href="#">Delete</a>
<a href="#">18</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	4/06/2013 9:10	4/06/2013 9:26	1004	<a href="#">Delete</a>
<a href="#">19</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	4/06/2013 9:11	4/06/2013 9:24	806	<a href="#">Delete</a>
<a href="#">20</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	4/06/2013 9:28	4/06/2013 10:12	2627	<a href="#">Delete</a>
<a href="#">21</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	4/06/2013 9:28	4/06/2013 10:12	2621	<a href="#">Delete</a>
<a href="#">22</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	4/06/2013 9:31	4/06/2013 9:40	559	<a href="#">Delete</a>
<a href="#">23</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	4/06/2013 9:31	4/06/2013 9:40	507	<a href="#">Delete</a>
<a href="#">24</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	Load/Unload	4/06/2013 9:39	4/06/2013 10:17	2303	<a href="#">Delete</a>
<a href="#">25</a>	A91E0C96-5298-480A-ADDC-6EDFA346661F	Load/Unload	4/06/2013 9:40	4/06/2013 10:12	1899	<a href="#">Delete</a>
<a href="#">26</a>	EB756A4F-7D3B-4C0D-828B-B651B54EBA27	Load/Unload	4/06/2013 9:41	4/06/2013 10:17	2171	<a href="#">Delete</a>
<a href="#">27</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	Load/Unload	4/06/2013 9:43	4/06/2013 10:04	1273	<a href="#">Delete</a>
<a href="#">28</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	Queue	4/06/2013 10:05	4/06/2013 10:11	384	<a href="#">Delete</a>
<a href="#">29</a>	D5445322-CCF5-499C-B9E1-0E09A3AC695F	Load/Unload	4/06/2013 10:13	4/06/2013 10:28	942	<a href="#">Delete</a>

The page at localhost:3000 says:

MICRO-CLUSTER SILHOUTTE MEASURE:

983055C6-F559-DD11-AF49-001D091BD8DE:  
Micro-Cluster 1 = -0.21738068850593809  
Micro-Cluster 2 = -0.19688167658013803  
Micro-Cluster 3 = -0.2398990260227227  
Micro-Cluster 4 = -0.12738201358221762  
Micro-Cluster 5 = 0.03468616368802445

B064F76C-8177-E111-AAA3-782BCB2814F2:  
Micro-Cluster 1 = -0.17445473626430713  
Micro-Cluster 2 = -0.645587195036785  
Micro-Cluster 3 = -0.18999332147853754  
Micro-Cluster 4 = -0.23903043029648202  
Micro-Cluster 5 = 0.03020900016922356

4936C7E9-C93C-DD11-AF49-001D091BD8DE:  
Micro-Cluster 1 = -0.15586132580477502  
Micro-Cluster 2 = -0.1813487182147818  
Micro-Cluster 3 = -0.20553915178323917  
Micro-Cluster 4 = 0.09750480462607905  
Micro-Cluster 5 = -0.1209015266663337

OK

# NEXT STAGES

- Improve accuracy of clusters and centroids
- Research and implement techniques to find a final prediction result
- Final evaluation of this final stop prediction

# RELATED WORK

- Supervised Vs Unsupervised Learning

- Chaovalit, P., & Zhou, L. (2005, January). Movie review mining: A comparison between supervised and unsupervised classification approaches. In *Proceedings of the 38th Annual Hawaii International Conference on System Sciences, 2005. HICSS'05.* (pp. 112c-112c). IEEE.

- Clustering for Recommender Systems

- Zhang, F., Liu, H., & Chao, J. (2010). A Two-stage Recommendation Algorithm Based on K-means Clustering In Mobile E-commerce. *Journal of Computational Information Systems*, 6(10), 3327-3334.
- Kim, T. H., & Yang, S. B. (2005). An effective recommendation algorithm for clustering-based recommender systems. In *AI 2005: Advances in Artificial Intelligence* (pp. 1150-1153). Springer Berlin Heidelberg.

The background is a dark blue gradient with faint, concentric circles. In the corners, there are white, stylized circuit-like lines with small circles at the ends, resembling a network or data flow diagram.

THANK YOU