Dynamics of execution in vehicles tracking from historical events

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Data and methods

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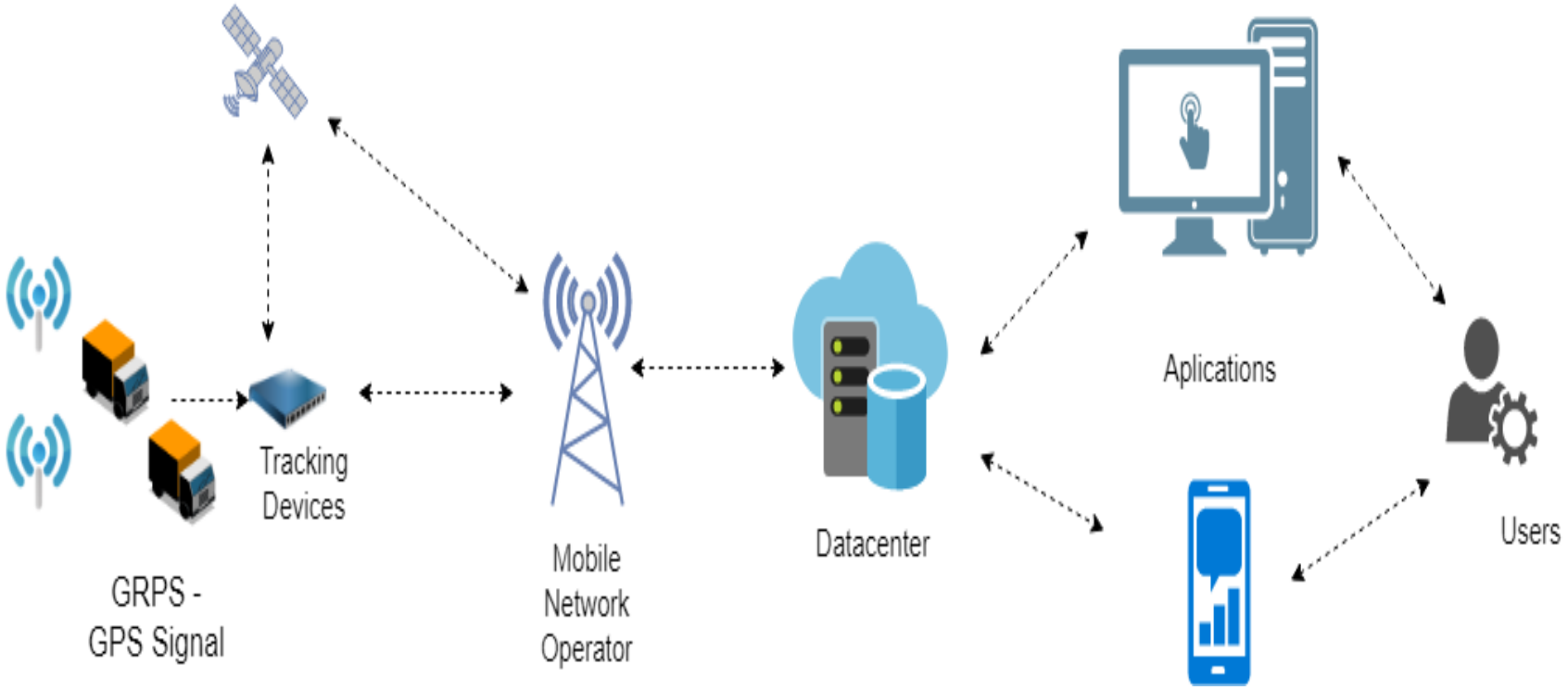
Agenda

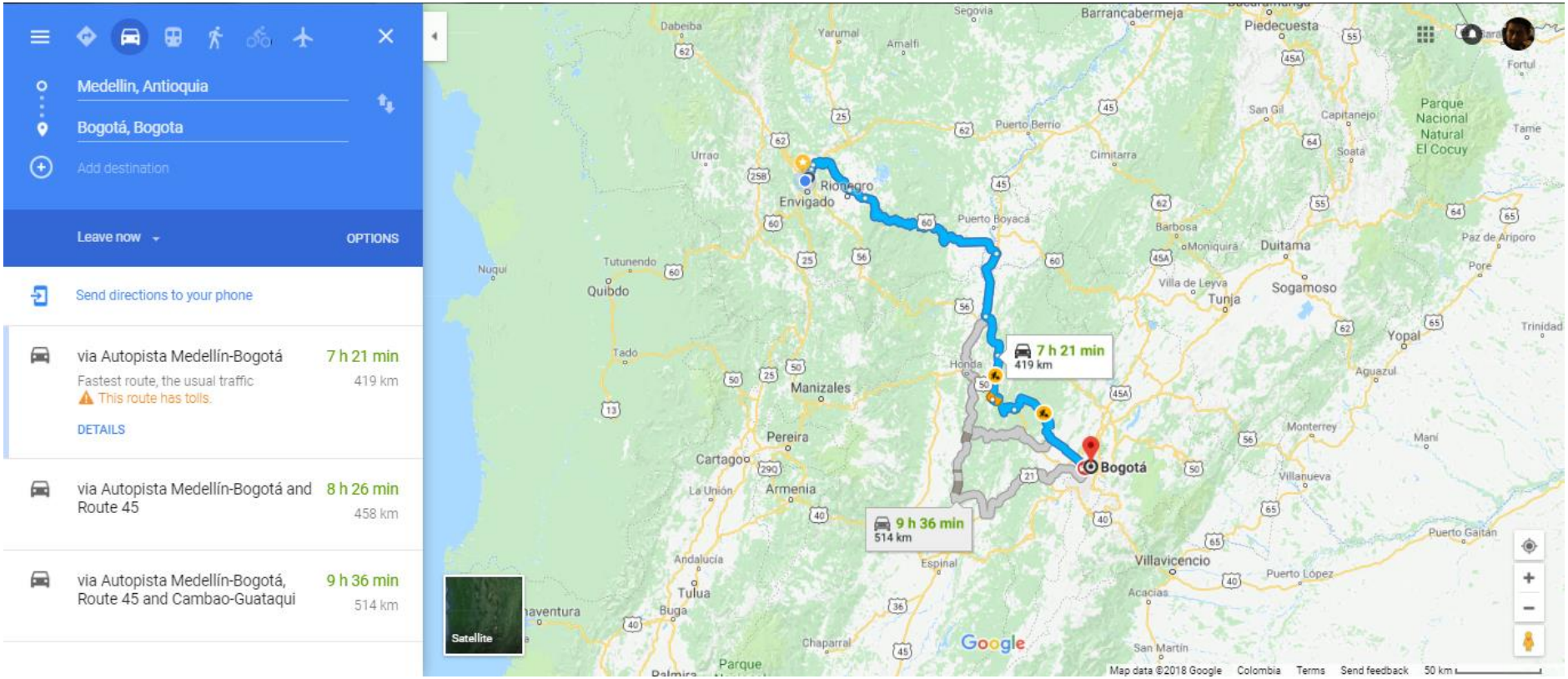
- Tracking Vehicles- AVL
- Problem
- Solution and case of study
  - Decision tree
  - Naive Bayes
- Validation

Tracking Vehicles- AVL



Outline of a tracking vehicle system. Source: Own elaboration

Problem


Medellin, Antioquia
Bogotá, Bogota
Add destination
Leave now
OPTIONS
Send directions to your phone
via Autopista Medellín-Bogotá
7 h 21 min
Fastest route, the usual traffic
419 km
This route has tolls.
DETAILS
via Autopista Medellín-Bogotá and Route 45
8 h 26 min
458 km
via Autopista Medellín-Bogotá, Route 45 and Cambao-Guataqui
9 h 36 min
514 km
7 h 21 min
419 km
9 h 36 min
514 km
Bogotá
Medellín
Manizales
Pereira
Cartago
Armenia
Ibagué
Girardot
Villavicencio
Tunja
Sogamoso
Duitama
Satellite
Google
Map data ©2018 Google
Colombia
Terms
Send feedback
50 km

Solution

System Variables	
City	EstimatedArrivingDate
IdTrip	EstimatedArrivingTime
LicencePlate	RealArrivingDate
RouteCode	RealArrivingTime
AssigmentDate	DifferenceEstimated-RealStart
AssigmentTime	DifferenceEstimatedReal-Arriving
WeekDayStart	IdClient
RealStartTimeInt	RouteDistance
ProgrammingStartDate	DurationPercentage
ProgrammingStartDate	RouteType
RealStartDate	Fullfilment

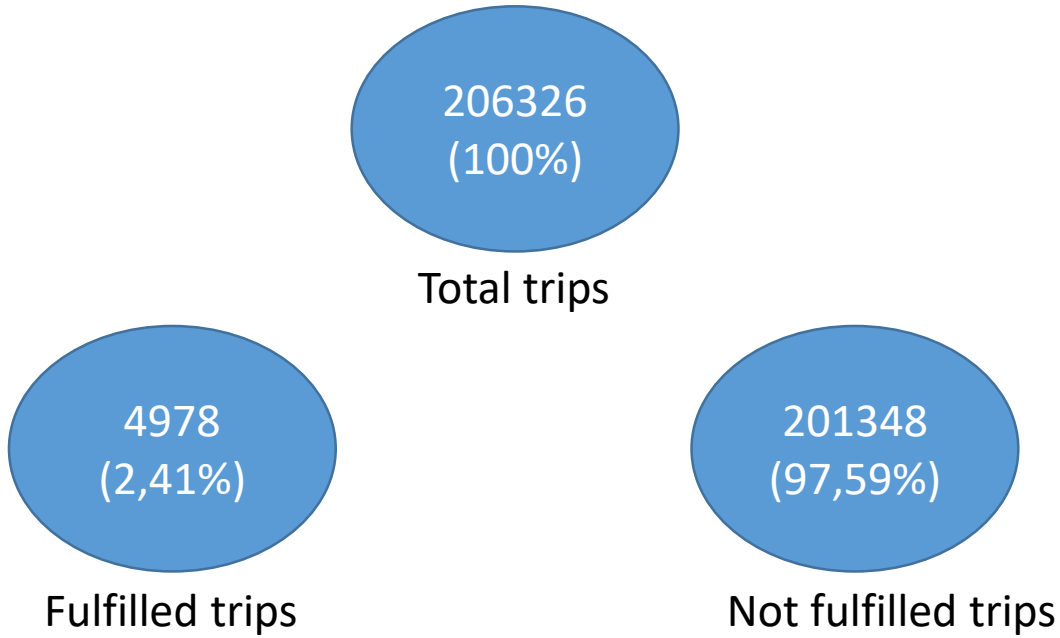
Input Variables	
Fulfillment	Predict Only
Id Trip	Key
Month Start	Input
Route Type	Input
Shift	Input
Week Day Start	Input
City	Input

Algorithm

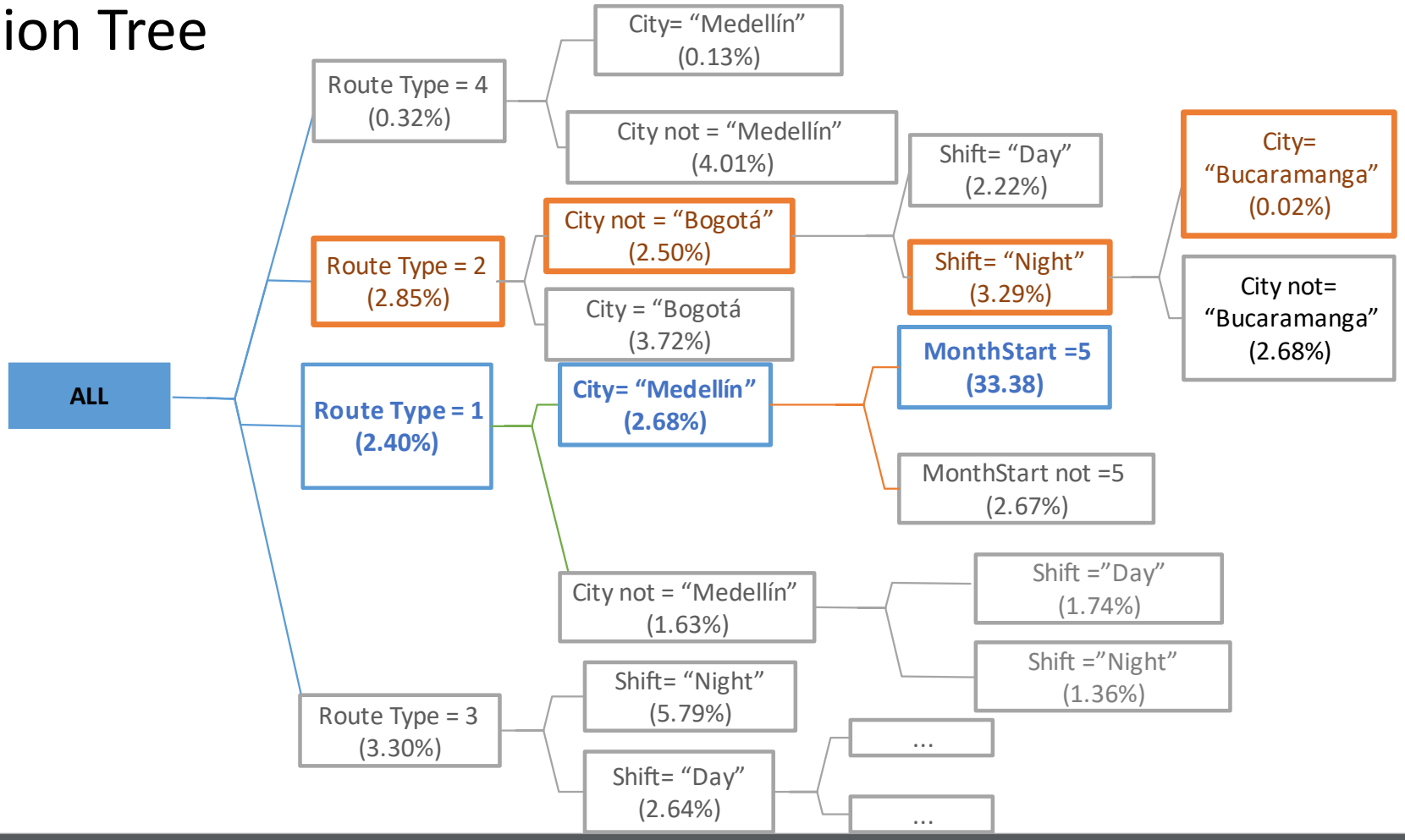
Algorithm: Fullfilment estimation

```
if DifferenceEstimatedRealArriving  >= (ProgrammingStartDate-EstimatedArrivingDate)*0.15
or DifferenceEstimatedRealArriving  < ProgrammingStartDate-EstimatedArrivingDate)*0.15
then
Fulfillment = 0
else
Fulfillment = 1
end if
```

Case of study



Decision Tree



Naive Bayes

Attributes	Population (1)	States	1
City	4957	Medellin	0,756%
		Bogotá	0.209%

Attributes	States	Population (1)	1
Route Type	1	4957	0,761%
	2		0,156%
	3		0,077%
	4		0,006%

Validation – Decision Tree

Parameter	Datasets Total	Total	Cases	Fulfillment	Accuaracy
Route Type =1	Original Data	157009	3771	2,40%	
	DataSet 1	8646	168	1,94%	80.83%
	DataSet 2	25251	370	1,46%	60.38%
Route Type =1 & City not ="Medellín"	Original Data	41688	608	1,63%	
	DataSet 1	25199	370	1,46%	89.57%
	DataSet 2	8524	162	1,90%	83.43%

Validation – Naive Bayes

Parameter	Total	Cases	Fulfillment	Accuracy
Type route =1 - Original	4957	3772	1,83%	
Type route =1 - DataSet1	8646	168	1,94%	94%
Type route =1 – DataSet2	25251	370	1,46%	79.78%

Conclusions

- Modeling the data logged from tracked vehicles and applying machine learning techniques allows identifying critical variables related to the route scheduling and execution.
- **This research provides the initial step to establish the bases for a decision support system.**
- The identification of key variables and their relationships in trips that are not fulfilled could be used to produce direct benefits.

Questions?

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EKHMET
MEHRBANI
GRAZIE
KOMAPSUMNIDA
MAAKE
JUSPAXAR
GOZAIMASHITA
EFCHARISTO
TINGKI
SPASIBO
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