

WIFI LOCATIONING PROJECT

IoT Consulting
27/02/2019

PROJECT

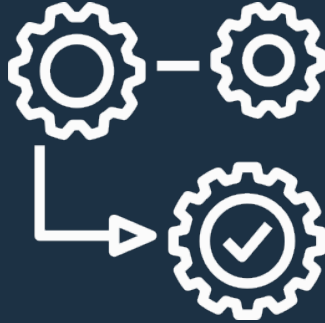
Investigate the feasibility of using WIFI fingerprinting to be able to design a software capable of guiding people through covered spaces, making their mobility easier and thus preventing them from being lost.



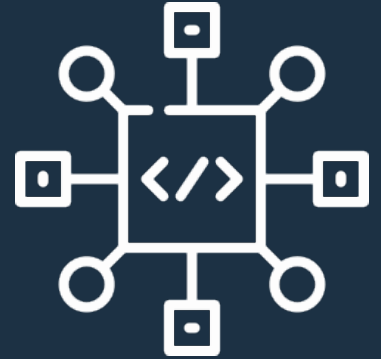
PHASES



Understanding Data



Pre-Process Data



Modeling and Predicting

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TRAIN

529 Vars | 19.300 Obs

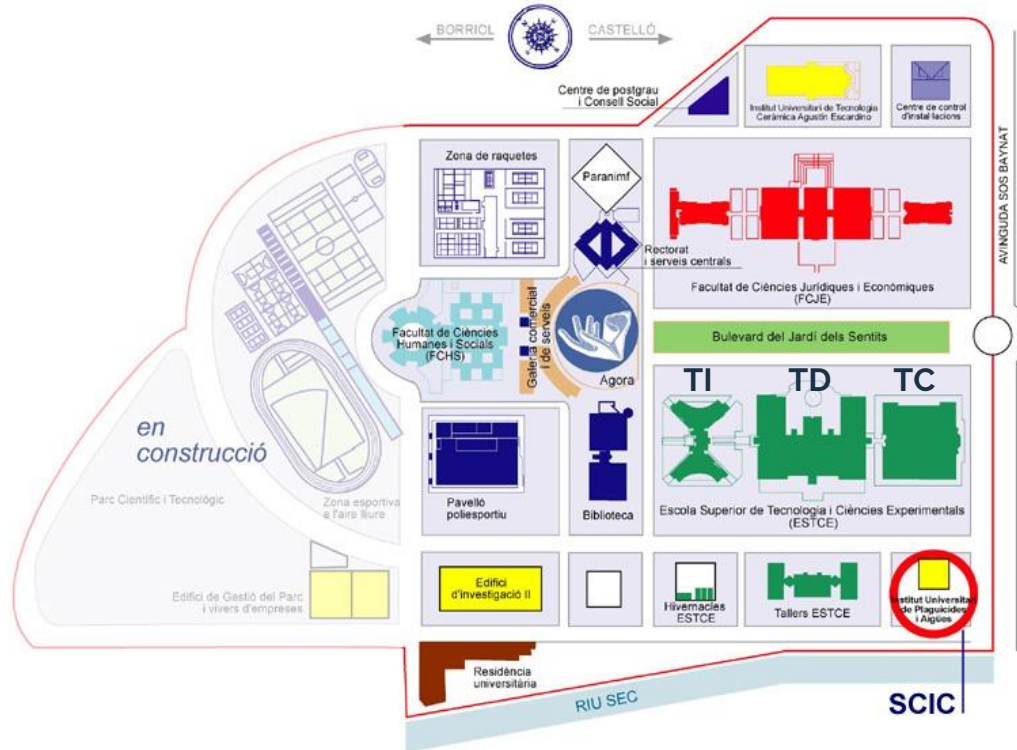
VALIDATION

529 Vars | 1.111 Obs

VARIABLES

- WAP 001 - WAP 520
- **LONGITUDE**
- **LATITUDE**
- **FLOOR**
- **BUILDING ID**
- SPACE ID
- REL POSITION
- USER ID
- PHONE ID
- TIMESTAMP

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Pre - Process Data

- Data Types
- Identify Duplicates
- Default 100 to -105
- Removing Zero Variance
- Outliers Understanding
- Identify the most relevant predictors
- Dummify (Distance based models)
- Standardize (Distance based models)
- Normalize (Distance based models)

Modeling and Predicting

APPROACHES

Divide Data frame per Building

Hole Data Frame

MODELS

Random Forest

K - nearest neighbor

Super Vector Machine

RESULTS



Building ID Prediction (Random Forest)

Confusion Matrix

| | TI | TD | TC |
|----|-----|-----|-----|
| TI | 536 | 2 | 0 |
| TD | 0 | 305 | 0 |
| TC | 0 | 0 | 268 |

Accuracy : 99,82% | Kappa: 99,72

Building ID Error Analysis (Random Forest)



Floor Prediction (Random Forest)

ALL TOGETHER

| | Main Floor | 1st Floor | 2nd Floor | 3rd Floor | 4th Floor |
|------------|------------|-----------|-----------|-----------|-----------|
| Main Floor | 116 | 3 | 0 | 0 | 2 |
| 1st Floor | 9 | 410 | 5 | 0 | 0 |
| 2nd Floor | 6 | 42 | 293 | 6 | 0 |
| 3rd Floor | 1 | 7 | 8 | 165 | 8 |
| 4th Floor | 0 | 0 | 0 | 1 | 29 |

Accuracy : 91,18% | Kappa: 87,66

SEPARATING PER BUILDING

TC

Accuracy : 91,64% | Kappa: 88,28

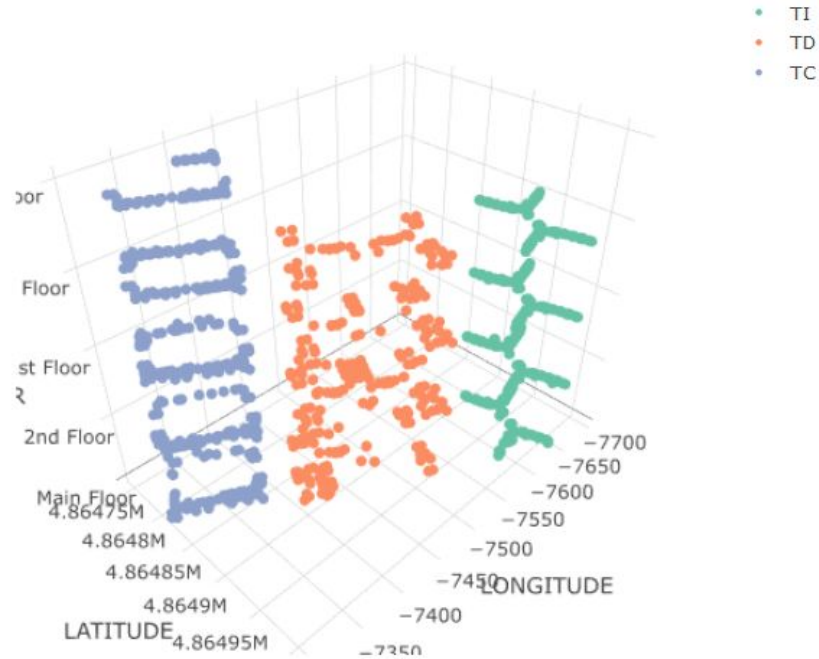
TD

Accuracy : 80,67% | Kappa: 70,66

TI

Accuracy : 97,4% | Kappa: 96,32

Floor Error Analysis (Random Forest)



Longitude Prediction (Random Forest)

ALL TOGETHER

RMSE: 8,95 | R Squared: 99,46% | MAE: 5,51

SEPARATING PER BUILDING

TC

RMSE: 9,01 | R Squared: 92,06% | MAE: 5,61

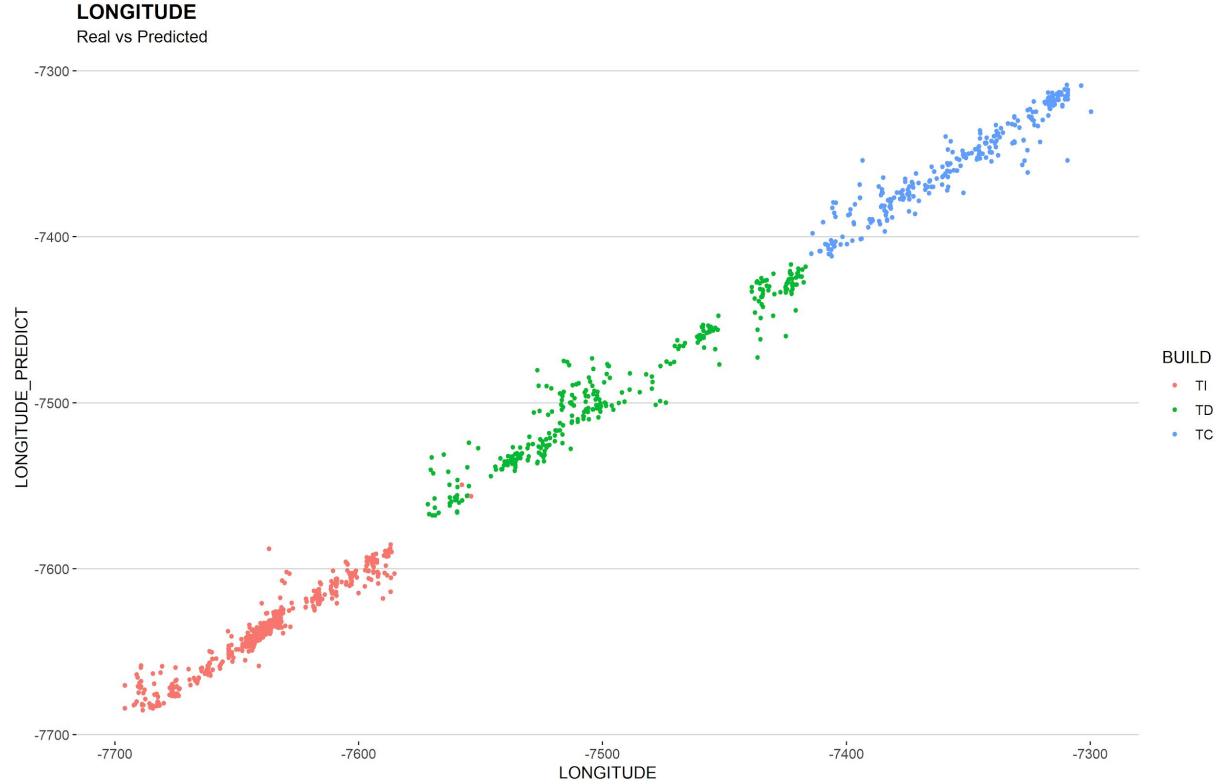
TD

RMSE: 10,24 | R Squared: 95,29% | MAE: 6,92

TI

RMSE: 7,72 | R Squared: 92,20% | MAE: 3,88

Longitude Error Analysis (Random Forest)



Latitude Prediction (Random Forest)

ALL TOGETHER

RMSE: 8,37 | R Squared: 98,64% | MAE: 5,10

SEPARATING PER BUILDING

TC

RMSE: 8,71 | R Squared: 91,21% | MAE: 5,47

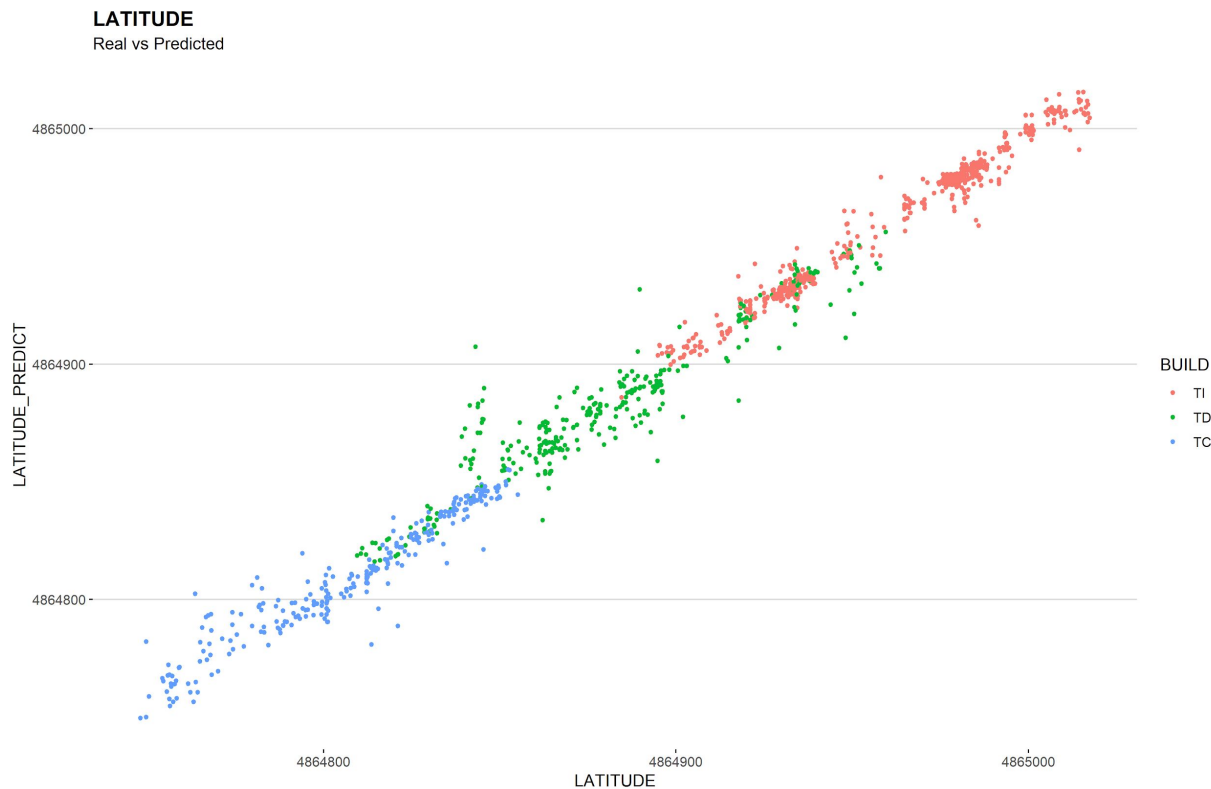
TD

RMSE: 10,67 | R Squared: 91% | MAE: 7,27

TI

RMSE: 7,64 | R Squared: 94,50% | MAE: 3,68

Latitude Error Analysis (Random Forest)



WHAT'S NEXT

MORE DATA

BETTER QUALITY DATA

BETTER DISTRIBUTED DATA

THANK YOU!
