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| LONDON FIRE BRIGADE |

MLOps Project Specifications

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# Context and Objectives

London Fire Brigade is the busiest fire and rescue service in the country. Moreover, it one of the largest firefighting and rescue organisations in the world protecting people and property from fire within the 1587 square kilometres of Greater London. It employs 5000 people.

The system to be implemented will address the need of the Control Staff that is in charge of taking emergency calls (999), discover details of the incidents and deploy resources to emergencies.

A diagram of a fire alarm

Description automatically generated

Fig.1 Use Case Diagram: The London Fire Brigade Incident Management System

**Actor**

Emergency Call Responder: a member of the Control Staff, in charge of taking the emergency calls, registering the incident details and sending the resources (firefighters, fire engines…) to the location of the incident.

**Use cases**

*Login*

This is the first use case of the incident. The system will ask the user to authenticate with a login and a password.

*Predict Attendance Time*

This use case enables the emergency call responder to predict the attendance time, that is the duration between the time of the emergency call and the arrival of the firefighters to the incident place. This information can be provided to the caller.

It returns 2 values:

* a range of **duration**, as the model is based on a label column that shows 6 categories that are 3-minute ranges of durations.
* The **distance** between the fire station and the incident place, in meters.

# Model

The best model for this project is the XGBoost according to the results obtained in the report London Brigade response Time 2023 written by Olga Tarkhanova, Jens Rhalf

And Eike Eckold.

The optimal parameters are:

* n\_estimators : 400
* max\_depth : 8
* learning\_rate: 0.1

The predicted variable is the attendance time, that is the duration from the call to the emergency call center, and the arrival of the firemen.

The initial attendance time has been classified in duration interval of 3 minutes.

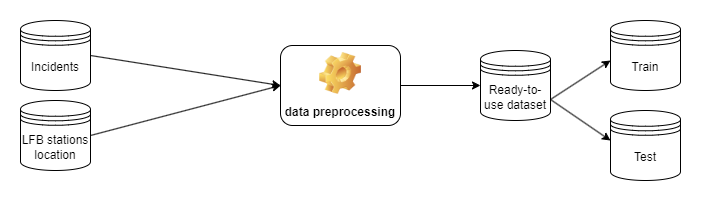
The accuracy of the model is 0.71 and the F2-score is 0.7.

# Database

In a first version, the users will be stored in a dictionary. So far, the only role is

“Emergency call responder”.

The emergency call responder will have access to the use cases “login”, “predict attendance time”, “calculate distance”.



This system uses data from the London Brigade Station. The Incident datasets gathers characteristics of the incidents including but not limited to: their description, their location (coordinates), characteristics of the place.

The data concerning the fire station location have been retrieved from the London Fire Brigade website.

In this first version, these data will be stored in **DataFrames** and **csv files**.

# API

We can propose 5 routes for the API :

* **https:\\[IP\_Address]\** **(GET):** check that the application is live.
* **https:\\[IP\_Address]\login** (**POST):** users will authenticate via this route.
* **https:\\[IP\_Address]\predict** **(POST)** : emergency call responders will use it to predict the attendance time for an incident and get the distance from the fire station and the incident place. It will be based on the address of the incident.

# Testing and monitoring

## Testing

API

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| --- | --- | --- |
| API | Inputs | Expected outputs |
| /login | Login = “harriet”  Password = “munich2024” | Code 200 |
| /predict | “122, Baker Street, London, UK” | attendance time: 3-6 minutes.  Distance to closest station: 1.8 Km. |
|  |  |  |

Model

|  |  |
| --- | --- |
| Metric | Expected result |
| Accuracy | Accuracy > 0.60 |
| F2 - Score | F2-score > 0.60 |

## Monitoring

The metrics to track are:

* The accuracy
* the f2-score

# Implementation Scheme

A diagram of a computer

Description automatically generated