Danger Cast

Hackathon Project

Attack on Python

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Introduction

Medical Rescue

Fire Fighting

Patrol

220 Million€

Nacional Budget

By using AI, most of the services can be optimized and well planned

Reducing cost and improving its efficiency!

Problem Identification

- It is a challenge for the Proteção Civil to make their work in reacting to emergencies and natural disasters as efficient as possible

- The goal is to try to make predictions about the frequency of occurrences in the future, allocate resources effectively, and identify patterns that can enhance their services.

- For this, Proteção Civil provided us with a dataset with the history of incidents, including dates, places, and the number of experts involved

Data Analysis

- A big part of the information we acquired during the analysis of the data was according to what we expected and what would be normal.

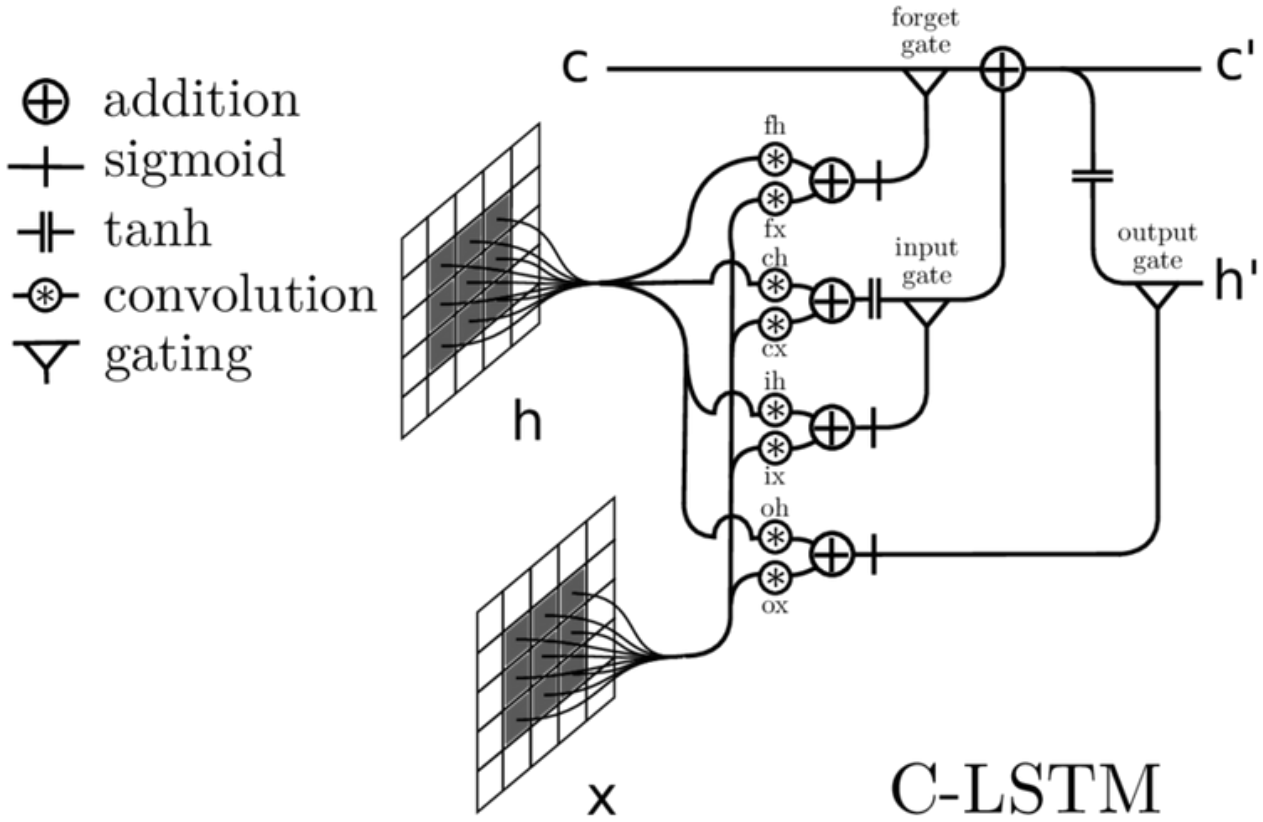
- However, we still found some things that were not as we expected such as:
  - the presence of null values in columns like 'DataOcorrencia' and 'Latitude' for example
  - some longitude/latitude errors when compared to the known boundaries of Portugal. However, this was easily fixed.

- There was also clearly missing data in the first 5 months of 2016 when in contrast with the rest of the dataset

Data Preparation

- Base Dataset: merge of 2016, 2017 and 2018 for extra data and accountability for seasonal occurrences.
- Data Prunning: removal of outliers, null values. Modification of date from string to DateTime and inconsistent data, such as Latitude/Longitude
- Aditional Data: addition of population density, weekdays and holidays. Attempt of addition of temperature and precipitation for firefighting purposes.
- Data Aggregation: creation of blocks of Time*Height*Width representing a region on a given day, each with the 4 features we are trying to predict: Aerial/Terrestrial Means and Aerial/Terrestrial Vechicles

ConvLSTM


addition
sigmoid
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gating
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forget gate
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fh
fx
ch
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input gate
output gate
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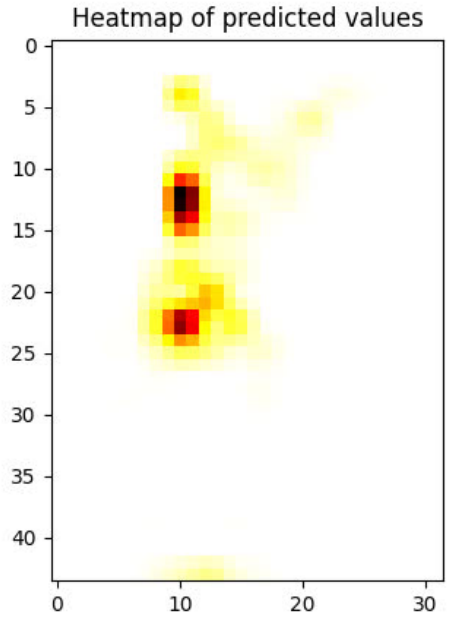
C-LSTM

Evaluation I

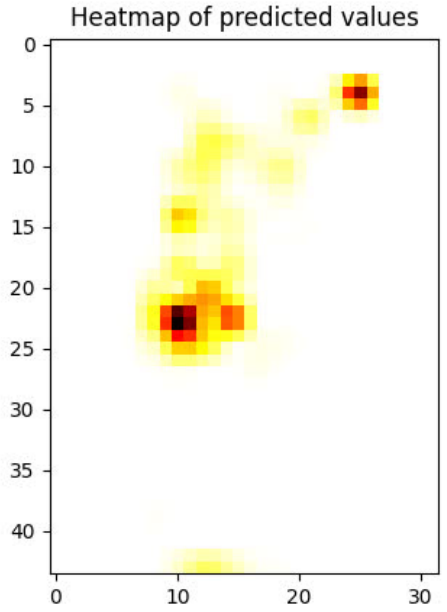
Metric	Value
RMSE	13.398
MASE	1.409

Evaluation II

Air resources progression between April and October of 2018



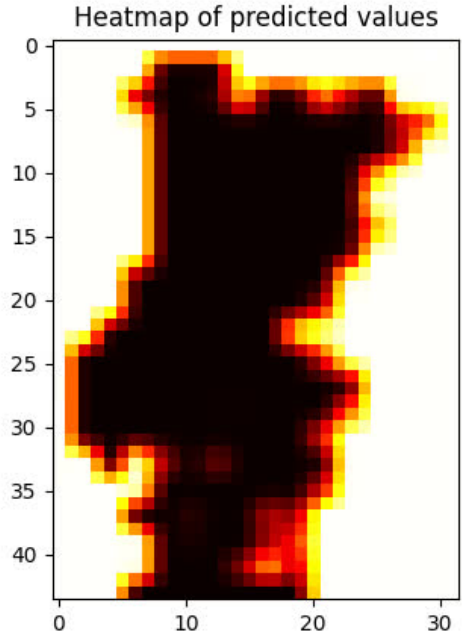
Air Vehicles



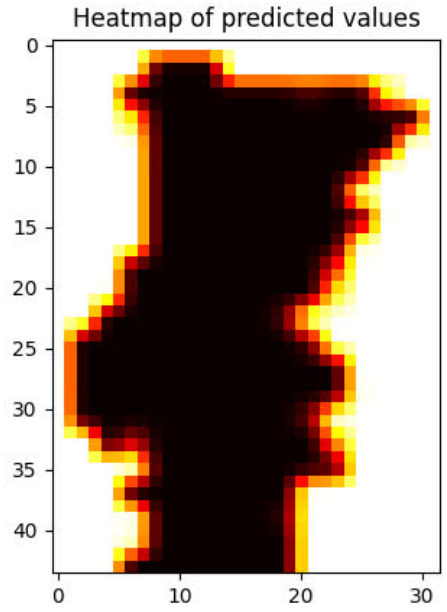
Air Units

Evaluation III

Land resources progression between April and October of 2018

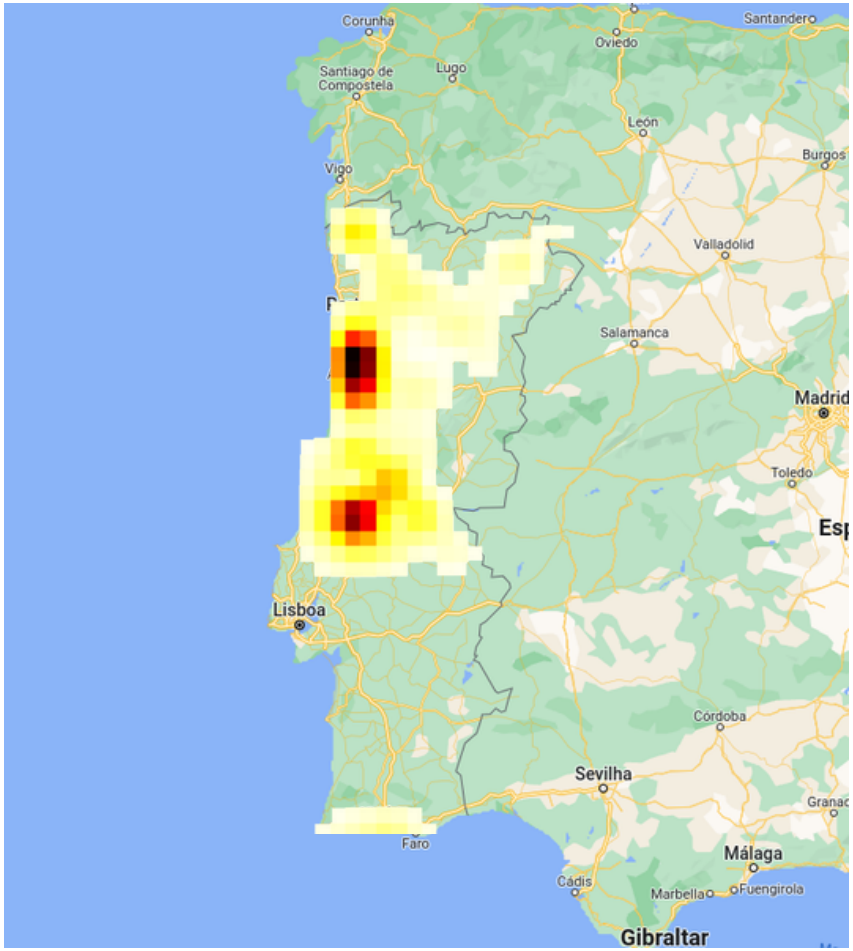


Land Vehicles



Land Units

Prototype


Corunha
Santiago de Compostela
Lugo
Oviedo
Santandero
León
Burgos
Vigo
Valladolid
Salamanca
Madrid
Toledo
Lisboa
Córdoba
Sevilha
Faro
Málaga
Cádis
Marbella
Fuengirola
Gibraltar

Conclusion

- A lot of info but few specific measures, due to better knowledge from authorities about their internal logistics.
- Convolutional Long Short-Term memory neural networks, given the needed resources, can be used to effectively predict spatial-temporal data, like the incidents in this context;
- A predictive model that could help authorities make informed decisions and optimize the allocation of resources to certain regions depending on which time of the year we are in.
- Visualization of predictions in a map can be in the future used to plan and improve the Proteção Civil operations, reducing the time needed to reach where they most need to be.