**Machine Learning for predicting the number of healthcare emergency admissions based on weather conditions**

1. **Introduction**

The issue of long wait times in healthcare emergency rooms is a pressing concern that affects many individuals seeking medical care. In numerous hospitals, emergency departments face overcrowding, understaffing and limited resources, resulting in extended wait times for patients in need of medical attention. On many occasions, peaks in hospital emergencies depend on the weather conditions such as extreme heat, storms, etc. GMV, has been selected to provide precise knowledge about the impact of particulate and gas concentration in ambient air on people’s health and the consumption of healthcare resources, measured through the overload of hospital emergency services and primary care for certain respiratory pathologies [1].

As a company, GMV has many years of experience developing a diverse range of projects for the health sector. Many of today’s health research projects rely on machine learning-based solutions, as this technique enables the analysis of vast amounts of complex data and identifies patterns and trends that would be difficult to detect through traditional methods. Therefore, at GMV, problems like the one presented have been tackled using artificial intelligence-based algorithms due to the speed and effectiveness of these types of solutions.

1. **The problem**

At GMV, we are currently working on solving the problem of the overload of hospital emergency services due to particulate and gas concentration in ambient and its consequences on people’s health. The objective of the problem we are addressing is to predict when emergency departments could be overcrowded based on weather conditions, regardless of whether the emergencies are related to respiratory problems or other health issues. To achieve this, we will be using two datasets - one with information on hospital emergencies attended in Castilla y León [2], and the other with information on the weather on those days. The first dataset includes variables such as the date of attendance, province, age, and sex, while the second dataset provides information such as the date, province, temperature, pressure, and wind velocity. The creation of the second dataset will be an objective of the problem, as the information must be retrieved from the AEMET OpenData API. [3].

Based on the above, the following objectives are proposed:

* **Understand** the idea and main concepts of the problem of **hospital emergency room saturation due to certain weather conditions.**
* **Retrieve** the meteorological information from the AEMET OpenData API and **create a dataset** from that information.
* **Understand** the importance of the **information represented in the datasets**, as well as **their structure.**
* **Understand** the basic concepts of **machine learning algorithms**, as well as **their functioning.**
* **Adjust** the datasets by determining **which variables are relevant** and what **treatment** should have each one of them.
* **Solve** the problem with **different machine learning algorithms** to determine which one adapts better to the problem.
* **Analyze** the results**, discuss** the limitations, advantages, and potential of machine learning algorithms.

1. **Work plan and learning outcomes**

During the first day, the students will receive an introduction to the problem and will be provided with documentation to help them better understanding the subject and the datasets involved in the problem [2] [3]. The rest of the week will be devoted to analyze the data, implement some machine learning algorithms and discuss the findings. We expect that at the end of the modelling week, the students will have a thorough understanding of the problem and the methods used to solve it, as well as means to continue digging deeper into the topic if they so wish.

1. **Literature and references**

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| [1] | «Medicina personalizada big data (MedP-Big Data),» [Online]. Available: https://www3.gobiernodecanarias.org/sanidad/scs/contenidoGenerico.jsp?idDocument=758577a7-ed83-11e8-b089-01b24d484798&idCarpeta=cc84147a-49e5-11de-9081-475c6b3766ff.[[1]](#footnote-2) |
| [2] | «Urgencias Hospitalarias atendidas,» [Online]. Available: https://datos.gob.es/en/catalogo/a07002862-urgencias-hospitalarias-atendidas. |
| [3] | «AEMET OpenData,» [Online]. Available: https://opendata.aemet.es/centrodedescargas/inicio. |

1. Text

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