"InFiX Space Apps Challenge Proposal for the challenge: From Curious Minds Come Helping Hands"

Introduction

The challenge raised was to find populations at risk. We were required to think beyond the proposed challenge, so that is why we propose to analyse risk factors, not only those that directly affect populations but also those that secondarily reflect the problems of certain groups. We have divided the risk factors into natural, social and economic.

The natural factors are earthquakes, tsunamis, draughts, floods, volcanic eruptions...

The social factors are wars, diseases, death rate...

The economic factors are GDP, job insecurity...

Although the ideal would be the analysis dividing the world map in quadrants, due to lack of resources and time we limit ourselves to make the analysis by countries.

Explaining the idea

The main idea is to develop an algorithm that, adapting to the different characteristic parameters associated with each factor, is able to identify those countries that have more problems. Based on the results obtained from the algorithm, measures can be suggested to mitigate these problems.

As the factors have different magnitudes, the most correct way to normalize and compare the countries has been to classify them as they are affected, following the criterion of first the most negatively affected and last the least.

We have applied the algorithm on datasets that contained information of the risks, explained previously, by year in each country.

Currently, the world is divided into 241 countries and islands (194 countries and some of the islands are included), so we have chosen to assign in each classification the first place to the value 241 and so on in descending order until the last country in the list will have the value 1. In addition, as all the factors are subjective or you may have more interest in some than others, starting from a base in which the "importance" of the different factors is the same by default (3), the user may modify the importance of them if he needs (wants) to.

Through machine learning techniques, the data obtained from the analysis would be analysed, with the aim of making a predictive model to predict where those same conditions will occur again and, with it, to be able to adopt measures to reduce the impact on the most disadvantaged populations.

In this way, the application would show different options: the general option, which shows a map with all the factors and the ranking taking into account the same, and 3 more specific options focused on natural disasters, social factors or economic factors respectively. On the other hand, within each individual option, the user could see the

map with all natural disasters or individually each disaster; the map with all social factors or individually each factor and, finally, he could see the map with all economic factors, or individually each factor.

We have focused on a specific risk factor, earthquakes, since it seemed to us to be a more difficult factor to analyse because of the fact that the coordinates of the epicentre of the earthquake must first be associated with the affected country. To simulate this, we decided to make a radius around the epicentre of the earthquake in order to locate the country. The radius we have taken as a reference is an average radius that takes into account that the same earthquake can affect several countries if they are under the area of influence. Although it is a somewhat inaccurate measure, it is possible to approximate the number of earthquakes that have affected a country.

The ideal would be to make a mesh to the world map and study which areas are affected by earthquakes more precisely because, as there are countries with different geometric shapes and sizes is complicated to associate the geometric shape of a country to a simple geometric shape. Also, this coordinate system, as it is not a system with Euclidean geometry, should not suppose a radius of affectation of the earthquake around the epicentre as it is not appropriate seen from the mathematical point of view. The algorithm should have taken into account both the depth and magnitude of the earthquake since it varies the radius of affectation and can involve large errors of calculation.

Conclusions

Even though all the ideas have not been carried out, the idea has a consolidated scientific basis. But although it is not an innovative idea since the techniques used are applied in many of today's fields, we believe that it can have an impact on society since it would help many populations that are currently invisible. The idea would not put the focus of problems on a single risk factor but goes further by unifying fields that appear to be very different from each other but are related in some way. We intend that those organizations that focus their aid on a single population, open their field of action and realize that there are other populations who need help and collaborate to make the problems of these populations visible.