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Objective Regressive Regression (ORR) Methodology and its Predictive Potentials

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Opinion

The struggle between man and infectious diseases dates back to the very beginning of civilization. Throughout history, mankind has suffered the scourge of an infinite number of entities with varied etiological diversity (viral, bacterial and parasitic), which have spread death and disability among millions of the planet's inhabitants. The increase in re-emerging and emerging diseases in recent decades has greatly complexified the epidemiological picture at the global level, where the occurrence of several epidemic and pandemic outbreaks has been evident, with marked repercussions on human health and that of other animals. It must be taken into account that this increase in infectious entities has not been, nor is it something casual, but rather the consequences of human mismanagement of ecosystems. The current situation that the planet is experiencing, due to the new coronavirus, is one more effect derived from the bad behavior of anthropogenic activity, accumulated over thousands of years.

Several models and methodologies have been applied in the study, analysis and modeling of COVID-19 in the world, among which the following stand out: Ordinary Differential Equation of First Order (EDOPO), linear type; Simple linear Regression model; Generalized Logistic Growth Model (GLM); Structured Susceptible-Exposed-Infected-Removed (SEIR)/ SEIR model; the Bayesian Probability Mathematical Model; SIRD model; Conceptual Model, the Simulation Model, the non-linear models (Gompertz, Richard and Weibull) among many others. In the case of the ROR methodology (linear model), it is used for the first time to predict the growth of the datos over time, specifically for COVID-19.

The Objective Regressive Regression (ROR) Methodology and its Possibilities

The Objective Regressive Regression (ROR) methodology has been implemented for different variables (viruses and bacteria that have circulated in the province of Villa Clara, Cuba) and even the SARS-CoV-2 virus that caused COVID-19.

Objective Regressive modeling (ROR), based on a combination of Dummy variables with ARIMA modeling, where only two Dummy variables are created and the trend of the series is obtained, requires few cases to be used and also allows the use of exogenous variables that make it possible to model and forecast in the long term, depending on the exogenous variable, has given better results than ARIMA modeling in some variables, such as HIV modeling, entities of viral etiology/arbovirosis and parasitic entities. In this methodology, the dichotomous variables DS, DI and NoC must first be created, where: NoC: Number of cases of the base (its coefficient in the model represents the trend of the series). DS = 1, if NoC is odd; DI = 0, if NoC is even, and vice versa. DS represents a sawtooth function and DI this same function, but in inverted form, so that the variable to be modeled is trapped between these parameters and a large amount of variance is explained, a detailed explanation of which can be found in Osés, et al. and Osés, et al. Subsequently, the Regression analysis module of the SPSS version 19.0 statistical package is run, specifically the ENTER method where the predicted variable and the ERROR are obtained. Then the autocorrelograms of the variable ERROR will be obtained, paying attention to the maximums of the

significant partial autocorrelations PACF. The new variables are then calculated according to the significant Lag of the PACF. Finally, these regressed variables are included in the new regression in a process of successive approximations until a white noise in the regression errors is obtained.

The ROR methodology offers many possibilities for mathematical modeling, in fact, the authors have applied it to model mosquito larval densities, as well as the population dynamics of mollusks, and even beyond (possibility of modeling infectious entities of different etiologies, such as HIV/AIDS, Cholera, Influenza, Acute Respiratory Infections (ARI), Fasciolosis, Angiostrongylosis); Acute Bronchial Asthma Crises (CAAB), and even, in the estimation of the length and area of the universe, monthly forecast of precipitation and extreme temperatures, forecast of extreme meteorological disturbances (hurricanes), prediction of latitude and longitude of earthquakes, search of information in white noises, modeling of the equivalent effective temperature (TEE) and atmospheric pressure (PA) up to the electricity consumption of a municipality, province or nation, and recently the forecast of earthquakes in Haiti up to the year 2096 was incorporated, and of which we only sketch some results, since they will be published very soon, we only need a journal that will open the doors, and what is even more important, that will not charge us.

The ANOVA analysis of variance was highly significant, with Fisher's F, large. The model obtained for the Year, depended on the value predicted by an ARIMA model with 12 autoregressive parameters, where the forecast of the Year appreciated its increase according to the trend of earthquakes at global level, which is increasing. The forecast of the year of occurrence using the ROR methodology, the variable Year did not present value in 2010, date in which the previous earthquake occurred in Haiti, and that does not appear in the original database that reached us, as a curious note, the forecast for 2011 is close to 2010, the earthquake that occurred on August 14, 2021 is the closest to the date of 2022 or 5 cases after the last case that we have data, these 5 cases will be important for the comments of other forecasts. The explained variance was 95.8 with an error of 2.53, this depends on 7 steps back (Lag7Month) in the short term, and 18 steps in the long term (7+11) (Lag18Month) adding the 11 years of the solar cycle, so in the short term all the variables were significant at 99.95 and 90%. In the case of the Day variable, 5 cases beyond 2011 corresponds to day 17 (16.69726) and the earthquake occurred on day 14, that is, approximately 3 days' difference only. The model for the short-term magnitude, the forecast value was 7.28, very close to the 7.2 on the Richter scale, while the long-term model for latitude, explained 99.3 with an error of 4.97º, there is no trend in latitude, while for longitude, the model explained 99.9 with an error of 5.71º, in this case the trend is to decrease, that is, the earthquakes tend to occur towards shorter longitudes in the Haitian territory. As we do not have the data of the latitude and longitude in which the earthquake of August 14 of the current year occurred, since we do not have Internet due to the COVID-19, we will focus on the next earthquake that should occur in the year 2031, according to the forecast for all the parameters.

As conclusions, good models were obtained, both for latitude, longitude, Month, Day, Hour, Depth and Magnitude, where the tendency of the earthquakes is to decrease in longitude, since latitude does not present a tendency. The earthquakes that will occur in Haiti can be predicted until the year 2096. The real and predicted values have good agreement, so it is demonstrated that it is possible to use the 11-year solar cycle to predict earthquakes, which in the case of Haiti, the next earthquake should occur in the year 2031.

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