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Short Report

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Predictions of daily contagions of CoViD-19 from October 10, 2020 until February 2021 in Italy with a new Epidemiologic FRactal Model plus Exponential (EpiFRAME) to better frame the pandemic due to the 2B-BetaSarbeco-virus SARS-CoV-2

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Abstract : We study a new fractal model for prediction of contagions of CoViD-19 using experimental data from October 10, 2020 to predict contagions from November until February 2021 in Italy. We obtain that the time of the peak is estimated to be at November 11, 2020 when number of contagions will be about 38489 cases.

Introduction

The aim of the present work is to effect a prediction of the contagions of SARS-CoV-2 in Italy using experimental data in the period from October 10, 2020 to February 2021. In the work we use the methods of the fractal analysis, fitting a new fractal model following the performance that was used previously from Ziff and Ziff [1] during the contagions in China. The current prediction, effected by such new model introduced by us, is that the size of the epidemic will be about 38489 cases of contagions in Italy and the time of peak will be about November 11, 2020 on the general plane, depending instead the actual size of

the process from the respect or an increase o decrease of the prevention measures that are fixed from the governing bodies.

Materials and Methods

The power-law (fractal) behavior has been postulated and applied in epidemic studies of Corona Virus disease in China. It is related to the properties of the networks that carry out the propagation of the disease. Vazquez [2] developed a network model, Anna L. Ziff and Robert M. Ziff [1] applied a fractal behavior model in contagions in China. The daily number of new contagions cases, $n(t)$, in an epidemic followed a power-law with an exponential cutoff

$$n(t)=kt^{\gamma}exp(-t/t_0)$$

This model was used in our previous estimations [3,4,5]. We have modified such model introducing an additive linear term $C(n)$. Therefore, the model that we adopt is the following

$$n(t)=kt^{\gamma}exp(-t/t_0)+C(n)$$

where $C(n)$ is a linear parameter that is established by the fitting operation.

Results

We applied the previous model for the contagions of SARS-CoV-2 in Italy. The parameter values that we estimate are the follows

$$k = 2.1486$$

$$\gamma = 3.8671$$

$$t_0 = 8.4377$$

$$C(n) = 6435.77$$

Statistics of parameters (r=0.98)

parameter	standard error	Range (95% confidence)
$k = 2,1486$	0,8517	0,3944 ÷ 3,902
$\gamma = 3,8671$	0,1210	3,6057 ÷ 4,1046
$t_0 = 8,4377$	2,8860	2,7977 ÷ 14,0777
$C(n) = 6435,77$	657,9700	5080,64 ÷ 7790,90

They confirm that we are in presence of a fractal regime given by the non-integer value of γ . The value γt_0 represents the Time of the Peak. The results are in Figures 1, 2, 3. The experimental data explored is from October 10, 2020 to February 2021. It is seen that the time peak is about the November 11, 2020, with a total of contagions of about 38489 cases.

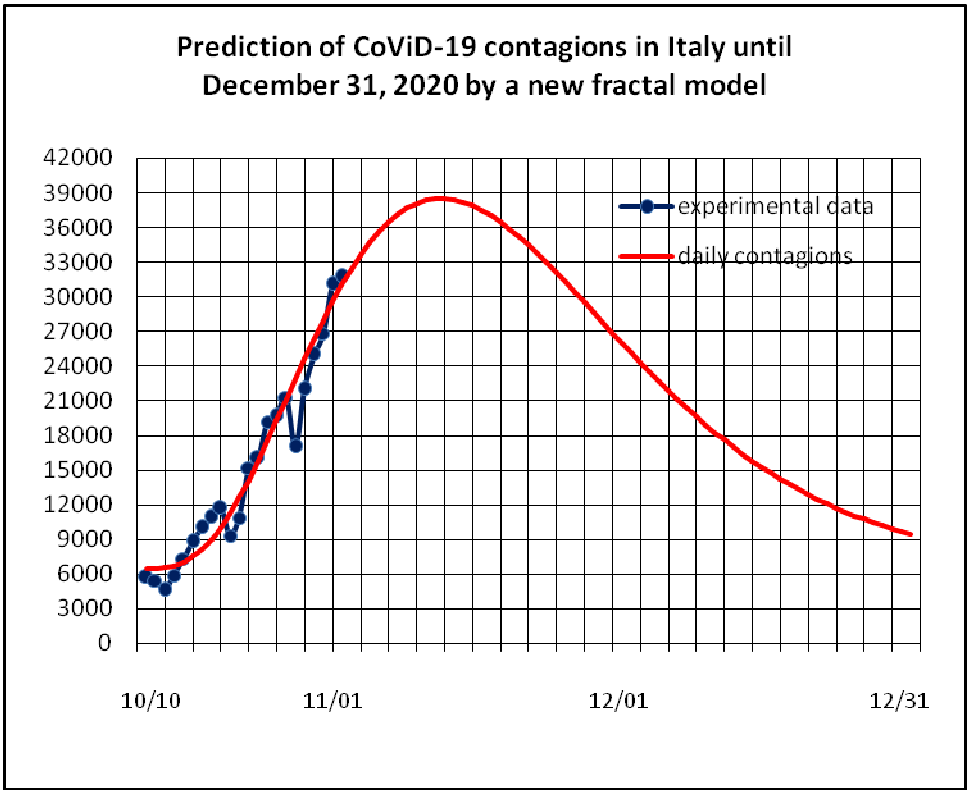


Figure 1

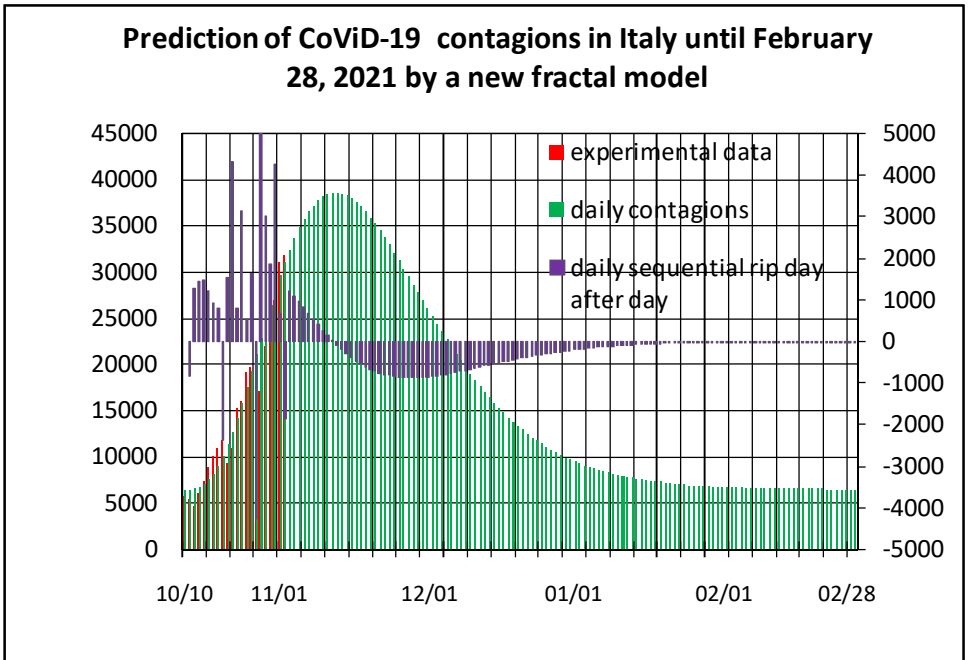


Figure 2

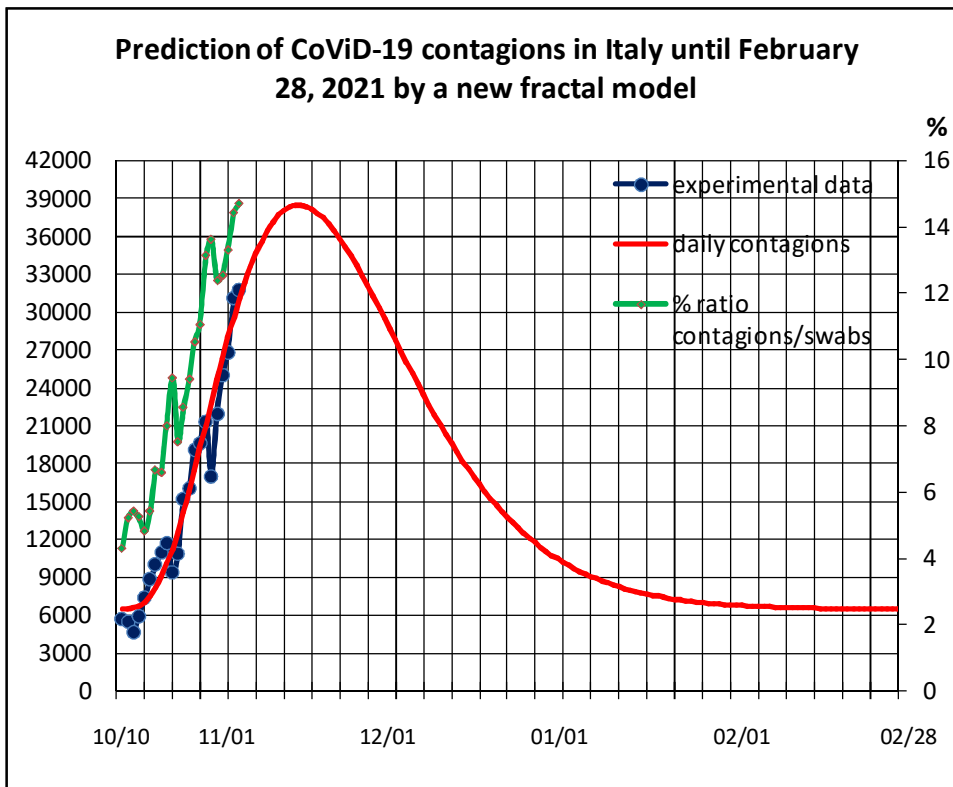


Figure 3

We calculated also the correlation existing daily between the number of contagions and the swabs made. The results that follow, indicate that such correlation exist at an high statistics level since the P-value is of < 0,0001 and the P value summary has three stars.

Statistics	
Number of XY Pairs	22
Pearson r	0,8515
95% confidence interval	0.6706 to 0.9368
P value (two-tailed)	P<0,0001
P value summary	***
Is the correlation significant? (alpha=0.05)	Yes
R squared	0,7250

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Figures

Prediction of CoViD-19 contagions in Italy until December 31, 2020 by a new fractal model

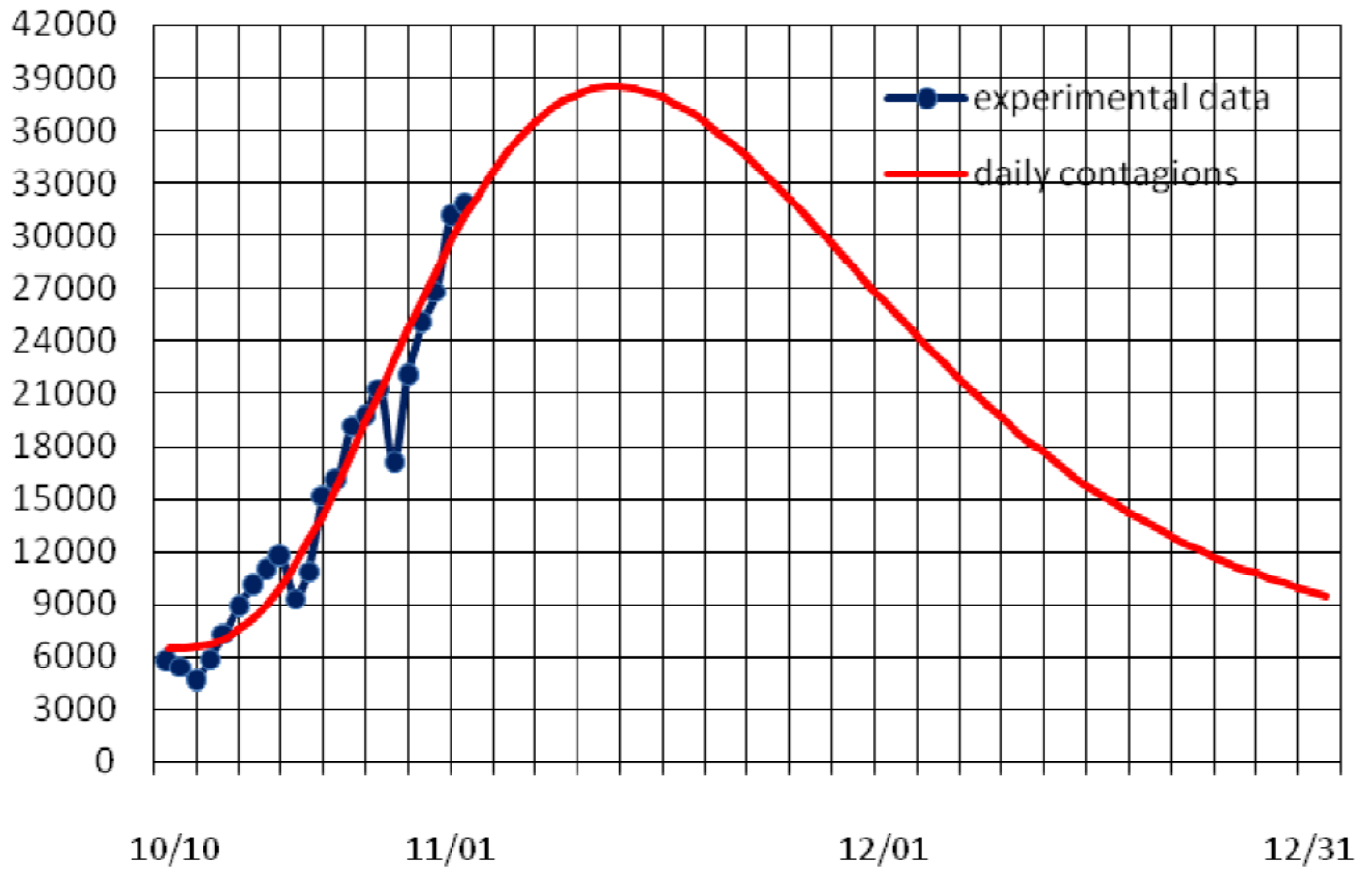


Figure 1

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Prediction of CoViD-19 contagions in Italy until February 28, 2021 by a new fractal model

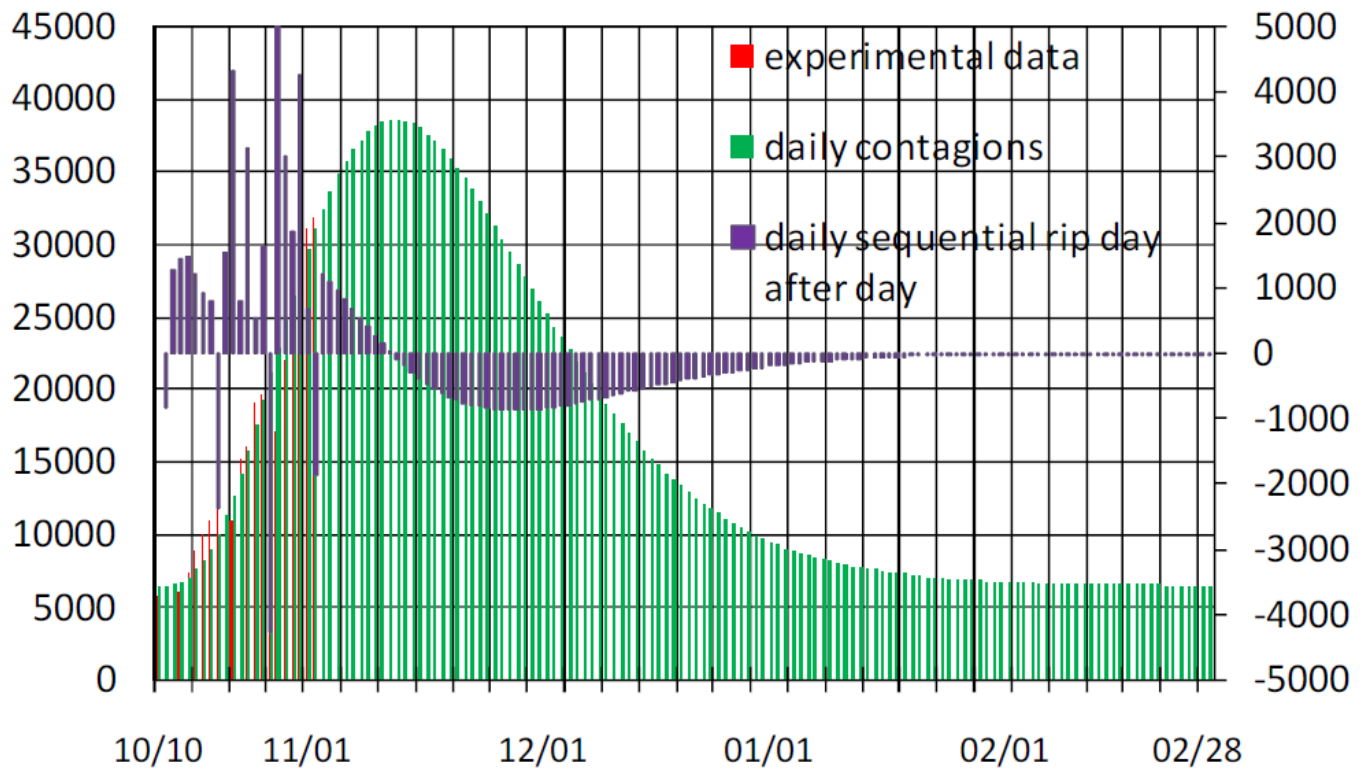


Figure 2

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Prediction of CoViD-19 contagions in Italy until February 28, 2021 by a new fractal model

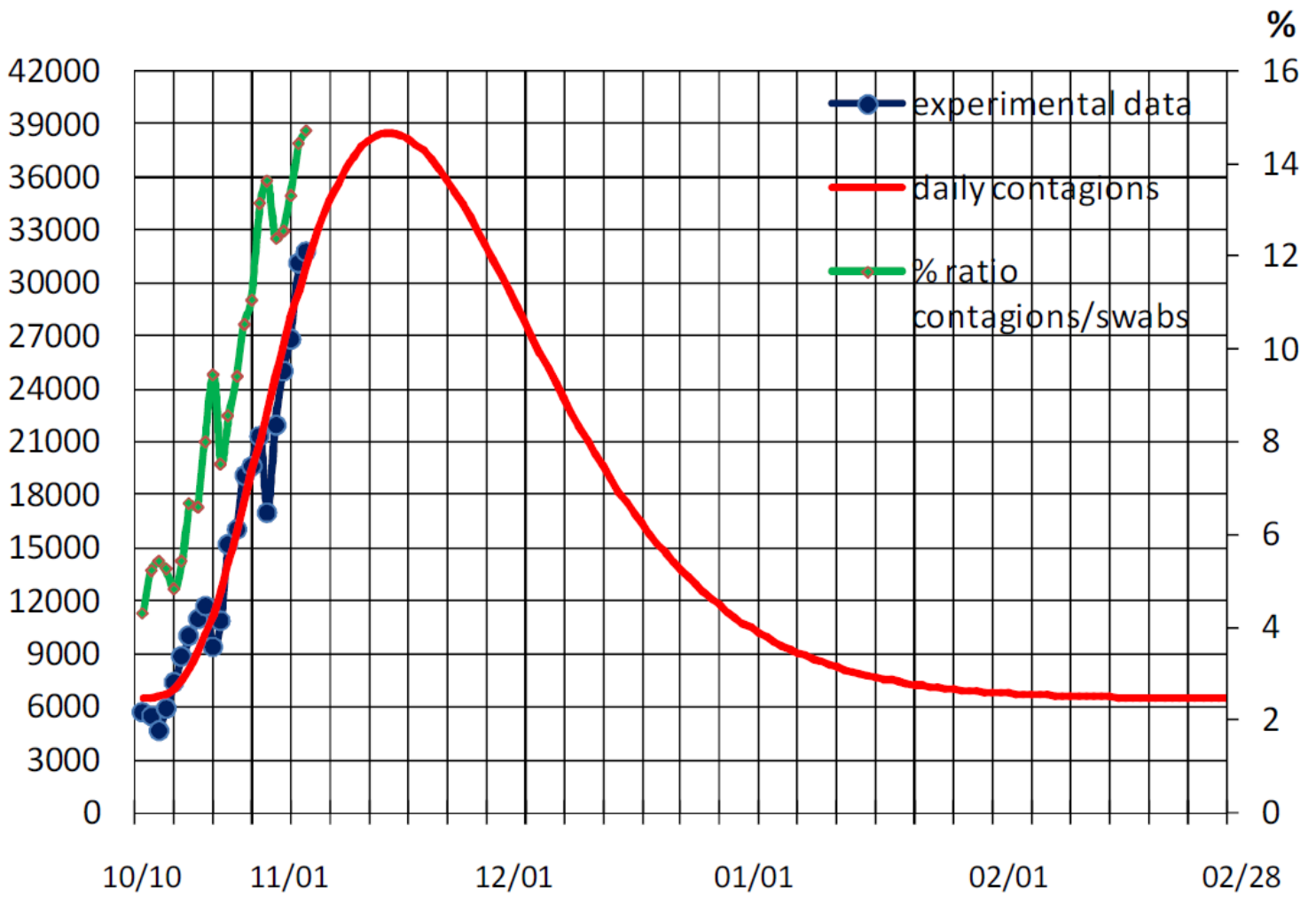


Figure 3

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