How India and its Neighbors are doing during Covid-19 Pandemics- A Critical Analysis

Pankaj Agarwal, Sapna Yadav, Juhi Chaudhary

Abstract: The prime objective of this work is to understand how India & its neighbors are doing during the ongoing period of Covid-19 pandemics. We have used the web crawlers to find specific data of India from official website www.mohfw.gov.in. We also referred to a dataset of global cases from Gitub for our work. We have analyzed the covid19 cases from 22/1/2020 till 1/5/2020. We applied a time series prediction model to forecast the possible deaths for next five days. We have taken into account six of our neighbors excluding China to understand how India is doing in comparison to our neighbors. We observed that considering the size of India population India has done fairly well. However the number of increasing cases in India particularly in the month of May needs a serious call from Indian Govt. We have presented the outcomes of our work through different kinds of comparisons & analysis. He have presented the prediction of next ten days for India & its neighbors for the duration 4/5/2020 to 13/5/2020

Keywords: Covid-19, SARIMA model, Prediction Analysis, Time Series, Indian Neighbors

I. INTRODUCTION

In India lockdown was imposed on March 25 and it was planned to lift it by May 17 after two extensions putting the total period of restrictions at 54 days. With every passing day Corona virus continues to strangle economy & healthcare facilities as world continues to record higher number of cases. Corona positive cases in India continue to rise on a daily basis despite implementation of social distancing measures and extension of nationwide lockdown.[1] As per the recent health ministry data, Maharashtra, Gujarat and Delhi continue to remain the worst-affected states by the Covid-19 pandemic. However, positive is that as per the Indian Council of Medical Research (ICMR) and health ministry the community transmission of Covid-19 is not happening at the moment. The entire world including World Health Organization has praised India's timely actions to stop corona virus. In India there has been an alarming spike in the number of positive COVID-19 cases seen from mid April onwards. The first case was detected on January 30, 2020.

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It took 45 days to reach the figure of 100 implying a slow spread of the disease. However it took only 9 days for the total number of positive cases to reach 500.

And just 5 days later, India crossed the 1000 mark. Furthermore, it took only one day to reach 1200, and just one more to reach 1500. Things are not looking encouraging for India [3].

The Health Ministry, however, says the rate of increase has been slower than some of the developed nations. Meanwhile, the testing rates in India continue to be significantly lower than that of other countries. According to one of the China's top scientists Sars-Cov-2, the virus that causes the coronavirus disease (Covid-19), cannot be stopped and will continue to cause seasonal infections like the flu [1,2].
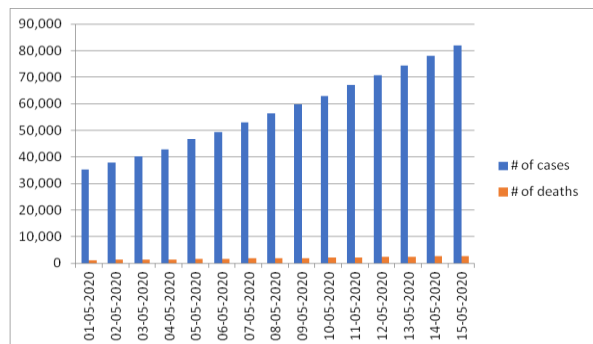

Figure 1: Actual Cases VS deaths in India in May 2020

We have tried to analyze the rate of growth of cases in India in comparison to our neighbors including Pakistan, Bhutan, Sri Lanka, Bangladesh, Thailand and Indonesia. We wanted to understand if the conditions like climatic, longitude, latitude etc has something to do with corona cases in this part of the world. This understanding is important as the number of cases in rest of the world particularly America & Europe is getting worse day by day.
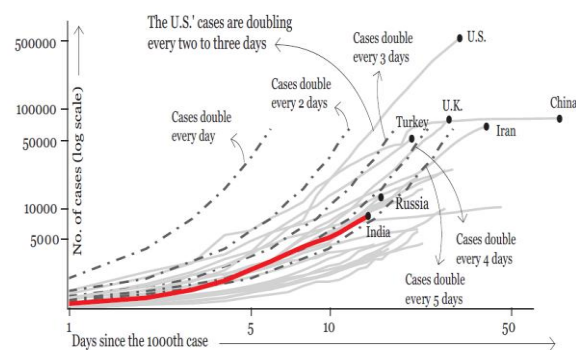

Figure 2. Day-wise case progression since the 1000th case in a country

75

The chart above shows the day-wise progression of cases since the 1000th case in each country. Fourteen days* have passed since India recorded its 1,000th case. As per the above figure the cases in India are now rising as an alarming rate in similar fashion as seen in worst hit nations.

As of the 14th day, cases in India are doubling every four to five days, similar to the U.K. and Russia. Cases in Turkey are doubling every three to four days.

II. PROPOSED STUDY & WORK

We have used the web crawlers to find specific data of India from official website www.mohfw.gov.in. We also referred to a dataset of global cases from Gitub for our work [4]. We have analyzed the covid19 cases from 22/1/2020 till 1/5/2020. We applied a time series prediction model to forecast the possible deaths for next five days. We have taken into account six of our neighbors excluding China to understand how India is doing in comparison to our neighbors.
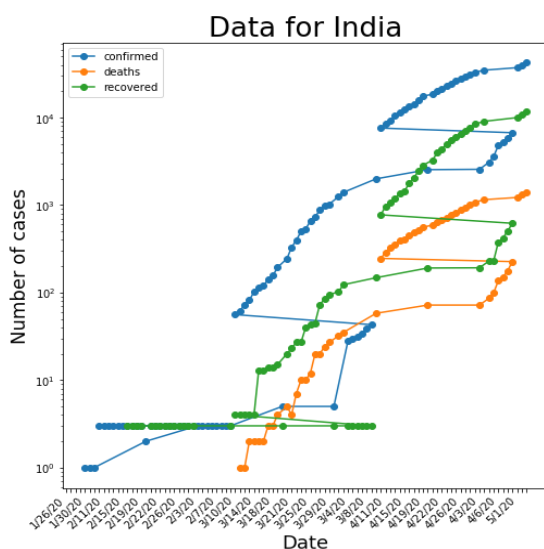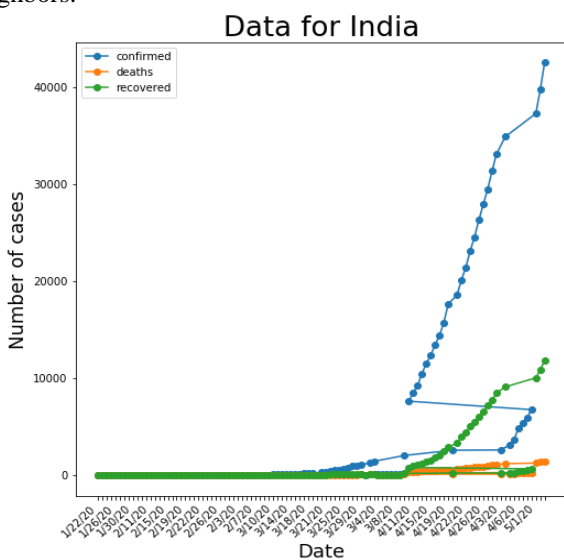

Figure 3: Number of cases w.r.t dates in India. LogScale=False (left figure)

A. Obversevations:

- Deaths started picking up from mid April. However as per the experts there are no signs of community spread.
- Sharp rise can be seen in the no. of confirmed cases from 2nd week of April onwards. This is the major area

of concern. This is primarily due to increase in the testing of corona cases upon the availability of testing kits

- However the % of recovery cases is also increasing from 2nd week of April 2020.

B. Major reasons for steep rise in cases

- According to Joint Secretary of the Health Ministry about 30% of the total coronavirus infections reported so far are linked to the Tablighi Jamaat congregation. the Markaz event-related cases have been found in States with high burden of the disease, such as Tamil Nadu (84%), Telengana (79%), Delhi (63%), Uttar Pradesh (59%) and Andhra Pradesh (61%).
- It has been observed that cases are spreading through vegetable & fruit sellers. Traces of virus are found in vegetables.
- In some crowded regions particularly in slum areas like Dharavi in Mumbai people are not following social distancing. This is also because of the lack for proper living conditions and basic amenities.
- It has also been noticed that the cases are also spreading through hospitals that are treating Covid cases.
- Poor people particularly those who are stranded in different states and are moving to their home states. Majority of them have also become the carriers of corona.

Following are the number of cases including confirmed, recovered & deaths for neighboring countries of India including Pakistan, Bhutan, Sri Lanka, Bangladesh, Thailand and Indonesia

C. Prediction Model for next 5 / 10 days

For prediction of cases we have applied Seasonal Autoregressive Integrated Moving Average, or SARIMA model which is an extension of ARIMA. It is a widely used method for time series forecasting with univariate data containing trends and seasonality. It supports the direct modeling of the seasonal component of the series.

SARIMA has three hyperparameters to specify the autoregression (AR), differencing (I) and moving average (MA) for the seasonal component of the series.

These components are :

p: Trend autoregression order,

d: Trend difference order,

q: Trend moving average order.

m: The number of time steps for a single seasonal period

Importantly, the m parameter influences the P, D, and Q parameters. For example, an m of 12 for monthly data suggests a yearly seasonal cycle. We have applied SARIMA using python in three steps i.e Define the model, Fit the defined model and then make a prediction with the fit model. We have first predicted next 10 days for India. To study the comparison of India VS our neighbors we have predicted the next five days
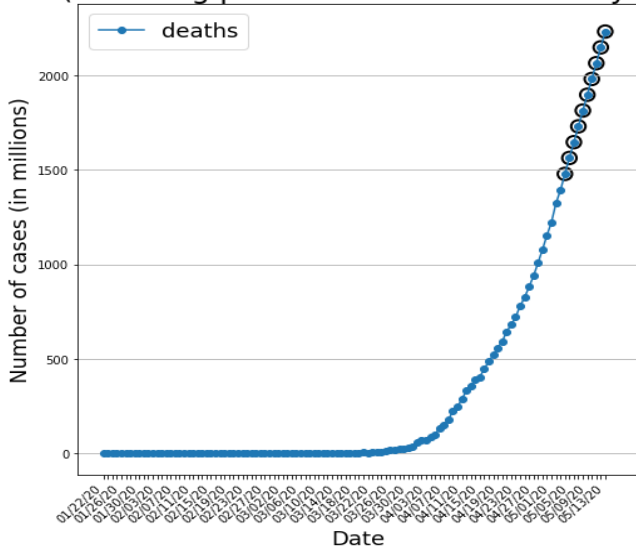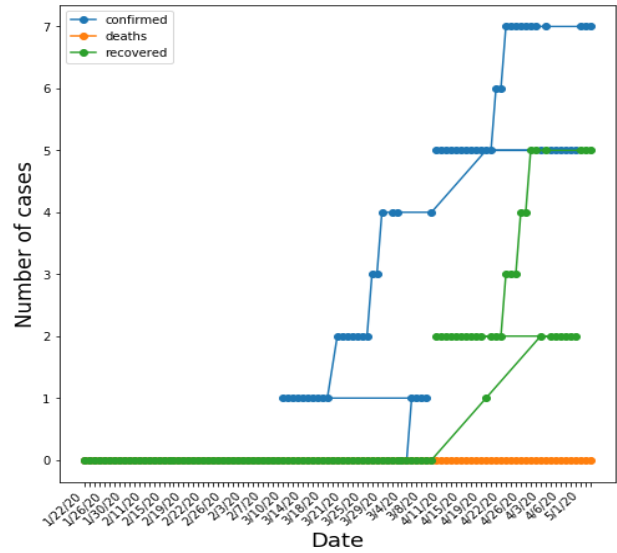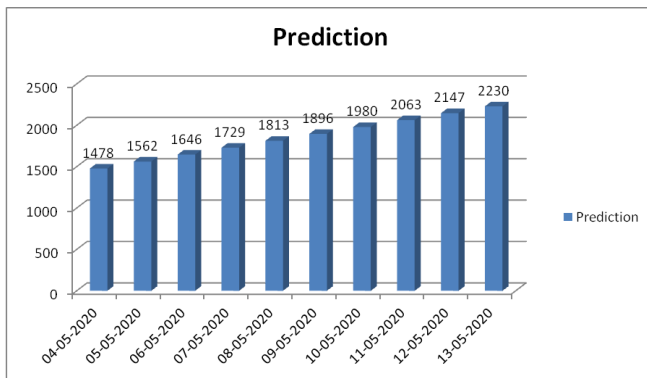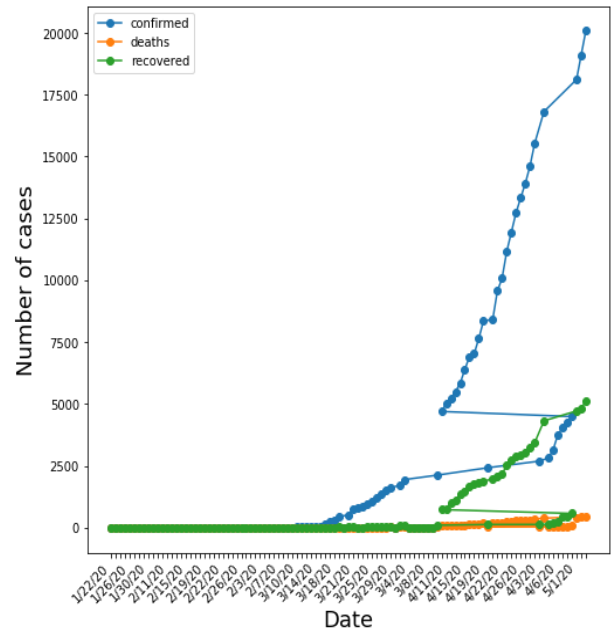
Figure 4: Date wise next 10 days prediction for India
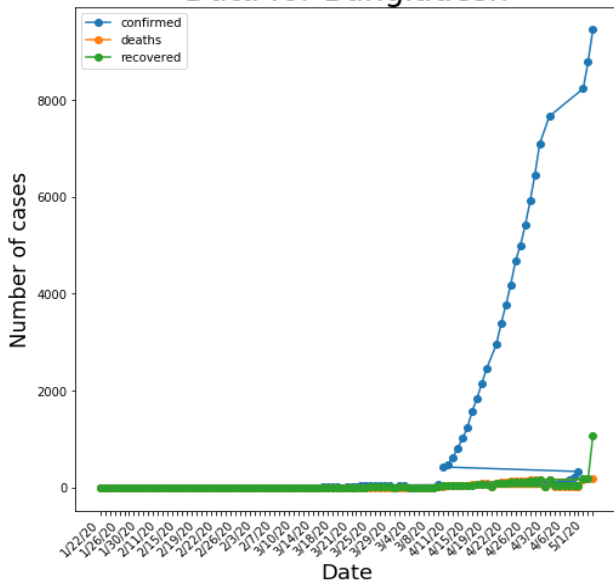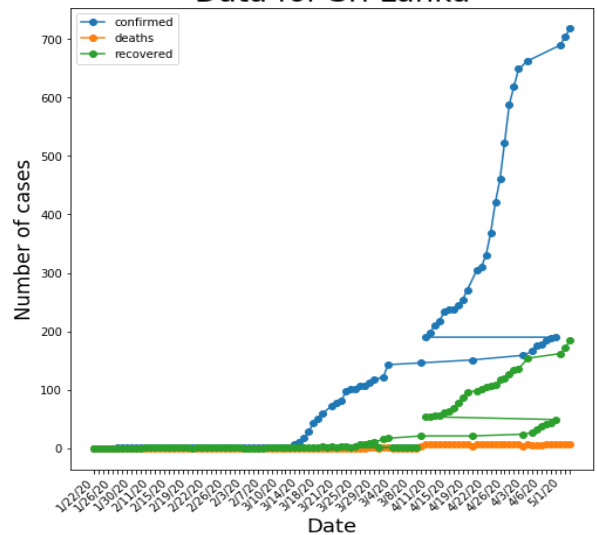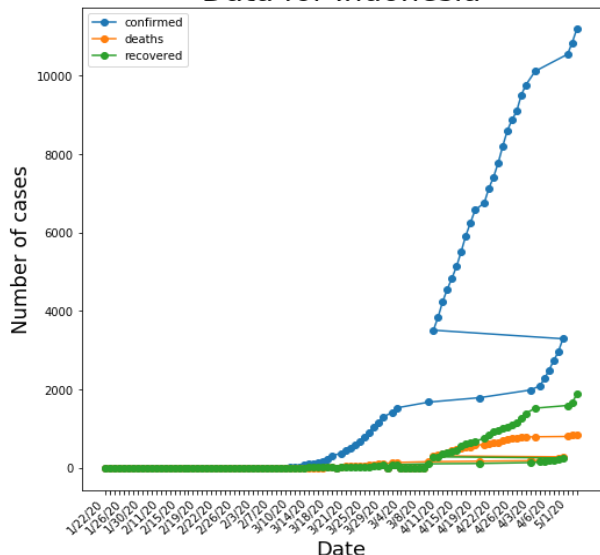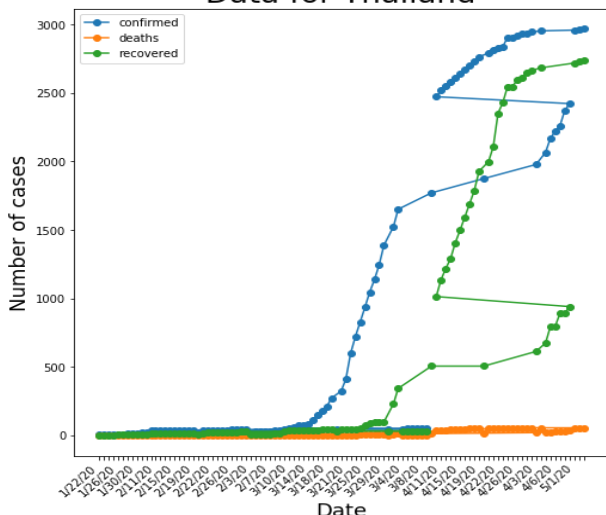
Data for Indonesia

Data for Thailand

Figure 5: number of predicted cases for next 5 days including confirmed, recovered & deaths for Pakistan, Bhutan, Sri Lanka, Bangladesh, Thailand and Indonesia
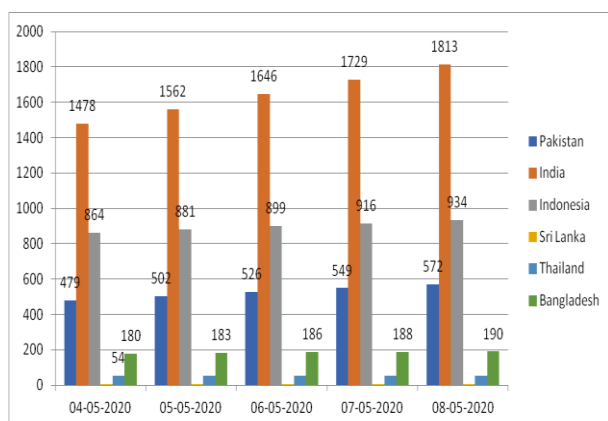

Figure 6: Comparison of predicted deaths for all neighbors for next 5 days

We have also done the prediction for next ten days for all neighbors

Table 1: predicted deaths for all neighbors for next 10 days

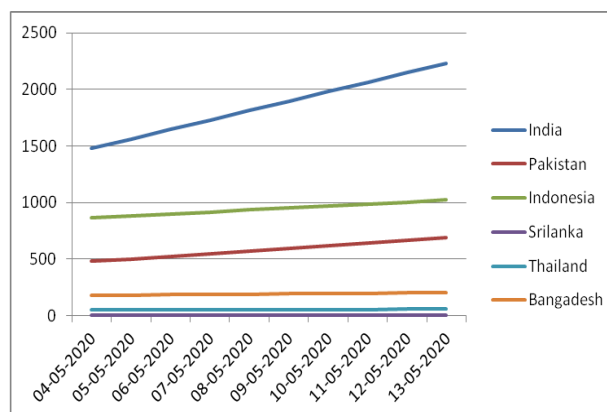| DATES	India	Pakistan	Indonesia	Srilanka	Thailand	Bangadesh
04-05-2020	1478	479	864	7	54	180
05-05-2020	1562	502	881	7	54	183
06-05-2020	1646	526	899	7	55	186
07-05-2020	1729	549	916	7	55	188
08-05-2020	1813	572	934	7	55	190
09-05-2020	1896	596	951	7	55	193
10-05-2020	1980	619	969	7	55	195
11-05-2020	2063	642	986	7	55	197
12-05-2020	2147	665	1004	7	56	200
13-05-2020	2230	689	1022	7	56	202

Figure 7: Comparison of predicted deaths for all neighbors for next 10 days

Above chart clearly depicts that rate of increase of cases for India is getting worse in comparison to its neighbors. This should surely raise concerns among officials and appropriate steps needs to be undertaken as soon as possible. This trend must be taken into account while taking any decisions by the government decisions to lift the lockdown.

Country	Deaths	Population Size(Millions)	% of Population
India	1391	1,369.56	1.015654663
Pakistan	457	208.57	2.191110898
Bhutan	0	0.76	0
Sri Lanka	7	22.18	0.315599639
Bangladesh	177	168.31	1.051630919
Thailand	54	66.56	0.811298077
Indonesia	845	275.69	3.065036817

Figure 8: Depiction of deaths (as on 1st May) w.r.t proportions of actual populations
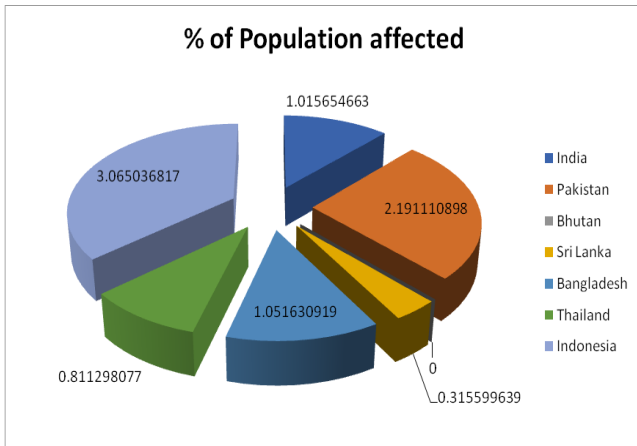
Figure 9: it shows the % of population that has got affected

Above comparison seems to be interesting. Here we have analyzed the proportion of Corona cases in respect to Country's total population. This shows that India stands pretty well in comparison to some its neighbors like Pakistan & Bangladesh which have similar cultural, demographic & climatic conditions. However this by any means does not make us relaxed as India is a hugely populated country and the way cases are rising, it may soon get into community spread like USA,Italy, Spain, UK etc.
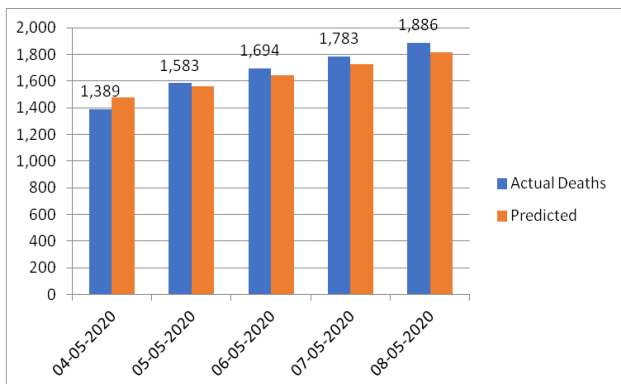

Figure 10. Comparison of actual deaths VS predicted values for India for next 5 days

Our prediction model seems to perform quite well. Model prediction accuracy will further improve with the increase in the size of the data.

III. CONCLUSION & FUTURE WORK

This work primarily focused on Corona Cases in India & various aspects related to it. The comparative analysis presented in this work clearly suggests that we need to bring about more serious implementation towards controlling the pandemics, otherwise the rising trends can turn into a very serious problem similar to many western countries like USA, Italy, Spain etc. the study also indicates that spread of Corona was quite slow in India and the experts went by the ongoing trends that were arising around the world. These trends also clearly rejects the theory by experts that rising temperature in the month of April/May will come as a boon to India. The Indian Government is now planning to relax the lockdown and this may work against us. It can even take us into the stage of community spread which will be very difficult to control.

In spite of all the good efforts by Indian officials, the corona spread has now become a serious issue. In our next work, we plan to focus on data of the entire globe by applying different regression & Time Series Prediction algorithms to understand the effectiveness of the ongoing medical treatments & recovery patterns.

WEB REFERENCES

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2. World Health Organization (WHO): https://www.who.int/
3. Johns Hopkins CSSE: https://github.com/CSSEGISandData/COVID-19
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AUTHOR'S PROFILE

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