Covid-19 Detection and Trend Analysis Major Project II

Major Project II

Under the Supervision of
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Problem Statement

The novel coronavirus (COVID-19), known as SARS-CoV-2 previously known as 2019-nCoV causes an illness which affects the respiratory system mainly. It has caused a huge impact on the lives of human lives, health and global economy.

The phase of vaccination in India has started. But, a sudden increase in the number of new cases was observed that's because India is densely populated country and isolation is not so easy. Considering the current case of India, the new cases increased a lot compared to the previous days. The reason behind was people were unaware that the cases will increase and people stopped taking precautions and the infection increased.

In order to solve this problem many models and researches are being done everyday. Talking about the forecasting model build till date has flaws considering the current data structure. So, we are trying to build a model which best fit the data and help the higher authorities to rely upon to some extent and take precautionary measures.

The output of our proposed model can help planners and authorities to make a decision on lockdown measures.These predictions are going to be helpful for state and national government authorities, researchers and planners for managing services and arranging medical infrastructure.

Current developments

- Most of the developments are State or Country Specific.
- They also lack the time variable when taking Covid-19 data into account. Many studies are based on linear knowledge and are not linear
- The models have area specific accuracies which leads model to predict better at some places and worst at other.
- Most of the models are built and tested on small data till July-August 2020 which was the phase when cases were increasing but the trend changed after September 2020 and March 2021 which makes the studies less convenient to current time.
- According to the study or researches done, Recurrent Neural Network based LSTM and it's various are better for forecasting.

Proposed Solution

We successfully implemented a Covid-19 detection model using Convolutional Neural Network. Keeping in mind the user and how can he be benefitted through a Web Application. We tried to implement an interface where users can diagnose and watch the trend of the current Covid affected patients(Active Cases, Recovered, and Dead).

This time we worked on LSTM(Long Short Term Memory), a type or an advanced version of RNN(Recurrent Neural Network) and try to overcome all the flaws of the previous studies. We have built a complete Web dashboard which consists of trend analysis and Case Load Rate forecasting which in turn can ensure the Rate at Active Cases are Increasing with respect to Daily Confirmed Cases.

Our Approach......

- A complete scalable and integrable web dashboard which has scope of future advancements and can be easily integrated with the normal user system.

- These predictions are going to be helpful for state and national government authorities, researchers and planners for managing services and arranging medical infrastructure.

- The model is built using LSTM keeping in mind the model achieves the better accuracy such the user can rely upon.

- The Covid-19(Case Load Rate) forecasting is built using LSTM.

- The above features are enough to make the application complete package reliable, smooth and the one with accurate solutions.

Objective

Dashboard

Build using React

The complete user friendly interface with various trend features to look for.

- **The dashboard is easy to operate and can be integrated easily.**

Features

Covid-19 Trend Analysis and Forecasting

The complete graphical information will be visible to the user.

- **The graphical representation will give information about the current scenario of the Covid-19 Cases and the forecasted value of Case Load Rate.**
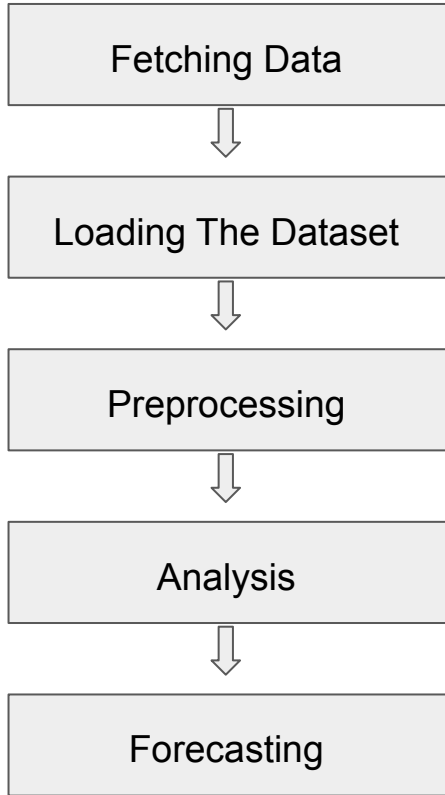- **The forecasted values will result to take proper precautions in near future if the trend increases.**
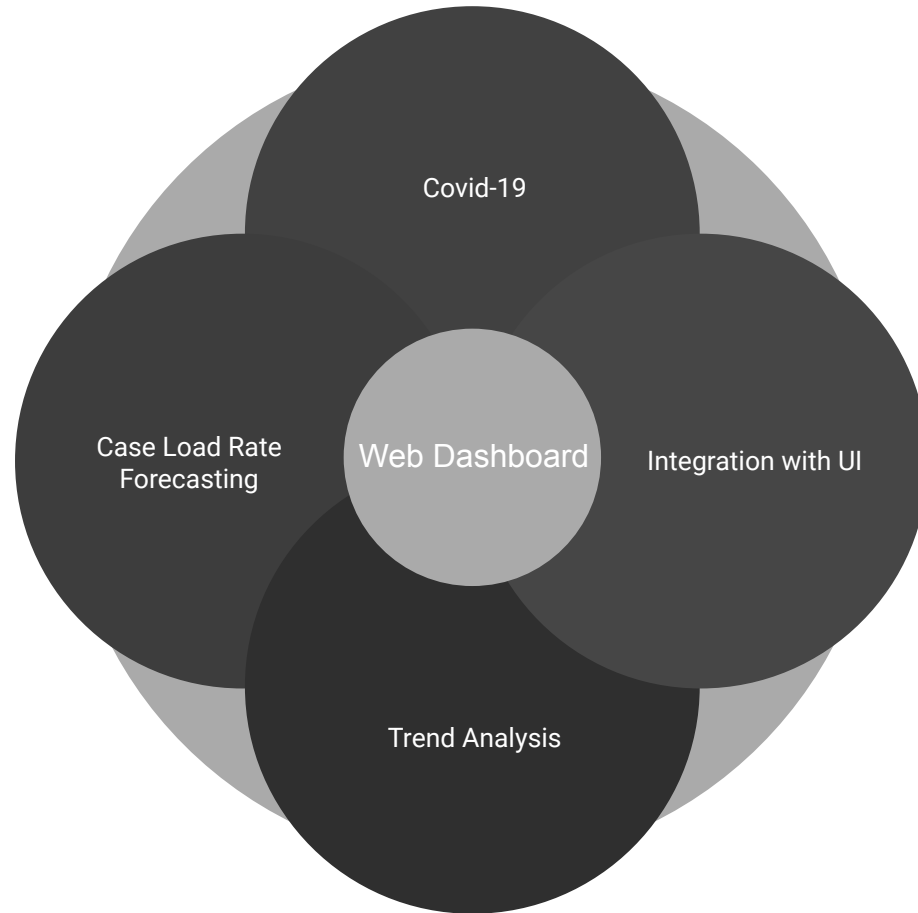
Implementation
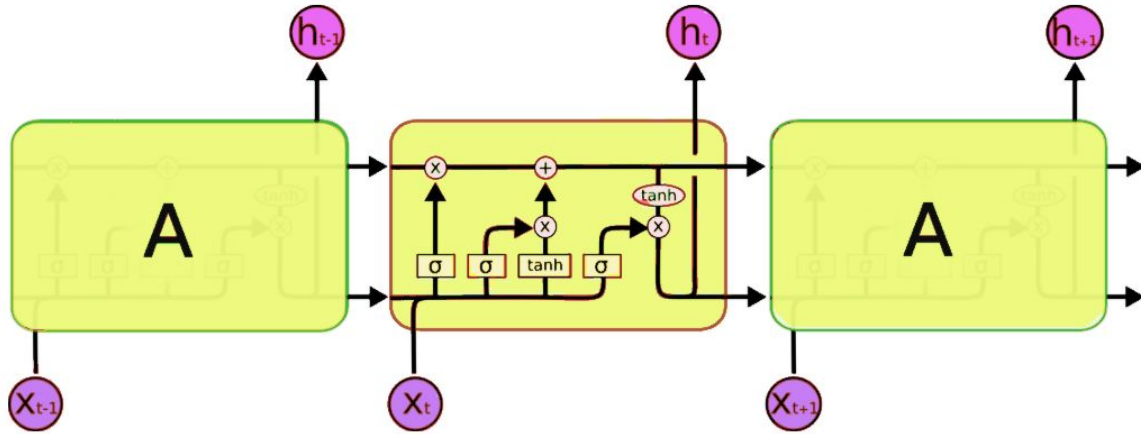
Long Short Term Memory

Implementation

```
┌─────────────────────────────┐
│        Fetching Data        │
└─────────────────────────────┘
              ⇩
┌─────────────────────────────┐
│     Loading The Dataset     │
└─────────────────────────────┘
              ⇩
┌─────────────────────────────┐
│        Preprocessing        │
└─────────────────────────────┘
              ⇩
┌─────────────────────────────┐
│          Analysis           │
└─────────────────────────────┘
              ⇩
┌─────────────────────────────┐
│         Forecasting         │
└─────────────────────────────┘
```

Our Model Implementation

```
Model: "sequential"

Layer (type)                Output Shape              Param #
=================================================================
lstm (LSTM)                 (None, 14, 64)            16896

lstm_1 (LSTM)               (None, 32)                12416

dense (Dense)               (None, 1)                 33
=================================================================
Total params: 29,345
Trainable params: 29,345
Non-trainable params: 0
```

Test and Results

After Training Various well known LSTM models and existing model with the same dataset. We found these observation.

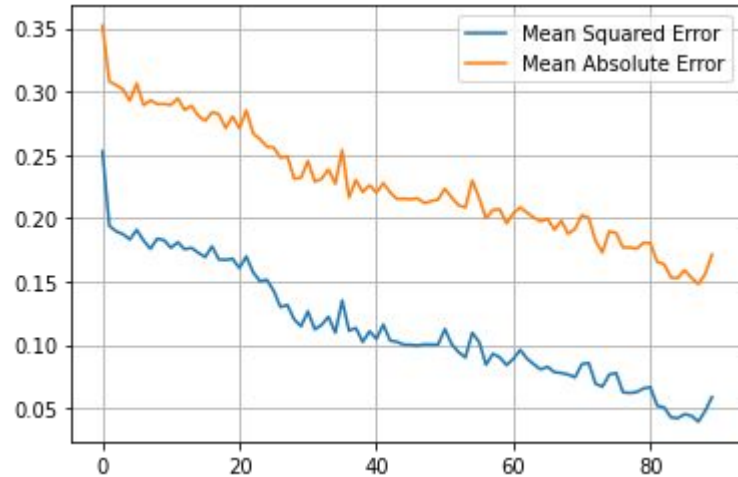| Model	Mean Squared Percentage Error	Mean Absolute Percentage Error
Vanilla-LSTM	0.04	0.18
Stacked-LSTM	0.08	0.22
Bidirectional-LSTM	0.06	0.17
Existing-1	0.18	0.28
Existing-2	0.10	0.25
Existing-3	0.05	0.20
Existing-4	0.04	0.18
FInal Model	**0.05**	**0.15**

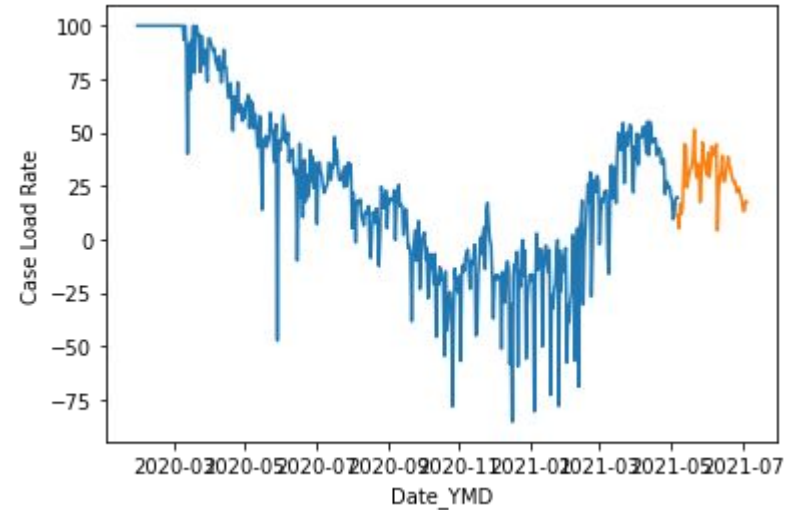**Graphical Results-**

Fig1: Error Value Representation

Fig2: Case Load Rate Forecast Representation

Future Scope

On considering the available dataset this model will definitely perform better. But, to increase its integrity and scalability of the model we will work in adding following features.

- We will work on finding the better insight out of the data.
- We will integrate this dashboard with the detection model of Covid-19 through X-Rays