Forecasting Model Documentation

Overview

This document provides a detailed overview of the forecasting model developed for predicting the number of visitors to a place. The model uses the Prophet algorithm and incorporates features such as the day of the week and user-specified forecasting periods. The following sections cover installation, usage, and output details, including screenshots for better understanding.

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1. Installation

1.1. Requirements

To run the forecasting model, ensure the following packages are installed:

- `pandas`
- `prophet`
- `matplotlib`
- `openpyxl` (for saving output to Excel)

1.2. Install the Required Packages

Before running the visitor forecasting model, ensure you have the following Python packages installed in your environment. These libraries are essential for data handling, forecasting, plotting graphs, and saving results.

Step-by-Step Installation:

You can install these packages using `pip` by running the following commands in your terminal or command prompt:

1. **Install pandas**:

   ```
   pip install pandas
   ```

2. **Install Prophet**:

   ```
   pip install prophet
   ```

   Note: Prophet requires an additional dependency, `cmdstanpy`. Installing `prophet` via pip will handle it automatically.

3. **Install matplotlib**:

```
pip install matplotlib
```

4. **Install openpyxl** (for exporting to Excel):

```
pip install openpyxl
```

Alternatively, you can install all the required packages at once by running:

```
pip install pandas prophet matplotlib
```

Verifying the Installation:

Once the packages are installed, you can verify by importing them in Python. Open a Python environment (either a Jupyter Notebook or Python shell) and run:

```
import pandas as pd
from prophet import Prophet
import matplotlib.pyplot as plt
import openpyxl
```

If there are no errors, the packages are installed correctly, and you are ready to run the forecasting model.

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2. How to Use the Forecasting Model

2.1. Load the Data

The model uses historical data of people visiting the place, which can be stored in a CSV file. For demonstration purposes, website visitor data was initially used to build the model

2.2. Execute the Script

Run the script to start the forecasting process. You will be prompted to input the number of days you want to forecast. After the input, the model will generate predictions and display a forecast graph.

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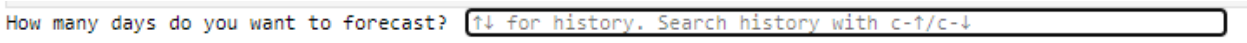
3. User Interaction

3.1. Input Prompt for Number of Days

Once the script is executed, it will prompt the user to input how many days into the future they want to predict. Enter a numerical value representing the number of days for which predictions are required.

```
How many days do you want to forecast? [Input Box]
```

Screenshot Placeholder



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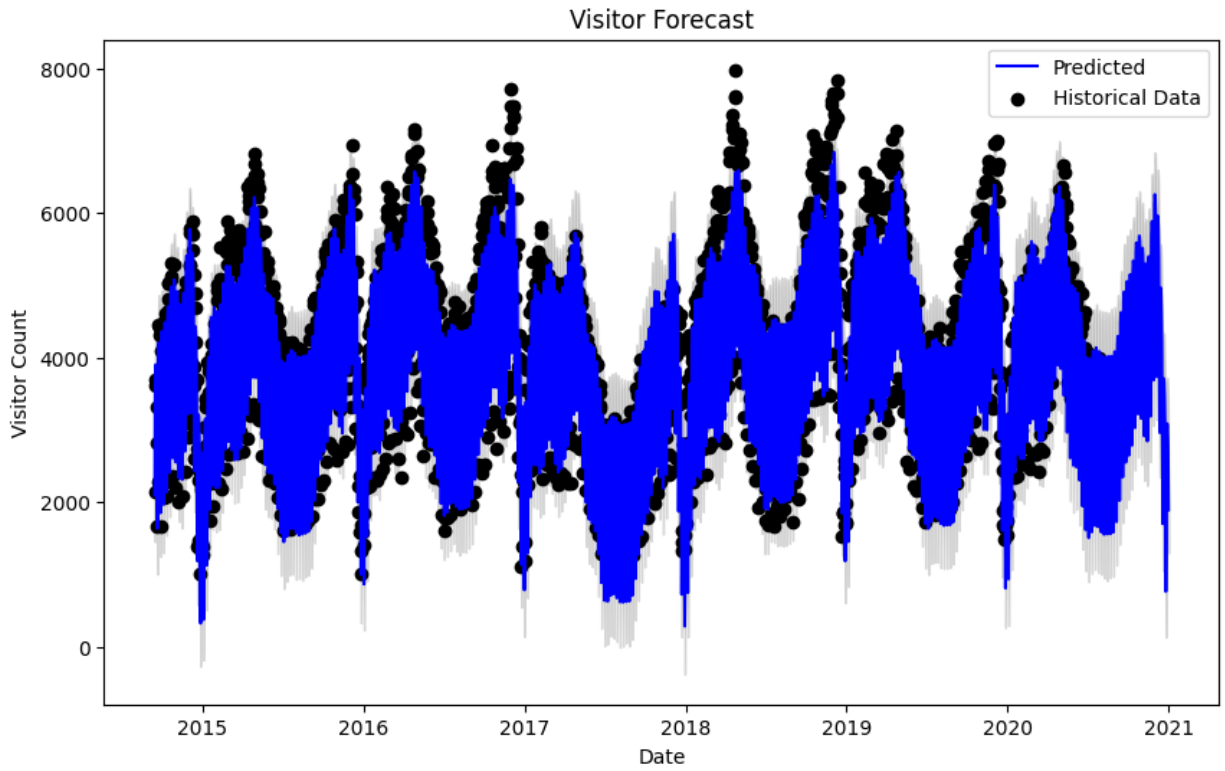
4. Output Details

4.1. Forecast Graph

After the model runs, it will display a forecast graph. The x-axis represents the date, and the y-axis represents the predicted number of visitors. The graph includes the historical visitor data points as well for comparison.



5. Saving the Results

5.1. Exporting to Excel

The forecasted visitor data, including the lower and upper confidence intervals, is saved in an Excel file (`visitor_forecast_output.xlsx`). This file provides an easy way to share or further analyze the predictions.

Screenshot Placeholder

Date	trend	Confidenc	Confidenc	rend_lowe	rend_upp	ditive_ter	ve_terms	ve_terms_	weekly	eekly_low	eekly_upp	yearly	early_low	early_upp	plicative_	tative_ter	native_ter	cted Page Loads
2014-09-14 00:00:00	3357.264	1453.025	2684.804	3357.264	3357.264	-1263.23	-1263.23	-1263.23	-867.648	-867.648	-867.648	-395.584	-395.584	-395.584	0	0	0	2094.032
2014-09-15 00:00:00	3360.263	3162.426	4327.342	3360.263	3360.263	384.1984	384.1984	384.1984	730.9006	730.9006	730.9006	-346.702	-346.702	-346.702	0	0	0	3744.461
2014-09-16 00:00:00	3363.262	3321.342	4521.213	3363.262	3363.262	541.8759	541.8759	541.8759	840.427	840.427	840.427	-298.551	-298.551	-298.551	0	0	0	3905.138
2014-09-17 00:00:00	3366.261	3263.594	4543.759	3366.261	3366.261	527.2201	527.2201	527.2201	778.883	778.883	778.883	-251.663	-251.663	-251.663	0	0	0	3893.481
2014-09-18 00:00:00	3369.26	3060.953	4316.866	3369.26	3369.26	326.643	326.643	326.643	533.1746	533.1746	533.1746	-206.532	-206.532	-206.532	0	0	0	3695.903
2014-09-19 00:00:00	3372.259	2227.166	3405.642	3372.259	3372.259	-562.021	-562.021	-562.021	-398.423	-398.423	-398.423	-163.598	-163.598	-163.598	0	0	0	2810.238
2014-09-20 00:00:00	3375.258	1003.279	2291.482	3375.258	3375.258	-1740.55	-1740.55	-1740.55	-1617.31	-1617.31	-1617.31	-123.236	-123.236	-123.236	0	0	0	1634.708
2014-09-21 00:00:00	3378.257	1800.051	3030.181	3378.257	3378.257	-953.389	-953.389	-953.389	-867.648	-867.648	-867.648	-85.7412	-85.7412	-85.7412	0	0	0	2424.868
2014-09-22 00:00:00	3381.256	3371.95	4652.341	3381.256	3381.256	679.577	679.577	679.577	730.9006	730.9006	730.9006	-51.3235	-51.3235	-51.3235	0	0	0	4060.833
2014-09-23 00:00:00	3384.255	3600.379	4868.103	3384.255	3384.255	820.3301	820.3301	820.3301	840.427	840.427	840.427	-20.0969	-20.0969	-20.0969	0	0	0	4204.585
2014-09-24 00:00:00	3387.254	3585.919	4755.213	3387.254	3387.254	786.8054	786.8054	786.8054	778.883	778.883	778.883	7.922359	7.922359	7.922359	0	0	0	4174.059
2014-09-25 00:00:00	3390.253	3326.92	4529.617	3390.253	3390.253	565.9914	565.9914	565.9914	533.1746	533.1746	533.1746	32.81681	32.81681	32.81681	0	0	0	3956.244
2014-09-26 00:00:00	3393.251	2470.788	3641.158	3393.251	3393.251	-343.657	-343.657	-343.657	-398.423	-398.423	-398.423	54.76576	54.76576	54.76576	0	0	0	3049.594
2014-09-27 00:00:00	3396.25	1248.921	2442.288	3396.25	3396.25	-1543.27	-1543.27	-1543.27	-1617.31	-1617.31	-1617.31	74.03979	74.03979	74.03979	0	0	0	1852.976
2014-09-28 00:00:00	3399.249	2018.588	3202.005	3399.249	3399.249	-776.656	-776.656	-776.656	-867.648	-867.648	-867.648	90.99225	90.99225	90.99225	0	0	0	2622.594
2014-09-29 00:00:00	3402.248	3671.837	4794.807	3402.248	3402.248	836.9486	836.9486	836.9486	730.9006	730.9006	730.9006	106.048	106.048	106.048	0	0	0	4239.197
2014-09-30 00:00:00	3405.247	3767.751	4925.951	3405.247	3405.247	960.1167	960.1167	960.1167	840.427	840.427	840.427	119.6897	119.6897	119.6897	0	0	0	4365.364
2014-10-01 00:00:00	3408.246	3698.488	4937.764	3408.246	3408.246	911.3247	911.3247	911.3247	778.883	778.883	778.883	132.4417	132.4417	132.4417	0	0	0	4319.571
2014-10-02 00:00:00	3411.245	3436.612	4712.493	3411.245	3411.245	678.0267	678.0267	678.0267	533.1746	533.1746	533.1746	144.8521	144.8521	144.8521	0	0	0	4089.272

6. Technical Details

6.1. Data Preprocessing

The historical visitor data is first preprocessed by:

- Converting the `Date` column into a `datetime` object.
- Removing any non-numerical characters from the `Visitor.Count` column to ensure numerical operations can be performed.

6.2. Model Features

- **Days of the Week**: The model accounts for the different visitor patterns on weekdays versus weekends.
- **Holidays (Optional)**: The model has the option to incorporate holiday-specific data to further enhance prediction accuracy, as visitor numbers may vary on special events or holidays.

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7. Future Improvements

- **Real-Time Integration**: Future versions of this model will incorporate live data feeds to continuously update predictions.
- **User Interface**: The command-line interface can be improved by building a graphical user interface (GUI) for easier use.

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8. Conclusion

This documentation provides all necessary information for understanding, running, and using the forecasting model. For further inquiries or issues, refer to the technical support documentation or contact the development team.
