BIKE RENTAL PROJECT

A PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report titled **"BIKE RENTAL PROJECT"** is the bonafide work of **"PIYUSH SARAF (19BAI10041), AADIL RAFIQ (19BAI10169) , ANSHUMAN RAINA (19BAI10151) , NAMIT RASTOGI (19BAI10159)"** who carried out the project work under my supervision. Certified further that to the best of my knowledge the work reported here does not form part of any other project / research work on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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LIST OF ABBREVIATIONS

1) E-bikes – Electronic bikes
2) GPS – Global Positioning System

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ABSTRACT

We developed this project to book a bike on rent at the fare charges. In the present system, all booking work is done manually and it takes very hard work to maintain the information of booking and bikes. If you want to find which bike is available for booking then it takes a lot of time and effort to execute it. The aim of this project is to automate the work performed in the bike rental management system like generate daily bookings, record of bikes available for booking, record of routes available, rental charges for bikes for every route, record of the customers, rent generated and affected due to certain circumstances like weather conditions. Bike rental management system is a bike booking software that provides a complete solution to all your day-to-day bike booking office running needs. This system helps you to keep the information of Customer online. You can check your customer information any time by using this system. Bike rental management system is a unique and innovative product. Using this, you can also keep the information of number of bookings in current month or in last 6 months or in last year. This helps you to track your business and your earning in particular month or in any year. Based on this information you can take decision regarding your business development.

In this framework we can procure bike rents. For travelling for more than 1-month you can hire a bike on rent. Seller will put their bikes on lease, the clients can choose the bikes according to the accessibility, after choosing bike of their choice they can book and pay online. This rental system has three modules namely Admin, User and Vendor. Admin can login, can add, update and delete vendors information and also bikes list. He/she can view bookings, user and feedbacks given by users. Users can register on the website and then login, can check of availability of bikes and book the bike of his/her choice and pay accordingly. Vendor's can login, update and delete the bikes list and also can view bookings.

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Chapter- 1

Introduction

1.1 Introduction

This application is named as Bike on Rent Management System. This system is designed to help the customers to take bikes on rent. When we go on any trip outside the town or country, we want to be free or else for going to office daily, we use either private or public transport. Also, instead of going through metros and taxis we prefer to have vehicle on rent according to our convenience .For this problem we have created a system. Using this system vehicle owner can register as sellers and customers who want to take bikes on rent can register themselves as renters and can take any bike on rent .This has one admin account who verifies the registering user and two types of the user accounts. One for bike sellers and one for customers who take the bike on rent. This system has only one admin account and cannot have more than one admin account.

1.2 Motivation

Indeed, the transport sector is considered as the one of the biggest sources of air pollution that degrades the viability of the city. The total emissions in world amounted to 32.5 billion metric tons CO_2, in this context, it is necessary to find alternative solutions for a sustainable transportation system, tends to the energy independence, rather than a polluting and congestive transportation system by developing more environmentally friendly transport such as public transport, bike and pedestrians. For this purpose, we are interested on the bike usage as an alternative solution for evolution without harmful consequences.

1.3 About the System

In this bike rental model, we are going to introduce online booking of bike and using them. So, the Burdon on the customer will be reduced. Our Aim is to design and create a data management System for a Bike rental company. This enables admin can rent a vehicle that can be used by a customer. By paying the money during a Specified Period of time. This system increases customer retention and simplify vehicle and staff Management in an efficient way.

1.4 Problem Statement

The aim of this project is to predict the count of bike rentals based on the seasonal and environmental settings. By predicting the count, it would be possible to help accommodate in managing the number of bikes required on a daily basis, and being prepared for high demand of bikes during peak periods.

1.5 Objective of the Work

We developed this project to book a bike on rent at the fare charges. In present system all booking work is done manually and it takes very hard work to maintain the information of booking and bikes. If you want to find which bike is available for booking then it takes a lot of time. It only makes the process more difficult and harder. This aim of the project is to automate the work performed in the bike rental management system like generating daily bookings, records of bike available for booking, record of routes available, rental charges for cars for every rout, store record of the customer. Bike rental management system is a bike booking software that provides a complete solution to all your day-to-day bike booking office running needs. This system helps you to keep the information of Customer online. You can check your customer information any time by using this system. Bike rental management system is a unique and innovative product. Using this, you can also keep the information of number of bookings in current month or in last 6 month or in last year. This helps you to track your business and you earning in particular month or in any year. Based on this information you can take decision regarding your business development.

1.6 Organization of thesis

1.6.1 INTRODUCTION

This section includes the overall view of the project i.e. the basic problem definition and the general overview of the problem which describes the problem in layman terms. It also specifies the software used and the proposed solution strategy.

1.6.2 SOFTWARE REQUIREMENTS SPECIFICATION

This section includes the Software and hardware requirements for the smooth running of the application.

1.6.3 DESIGN & PLANNING

This section consists of the Software Development Life Cycle model. It also contains technical diagrams like the Data Flow Diagram and the Entity Relationship diagram.

1.6.4 IMPLEMENTATION DETAILS

This section describes the different technologies used for the entire development process of the Front-end as well as the Back-end development of the application.

1.6.5 RESULTS AND DISCUSSION

This section has screenshots of all the implementation i.e. user interface and their description.

1.7 Summary

Bike rental business has emerged with new goodies compared to the past experience where every activity concerning bike rental business is limited to a physical location only. Even though the physical location has not been totally eradicated; the nature of functions and how these functions are achieved has been reshaped by the power of internet.

Chapter-2

Literature Survey

2.1 Introduction

Much has been said about how making a city smart and many international conferences have taken place on this issue for a sustainable future. Many researchers have published their research on using a bike sharing system to make the city smarter and how to analyze the bicycle sharing data for generating insights into sustainable transport systems. We have primarily taken guidance from one research paper which deals with how the bikes will send the data on the way and what will be the protocol that will govern this transmission.

2.2 Core Area of Project

Our core area of the project includes using various Machine learning algorithms and their implementation along with calculating the accuracy of the model using various parameters. This Machine Learning model will be made available to the company which provides bikes and then using this model, they will able to monitor the usage of bikes in various sectors of the city and calculate the revenue generated from each place. This will help eradicate all the man power to all these odd jobs and they will be able to do something more important.

2.3 Existing Algorithm

We will be following the below steps to solve this problem:

1) Importing the libraries

2) Using some predefined utility functions

3) Loading the data

4) Cleaning the data

5) Dividing the dataset into training and test dataset

6) using train_test_split in the ratio 70:30

7) Training several models and analyzing their performance to select a model

8) Fine-tuning the model by finding the best hyper-parameters and features

9) Evaluating selected model using test dataset

2.4 Research observations from Literature Review

The success rate of this project for obtaining data and analyzing is 80% to 90%. In some real time, conditions, it will be wrong hence affecting the bike sharing process and the business of the company.

Chapter-3

System Analysis

3.1 Introduction

System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. System testing falls within the scope of black-box testing, and as such, should require no knowledge of the inner design of the code or logic. As a rule, system testing takes, as its input, all of the "integrated" software components that have passed integration testing and also the software system itself integrated with any applicable hardware system(s). The purpose of integration testing is to detect any inconsistencies between the software units that are integrated together (called assemblages) or between any of the assemblages and the hardware. System testing is a more limited type of testing; it seeks to detect defects both within the "inter-assemblages" and also within the system as a whole.

3.2 Disadvantages/Limitations in existing systems

1)The current system does not identify the type of data sent by the bike.

2) Continuously updating the data received from bikes in the database and analysing the data set of records is done manually and it’s a very tedious job. Also, the availability of data with respect to a particular country is a challenge.

3) When the bike is not in range of any station, it will not be able to send the data and we will try to use the protocol required for multi-hop communication.

3.3 Proposed System

The system proposed has the following workflow: importing the necessary libraries required for the project and then loading the dataset followed by cleaning the data. Basically, cleaning here is dropping unwanted features which is not required for training. Then we perform train-test split. Also, for the ease, we define some utility functions such as display_scores() for calculating the mean and standard deviation. Also, we do feature scaling of the data so as we

get normalized values when we draw the graphs of the features. Then we, train and analyze the model using 3 machine learning algorithms - Linear Regression, Decision Trees and Random Forest. Then we perform fine-tuning and finally evaluate the model.

Chapter-4

System Design & Implementation

4.1 Importing the Libraries

We will import these libraries into the environment

•numpy: np

•pandas: pd

•sklearn - preprocessing, linear_model, StandardScaler, mean_squared_error

•matplotplib.pyplot: plt

•os

4.2 Loading the data

The dataset can be loaded from a csv which is present on the shared drive at the location: (Location: /cxldata/datasets/project/bikes.csv)

The dataset contains the following parameters:

•**instant**: record index

•**dteday** : date

•**season** : season (1:springer, 2:summer, 3:fall, 4:winter)

•**yr** : year (0: 20--, 1:20--) // the data were taken from the year 2011-2012

•**mnth** : month (1 to 12)

•**hr** : hour (0 to 23)

•**holiday** : weather day is holiday or not (extracted from [Web Link])

•**weekday** : day of the week

•**workingday** : if day is neither weekend nor holiday is 1, otherwise is 0.

weathersit :

• Clear, Few clouds, Partly cloudy, Partly cloudy

• Mist + Cloudy, Mist + Broken clouds, Mist + Few clouds, Mist

• Light Snow, Light Rain + Thunderstorm + Scattered clouds, Light Rain + Scattered clouds

• Heavy Rain + Ice Pallets + Thunderstorm + Mist, Snow + Fog

•**temp** : Normalized temperature in Celsius. The values are derived via (tt_min)/(t_maxt_min), t_min=*8, t_max=+39 (only in hourly scale)

•**atemp**: Normalized feeling temperature in Celsius. The values are derived via (tt_min)/(t_maxt_min), t_min=*16, t_max=+50 (only in hourly scale)

•**hum**: Normalized humidity. The values are divided to 100 (max)

•**windspeed**: Normalized wind speed. The values are divided to 67 (max)

•**casual**: count of casual users

•**registered**: count of registered users

•**cnt**: count of total rental bikes including both casual and registered

4.3 Cleaning the data

As we observe, some of the attributes are not required as per the requirement of the project: ['instant','casual','registered','atemp','dteday']. These can be dropped.Some of the numerical columns will have to be scaled: ['temp','hum','windspeed']

4.4 Analyzing and visualizing the dataset

These tasks shall be performed as a part of analyzing and visualizing the dataset:

1) Hourly count of bikes with trend and without trend

2) Correlation matrix between the features and the dependent variable

3) Plotting correlation among selected variables - 'yr','mnth','isWorking','xformWorkHr','dayCount','temp','hum','windspeed','cntDeTrend'

4) Plotting the count pattern with daycount for specific hours

5) Plotting box plot for different attributes: 'hr', 'mnth', 'weathersit', 'isWorking', 'dayWeek', 'xformHr'

6)Plotting scatter matrix for selected attributes: 'temp', 'hum', 'windspeed', 'hr', 'xformHr', 'cntDeTrended'

7) Plotting box plots for 0900 and 1800 hrs working and non-working days

8) Plotting the demand counts for each of the transformed work hours which include working and non-working hours.

4.5 Dividing the dataset into training and test dataset

After having analyzed the dataset, we shall divide the entire dataset into training and test set using train_test_split in the ratio 70:30 It uses random sorting and hence the resulting train_set and test_set is sorted by daycount.

4.6 Training and analyze models

Models to be trained and analyzed:

1. DecisionTreeRegressor

2. LinearRegression

3. RandomForestRegressor

Metrics calculated: neg_mean_absolute_error, neg_mean_squared_error using cross-validation

Features used:

1.xformWorkHr

2.temp

3.dayCount

4.7 Visualizing prediction versus actual values

Fine-tuning the model:-

We assign different combination of max_dept and min_samples_leaf and min_samples_split to param_grid - 'max_depth': [28, 30, 32, 34, 36], 'min_samples_leaf': [5, 10, 15, 12],'min_samples_split': [120, 128, 136]

Then, we calculate the best parameter using GridSearchCV and store it in grid_search. Print the parameters. from sklearn.model_selection import GridSearchCV

Fit the training dataset to the calculated best parameter model using the fit() method.

Complete the code to calculate the importance score for each of the feature.

4.8 Evaluate the model on test dataset

Step 1: Extract the relevant data from test_set and store it in X_test

Step 2 : Extract the relevant data from test_set and store it in y_test

Step 3 : Calculate the predicted values from the model and store it in 'predictedCounts_test'

Step 4 : Calculate the mean squared error using mean_squared_error function.

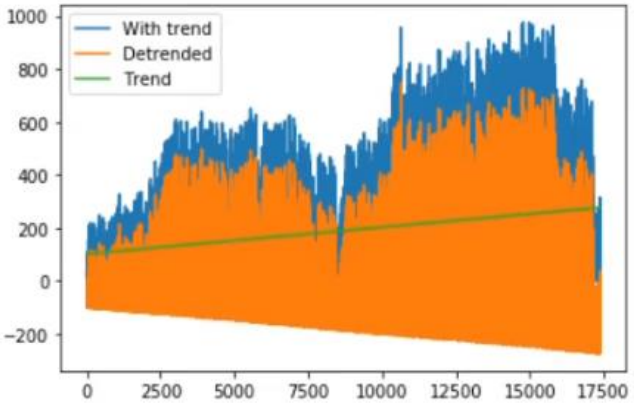
Chapter-5

Performance Analysis

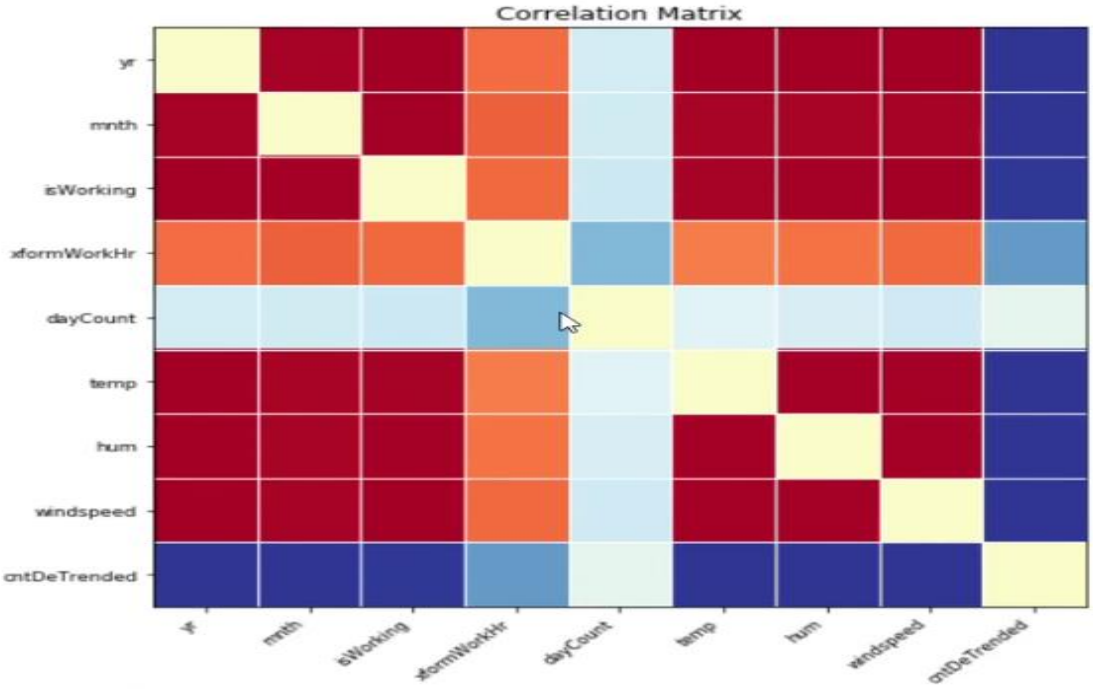
1) This is the basic statistics of the dataset using the describe() method

	temp	hum	windspeed
count	1.737900e+04	1.737900e+04	1.737900e+04
mean	3.497212e-16	-4.195150e-16	4.035529e-15
std	1.000029e+00	1.000029e+00	1.000029e+00
min	-2.477205e+00	-3.251166e+00	-1.553889e+00
25%	-8.153035e-01	-7.631431e-01	-6.996886e-01
50%	1.564696e-02	1.436398e-02	3.189880e-02
75%	8.465975e-01	7.918711e-01	5.198962e-01
max	2.612367e+00	1.932215e+00	5.399871e+00

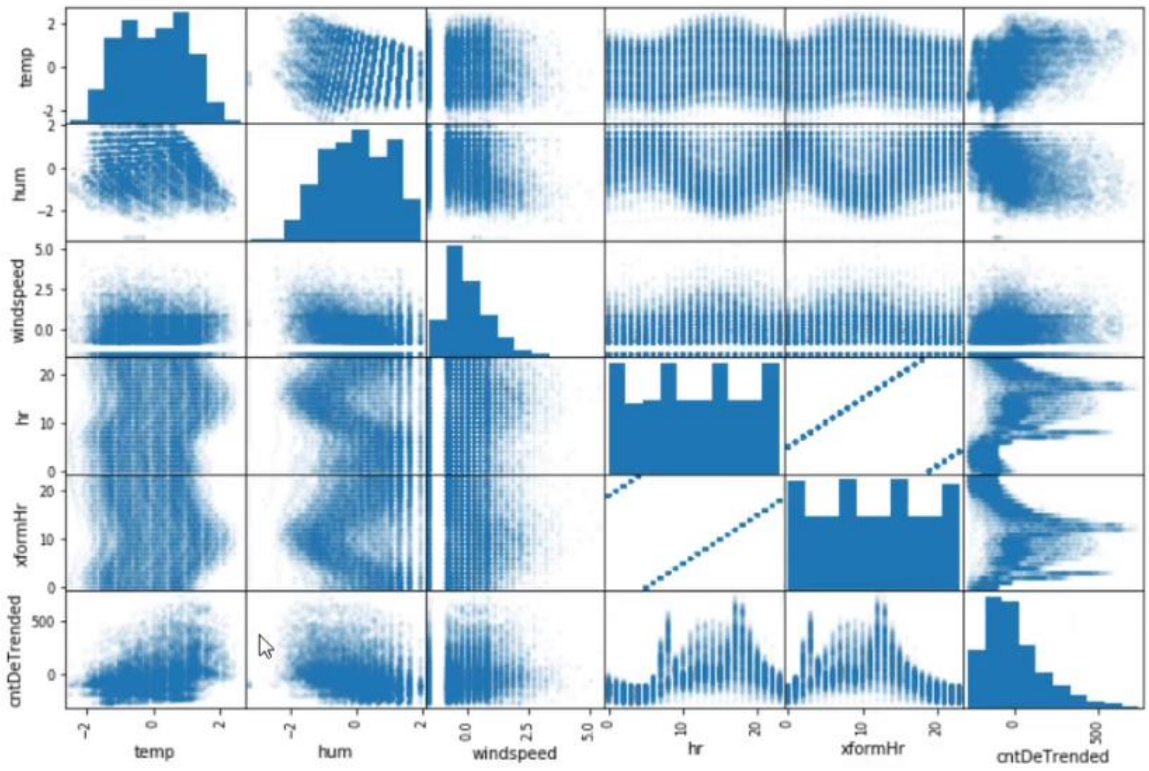
2) Plotting the hourly count with and without trend



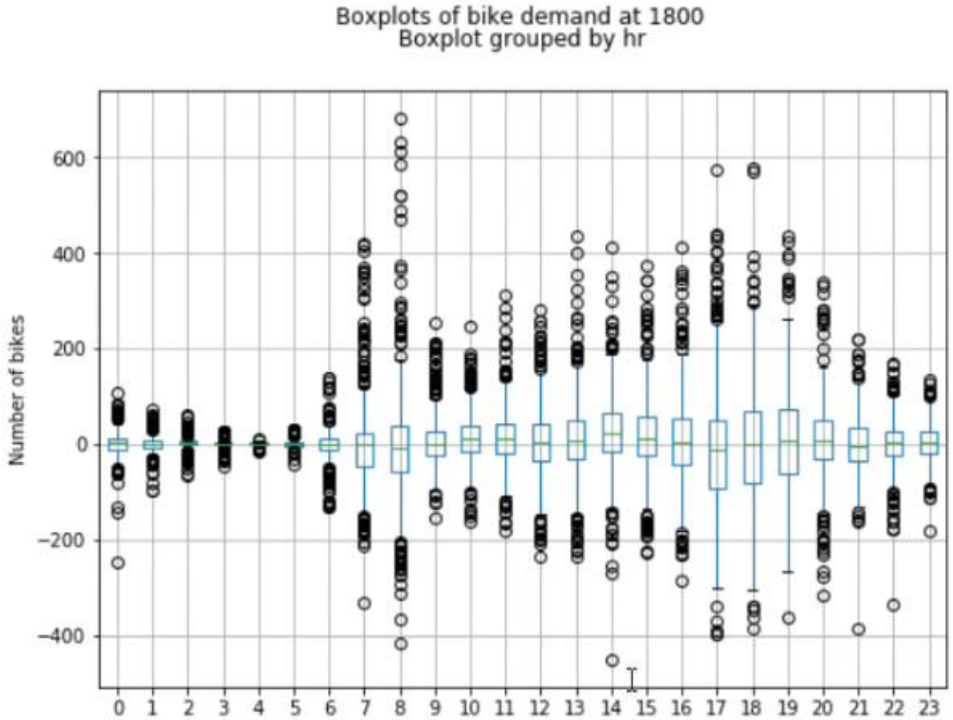
3) Correlation matrix with all the attribute variables



4) Scatter Matrix of Different Features with each other



5) Box plot of bike demand at 1800 hrs grouped by hours



Chapter -6

Future Enhancement & Conclusion

6.1 Limitations & Constraints

The current system does not identify the type of data sent by the bike. Also, continuously updating the data received from bikes in the database and analyzing the data set of about over 17 million records is a big challenge. Also, the availability of data with respect to a particular country is a challenge. When the bike is not in range of any station, it will not be able to send the data and we will try to use the protocol required for multi-hop communication.

6.2 Future Enhancements

The data send by the bike can include Traffic data, Air Quality data, Road Conditions data etc., which will benefit the operator in solving the redistribution problem as well as users of the system thus saving on operational cost as well as the time of users. In the future when conventional sources of energy would be scarce, bike share system will provide an effective means of transport and within the city, it can be made compulsory to travel through bicycles. In future, our smart bike sharing system can be improved by using collaborative software agents on user's and station details store on ontologies. Ontologies can easily expand with the addition of users and stations in the system, provide a secure environment, and machine-readable data for agent's interaction. Software agents can monitor data packets at heterogeneous stations to provide real-time information.

6.3 Conclusion

The bike sharing system represents the first comprehensive mobile sensing system conveying the cyclist experience. Bike sharing provides the collection and communal environmental sampling. It also supports two modes of operation in support of delay tolerant and real-time sensing. Collected data could be presented both locally to the cyclist and to others as well through back-end services. Bike sharing portal concept promotes social and friendly network among cyclists. Our smart bike sharing system allows the users to easily book a bike using the website at any time without human intervention. There is no need of human for conducting this smart bike sharing system. A user can take a bike from the station using his/her smart card (a smart

card that will be given to the user after the SignUp) and start the ride and after completing the trip drop the bike to the station which is near to his/her destination. The Simulator in our system is using the sensor to trace the bike and to update the information of the bike position at each time. The sensor will send packets to its nearest station and these all station will be connected to the website and send the information regarding the bike's status to the app which will update the record.

LITERATURE REVIEW

The number of cities offering bikeshare has increased rapidly, from just a handful in the late 1980s to over 800 currently. Several themes have begun to emerge from studies examining bikeshare. Convenience is the major motivator for bikeshare use. Financial savings has been found to motivate those on a low income and the distance one lives from a docking is an important predictor for bikeshare membership.

Men use bikeshare more than women, but the imbalance is decreasing as cycles are getting modified and better. Users are less likely than private cyclists to wear helmets, but in countries with mandatory helmet legislations, usage levels have suffered. Bikeshare users appear less likely to be injured than private bike riders. Future directions include integration with e-bikes, GPS, dock less systems and improves public transport integration. Greater research is required to quantify the impacts of bikeshare, in terms of mode choice, emissions, congestion and health.

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