DEEP LEARNING BASED SMART PARKING SYTEM

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ABSTRACT:

Due to the fast growth of automobiles and thescarcityofparkingspots,smartparking managementhasbecomeacrucialnecessity in contemporary urban settings. Conventional parking arrangements frequently resultintrafficjams,wastedtime,andtrouble locatingopenspaces.Thisprojectsuggests aDeepLearningBasedSmartParkingSystem that makes it simple for users to keep an eye on and reserve parking spaces in a variety of places, including shopping centers,medicalfacilities,andofficebuildings.

The system analyzes parking occupancy and dynamically initializes parking spaces for each zone using real-world parking datasets. The availability of slots can be shown by users, who can then choose and reservetheirchosentimeperiodfora certain amount of time.

Additionally, the system automatically determinestheparkingpriceatasetrateof ₹20perhourbasedonthedurationofpark- ing. In order to assist customers in finding appropriate parking spots quickly, the system also recommends the best available parkingspacesinsideeachzone.Thissmart parking management strategy increases userconvenience,decreasestrafficinparking lots, and increases efficiency. The suggested method shows how automation and data-driven technology can help smart cities manage parking more effectively.

Keywords: Smart Parking System, Deep Learning,ParkingSlotBooking,DataAnalytics, Smart City, Parking Management.

1.INTRODUCTION:

Parkingmanagementhasbecomeasignificantconcernduetothegrowingnumberof automobiles in urban areas. In busy locations like shopping centers, medical facilities, and business buildings, drivers frequently spend a considerable amount of time looking for parking spots. Driver annoyance, fuel waste, and traffic congestion result from this.

Conventional parking systems do not offer real-timespaceavailabilityinformationand primarily rely on manual monitoring. Therefore,untiltheyphysicallyarriveatthe area, consumers might not be aware of which parking spaces are available.

It is nowfeasibleto createintelligentparkingsystemsthatcanmoreeffectivelymanageparkingspacesbecausetorecentdevelopments in automation, data analytics, and artificial intelligence. In addition to monitoring slot occupancy and analyzing parkingdata,smartparkingsystemsenablecustomerstoreservespotsinadvance.

The parking dataset used by the proposed Smart Parking System contains data on zones,totalparkingspaces,occupied spaces, entry and exit counts, and occupancyrates.Thesystemusesthisdatatodynamically manage parking spaces in various locations, including offices, hospitals, and shopping centers

Parking slot availability can be viewed by users, who can then choose their desired timeslotandreserveitforaspecificamount of time. Additionally, the technology automatically determines parking costs and offers recommendations for open spots. This methodoffersabettercustomerexperience and increases parking efficiency.

2. LITERATUREREVIEW:

Numerousstudieshaveconcentratedonenhancing parking management systems through the use of contemporary technologies including artificial intelligence, computer vision, and the Internet of Things. Conventional parking systems frequently rely on manual supervision or straightforward ticket-based techniques that don't offer real-time parking availability information.

Sensorsplacedinparkingspotsareusedby certain smart parking solutions to identify the presence of vehicles and provide real-timeupdatesonparkingavailability.These systemscanusedigitaldisplaysormobile

applications to direct cars to open parking spots.

The application of machine learning and dataanalyticstoforecastparkingavailabilitybasedonpastparkingdatahasalsobeen investigated in recent studies. These technologies can predict parking demand and assist drivers in making ahead parking plansbyexaminingoccupancypatterns.

Other methods employ cameras and computer vision techniques to identify cars coming into and going out of parking lots. Without the need for human involvement, these systems automatically update the parking slot availability.

The suggested solution is centered on a data-driven parking management strategy that simulates actual parking situations using a parking dataset. It enables users to make reservations, keep track of parking status,computeparkingcosts,andgetparking recommendations. This approach shows how clever data processing can increasetheeffectivenessofparkingmanagement.

3. METHODOLOGY:

The Smart Parking System uses user interactionandaparkingdatasettodynamically manageparkingspaces.Pythonisusedin thedevelopmentofthesystem,whichisrun on a Google Colab environment.

3.1 Data Collection:

The system makes use of a parking dataset that includes details on various parking zones,includingshoppingcenters,medical facilities, and office spaces. Parking ID, zone name, total parking spaces, occupied spaces,vehiclekinds,entryandexitcounts, parking fees received, and occupancy rate areamong the elements includedin theda- taset.

Thisdatasetoffersinsightsintoparkingutilizationpatternsandaidsinsimulatingreal- world parking conditions.

3.2 Data Preprocessing:

Preprocessing and data cleaning are done before the dataset is used. To ensure data consistency, invalid records with more occupied slots than total slots are eliminated. Toenabletime-basedanalysis,thedateand time data is formatted appropriately.

3.3 ParkingSlotInitialization:

Based on the dataset, the system dynami- cally initializes parking spaces for every zone.Thenumberofparkingspacesthatare now available and those that have already been reserved are determined by counting the total number of spaces and the number ofoccupiedspaces.Everytimeslothasa

status,like"Booked"or"Available."

3.4 ParkingSlotBooking:

Customers can check the availability of parking spaces and choose one to reserve. Thesystemdetermineswhetheraslotisaccessiblewhenauserchoosesone.Theuser caninputthebookingdurationiftheslot is available.

Thebookingtimeanddurationarethenrecorded by the system, which also modifies the slot status to booked.

3.5 ParkingFee Calculation:

Parkingcostsareautomaticallydetermined bythesystembasedonthelengthofthereservation.Thehourlyparkingfeeissetat ₹20. During the booking process, the systemdeterminestheentirecostandshowsit to the user.

3.6 SlotSuggestion Mechanism:

Bylocatingthefirstavailablespacesinthe list,thealgorithmalsorecommendsthebest parking spaces for each zone. This eliminates the need for users to physically inspecteveryparkingspaceinordertoswiftly select a suitable spot.

4. FINDINGS:

The created Smart Parking System effectivelyshowedhowtouseadataset-driven

method to manage parking spaces across several zones.

Based on actual parking data, the system was able to dynamically create parking spaces andpreciselyshoweachslot'sstate. Viewingavailableparkingspotsandchoosingatimeframeforreservationwassimple for users.

Users were able to find available parking spacesmorequicklybecausetotheslotsug- gestion method, which cut down on the amountoftimeneededtofindaspot.

By calculating the parking cost depending onthechosenbookingduration,theparking fee computation tool also performed well.

Overall,thesystemdemonstratedhowdata- driven parking management can enhance user ease and parking efficiency.

5. RESULTS:

During testing, the Smart Parking System yielded a number of favorable outcomes. Malls, hospitals, and office spaces are just a few of the parking zones that the system effectively managed.

Real-timeparkingslotavailabilityandtime slotbookingwereavailabletousers.After

everyreservation,thesystemaccuratelyup-dated the slot status.

The parking fees were precisely calculated by the parking cost calculation module us-ingtheuser'ssuppliedduration.

Additionally, without having to manually review the complete parking layout, users were able to swiftly find appropriate park-ing spaces thanks to the slot suggestion tool.

Theseoutcomesshowthatthetech-nology can efficiently replicate a smart parking environment and offer an ap-proachable parking management solution.
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6. DRAWBACKS:

TheSmartParkingSystemhasanumberof drawbacks despite its good performance.

The existing solution is simulation-based anddoesnotincorporateliveparkinginfra-structure or real-world sensors.

Asaresult,thesystem'suseofparkingdata isrestrictedtothedataset Additionally, the system uses manual user inputtoreserveplaces,whichmightnotbe representative of automated parking sys-temsintherealworld.

The system's present console-based inter-face,whichmightnotbeasuser-friendlyas a web or mobile application, is another drawback.

IoT sensor integration, real-time parking data,andagraphicaluserinterfacearepos- sible future enhancements.

7. CONCLUSION:

This project introduced a Smart Parking Systemthatusesdata-drivenmethodstoen-hance parking management. The technol-ogy lets users reserve spots for particular times, keep an eye on parking availability, and compute parking costs automatically.

The system offers a straightforward yet ef-ficient solution for parking management in various zones, including shopping centers, medical facilities, and business buildings, byutilizingaparkingdatasetandintelligent slot management.

The implementation shows how cutting-edge technology like automation and data analytics may increase parking efficiency and cut down on the amount of time spent looking for spots.

Futureimprovementsmightincorporatma-chinelearningmodels,mobileapplications,

andreal-timesensorstoforecastparking availability.

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