STUDY ON USE OF BIG DATA ANALYTICS TO CREATE SMART CITIES

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Abstract

To increase sustainability and living conditions, several governments are embracing smart cities and big data technologies. Smart cities use different technologies to increase citizen comfort. Smart cities reduce resource usage and expenditures and better engage their inhabitants. Smart cities improve big data. Data gathering and storage of massive volumes of useful data has become part of daily life. Successful service and company areas use and analyze large data. This study discusses big data-based smart cities. It examines big data definitions, problems, benefits, and smart city applications. This article discusses smart city big data prospects.

Key Words: *Application of Smart cities, Application of Big data, Analytics, Smart Education.*

INTRODUCTION

Big data's strength is acquiring massive amounts of data, which will impact many smart city features. Big data is expanding at 40% per year, compared to 5% for worldwide IT expenditure. During the previous five years, 90% of global data was digital. Hence, many governments are using big data to construct and maintain smart cities. It maintained smart city standards, requirements, applications, and principles. Smart cities are resilient, governable, sustainable, high-quality, and resource-efficient. Smart cities include environment, mobility, health care, governance, and people, as well as smart education, energy, transportation, and health care [2]. Such applications need storage and big computational services. Cloud computing can enable large data in smart cities administration. This paper addresses smart city big data potential and difficulties. This article designs and implements smart city and service-based big data.

Section 1 introduces big data, smart cities. Part 2 discusses smart cities' big data advantages and opportunities. Part 3 discusses smart city big data problems. Section 4: Big data smart cities application requirements. Part 5 will exhibit and explore some open that may aid other field study, and Section 6 will finish the report.

BACKGROUND

Technology and humans see smart cities

differently. A developed urban area has excellent quality of life and economic development in people, living, environment, governance, and mobility. Using hardware, software, networks, and data about municipal services and locations to improve city residents' quality of life. It includes transportation, health care, natural resources, electricity, education, and public safety. To develop smart cities, we may incorporate a living solution that combines transportation, buildings, and lifestyles. The term also considers resource applications for future generations. Each location, size, and resource has this attribute. Due to financial, ecological, and resource management limitations, governments worldwide are largely concerned about smart city costs. Smart city maintenance and construction issues and resource availability. Technical difficulties impact success. Database resources create huge data. Smart phones, GPS, environmental sensors, computers, and even individuals use data sets for gaming, advertising, digital photos, social networking, and more.

SAS: "Big data describes information availability, including structured and unstructured growth." [7] IBM: "Data everywhere like sensors, climatic information, photographs and videos, transaction records, social media, GPS signals" [7]

Huge data stores plenty of structured or unstructured data [20].

Traditional databases handle big data [20]. Big data technologies will efficiently store massive amounts of data to improve smart city services. Big data will assist administrators plan smart city expansions, regions, and resources.

Some characteristics of big data

Volume: Data set size. Velocity: Data storage, processing, analysis, and generation. It supports real-time Big data management systems.

Variety: Most data is unstructured and difficult to classify.

Limited by tools and technology. Huge data demands efficient classification and analysis technologies to serve smart cities. Big data may improve smart city applications and services by recognizing constraints and capabilities.

BENEFITS AND OPPORTUNITIES

Several cities are smart cities for environmental, economic, and analytical reasons. Hence, we will address some of the advantages and prospects that might make our city smart. We can make our city smarter with these advantages. Benefits and possibilities improve sustainability, governance, and resilience. Intelligent infrastructure management may enhance lives and natural resources.

Smart cities have several benefits:

Efficient resource utilization: Controlled use and integrated solutions of limited or costly resources are needed. ERP and GIS systems. Monitoring system will help identify waste spots, save energy, and regulate energy and natural resources. Smart cities apps for data collecting and interconnectivity. Improved quality of life: Smart cities have superior job, services, and living models. Location, living/working spaces, better and quicker transit, and enough information to make decisions.

Higher levels of transparency and openness: Needs for better control and smart city applications, openness, and interoperability. They will allow organizations and creators to collaborate on smart city services and apps. Government and individuals to share and utilize data.

These advantages demand application expertise, people, and resources, as well as data quality, privacy, control, and security, as well as data documentation standards to guide content and data set usage. [10].

Technology helps safeguard and manage environmental resources and infrastructure and promote natural resource sustainability [11].

Smart cities can use big data [8].

Better services and experience improve big data analytic performance for businesses. Preventive care, diagnosis, treatment, and health-care management. Optimized timetables and routes, ecologically sustainable, and flexible.

Big data and cloud will solve storage and analytical problems. It will stimulate cooperation and innovation and interact with smart city organizations. Big data communities will provide innovative solutions and collaborative applications for environments, safety, energy, law, manufacturing, and education. Big data will enable real-time crowd control, transportation, and agricultural applications. Big data applications in smart cities include:

Smart Education: Information and communication technologies and big data will build a knowledge-based society that boosts competitiveness and capabilities. Big data in education comes from students, instructors, parents, administrators, infrastructure like schools, libraries, educational sites, professors, museums, universities, and information like courses, tests, books, economics, reports, and more. Data will help analyze and improve education. Data aids educational personal learning [14], "produce practice and standardize knowledge" [15]. Educational curriculum can use big data.

Smart traffic lights: Population growth causes environmental, economic, and transportation issues. Smart cities use traffic lights and signals to reduce

congestion. Traffic grid-connected smart signals and lighting. Sensors monitor traffic flow data including traffic congestion, automobile speeds, light wait times, and car speeds. System parameters provide signals and lights.

Smart grid: Smart city relies on smart grid. Electrical grid data collection. Electricity dependability, economy, and efficiency increase. Computer-based remote controllers employ clever two-way communication. Smart sensors and meters on distribution, manufacturing, and transmission provide real-time power usage and defect data. It gives users near-real-time energy information and inexpensive costs. Controlling water heaters and washing machines automatically at cheap prices might cost more.

CHALLENGES

Big data Analysis challenges smart city development, design, and implementation. Smart cities must take into account changing surroundings and design. They include large data tools, cost, accessibility, representation, analytic, and real-time analytic. Big data smart city challenges:

Data source and characteristics: Several formats and sources create big data. Unstructured data formats abound (Eg: Audio, Video, Server logs, etc..) Advanced database systems organised this data. Big data produces complicated models and

techniques that are challenging to manage. Data mining tools cannot manage enormous size and complexity. Many sources with differing access policies, use, kinds, and formats make data collection difficult. Unstructured data is readily organized and used.

Data and information sharing: City-to-city data sharing is difficult. Most cities and government agencies have their own warehouses and public information. We'll gather data to protect citizens' privacy in big data analysis. Smart cities encompass many industries. Smart city applications must prevent for smooth information. Big data makes it simple to detect, extract, process, and load information using fresh knowledge from particular and real-time data.

Data Quality: Big data, collected by multiple persons in different forms and kept in separate databases, give data quality. Data will lack heterogeneity, consistency, and disparity. Hence, "there is no uniform technique to modify and extract the data source for usable analysis". For instance, third-party sensor data without central control.

Security and privacy: Smart cities embracing big data face security and privacy risks. We need great security and privacy since these databases include government and personal data. We must safeguard data. Until data moves to

another database or network, these applications need strong security. Most big data analytics nowadays uses Cassandra, Hadoop, and MapReduce to conduct lack of security. Smart city applications properly reflect individual and organization data privacy rights. People will see medical, bank, and financial records. Smart cities' huge data dilemma is this.

Cost: Cost is a significant issue for ICT users. For instance, energy reduction [11], data recording components.

It costs a lot to install [16] and may impact the city [7]. Smart city and signal system testing is expensive. Testing is expensive, causes traffic, and is physically deployed in testing systems [16]. Monitoring and developing smart cities apps and infrastructure requires costly hardware and software [11].

Smart city population: Big data size affects smart city applications because of population size. Data growth dramatically increases population size. City traffic, social, economic, technological, issues, pollution, and environment will rise if population grows fast [12]. Big data solves smart city challenges swiftly and efficiently. Develop and implement smart city apps to manage huge data expansion for better outcomes.

REQUIREMENTS

Smart cities need big data implementation and design. Sensors, electronic data readers, and users handle big data. Data processing, storage, and organization. Plan development and design.

Smart cities use real-time and offline large data. Real-time Big data rapidly accesses database data and makes judgments. Often, delaying a decision is futile. Fast, accurate data analysis is needed. Health, traffic, education, and real-time controls will leverage big data in smart cities [19].

Smart city big data applications suit several needs. Smart cities and big data set these standards. Government and awareness needed. Smart cities and big data use them.

Advanced Algorithms: Big data cannot handle normal applications owing to its unique requirements and large volume and speed. Big data cannot handle all data mining methods. Big data algorithms use small, well-defined datasets. Massive data analysis in smart cities requires advanced algorithms. Real-time and offline apps are designed differently. High data volume, huge data sets, and decision-making procedures optimized this method. These algorithms manage extremely dynamic diverse settings.

Open standard Technology: Open standards enable large-scale heterogeneous data and systems in smart cities, making application upgrades and maintenance easier. To discover smart cities application

standards for infrastructure and big data environment. Government, infrastructure, and stakeholders evaluate smart city futures [10]. Big data applications enable smart city planning.

Security and Privacy: Smart cities will gather and analyse data from private sources to guarantee application and technology security and privacy. Smart cities provide numerous benefits but risk their data. That will protect our data. Big data applications create security and privacy rules throughout code development and deployment.

Citizen Awareness: Smart city citizens informed of safe ICT usage. Smart city apps' data collecting and performance concerns. Data-driven decisions to improve smart cities components in big data applications. Awareness helps citizens understand safety, privacy, and security. Big data will guard and understand their data.

Government Roles: Intelligent cities Governmental institutions encourage cooperation and large data exchange [10]. Government data collection needs large data systems. Smart cities needed it. The government must assess privacy, accuracy, access, and preservation data [10]. Documentation and code books employ data sets [10]. Big data applications benefit smart cities and privacy legislation.

DISCUSSION AND OPEN ISSUES

Smart city planning goes beyond big data analysis or stand-alone projects. Smart cities will compare enormous data. Storing, managing, and analyzing large data is difficult. Data and decision-making tools for smart city app development. Smart cities will use big data without realizing they need sophisticated big data and technology to start their structures. Big data includes "creation of application systems, public platforms for smart city, public infrastructure" [20]. Smart cities require technology, society, and space. Success plan: 1. Create smart city goals, plans, and operations.

Huge data needs standards, resources, and IT management.

Smart city applications need public infrastructure and ICT platforms.

Smart cities emphasize essentials.

Big data services enhance citizen application features.

Data improves infrastructure, environment, and smart apps and services.

Monitoring advances produces new requirements and challenges.

Smart cities and IT leverage big data. Big data smart cities have enough funding. Anticipate and see possible problem changes. Testing reduces risks.

Big data smart cities utilize flawed and successful models.

Resource exports to smart/service/data marketing systems. Smart city adds

systems.

Smart software analyzing massive data. Improve smart city functionalities with adequate data. Values diagram:

CONCLUSION

Big data and smart cities are essential ideas, thus many began integrating them to produce smart cities applications with greater resilience, governance, quality of life, and resource management. Determine the big data design and support advantages of smart cities. Smart cities and data-driven operations were explored. We covered domain problems and smart city big data application concerns. Designing and implementing efficient apps. Various approaches to problems provide better outcomes. Ultimately, open problems to examine and observe smart cities and create them.

Deploying and building big data applications in smart cities successfully to address challenges and open issues to implement and design human resources, further enhancing it smart cities application to better making concepts, making a smart city with possible further it for a service and models will be a sustainable and attainable goal.

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