Big Data Analytics and Security

CSEC 5311/CETE 4392

Spring 2025

TEXAS A&M UNIVERSITY SAN ANTONIO

Assignment- Big Data Analytics Scenario

If you use any AI tools (e.g., ChatGPT) to answer any of the questions, you MUST cite and add a section "My thoughts on AI-generated answers" at the end of that questions.

Scenario: Implementing Big Data Solutions for a Smart City

As a data scientist hired by a city council, you are tasked with designing a big data strategy to address challenges and optimize services for a smart city initiative. The city generates data from various sources, including:

1. Traffic Sensors: High-speed data streams monitoring traffic flow, accidents, and congestion.
2. Public Transport Systems: Data on schedules, delays, and passenger usage.
3. Environmental Sensors: Real-time data on air quality, temperature, and noise pollution.
4. Social Media Feeds: Public sentiment analysis on city policies and events.
5. Utilities and Infrastructure: Data on energy usage, water consumption, and maintenance schedules.

The city council expects actionable insights to make real-time decisions and long-term plans.

Your Task: (AI permitted)

Design a comprehensive big data strategy to achieve the following objectives. Include the approaches, tools, and challenges for each step.

1. Data Collection and Integration (25 Marks possible):
    - Explain how you would handle diverse data sources (e.g., structured, semi-structured, and unstructured data). (no less than 150 words)
2. Data Processing and Analytics (25 Marks possible):
    - Propose methods to process high-velocity streaming data, ensuring low-latency decision-making (e.g., traffic and environmental sensors). (15 marks possible)
    - Suggest analytical models to derive insights from historical data, such as trends in energy consumption or transport delays. (10 marks possible)

3. Data Visualization and Decision Support (25 Marks possible):
    - Recommend visualization techniques to present insights effectively to city officials. (10 marks possible)
    - Discuss how real-time dashboards can support immediate decision-making (e.g., adjusting traffic light timings). (15 marks possible) (no less than 100 words)
4. Future Scope (25 Marks possible):
    - Discuss how emerging technologies such as AI and IoT can further enhance the smart city initiative. (no less than 150 words)

Submission Requirements:

- Prepare a detailed report (PDF format).
- Include visuals or diagrams where applicable (e.g., proposed architectures, dashboards).
- Ensure logical structuring with an introduction, detailed sections for each task, and a conclusion