**Fundamentals of Big Data & Business Analytics**

**NMIMS Centre for Distance and Online Education (NCDOE)**

**Internal Assignment Applicable for April 2025 Examination**

**Q1. On Christmas Eve in 2024, American Airlines faced a significant disruption, grounding all flights on a critical travel day. Discuss how descriptive, predictive, and prescriptive analytics can help the airline normalize operations in the aftermath and prevent similar incidents in the future. Highlight specific analytical approaches to optimize resource allocation, identify potential risks, and enhance operational resilience. Explain how leveraging historical data, real-time monitoring, and forecasting techniques can improve decision-making during such crises.**

**Answer:**

**Introduction:**

On Christmas Eve 2024, American Airlines experienced a major operational disruption, grounding all flights on one of the busiest travel days of the year. Such large-scale disruptions impact thousands of passengers, cause financial losses, and damage the airline’s reputation. To recover from this crisis and prevent future occurrences, American Airlines can leverage data analytics, specifically descriptive, predictive, and prescriptive analytics. These analytical approaches help assess past disruptions, forecast potential risks, and recommend optimal solutions to enhance operational efficiency. By utilizing historical data, real-time monitoring, and advanced forecasting techniques, the airline can improve resource allocation, strengthen risk management, and enhance operational resilience. This discussion explores how data-driven strategies can enable better decision-making, ensuring faster recovery from disruptions and mitigating risks to maintain seamless airline operations in the future.

**This is partially solved sample answer**

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**Q2. The fast fashion industry deals with massive and complex datasets originating from multiple sources, such as social media, e-commerce platforms, manufacturing units, and supply chain systems. These datasets are generated at high velocity and in various formats. Discuss how organizations in the fast fashion industry can effectively manage and process this data using big data technologies. Highlight the role of distributed storage systems, stream processing tools, and machine learning techniques in deriving actionable insights from this data. Suggest a framework for integrating structured and unstructured data to optimize inventory, predict trends, and enhance sustainability efforts.**

**Answer:**

**Introduction:**

The fast fashion industry generates vast amounts of data from diverse sources, including social media trends, online sales, manufacturing processes, and global supply chains. This data is produced in various formats and at high velocity, making its management and analysis complex. To stay competitive, fashion brands must leverage big data technologies to process and extract valuable insights from these datasets. Distributed storage systems enable efficient data handling, while stream processing tools help analyze real-time consumer behavior. Machine learning techniques further enhance decision-making by predicting fashion trends, optimizing inventory, and improving sustainability efforts. This discussion explores how an integrated big data framework can effectively manage structured and unstructured data, allowing fast fashion companies to streamline operations, reduce waste, and respond swiftly to evolving consumer demands.

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**Q3a. Governments strive to reduce income inequality between urban and rural regions. Suggest the types of datasets required to analyze historical trends and disparities. Explain how descriptive analytics can be used to understand regional inequalities and discuss how data visualization tools or techniques can effectively communicate these insights to policymakers.**

**Answer:**

**Introduction:**

Income inequality between urban and rural regions remains a critical challenge for governments worldwide. To address this issue, policymakers need access to comprehensive datasets, including income distribution, employment rates, education levels, and access to basic services. Descriptive analytics helps analyze historical trends, highlighting key disparities across regions. Data visualization tools, such as heat maps and interactive dashboards, effectively communicate these insights, enabling policymakers to make informed decisions. This discussion explores how data-driven approaches can support efforts to bridge the urban-rural income gap and promote balanced economic development.

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**b. The Mumbai city police department is investigating a series of burglaries reported in different neighborhoods over the past six months. They have collected the following data:**

* **Crime Locations: GPS coordinates of burglary incidents, along with timestamps.**
* **Suspect Profiles: Witness descriptions, behavioral patterns, and prior criminal records.**
* **Social Media Activity: Posts and discussions in local community groups about suspicious activities.**
* **Environmental Factors: Weather conditions, lighting, and proximity to high- traffic areas during incidents.**
* **Neighborhood Metrics: Demographics, foot traffic, and socioeconomic data for the affected areas.**

**Please propose ways to use social media activity to uncover potential suspects or accomplices. Additionally, suggest predictive analytics techniques to forecast future burglary hotspots and recommend proactive measures for crime prevention. Outline the visualizations that would best support your analysis and assist the police in their investigation.**

**Answer:**

**Introduction:**

The Mumbai police department is analyzing a surge in burglaries across various neighborhoods over the past six months. By leveraging social media activity, investigators can identify discussions about suspicious behavior, track patterns in community reports, and uncover potential suspects or accomplices. Predictive analytics techniques, such as machine learning models and geographic clustering, can help forecast future burglary hotspots based on historical data. Effective visualizations, including heat maps, trend graphs, and network analysis charts, can assist law enforcement in identifying crime patterns and implementing proactive measures to prevent future incidents.

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