**Case Study**

**Case Study Scenario:** Advanced Analytics for Optimizing Health Service Delivery

**Background:** In the dynamic landscape of healthcare service delivery XYZ is poised for rapid growth and innovation. To support this growth trajectory, comprehensive datasets have been amassed, chronicling client engagements, service utilization patterns, and employee interactions. The Data Scientist’s role is pivotal, involving the leveraging of this data using a blend of Power BI and advanced analytical notebooks. The goal is to architect predictive models that forecast health service demands with a high degree of accuracy, thereby facilitating optimal allocation of resources and underscoring potential avenues for service expansion. Through the synthesis of analytical insights and technological acumen, these models will not only forecast future demands but also categorize them by service type and zone, providing a granular view of the organization’s operational needs.

**Part 1: Power BI for Data Management and AI-Enhanced Insights**

**Objective:** Use Power BI to perform data cleaning, transformation, and model creation. Develop advanced visuals that leverage AI capabilities within Power BI to extract key insights.

**Tasks:**

* + 1. Data Transformation and Cleaning: • Import the API data into Power BI and perform initial data assessment.
  + • Cleanse the data, ensuring that group IDs are parsed correctly and associated data like zones and service types are accurately represented.
  + 2. Data Model Creation: • Establish relationships between Clients, Employee, Groups, and Visits tables.
  + • Ensure the data model supports advanced analytics and AI-based visualizations.
  + 3. Advanced Visualization: • Utilize Power BI AI visuals such as decomposition trees and key influencers to uncover trends and patterns in the data.
  + • Create dashboards that highlight service utilization, employee workload distribution, and client demographics.

**Deliverables:** A Power BI report with a well-structured data model and a dashboard containing advanced AI-powered visuals.

**Part 2: Notebook for Predictive Modeling and Business Problem Solving**

**Objective:** Utilize a notebook environment to develop a predictive model that analyzes past visit trends to project future service demands, taking into account related factors such as employee assignments, client requirements, and group classifications. The model should offer categorized predictions that are segmented by crucial service types—specifically 'Home Care' and 'Mental Health'—and further delineated by geographical zones.

**Tasks:**

* + 1. Data Preparation: • Extract the transformed and cleaned dataset from Power BI into the Notebook environment.
  + • Prepare the data for predictive modeling, focusing on time-series analysis.
  + 2. Predictive Model Development: • Choose suitable time-series forecasting models to predict the future demand for services.
  + • Train the model, incorporating elements like seasonality and trends observed from the data.
  + 3. Categorized Predictions: • Forecast future visits, categorizing predictions by service type (Home Care and Mental Health) and by zone.
  + • Assess the models' performance and validate the forecasts.
  + 4. Business Problem Solving: • Address a specific business problem: predicting how the demand for different health services will change over time and identifying potential areas that require additional resources or service expansion.

**Deliverables:** A Jupyter Notebook containing the code, models, and a clear explanation of the methodology used, along with the findings and business implications of the predictive analysis.

This case study is designed to assess the candidate’s full spectrum of skills, from leveraging business intelligence tools for data visualization to applying statistical programming for predictive modeling. It provides a comprehensive evaluation of their technical capabilities, their analytical thought process, and their ability to derive actionable business insights from complex datasets.