

The background is a dark blue gradient with a subtle pattern of white dots. Overlaid on the left side are several concentric circles and arcs, some with tick marks and numbers, resembling a circular scale or a data visualization. The numbers range from 140 to 260. There are also some curved arrows and dashed lines, suggesting a process or flow.

A DATA-DRIVEN APPROACH TO CUSTOMER SEGMENTATION USING MACHINE LEARNING

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RESEARCH BACKGROUND :

- Customers with a wide range of investment habits, risk tolerances, and financial objectives are served by the financial sector.
- Banks and wealth management companies can tailor financial plans through customer segmentation, which improves happiness and fosters corporate expansion.
- Financial companies can provide more individualized services by classifying their clients according to shared traits.
- Traditional segmentation methods are less useful in decision-making since they are unable to capture dynamic financial behaviours.
- To deliver precise and instantaneous segmentation, machine learning examines past transactions, spending trends, and financial objectives.
- It enhances fraud detection, risk assessment, and investment suggestions while optimizing consumer engagement tactics.
- Improved segmentation helps banks provide specialized financial solutions by improving customer retention.

RESEARCH PROBLEM :

- Existing studies use individual clustering models, but do not explore hybrid clustering techniques.
- Lack of focus on wealth management-specific customer segmentation.
- This research proposes using a hybrid ML approach (K-Means, DBSCAN, Hierarchical) to improve segmentation.
- Traditional segmentation methods (demographics, rule-based) fail to capture dynamic financial behaviors.

RESEARCH AIM & OBJECTIVES :

- **Research Aim:** Develop a machine learning-based hybrid customer segmentation model for wealth management.
- **Research Objectives:**
 1. To identify limitations in traditional customer segmentation methods.
 2. To develop and compare ML-based customer segmentation models.
 3. To provide insights for wealth management firms to improve financial decision-making.

LITERATURE REVIEW & RESEARCH GAP :

❖ Literature Review :

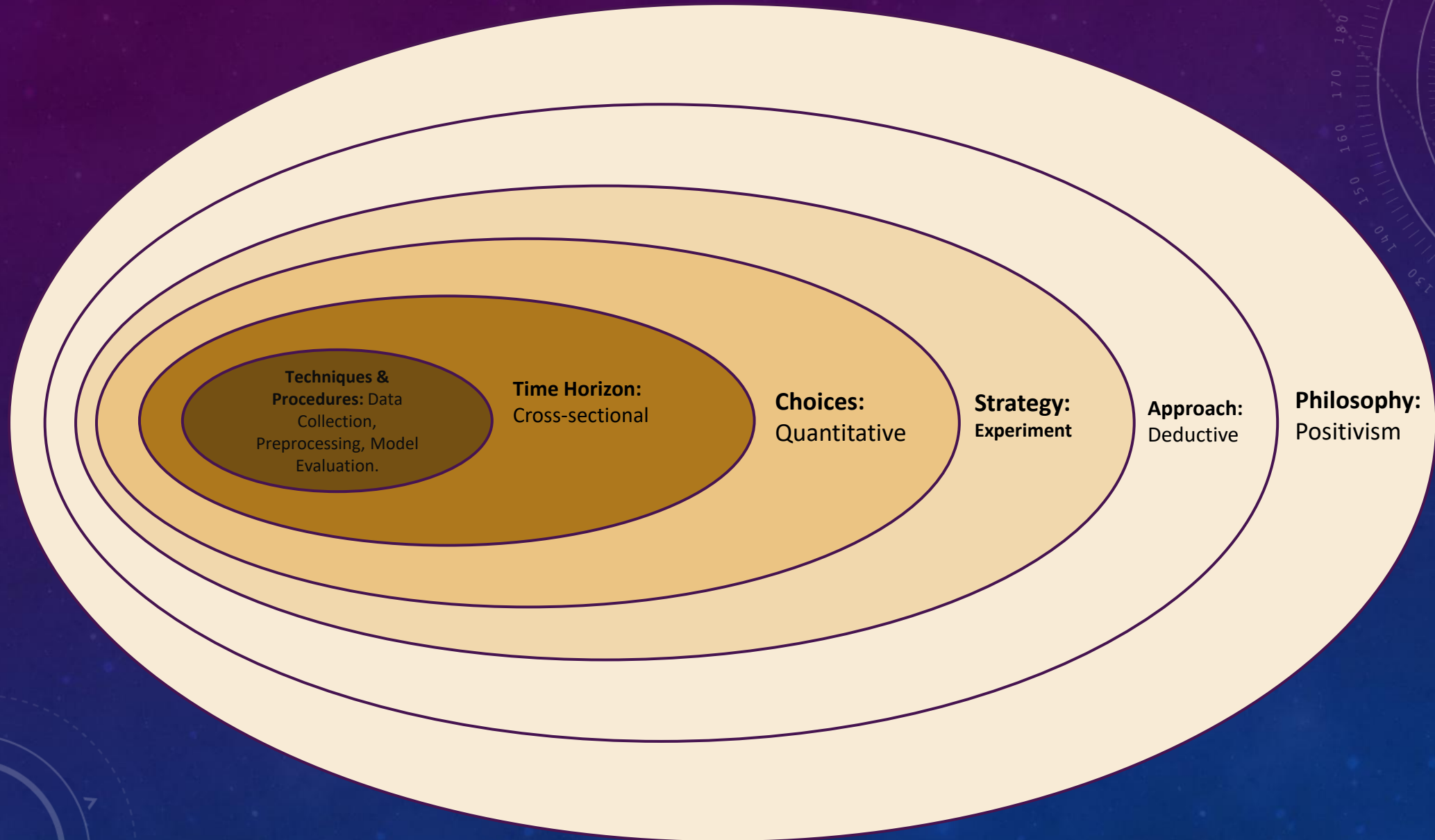
- **Smith et al. (2023)** states that traditional banking segmentation methods fail to capture dynamic customer behavior as they rely on static attributes rather than real-time financial transactions.
- **Traditional segmentation is static** and fails to adapt to changing customer behaviors, leading to inaccurate financial recommendations.
- **Brown et al. (2022)** highlights that ML-based segmentation improves customer targeting but lacks transparency, making it difficult for financial analysts to interpret results.
- **Gupta et al. (2021)** emphasizes the need for hybrid machine learning models in financial segmentation, as single-model approaches do not capture diverse customer profiles effectively.
- **ML-based segmentation** identifies hidden patterns and helps financial institutions offer personalized wealth management.

LITERATURE REVIEW & RESEARCH GAP(CONT.) :

❖ Research Gap :

- **Gupta et al. (2021)** highlights the need for multi-model approaches in financial segmentation, as existing methods mostly rely on a single clustering algorithm, which does not provide optimal segmentation for diverse customer profiles.
- **Wang et al. (2020)** suggests that investment-specific segmentation can significantly improve financial planning by identifying high-value customers and tailoring personalized wealth management strategies.
- **Patel et al. (2023)** states that most segmentation models rely on a single evaluation metric like the Silhouette Score, which limits overall clustering accuracy and does not capture cluster compactness effectively.

RESEARCH METHODOLOGY :

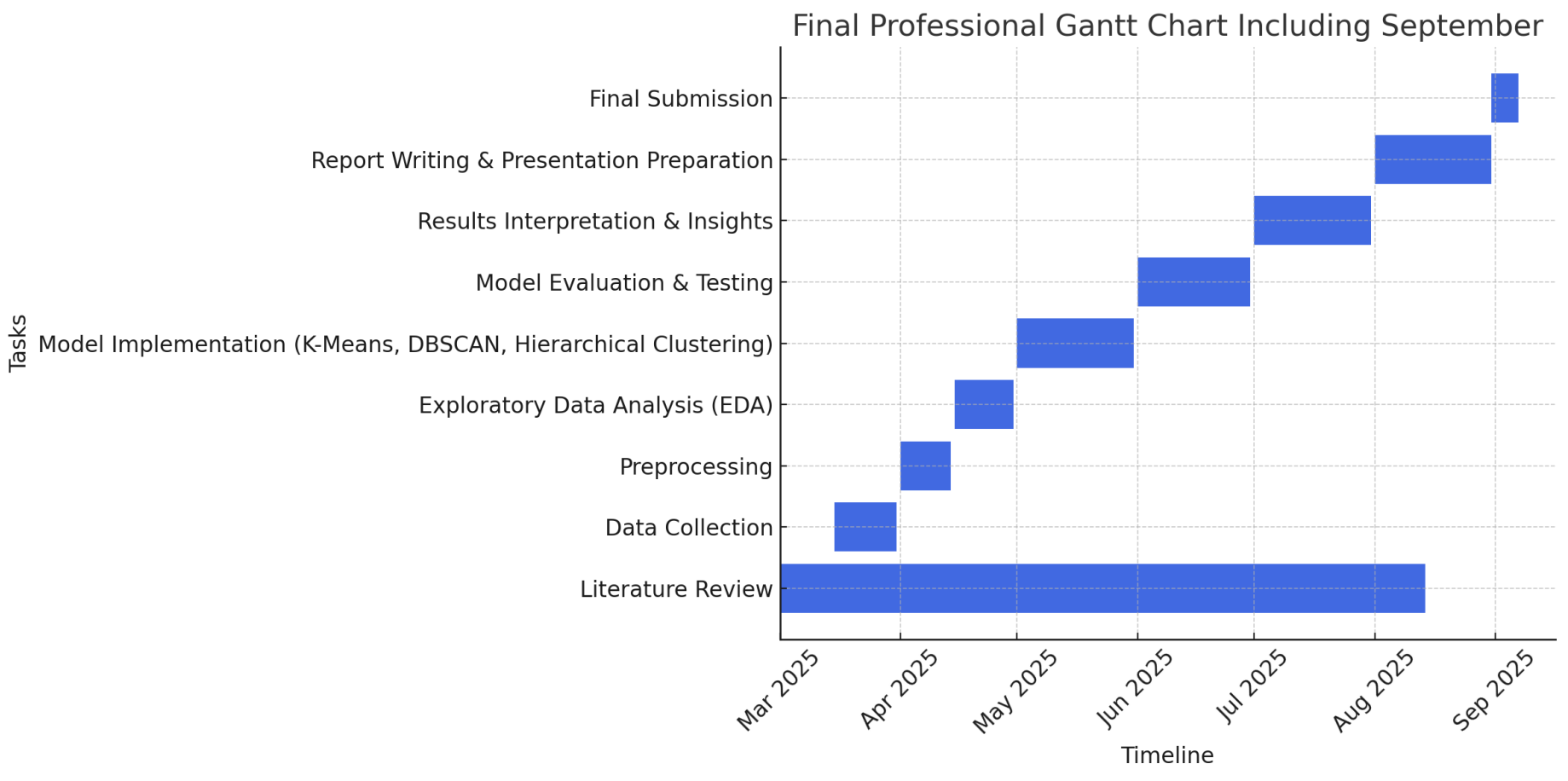


RESEARCH METHODOLOGY(CONT.) :

- **Philosophy:** Positivism - based on quantifiable and data-driven analysis.
- **Approach:** Deductive - uses structured segmentation using machine learning techniques.
- **Research Strategy:** Experiment - analyzing financial client data using clustering methods.
- **Choices:** Quantitative - uses machine learning algorithms and numerical financial data to do structured analysis.
- **Time Horizon:** Cross-sectional - Segments customers using past financial data.
- **Research Design:**
 - The study uses an experimental research design, segmenting financial clients using clustering methods.
 - To guarantee model accuracy and segmentation effectiveness, a systematic data analysis procedure is used.
- **Data Collection:** makes use of Kaggle/UCI datasets that include risk profiles, spending patterns, and income.
- **Data Preprocessing:** For improved model performance, it normalizes numerical features, handles missing values, and encodes categorical variables.

PROJECT PLANNING & RESOURCES :

➤ Gantt Chart



RESOURCE :

- Python (Scikit-Learn, Pandas, NumPy, Matplotlib, Seaborn)
- Jupyter Notebook / Google Colab for model execution
- WEKA (Optional) for alternative ML model testing

PROJECT IMPACT & LIMITATIONS :

❖ Project Impact:

- **Improved Customer Segmentation:** Better decision-making results from wealth management organizations' ability to divide their clientele into discrete groups, such as high-net-worth, medium-risk, and low-risk customers, according to this research.
- **Personalized Financial Advisory:** Financial advisers can provide individualized investment solutions based on the demands and risk profiles of their clients by utilizing data-driven consumer segmentation.
- **Fraud Detection & Risk Management:** By spotting possible fraudulent activity in high-value customer accounts, the DBSCAN model assists in the detection of financial irregularities.
- **Optimized Marketing Strategies:** By targeting particular consumer segments with tailored financial offerings, banks and other financial institutions can increase engagement and conversions.

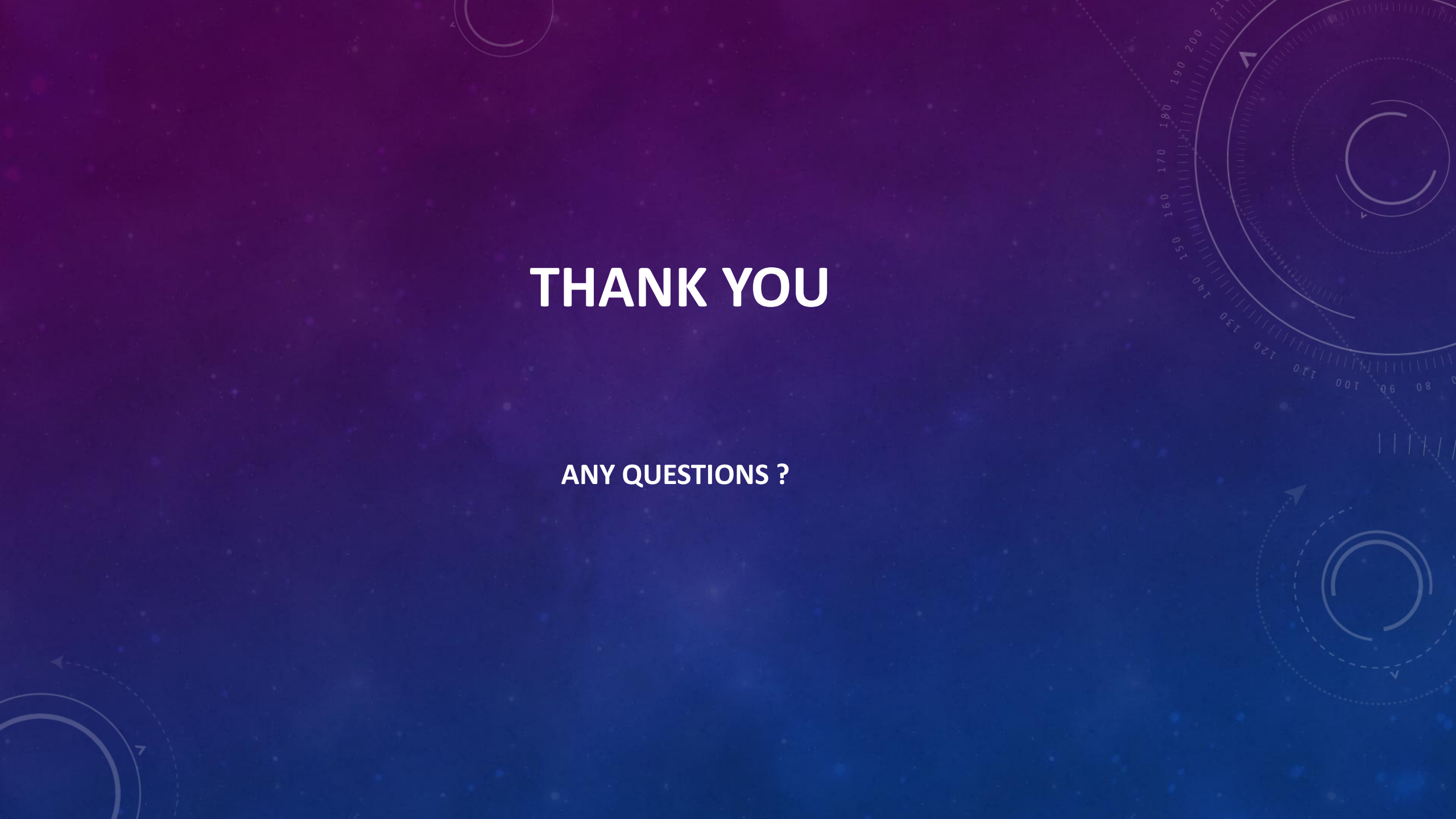
PROJECT IMPACT & LIMITATIONS (CONT.):

❖ Project Limitations:

- **Data Availability Issues:** Access to actual banking data is restricted by financial privacy laws, necessitating the use of open-source datasets that could not accurately depict real-world situations.
- **Computational Complexity:** Due to its high computing requirements, hierarchical clustering may perform less well on huge financial datasets.
- **Ethical Considerations:** Handling sensitive financial data as part of customer segmentation raises privacy issues with relation to data security and ethical compliance.

REFERENCES :

- J. Smith, "Machine Learning-Based Customer Segmentation and Personalized Marketing in Financial Services," *IEEE Transactions on Computational Intelligence*, vol. 15, no. 3, pp. 45-59, 2023.
- M. Brown, "Customer Segmentation for Improving Marketing Campaigns in Banking," *Proceedings of the International Conference on Data Science*, 2022.
- R. Gupta, "Experimental Analysis on Banking Customer Segmentation using K-Means Clustering," *Journal of Financial Data Analytics*, vol. 12, no. 5, pp. 120-135, 2021.
- K. Patel, "A Review of Customer Segmentation Methods," *International Journal of Data Science*, vol. 9, no. 2, pp. 200-215, 2023.
- L. Wang, "Demographic Customer Segmentation of Banking Users Based on K-Prototype Methodology," *IEEE Conference on Business Analytics*, 2020.



THANK YOU

ANY QUESTIONS ?