Vietnam Datathon (VNDH)

ADDRESSING YEAR-END SHOPPING CHALLENGES IN THE ERA OF INFLATION

#CoChoDung_team
#OPTIC_solution

OUTLINE

INTRODUCTION

The Festive Dilemma

As the year-end festivities 2023 approach, retailers eagerly anticipate customers opening their wallets. However, the shadow of inflation looms over the global consumer spending

Inflation Impact

- Recent statistics from Axios reveal that a staggering 60% of consumers in Europe and the Americas believe that inflation is making their year-end shopping more challenging.
- Beyond inflation, the lingering effects of the pandemic have given rise to a new trend—a shift from extravagant holiday spending to a more cautious approach, focusing on essential purchases.

Changing Trends

The traditional "splurge" mentality during festive seasons is evolving. Consumers are now inclined to carefully consider their purchases, ensuring they acquire only what they truly need.

OPTIC Solution Integration

Amidst these challenges, retailers are turning to innovative solutions like OPTIC—a tool designed to optimize business effectiveness through market simulation, providing reliable marketing and sales strategies aligned with reality.

PROBLEM STATEMENT

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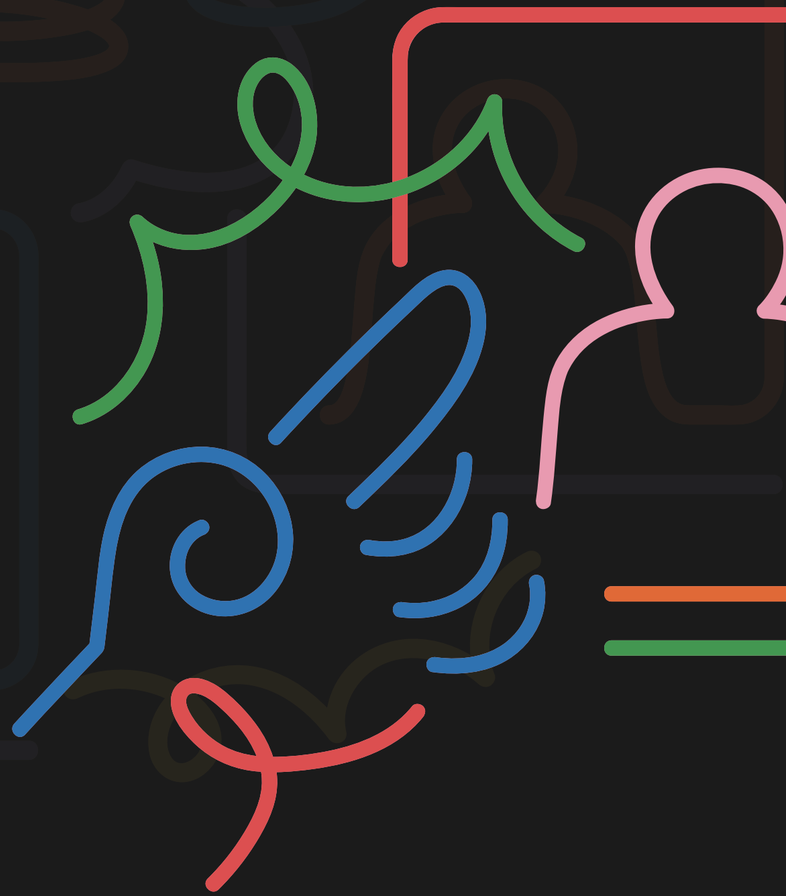
Defining the Problem

- **Retailer Strategies:**
  - Retailers in the U.S. employ various tactics to entice even the most hesitant shoppers. The prevailing approach involves leveraging AI tools and social media to swiftly understand consumer behavior and compel them to make purchases.
- **AI Revolution:**
  - AI is heralding a revolution in the shopping experience, empowering retailers to expand their customer base, precisely target individual shoppers, enhance customer support, and roll out faster, more intuitive shopping programs.
- **Consumer Adoption:**
  - From the consumer standpoint, integrating AI and social media is seen as the optimal solution for discovering desired items at reasonable prices.
- **Ease of Discovery:**
  - According to Sapio Research, ***69%*** of users express that AI simplifies the process of discovering products and brands, streamlining the search for desirable items.
- **Importance of Discounts:**
  - A staggering ***74%*** highlight the crucial role of AI in uncovering discounts, a pivotal factor in this year's shopping spree. In a landscape where every fifth shopper places explicit trust in AI-driven tools, the impact is undeniable.



PROBLEM STATEMENT

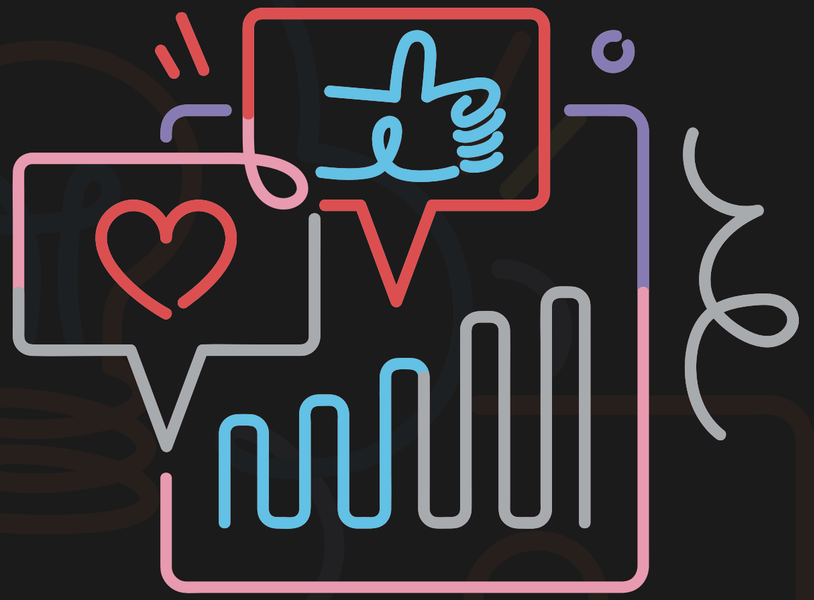
Pain Points and Inefficiencies

- **Complex Decision-Making:**
  - Retailers grapple with the complexity of decision-making in the face of dynamic market trends, making it challenging to strategize effectively and allocate resources optimally.
  - *Example:* Seasonal demand variations, changing consumer preferences, and external factors like economic conditions contribute to decision-making complexity.
- **Limited Predictive Insights:**
  - The absence of comprehensive predictive insights leaves businesses susceptible to market fluctuations, hindering their ability to anticipate consumer needs and preferences.
  - *Example:* Without accurate predictions, retailers may struggle with inventory management, leading to overstock or stockouts, affecting customer satisfaction.
- **Resource Allocation Challenges:**
  - Inefficient resource allocation often results in missed opportunities and excess costs, adding to the challenges faced by retailers striving to stay competitive.
  - *Example:* Misallocation of marketing budgets, failure to identify optimal product placement, and inadequate staffing can impact overall operational efficiency.
- **Data Overload and Analysis Paralysis:**
  - Retailers are inundated with data but often face challenges in deriving meaningful insights. The sheer volume can lead to analysis paralysis, impeding effective decision-making.
  - *Example:* Retailers might struggle to extract actionable insights from vast datasets, causing delays in responding to market changes.

PROBLEM STATEMENT

Current Landscape and Competitor Positioning

- **Competitive Retail Arena:**
  - The retail sector is highly competitive, with various players adopting different strategies to gain a competitive edge. Traditional methods of market analysis and decision-making are no longer sufficient in this fast-paced environment.
- **Emergence of AI Solutions:**
  - Competitors in the market are recognizing the power of AI solutions. However, many existing solutions fall short in providing a holistic approach that combines predictive analytics and deep learning to offer a comprehensive understanding of market dynamics.
- **Varied Technological Adoption:**
  - While some competitors are integrating AI into their systems, the level of technological adoption varies. OPTIC distinguishes itself by offering a cutting-edge solution that seamlessly combines Agent-Based Modeling and Deep Learning, providing retailers with a technological advantage.
- **OPTIC's Competitive Edge:**
  - OPTIC positions itself as a leader by offering a two-fold solution: an Agent-Based Model (ABM) for market simulation and Deep Learning for extracting high-level insights. This combination sets OPTIC apart, providing retailers with a unique advantage in understanding, predicting, and strategically responding to market changes.



SOLUTION OVERVIEW

OPTIC: Revolutionizing Retail Strategies

GENERAL OVERVIEW:

OPTIC is a tool that helps retailers optimize business information efficiency through market simulation, providing the best marketing and sales strategies that are realistic and reliable.

* AGENT-BASED MODELING (ABM)
* DEEP LEARNING MODEL

* **Agent-Based Modeling (ABM)** ABM is a computer model that simulates reality based on agents. Each agent is an entity assigned several properties and programmed to interact with each other and their environment in a certain way. In OPTIC, agents are **consumers, products are sold, and products are in stock**. Based on sales data and inventory data, agents will be assigned attributes depending on the type of agent, for example, a consumer agent may have attributes of number of shoes purchased, purchase history, gender, hobbies...

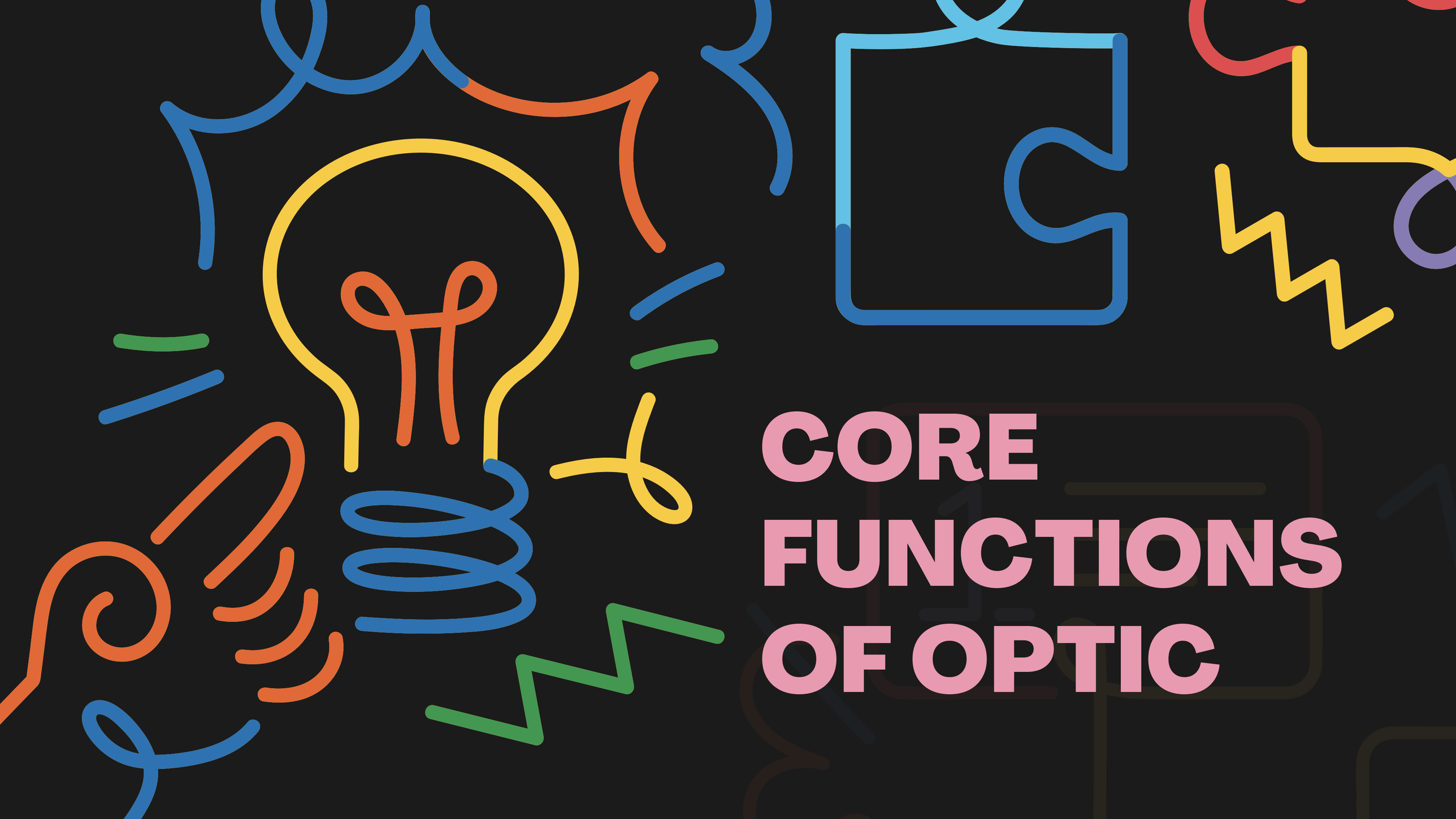
Benefits of ABM:

- **No need for hardware and large amounts of data:** some AI methods require specialized hardware devices (GPUs) and large amounts of training data. Meanwhile, ABM can work well with only a relative amount of data and commonly available hardware.
- **Explainability and trust:** one problem with AI models is explainability (also known as the black box problem). That is how humans can trust the decisions of an AI model when the decision-making process is often so complex that it cannot be tested. ABM does not have this problem because its operation itself is completely understandable and explainable.

Deep Learning: Deep Learning models are widely known for their ability to learn general rules in a set of complex data. OPTIC's use of Deep Learning has the following breakthroughs:

- **Combining DeepLearning and ABM:** by combining ABM, OPTIC can create large and diverse data sets without spending much time collecting through changing strategies when entering ABM and observing. result.

- **Saliency Map:** in computer vision and XAI, a saliency map is a technique to evaluate important regions of an image that contain a lot of important information and make a major contribution to the model's decision. Applying a Saliency Map to evaluate the importance of factors affecting the market is a new point of OPTIC.



CORE FUNCTIONS OF OPTIC

MODELING MARKET BEHAVIOR

The core of OPTIC is a **simulation model** based on agents. OPTIC's model is capable of simulating market developments in a certain future. Thanks to the modeling of many impact factors, OPTIC is able to simulate detailed market changes, from which **valuable information** is predicted such as sales growth, growth of customer groups (new customers, old customers, potential customers, ...), popular product groups, potential distribution channels, etc.

TESTING BUSINESS STRATEGIES:

By incorporating business strategies into the model as current data, combined with past data, OPTIC can predict how the market will react to those strategies in the future. Thanks to this, businessmen can test the effectiveness of different strategies before launching them into the actual market. Strategies can be added such as:

Distribution strategy:

How many different types of products are distributed to different channels in different locations

Business strategy:

When should I launch which product model, and what order should I launch different products in different channels? Quantity, value, time, location and product type of promotions. How should promotions be combined with each other and launch events?

EXTRACT HIGH-LEVEL KNOWLEDGE

Not only taking advantage of the power of the ABM model based on the information provided by simulating reality, OPTIC integrates a second solution which is to extract high-level knowledge using **Deep Learning**. By combining accumulated real data and simulated data using ABM, we can generate a number of condition-outcome mappings. These mappings are used as a **labeled dataset** and fed to a Deep Learning model. From there, OPTIC can learn the rules that affect the market. OPTIC will then provide this knowledge to businessmen through tools such as **Saliency Map** to evaluate the importance of factors to the market. In addition, the Deep Learning model can also suggest to traders what is the most **optimal business strategy**.

METHODOLOGIES

Agent-based modeling

Deep learning model

AGENT BASED MODELING

Organize data

The raw data needs to be organized so that the model is as easy to use as possible. This operation uses databases such as MySQL.

Produce infomation

Data after being collected needs to be analyzed to find useful information. There are two operations to do: (i) select the information that will be the attributes for the agents, and (ii) on each attribute, find a suitable probability distribution, (iii) determine the correlation relationship. interactions between agents, this relationship depends on the attributes and probability distributions found. This operation requires using probability distributions such as Lognormal, Bernoulli,...

Conduct simulation

First set up the agents with the properties and relationships defined. Then start the simulation process for a certain period of time and according to a pre-programmed scenario. Probability factors are added to bring randomness into line with reality. Several attributes can be added to the model to evaluate the impact of that attribute on the entire system (business strategy testing). This operation can be done by using Python and other packets for simulating like numpy, Mesa,...

DEEP LEARNING MODEL

Prepare dataset

The first thing to do is set up the dataset. By combining actual recorded data and ABM simulation results, we can quickly create a completely new labeled dataset.

Model building

A Deep Norron Network model with many hidden layers can be chosen to learn the rules inside the dataset. Choosing the classification class and loss function is also very important. This operation requires using libraries related to machine learning and artificial intelligence such as Tensorflow, Pytorch, scikitlearn.

Model training

After completing the model building process, we begin the model training process. The prerequisite is to have hardware that supports GPU (you can use Google Colab if you don't have physical hardware. Determining optimal parameters such as number of epochs, batch size, learning rate and propagation algorithms Contrast also plays an important role in the training process.

PERFORMANCE METRICS

Define the key performance metrics that will be used to assess the OPTIC's success & Explain how the OPTIC's performance will be measured and evaluated.

KEY PERFORMANCE METRICS

Accuracy of Predictions

- *Definition:* The extent to which OPTIC's market predictions align with real-world market outcomes.
- *Measurement:* Calculated by comparing predicted market behaviors, such as sales growth, customer segmentation, and popular product categories, with the actual market performance.

Strategy Effectiveness

- *Definition:* The success of business strategies predicted by OPTIC when tested in the real market.
- *Measurement:* Evaluation of how closely the outcomes of implemented strategies match OPTIC's predictions, assessing the tool's ability to guide effective decision-making.

Model Flexibility

- *Definition:* OPTIC's adaptability to different market conditions and scenarios.
- *Measurement:* Testing OPTIC's performance under various market dynamics, including economic changes, seasonal variations, and unexpected events, to ensure its effectiveness across diverse conditions.

KEY PERFORMANCE METRICS

Return on Investment (ROI)

- *Definition:* The financial returns generated by retailers following OPTIC's recommended strategies.
- *Measurement:* Comparing the financial outcomes of businesses implementing OPTIC's strategies against those not using the tool, calculating the ROI as a percentage.

User Satisfaction

- *Definition:* The level of satisfaction among retailers and business analysts using OPTIC.
- *Measurement:* Surveys and feedback mechanisms to collect user opinions, focusing on ease of use, clarity of results, and overall satisfaction.

Competitive Advantage Index

- *Definition:* The degree to which businesses utilizing OPTIC gain a competitive advantage in the market.
- *Measurement:* Creating an index that combines factors like pricing competitiveness, product innovation, and time-to-market, comparing OPTIC users with non-users.

EVALUATION PROCESS

Regular Testing and Validation

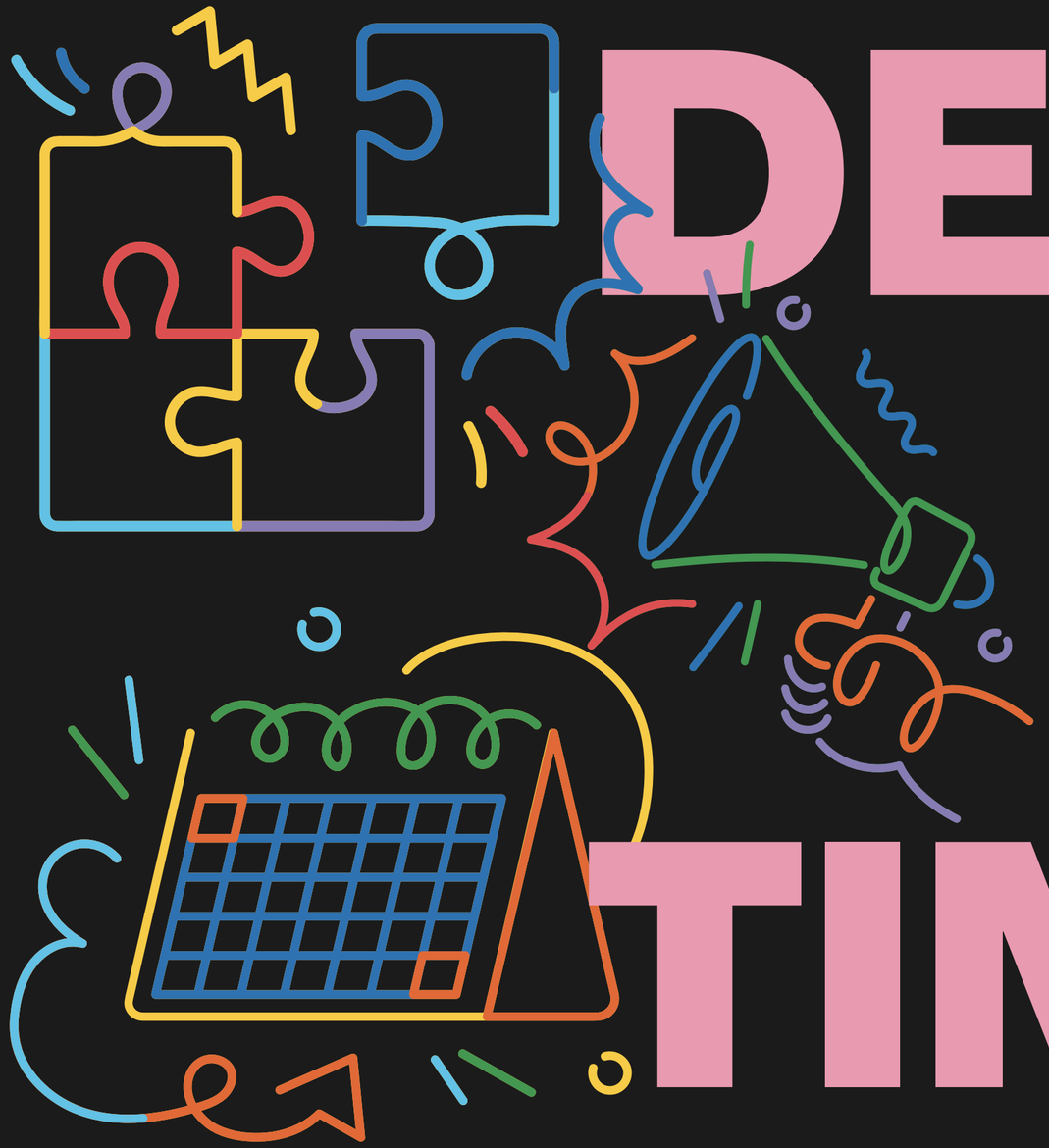
- Frequency: Continuous and regular testing of OPTIC's predictions against real market data.
- Validation: Using historical data to validate the accuracy of past predictions and adjusting the model based on any discrepancies.

A/B Testing

- Implementation: Implementing OPTIC's strategies in a controlled A/B testing environment.
- Comparison: Comparing the outcomes of businesses following OPTIC's strategies (Group A) with those following traditional strategies (Group B).

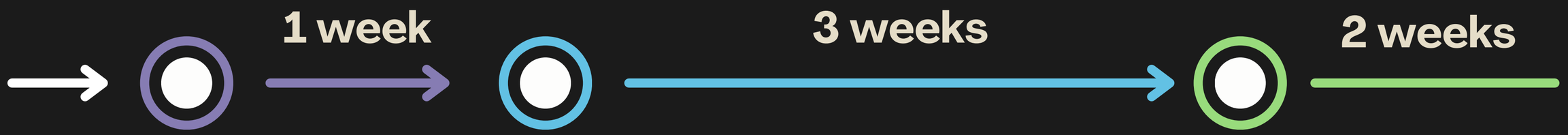
Real-time Monitoring

- Implementation: Employing real-time monitoring tools to observe OPTIC's predictions against current market trends.
- Adjustment: Ensuring that OPTIC can adapt to sudden changes in the market, maintaining accuracy and relevance.



DEVELOP -MENT TIMELINE

PREPARATION PHASE



Define Scope

- Define the goal of the model
- Define capabilities and limitations

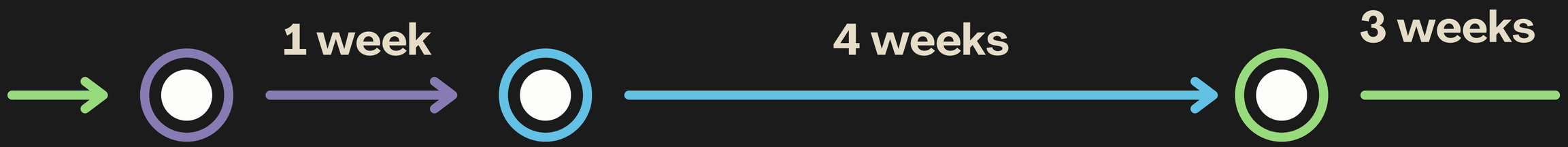
Data Collection

- Collect relevent data
- Clean up data and label the collected data

Data Analysis

- Analyze the data and find its characteristics
- Understand the relationships between pieces of data

TRAINING PHASE



Framework Selection

- Choose a suitable framework or algorithm for the problem
- Experiment with different technologies

Model Training

- Create training set and validation set
- Train model with training set
- Fine-tune the model for better performance

Evaluation

- Evaluation the model on the test data
- Identify areas for improvement and iterate on the model

DEPLOYMENT PHASE

Deploy Model

- Integrate the model into the application or service

Maintenance

- Monitor the model's performance in real-world scenarios.
- Implement regular updates and maintenance

LIMITATIONS

LIMITATIONS OF OPTIC SOLUTION

Data Dependency

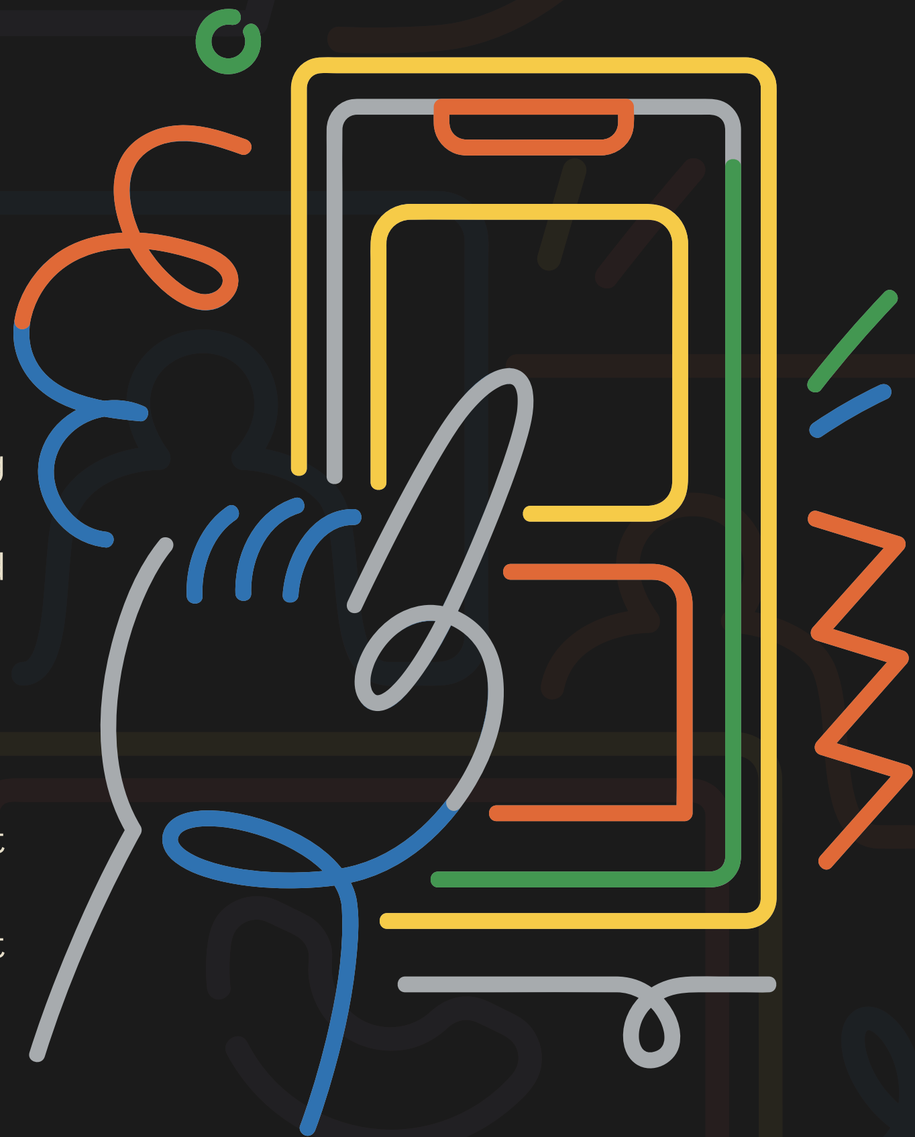
- *Challenge:* OPTIC's effectiveness relies on the availability and accuracy of historical and real-time data.
- *Mitigation:* Continuous collaboration with retailers to enhance data quality and exploring partnerships for more comprehensive data access.

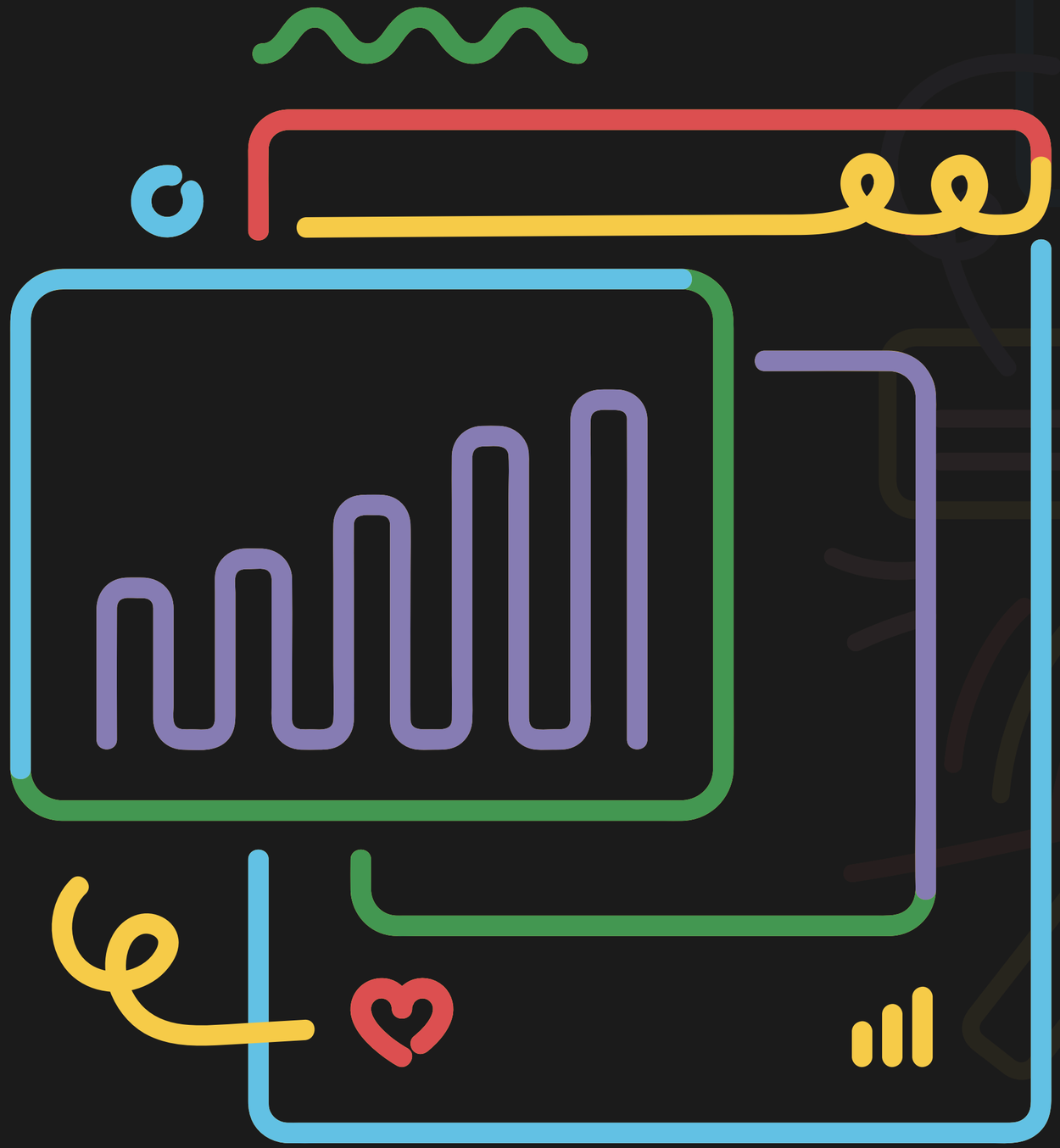
Initial Learning Curve

- *Challenge:* Users may face a learning curve in understanding and maximizing the functionalities of OPTIC.
- *Mitigation:* Implementing user-friendly tutorials, documentation, and customer support to facilitate a smoother onboarding process.

Market Dynamics

- *Challenge:* Rapid and unpredictable changes in market dynamics may affect the accuracy of predictions.
- *Mitigation:* Regular updates and refinements to OPTIC's algorithms to adapt to evolving market conditions.





FUTURE ENHANCE-MENTS

OPTIC "SUPER-SOLUTION" IN FUTURE

Predictive Analytics for Emerging Markets

- *Vision:* Incorporate advanced predictive analytics to identify and capitalize on opportunities in emerging markets.
- *Potential Impact:* Enable retailers to expand strategically into new markets with high growth potential.

Real-Time Machine Learning Algorithms

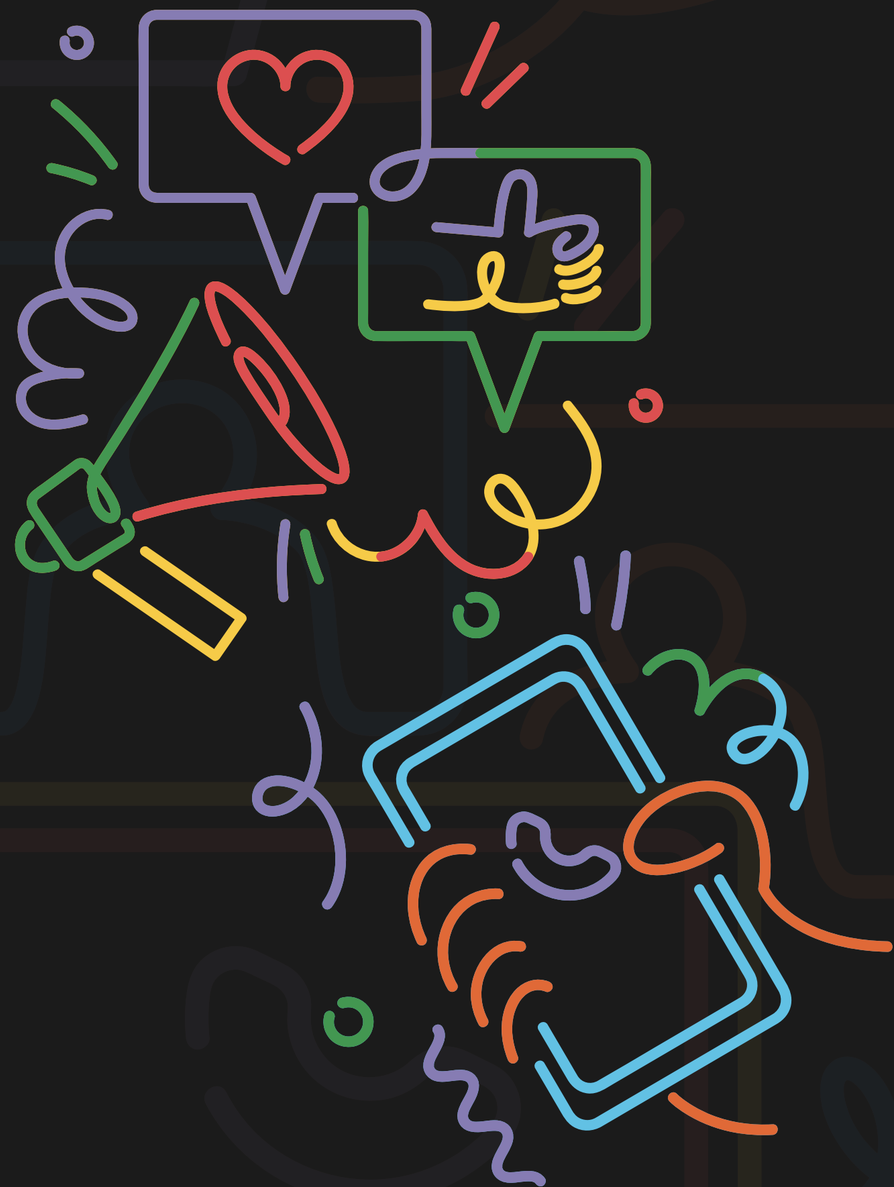
- *Vision:* Implement machine learning algorithms that can adapt in real-time to sudden market shifts.
- *Potential Impact:* Enhance OPTIC's agility and responsiveness, ensuring retailers can promptly adjust strategies.

Integration with E-commerce Platforms

- *Vision:* Seamless integration with popular e-commerce platforms for more direct implementation of OPTIC's recommendations.
- *Potential Impact:* Streamline the execution of OPTIC's strategies, providing a more user-friendly experience for retailers.

AI-Driven Customer Personalization

- *Vision:* Develop AI-driven tools for personalized customer experiences.
- *Potential Impact:* Increase customer engagement and satisfaction by tailoring recommendations to individual preferences.



CONCLUSION

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Potential of OPTIC in Business Strategy Optimization

OPTIC is a tool for optimizing business strategies for retailers, with the ability to simulate and predict the market.

Application of ABM Model in Strategy Testing

Using the ABM model, OPTIC allows for strategy testing, risk and cost reduction, and provides an overview of the expected performance of the strategy.

Combining ABM and Deep Learning to Create Diverse Data Sets

Combining ABM and Deep Learning, OPTIC creates a large and diverse dataset, enhancing the predictive ability and efficiency of the model.

Application of Deep Learning to extract high level of knowledge

OPTIC can extract knowledge from the dataset, which helps to provide a more in-depth understanding of the market.

CoChoDung_team

THANK YOU FOR YOUR ATTENTION!