DATASET 5:
Shelf Behaviors CCTV Data

TEAM 70:

TEAM MEMBERS

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Team Leader

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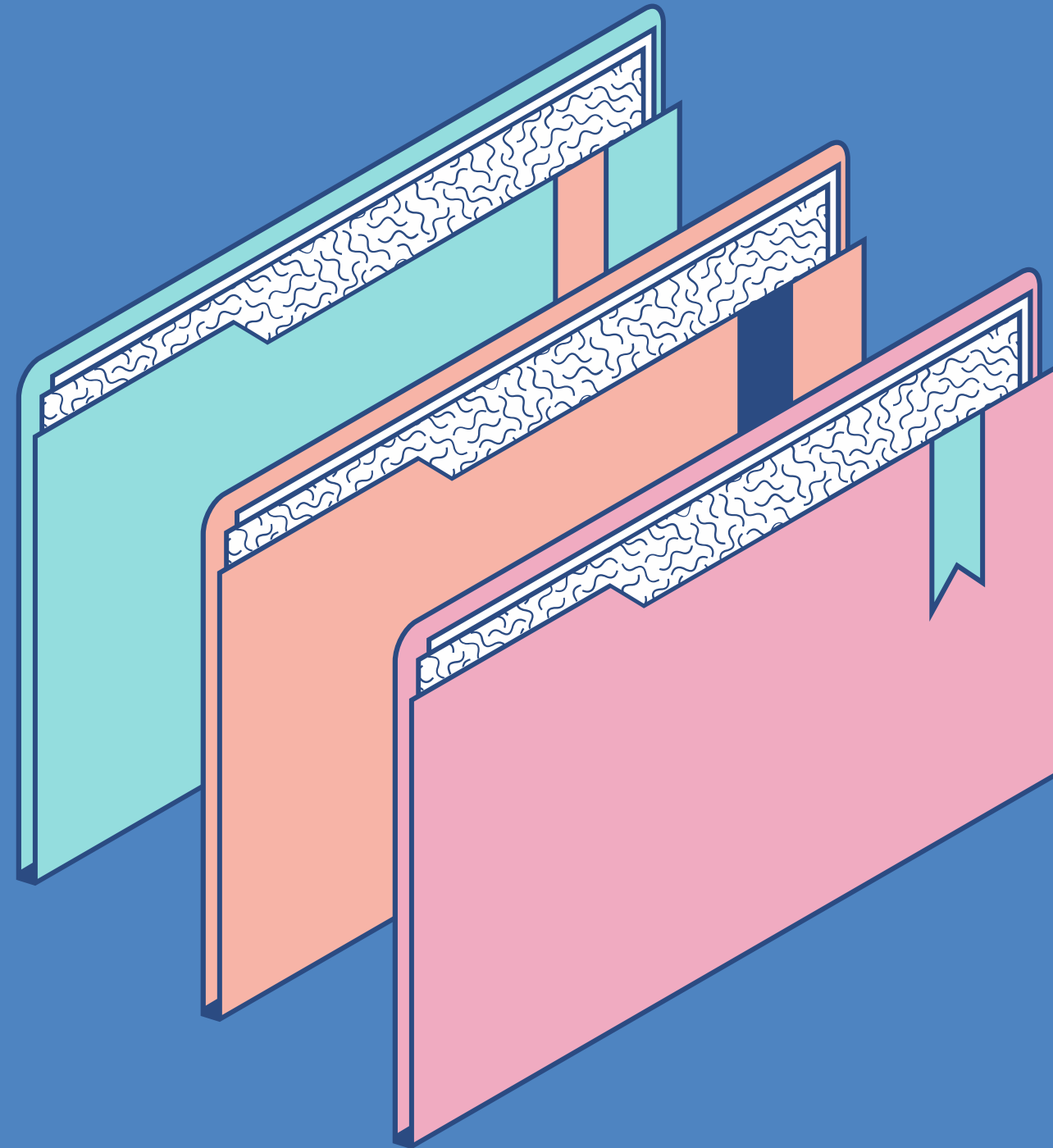**Member**

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Agenda

1. Introduction
2. Problem Statement
3. Solution Overview
4. Methodologies
5. Core Functionality
6. Performance Metrics
7. Timeline and Roadmap
8. User Interface (UI) or Interaction
9. Limitations and Future Enhancements
10. Conclusion

1.INTRO:

Introduction to the importance of understanding customer behavior in retail environments.
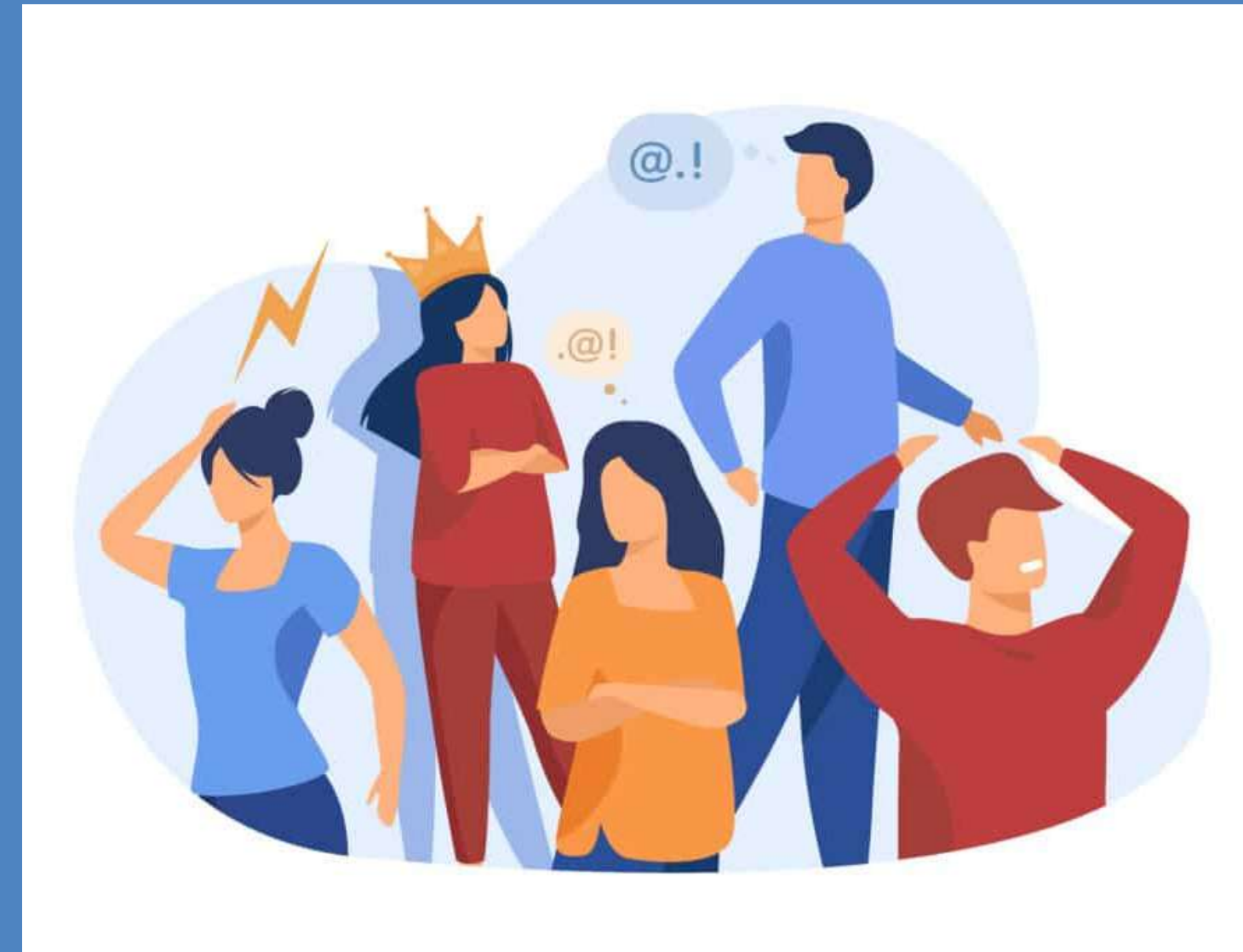
Proposal: Develop an AI solution utilizing video surveillance data for in-depth analysis of customer behavior.
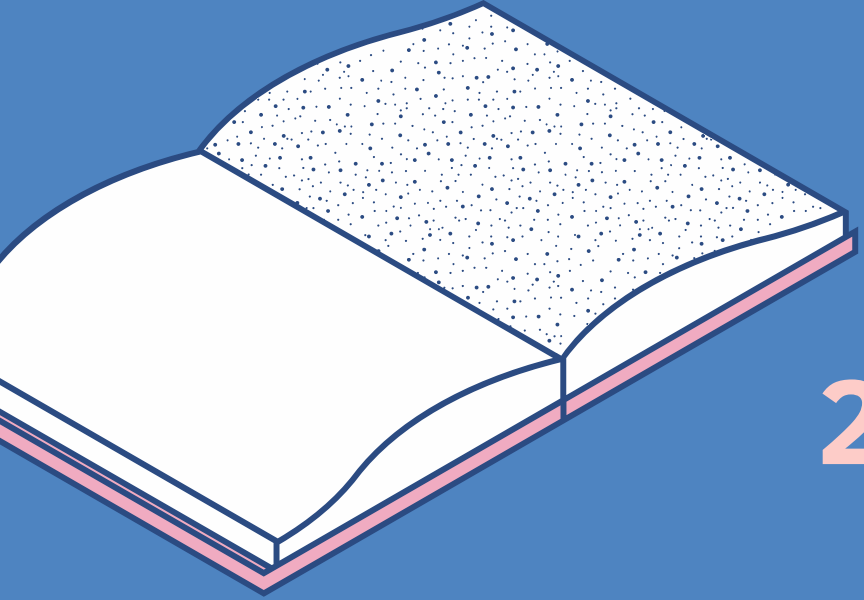
2. PROBLEM STATEMENT

DEFINING THE PROBLEM

- Core issue addressed by the MVP: Lack of real-time, detailed information on customer behavior in retail environments.
- Traditional data collection methods are limited in scope and fail to provide a comprehensive understanding of customer interactions.

WEAKNESSES AND INEFFICIENCIES

- Challenges and inefficiencies faced by retail businesses.
- Suboptimal store layout due to a lack of understanding of customer navigation.
- Ineffective marketing strategies without detailed customer insights.
- Decreased customer satisfaction due to a lack of understanding of needs and preferences.

Current Competitive Landscape

| Current Competitive Context	Unique Differentiation of MVP
- Overview of the current competitive landscape for AI-supported customer behavior analysis. - Mention of companies utilizing video data for monitoring customer movements. - Highlight the limitations of existing solutions, primarily focusing on aggregated data rather than detailed action identification	- MVP differentiates itself by focusing on detailed action recognition and providing actionable insights based on customer behavior models. - Aim to enable businesses to make informed decisions on store layout, product placement, and marketing strategies. - Emphasis on improving customer satisfaction and increasing sales.

3. Solution Overview.

Our proposed AI solution is to develop an action recognition model to classify and track customer behavior.
Machine learning and computer vision techniques will be used to analyze the images.

- Data preprocessing: Remove noise and enhance video quality.
- Action recognition model: A deep trained network to classify actions.
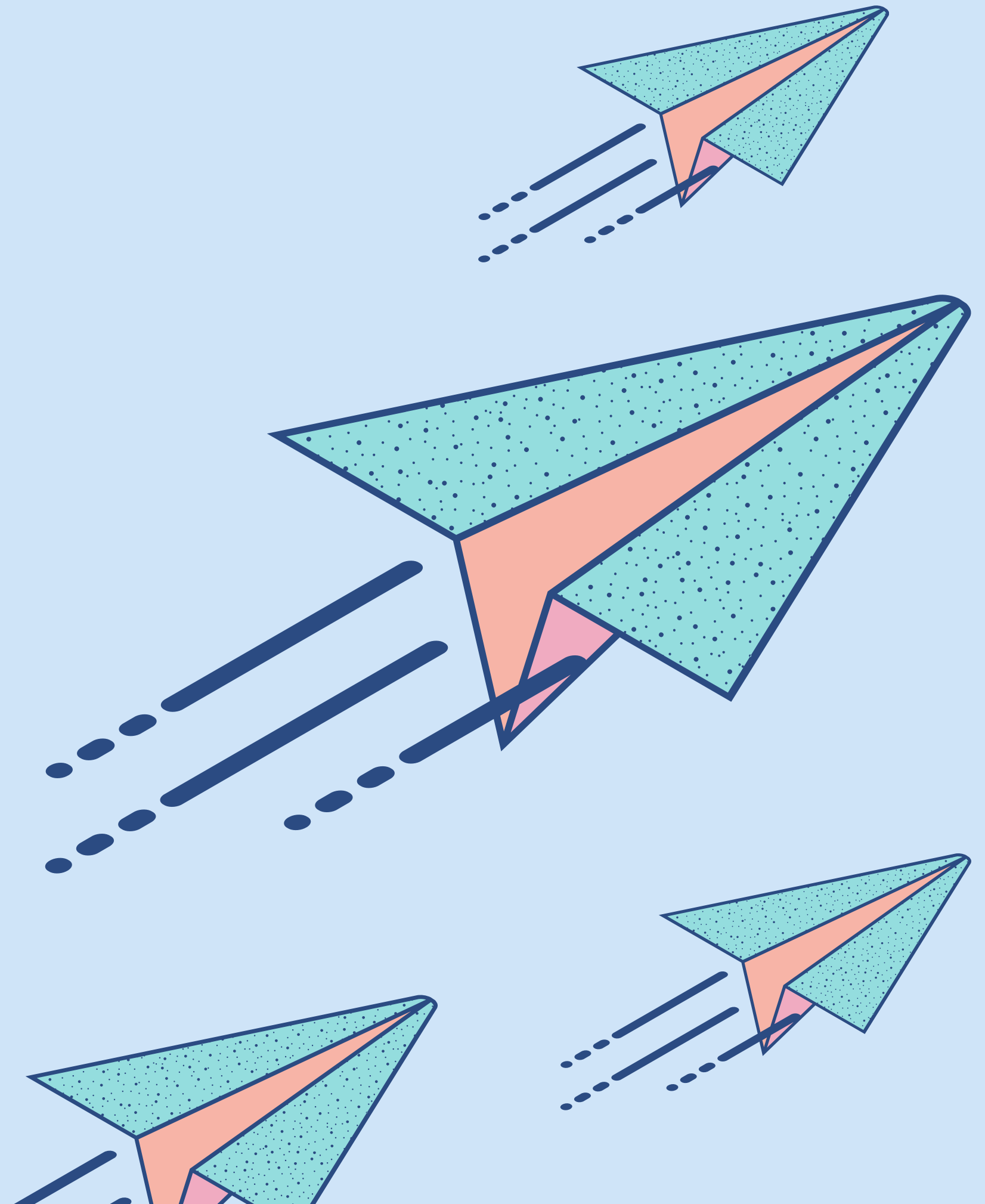- Action tracking: Track customers' actions and movements during shopping.

What's new in the solution we offer?

Existing customer behavior analysis solutions only use sales data by month, quarter, etc. This is quite inadequate because it may not be optimal and does not accurately reflect real behavior. customer's health. We use AI tools and algorithms to analyze based on provided image and video data. The solution provides a more comprehensive and detailed behavioral analysis result.
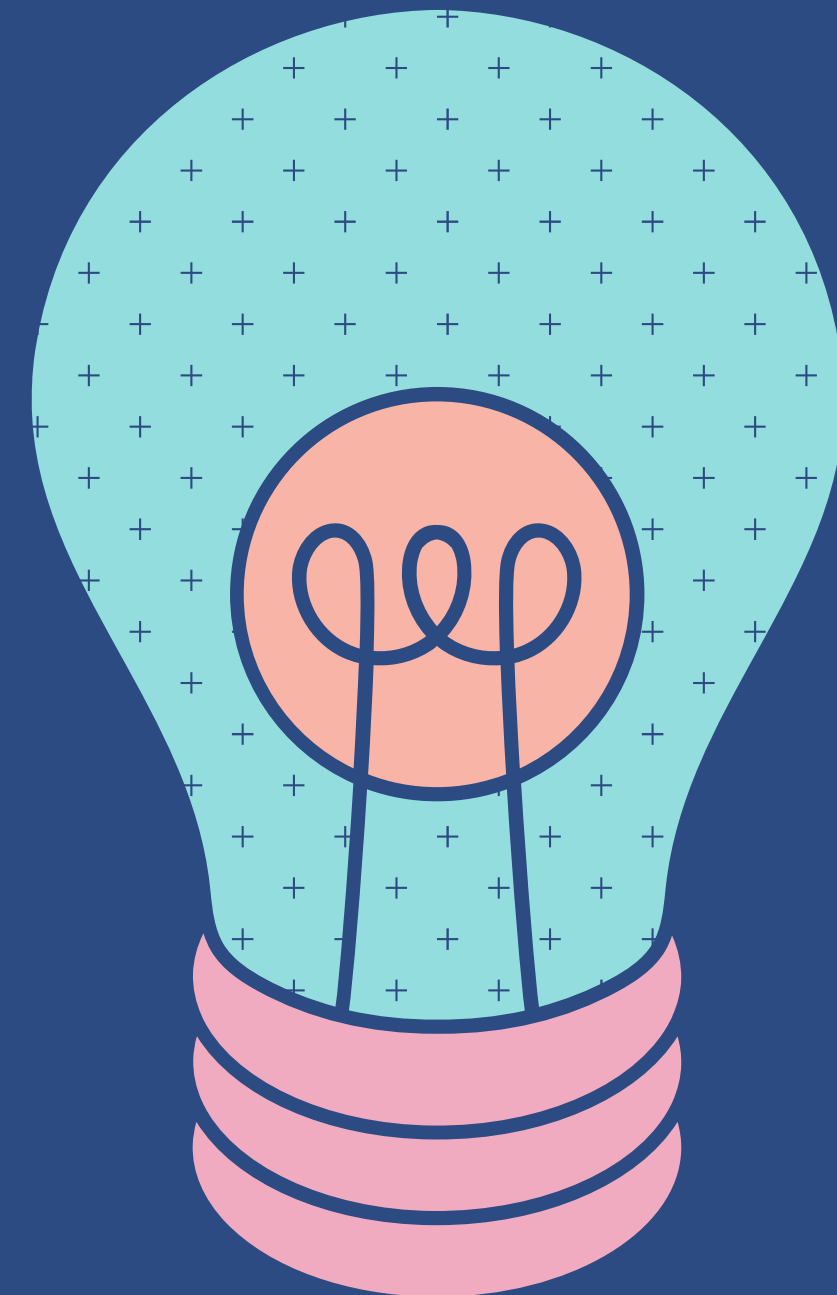
Specifically, the AI solution will include improvements such as:

- Detailed action recognition: Solution to identify and classify many customer actions.

- Real-time insights: The solution can analyze and provide insights from video data in real-time, allowing businesses to make immediate adjustments to their operations based on on customer behavior.

- Actionable Insights: The solution provides insights that can be used to optimize store layout, product placement and marketing strategy.

4. Methodologies

TECHNOLOGY USED

- Computer Vision
- Machine Learning
- Deep Learning Frameworks: TensorFlow, PyTorch,...
- Video processing library: OpenCV, FFmpeg,...
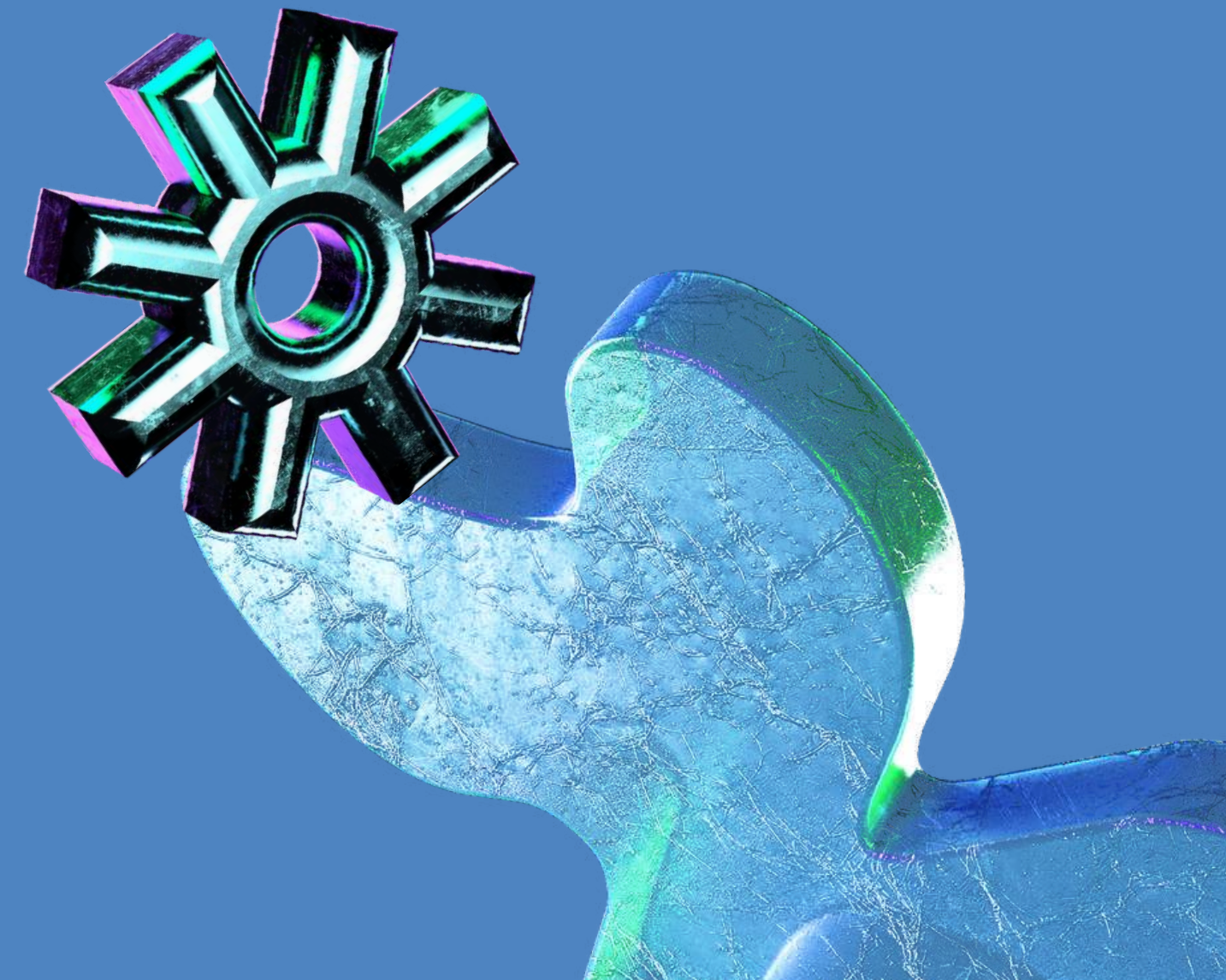
AI MODEL ARCHITECTURE.

The action recognition model is a deep convolutional neural network (CNN) architecture. CNN extracts features from video frames and these features are then used to classify customer actions.
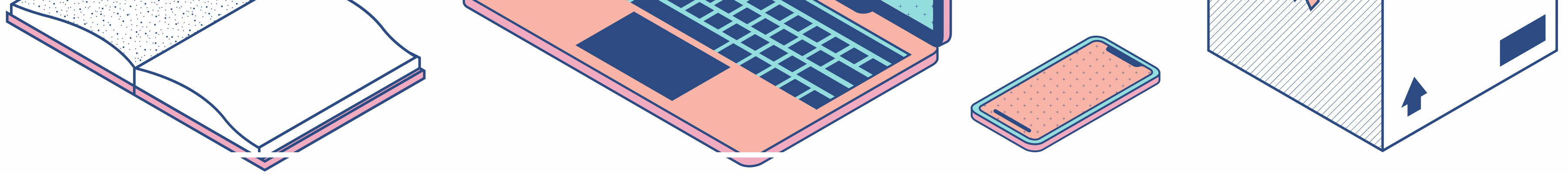
MAIN COMPONENTS OF THE MODEL.

- Convolution layer (input): This layer will receive video data from surveillance cameras.

- Pooling (processing) layers: This layer will use machine learning techniques to analyze video data and extract features of customer behavior.

- Fully connected layer (classification): This layer will use classification techniques to classify behavioral features into specific behaviors.

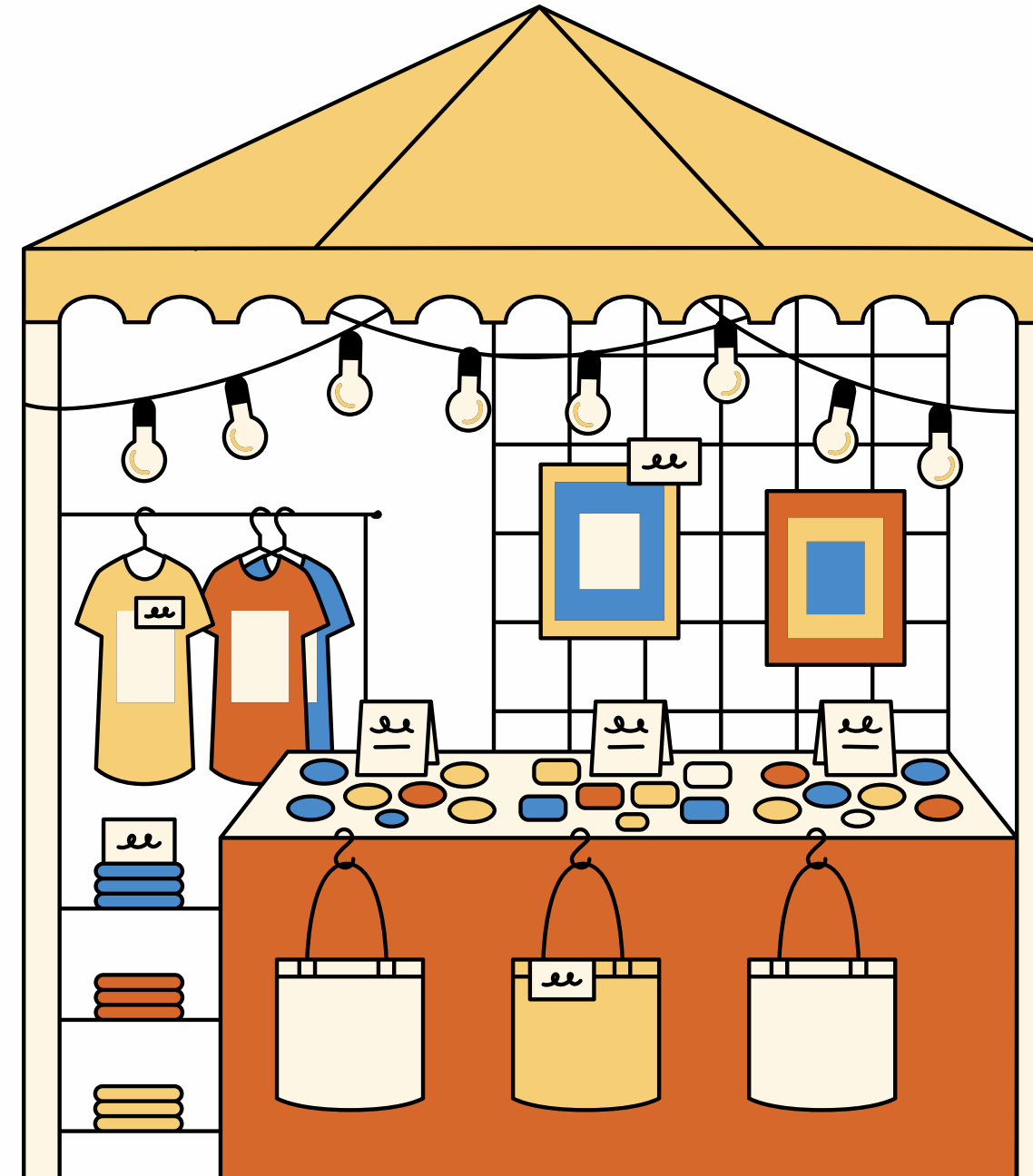# 5. The MVP will have the following core functions:

- Action recognition

- Action tracking

- Action Insights

Action recognition

The MVP will be able to identify and categorize the following five customer actions:

1
Access to the product shelf

Customers access the product they want to buy

2
Remove the product from the shelf

Find and select products they want to see

3
Put the product back on the shelf

When a customer decides not to buy a product, they often reorder the product to its original place.

4
Product Inspection

Customers review the product carefully before deciding to buy

5
Price and quality comparison

Customers often compare product price and quality with other brands to ensure the best value

Action Tracking

MVPs track customer movements in video series, aiding businesses in analyzing behavior, improving the customer experience, and optimizing store layout and product placement.

Action Insights :

MVPs will provide actionable insights based on customer behavior patterns :

- Be able to identify what factors make customers more interested and engaged.
- Adjust your store layout to optimize the shopping experience and enhance product appeal.
- Placing products in strategic locations in the store increases the chances that customers will interact with the product and even increases sales, advertise and promote products or areas that customers frequently visit.
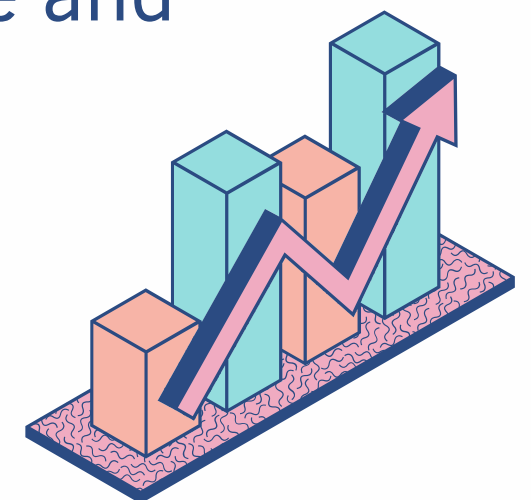
6. MVPs will be evaluated based on performance metrics

Action recognition accuracy: The accuracy of the action recognition model will be measured as the percentage of correctly classified frames.

MVPs will be evaluated based on performance metrics

- **Accuracy of action tracking**: The accuracy of the action tracking component will be measured in the percentage of correctly tracked frames.
- **Relevance of action insights:** will be measured by how useful they are in optimizing store layouts,product placement and marketing strategy.

7. Timeline and Roadmap

THE MVP IS EXPECTED TO BE COMPLETED WITHIN SIX MONTHS. HERE ARE THE RECOMMENDED TIMINGS AND ROADMAP:

MONTH	MONTH	MONTH
1-3	**4-5**	**6**
Research and development of action recognition models	Data collection and action recognition model training	MVP implementation

Stage 1:

RESEARCH AND DEVELOPMENT OF ACTION RECOGNITION MODELS(MONTH1-3)

- **Research:** In this phase, the team will dedicate time to conduct extensive research on action recognition methods, available machine learning models, and modern standards in this field. The goal is to identify the most suitable strategy and technology for the project.

- **Model Development:** Building on the knowledge gained from research, this stage focuses on developing the action recognition model. Decisions regarding the model's structure, algorithms, and key parameters will be made during this phase.
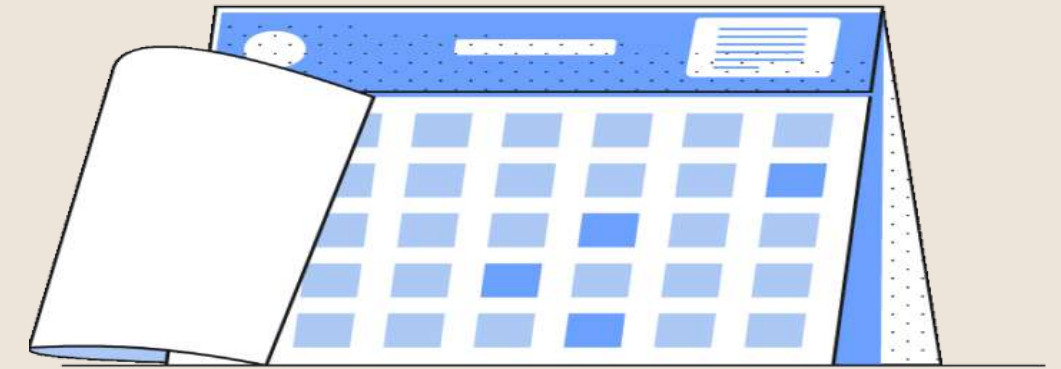
Stage 2:

- **Data Collection:** In this stage, the team will concentrate on gathering the necessary data for training and testing the model. This data will include images or videos of the actions that the model needs to recognize.

- **Model Training:** With the collected data, the team will initiate the model training process. Techniques for fine-tuning the model and optimizing performance will be applied during this stage to ensure the model operates accurately and efficiently.

Stage 3:

DEPLOYMENT OF MVP(MONTH 6)

- **Deployment:** The final stage of the project is the deployment of the Minimum Viable Product (MVP). This may involve integrating the model into a real-world environment, connecting with other systems if necessary, and preparing for the collection of real-world data.

- **Testing and Adjustment:** Following deployment, the team will conduct testing to ensure that the MVP functions correctly in real-world conditions. Final adjustments may be implemented to improve performance and address any issues that arise during the deployment process.

8. User Interface(UI) or Interaction.

Customizable Reporting:

Enables users to create and customize reports based on their specific needs. This may include selecting specific charts, combining data from various sources, and choosing key metrics.

Real-Time Interaction:

Allows users to track behavior and analyze data instantly, enabling them to make decisions promptly. This can be achieved through continuous updates on the user interface or through push notifications.
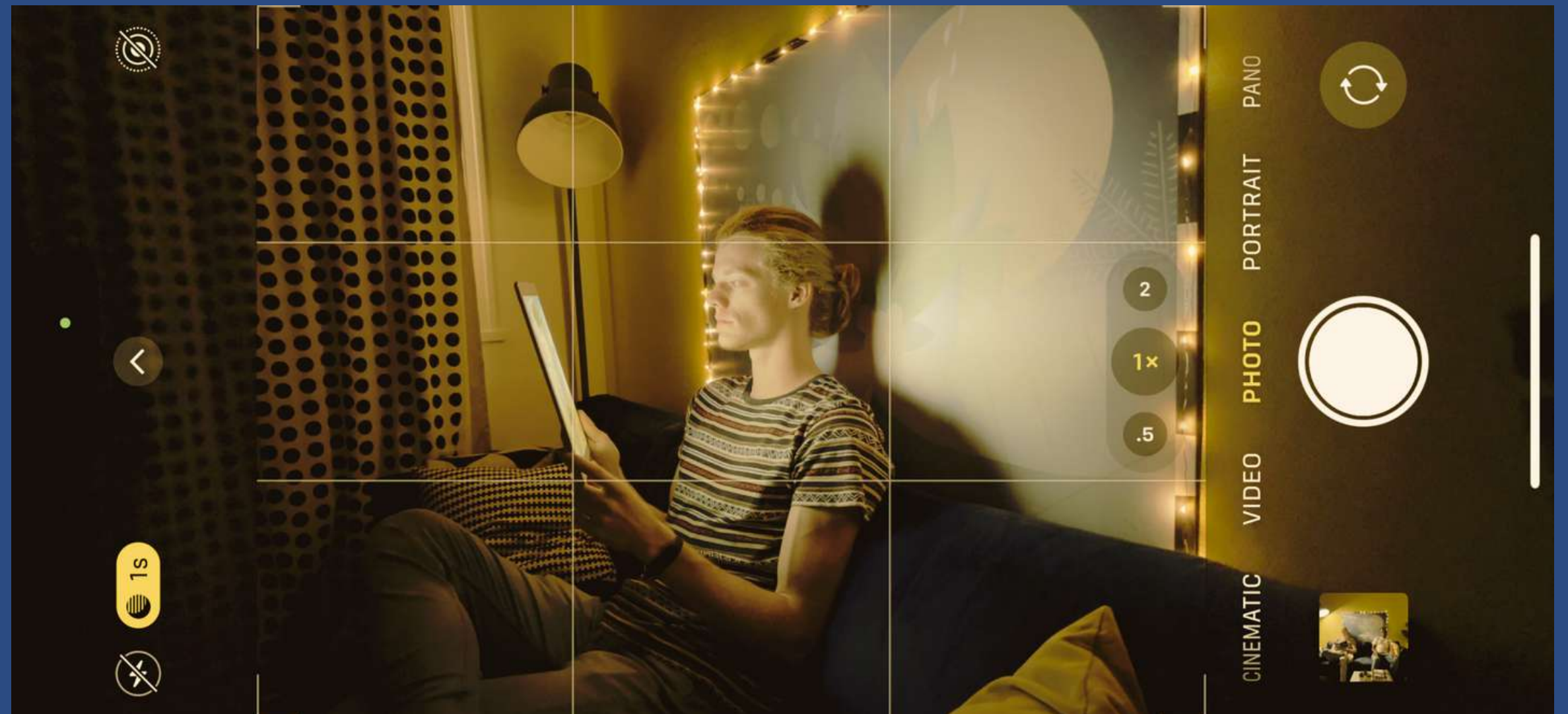
Cloud Interface:

Stores data in the cloud, providing users with access to information from anywhere they need. This creates flexibility and convenience in managing and monitoring customer behavior.
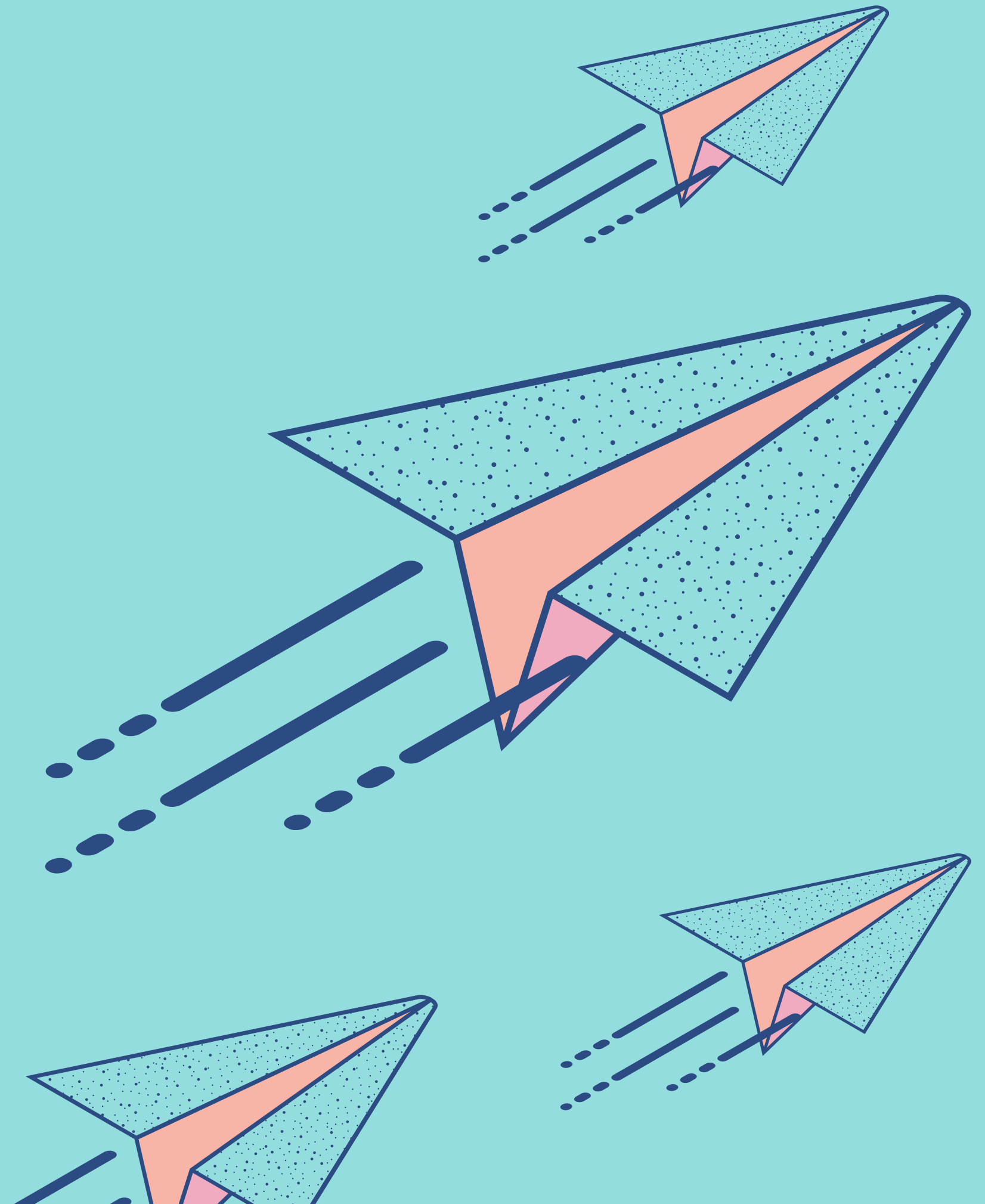
MODEL DRAWBACK

The model relies on the quality of the video. To be more specific, these factors need to be accounted:
- Light
- Angle
- Movement

As we know the downside of the model, what can we do to improve it?

Here are five ways to optimize it.

9. Potential of model analysis

- Improve with more advanced ML models to increase accuracy

- Improve with more advanced computer vision technology

- Expand the detectable action lists

- Improve the ability to track more customers concurrently

- Apply personalization and customization methods from business to the model to analyze each customer in detail

10. Conclusion

HOW CAN THIS MODEL BENEFIT THE CLIENT?

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- Emotional analysis
- Behaviour analysis
- Time-series analysis
- ...

- Deeply understand the needs of customers
- Better store organization, advertizing and promotion
  → more revenue/profits

10. Conclusion

KEY POINTS OF MODEL DEPLOYMENT

search

- High image/video data is crucial
- Constantly improve the model by updating the newest ML/AI model

These technologies are costly in context of time, finance and other resources, but with the right path, fruitful results are on the way.

Do you have any questions?

Send it to us! We hope you learned something new.