

Case for a **Leader in the Retail Sector**

A Computer Vision Solution for a Retail Company_

Reduced maintenance costs and enhanced customer
experience with intelligent human activity recognition

Industry: Retail

Location: Asia

Employees: 100,000+



Client Background

Our client is one of the largest retailers, shopping mall developers, and operators in Asia.

They have a retail network comprising around 300 consolidated subsidiaries, ranging from convenience stores and supermarkets to shopping malls and specialty stores.

Business Challenge

As an industry leader, our client strives to introduce the latest technologies in their day-to-day operations to provide exceptional customer service, improve decision-making, and achieve a better understanding of the consumers' needs. To enhance their strategy and get insightful data, our client decided to implement an AI-powered surveillance system.

A computer vision solution had to be unraveled in one of the largest malls of the chain with a space of more than two thousand square meters (20,000+ square feet). Integrated with the extensive camera system, it would collect variable data on customer behavior, people flow, number of visitors, and their paths around the store. With all these features integrated, such a solution would provide our client with holistic data to enable data-driven decision-making.

To enable precise and effective computer vision solution, it was necessary to:

- Decide on the most fitting hardware that would suit the technical requirements;

- Set up and configure an efficient surveillance system in a large two-story supermarket that would cover the entire area of 2,000 square meters (20,000+ square feet);
- Enhance security system at the store with intelligent human activity recognition to detect habitual criminals;
- Collect, store, and analyze in-store customer behavior data to adjust the company's marketing strategy;
- Provide data on customer flow and heatmap for efficient maintenance of premises and energy optimization;
- Ensure precise human recognition in the context of COVID-19 preventive measures and [mask-wearing detection](#);
- Deploy the solution within a short time frame.

Solution

Infopulse cognitive computing specialists worked closely with the client's team for a seamless implementation of the solution according to the set objectives.

Our experts provided a full suite of services from the initial environment assessment to system configuration and data science models training.

Operations

Infopulse team enabled the smooth performance of the system with an end-to-end approach to its development and implementation:

- Advised on the hardware choice, including servers and cameras, according to the data processing requirements;
- Located, configured, and calibrated 50+ cameras on-premises to best meet the project objectives;

- Enabled on-premises computing and data processing without any external service connected;
- Continuously researched for state-of-the-art data science models to utilize in the project for the best result;
- Customized the data science models by collecting, labeling, and feeding the models with real-life data from the project site to enable their training;
- Gathered extended data on customer behavior, including the number of people and movement tracking;
- Provided data visualization dashboards, such as people tracking graph and store heatmap;
- Ensured secure on-premises data storage with role-based access;
- Utilized AWS cloud platform for secure backups and a testing environment.

Data Science

Infopulse developed a custom computer vision solution for intelligent customer behavior analytics with features including people detection, recognition, and movement tracking.

People counting:

- Set up a high-precision face camera at the mall entrance with a scanning frequency of 10 frames per second;
- Enabled real-time people tracking and counting once entering the store;
- Facilitated further re-identification with image segmentation and detecting unique features for each visitor.

Solution

Flowline analysis:

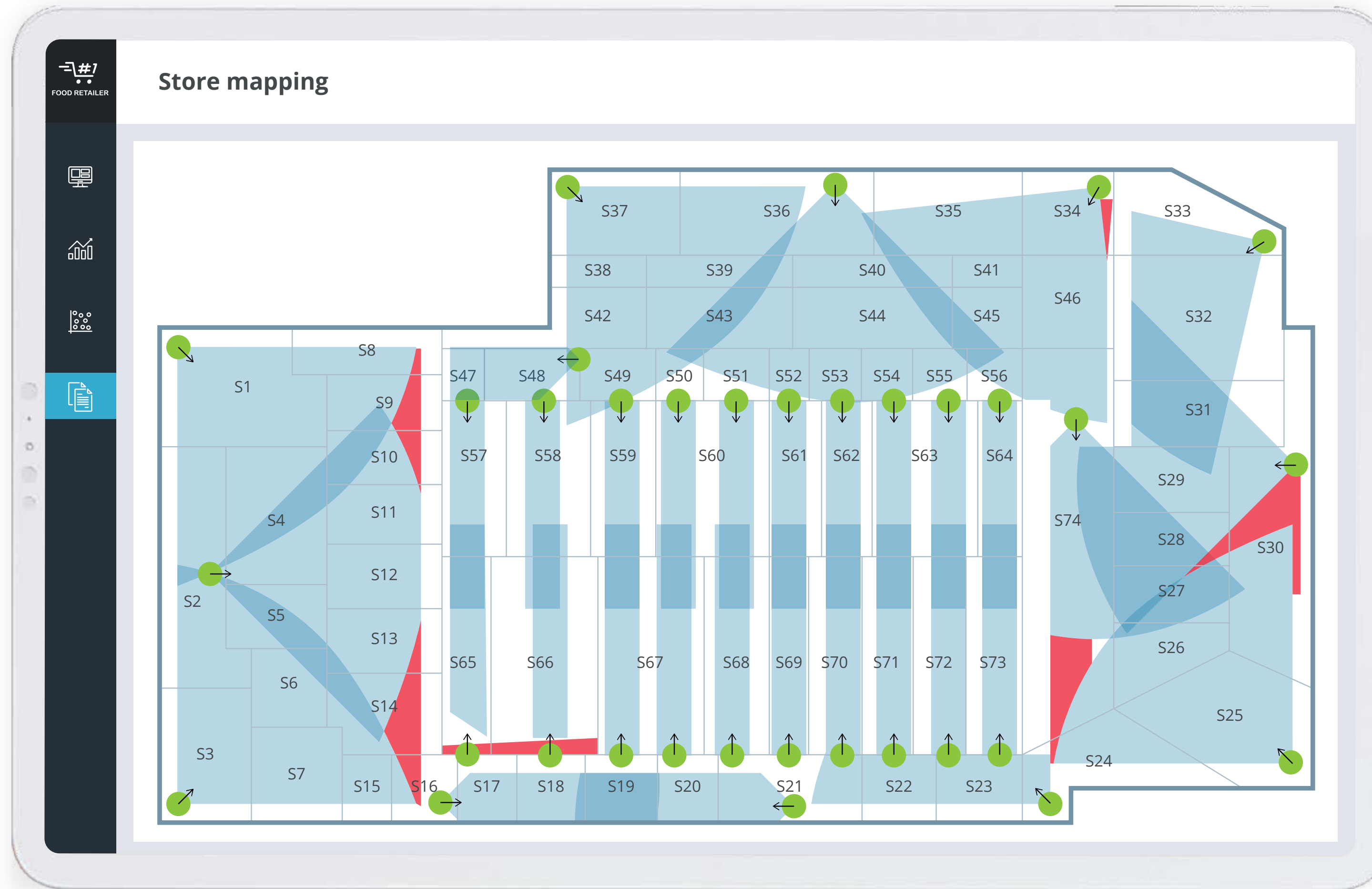
Infopulse team enabled the smooth performance of the system with an end-to-end approach to its development and implementation:

- Introduced a full-body image re-identification model, which is not sensitive to wearing masks, hoods, scarves, glasses, and allows for precise customer flow analysis even during the pandemic and obligatory wearing of personal protective equipment;
- Utilized a person re-identification model to track customers moving around the store. Collecting the data from different cameras, the solution can track customers' paths through the sections of the mall;
- Implemented a lazy tracking model to meet the data processing capabilities.

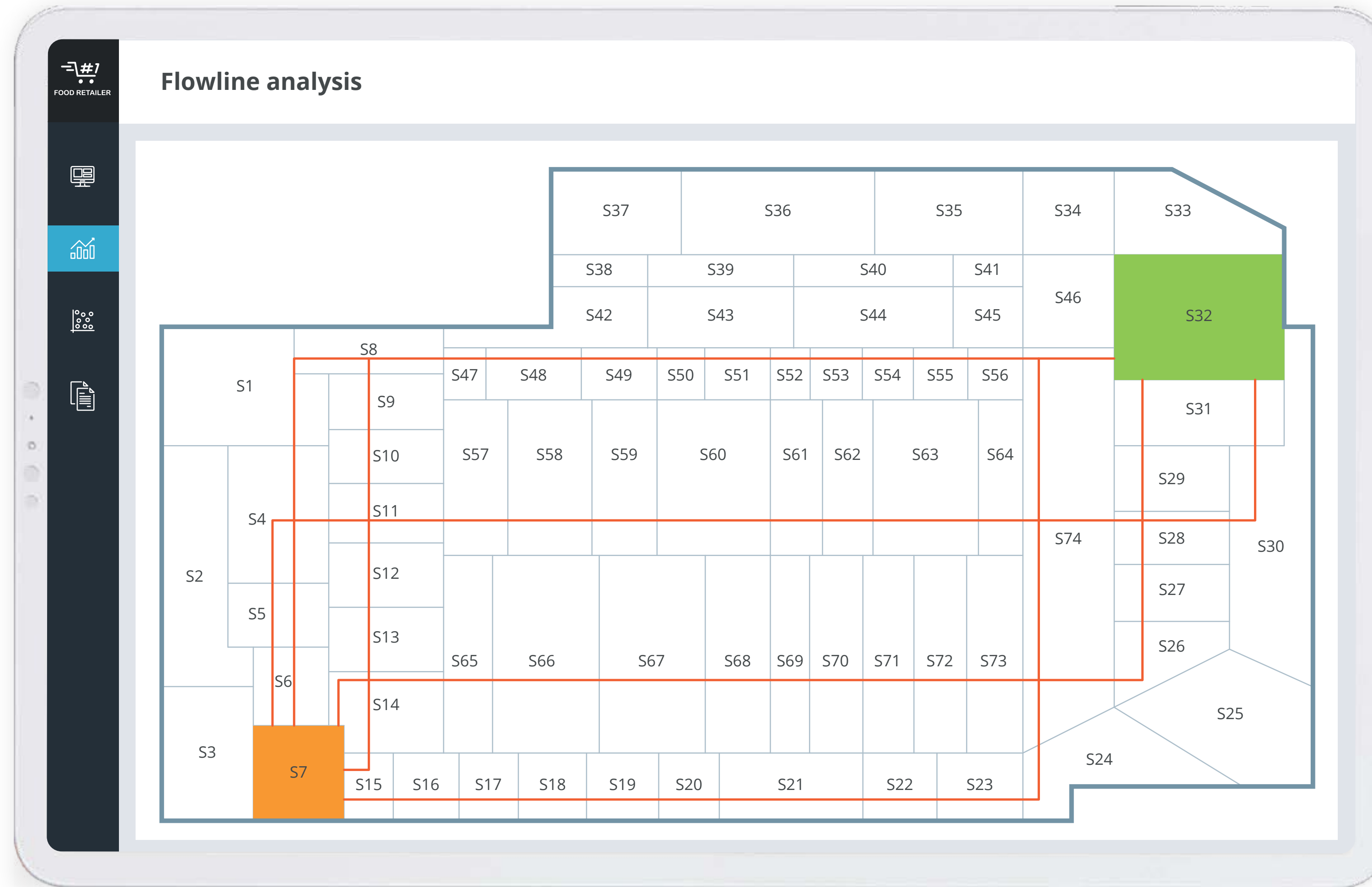
Camera view example



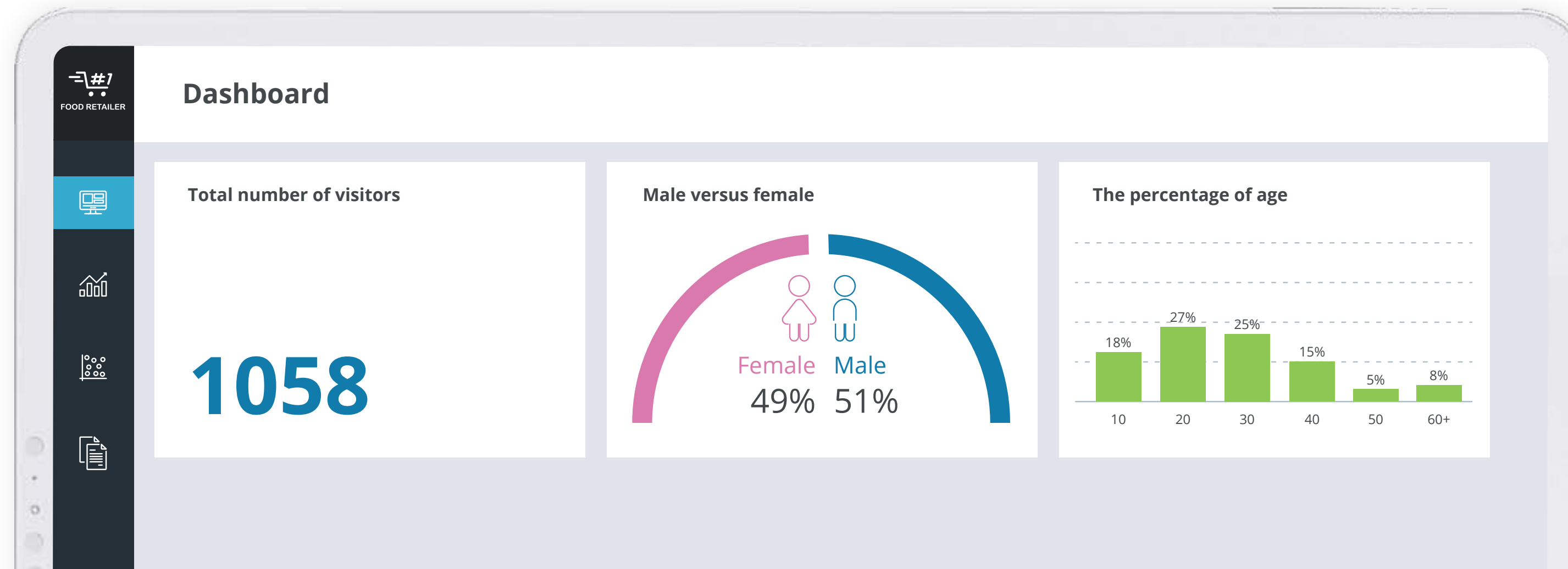
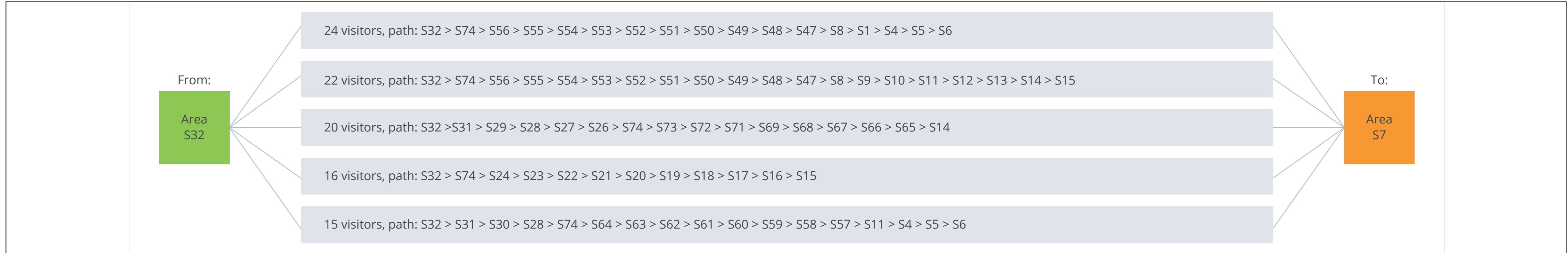
Store Mapping



Flowline Analysis



Dashboard



Solution

Heatmap:

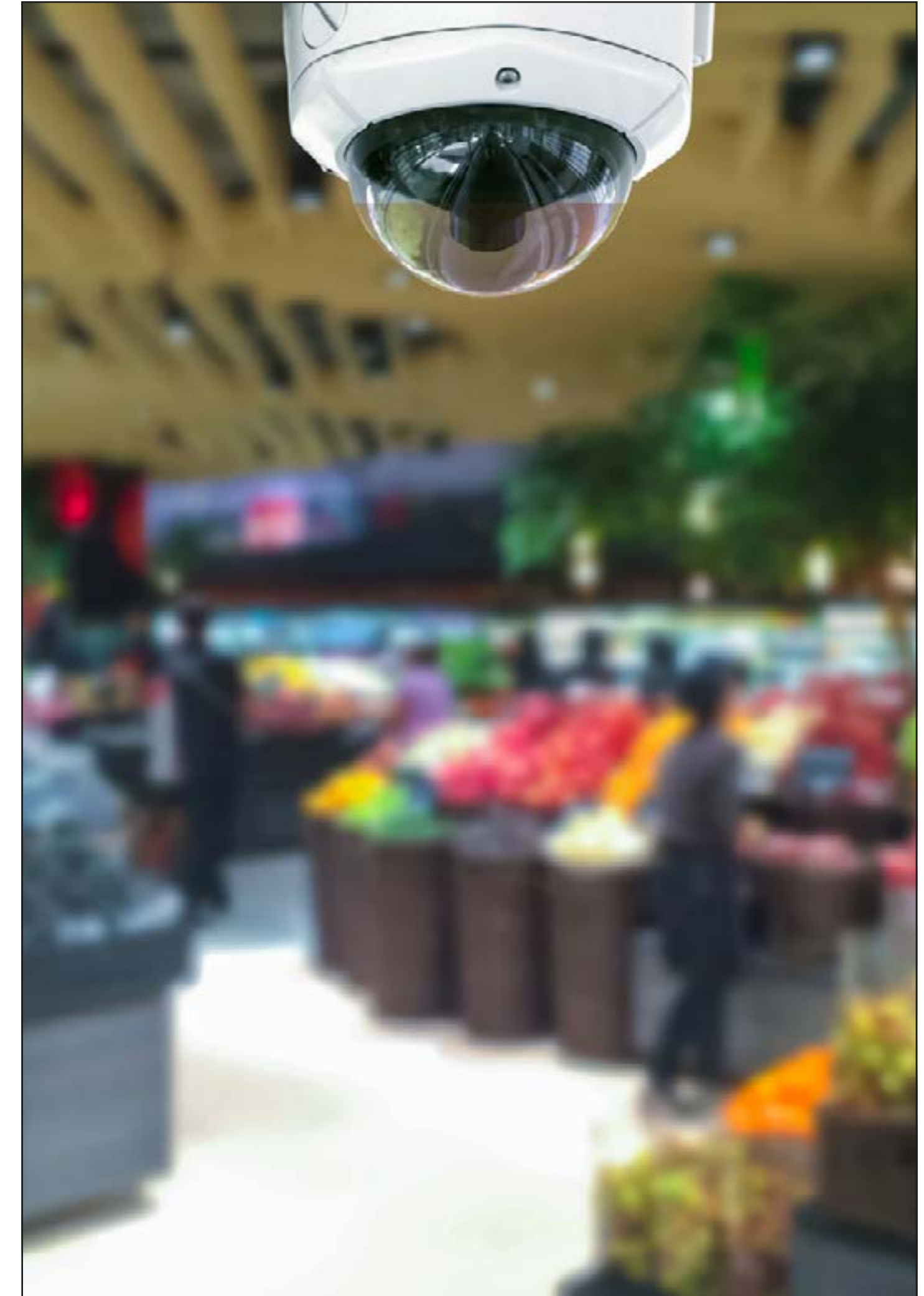
- Enabled real-time people counting across different areas of the mall;
- Configured scanning frequency with 1 frame per 4 seconds for cost- and resource-efficiency;
- Implemented a computer vision model to detect crowd density within a camera range and count the number of people per frame;
- Enabled heatmap dashboard update with a 10-second interval for real-time data visualization.

Age & Gender Recognition:

- Applied a tailored approach to the computer vision solution to eliminate the side-effects of pandemic protective measures, which include face covers;
- Implemented a custom data set, based on production data, to enable age and gender recognition with an image of the face and upper torso.

Blacklist:

- Utilized people recognition model to identify persons listed in the security database;
- Set up user notification for the authorized personnel when detecting a habitual criminal in the store.



Technologies

Data Science:



TensorFlow



Keras



TensorFlow Serving



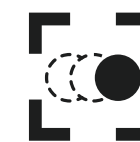
OpenCV



TensorFlow Object Detection API



Spatial-Temporal Person Re-identification



Real-Time Object Detection



SSD on MobileNet



EfficientDet



DeepFace



ESR-9

Back-end:



Python 3



Kafka



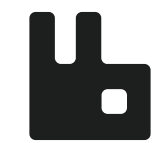
Kubernetes



Docker



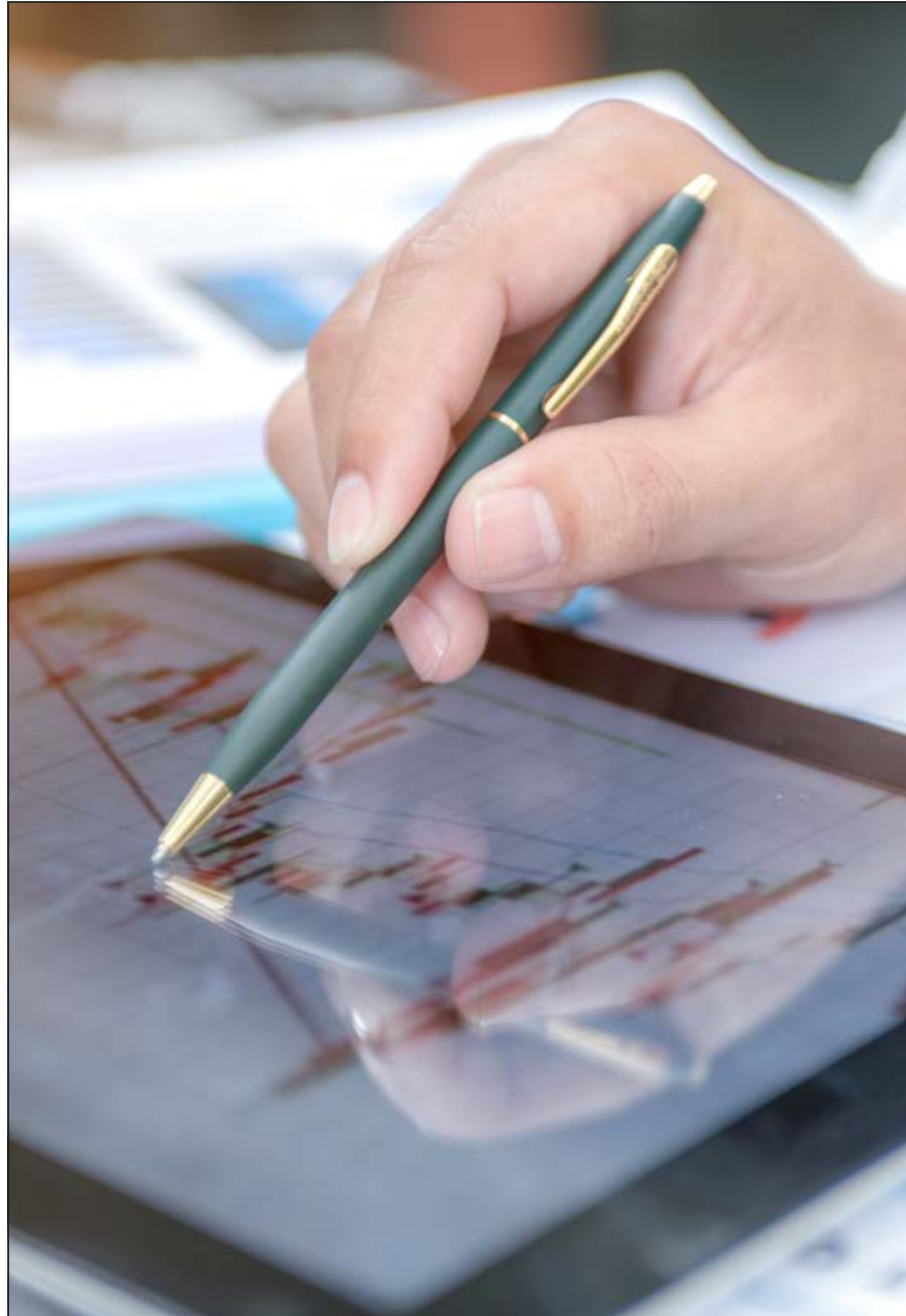
TimescaleDB



RabbitMQ



Redis



Business Value

Infopulse client leverages their retail strategy with insightful data and real-time analytics provided by an advanced computer vision solution:

- Quick time-to-market: first working version deployed in 3 months after the start;
- Continuous video analysis with 50+ cameras: real-time people counting and movement tracking;
- Lowered energy costs by optimizing customer flow and dynamically adjusting power consumption thanks to the customer flow data analysis;
- Data-driven marketing and promotion, better customer experience and optimized store layout based on customer flow and demographic analysis;
- Enhanced store security by implementing accurate facial recognition of habitual criminals and sending immediate alerts to the store staff;
- High precision of computer vision models:
 - 95% for people counting;
 - 72% for movement tracking and re-identification;
 - 89% for age & gender detection;
 - 90% for blacklists;
 - 91% for heatmap.

Satisfied with the quality of the Infopulse project delivery and our dedication to the project, the client plans to continue our cooperation and further develop the AI-powered surveillance solution.



About Infopulse

Infopulse, part of the leading Nordic digital services company Tietoevry, is an international vendor of services in the areas of Software R&D, Application Management, Cloud & IT Operations, and Cybersecurity to SMEs and Fortune 100 companies across the globe. Founded in 1991, the company has a team of over 2,300 professionals and is represented in 7 countries across Europe and the Americas.

Infopulse is trusted by many established brands, such as BICS, Bosch, British American Tobacco, Credit Agricole, Delta Wilmar, ING Bank, Microsoft, Offshore Norge, OLX Group, OTP Bank, SAP, UkrSibbank BNP Paribas Group, Vodafone, Zeppelin Group, and others.

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