Adopting Intel® CPUs and the Intel® Distribution of OpenVINO™ toolkit accelerated Pathr.ai’s deployment in multistory shopping centers in near-real time, allowing us to scale our solution across existing infrastructure and deliver cost and power savings to our client in a GDPR-compliant way.

—George Shaw, Founder and CEO, Pathr.ai

Online retailers can easily track and analyze customer behavior in real time. Most know, for instance, how many customers are shopping at a given time and which products are attracting the most interest. Brick-and-mortar retailers have struggled to achieve similar levels of insight while maintaining customer privacy. An additional challenge is that gathering and analyzing near-real-time data in physical spaces typically requires up-front purchase of hardware and sensors that many retailers cannot afford—even if the resulting customer behavior insights would deliver a competitive advantage.

Two large mall deployments by Pathr.ai demonstrate the potential for brick-and-mortar retailers to overcome the challenges and achieve weblike analytics in the physical world at an affordable price. In each case, Pathr.ai deployed its spatial intelligence platform within one month using existing mall infrastructure.

To cost-effectively scale its existing retail offering for the mall deployments, Pathr.ai used the Intel® Distribution of OpenVINO™ toolkit and Intel® Xeon® processors, resulting in a 10x improvement in edge analytics performance, 2.5x lower system costs, and 5.4x lower operating costs.1,2 Pathr.ai’s solution, which uses predictive data analytics tools powered by artificial intelligence (AI), is fully compliant with the General Data Protection Regulation (GDPR) and California Consumer Privacy Act (CCPA).

Solving strategic challenges for mall operators

To compete with online shopping alternatives, mall operators worldwide recognize the need to optimize operations and deepen their understanding of customer experiences. To do so, they need data-driven insights that historically have been too difficult or expensive to acquire.

A major US mall operator sought a powerful AI-based solution that could provide answers to questions like these:

- How high should lease rates be set in different parts of each mall, based on foot traffic?
- Where do shoppers enter each mall?
- Are people shopping individually or in groups? How large is each group?
- Does traffic flow need to be improved at elevators, lobbies, or other mall locations?
- Where in the mall are more (or fewer) valet and other customer services needed?
The mall operator needed to protect shoppers’ privacy, so the solution could not include facial recognition or other biometric profiling techniques that would identify individuals. The solution also needed to scale easily to meet the needs of malls of varying sizes and layouts. In addition, the solution needed to be easy to implement, with limited up-front capital costs for purchase and installation of new hardware infrastructure and sensors.

For a solution that would address all these challenges, the mall operator reached out to Pathr.ai.

**Spatial analytics deliver near-real-time insights**

Pathr.ai’s AI-powered spatial intelligence solution is designed to turn raw data into applied learnings at sites including malls, grocery stores, commercial office buildings, and industrial warehouses. Businesses can use the platform to see and understand the many daily spatial interactions that occur within their physical environment and turn those insights into improved fiscal and operational outcomes.

Figure 2 shows how Pathr.ai collects data and turns it into actionable insights.

**Data collection:** Data is collected from existing loss prevention and security cameras. The platform can also collect data from other cameras and sensors.

**Location extraction:** Using pretrained models from the Intel Distribution of OpenVINO toolkit, Pathr.ai can detect customers and staff in the video feeds.

**Spatial projection:** To preserve privacy, each detection of a person is projected onto a floor plan, viewable only as an anonymous dot moving in the physical space. No personal information or socioeconomic, demographic, or visual data is collected.

**Behavior engine:** Pathr.ai’s behavior engine evaluates in near-real time the way people and objects move through and interact with their physical environment.

**Actionable insights:** Businesses can use their preferred business intelligence software or custom dashboards to view the insights provided by Pathr.ai.
Optimizing and scaling with the Intel Distribution of OpenVINO toolkit

The immense size and differing layouts of the US mall deployments presented unique processing, deployment, and infrastructure challenges for Pathr.ai. The first shopping center comprised nearly 185 stores on a single level, while the second housed more than 100 stores on eight floors.

The Pathr.ai platform used for smaller deployments—including at department stores, grocery stores, and specialty retail stores—presented several challenges for the larger mall deployments. The servers were already running hot in the smaller deployments, indicating that they were being pushed to their limits. The servers were also expensive, and the 2021 chip shortage made it difficult to readily acquire the GPUs from distributors.

In response to these challenges, Pathr.ai opted to rearchitect its software and shift its deployments to servers powered by Intel® Xeon® Gold processors at the first mall and Intel® Xeon® Silver processors at the second mall. To optimize its solution, Pathr.ai used these and other resources from the Intel Distribution of OpenVINO toolkit:

- **Deep Learning Workbench (DL Workbench)** provided a detailed performance assessment and made it possible to explore different configurations before selecting an optimized model that eliminated bottlenecks.
- **Open Model Zoo**, part of DL Workbench, provided pretrained, out-of-the-box deep learning models to accelerate deployment.
- **Intel® DevCloud for the Edge**, a sandbox for prototyping and experimenting with AI inference workloads, helped Pathr.ai determine the hardware to use in each deployment.
- **Computer Vision Annotation Tool (CVAT)**, an open source tool, helped Pathr.ai annotate and label its videos.
- **OpenVINO™ Model Server** made it easy for Pathr.ai to deploy new model versions quickly and measure latency on each. It also provided support for AI accelerators.

Compared to the earlier configuration with GPUs that processed video feeds at 40 frames per second (fps), Pathr.ai’s benchmarks show that the new configuration with Intel Xeon processors can process feeds at 400 fps—a 10x increase in performance. The mall operator also achieved 2.5x lower system costs and 5.4x lower operating costs.

Data-driven insights help malls optimize operations and improve customer satisfaction

To help brick-and-mortar retailers compete with online shopping alternatives, Pathr.ai offers an AI-powered spatial intelligence platform that uses anonymous location data to observe shopper behavior and deliver actionable insights in near-real time, with full GDPR and CCPA compliance. Equipped with these insights, mall operators can optimize lease rates based on a retail store’s location value.

For its recent deployments at two large malls, Pathr.ai used models and optimizations made possible by the Intel Distribution of OpenVINO toolkit to rapidly scale its retail offering, achieving a 10x improvement in edge processing performance, as well as a 2.5x reduction in system costs and a 5.4x reduction in operating costs. The powerful, cost-efficient solution works with existing hardware and sensors and can be deployed in weeks.

Key benefits

- Track anonymized human behavior as it happens in physical spaces
- Use existing cameras and other infrastructure and sensors, reducing the need for capital investments
- Maintain privacy with GDPR and CCPA compliance
- Distinguish between customers and staff through behavioral analysis
- Visualize insights on preferred business intelligence software or custom dashboards
About Pathr.ai
Pathr.ai is the industry’s first AI-powered spatial intelligence software company that uses anonymous location data from available and existing infrastructure to observe human behavior in any physical space. Its sophisticated technology turns raw behavioral and spatial data from existing sensors into actionable and applied business learnings—allowing companies to drive the business results that matter most to their growth in near-real time. Founded in 2019, Pathr.ai is headquartered in Mountain View, California.

Learn more
For additional information about Pathr.ai solutions, email info@pathr.ai today or visit pathr.ai.

1. Tests using Intel® Xeon® Scalable processors conducted by Pathr.ai in May of 2021. Configuration was based on the Supermicro SYS-1029GQ-TRT dual socket server based on 2x Intel® Xeon® Silver 4110S, 8 cores. The server featured DDR4 ECC/2666 – 32 GB/stick (4) with 128 GB memory and 1 TB storage boot. Dual LAN with 10GBASE-T with Intel® X540 10GbE Controller, Intel® C621 PCH, and 4x NVIDIA GPU. The operating system was Ubuntu release 16.04 featuring PathrLite w/GPU support. The above configuration was compared to the Supermicro SYS-1029GQ-TRT dual socket (one socket used) server based on one Intel® Xeon® Gold 6230R, 26 cores. The server featured DDR4 ECC/2933 – 32 GB/stick (4) with 128 GB memory and 1 TB storage boot. NIC, Dual LAN with 10GBase-T with Intel® X540 10GbE Controller, Intel® C621 PCH, and no additional accelerators. The operating system was Ubuntu release 20.04 featuring Pathr Edge Application including the Intel® Distribution of OpenVINO™ toolkit.

2. The mall operator lowered system costs by USD 3,046, a 2.5x improvement, and reduced operating costs by USD 88 per month, a 5.4x improvement.

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