

YVR SMART AIRPORT

Insightful Lens

HACKATHON 2024



HACKATHON

Insightful Lens: Enhancing Infrastructure & Building Health



Friday April 5 - 12, 2024

YVR to provide hardware and industry experts
Details coming very soon!

CASH PRIZES





YVR sits on the traditional, ancestral and unceded territory of the Musqueam people.

We are privileged to be able to come together and learn together today.



Welcome to YVR

HACKATHON 2024



Welcome to YVR Airport

- YVR Airport is the second busiest airport in Canada servicing nearly 30 million passengers per year.
- After spending 10 years rated the #1 airport in North America by Skytrax, we have finished the last 2 years in the #2 spot.

We are making a comeback, though! Watch this space around you...

- Airport operations are a complex effort involving government, regulators, partners, airlines, ground handlers, contractors, travelers, the community and so many more...
 - Thank you for contributing your talents to this complex airport operations network!





Getting to YVR's East Concourse

Arriving by Car

1. From Grant McConachie Way, slightly turn right just before the Templeton St. intersection and into the lot.
2. Upon entry, drive up to the gate and collect the parking token by clicking the green button.
3. Please do not lose the token. Keep it within the vehicle to avoid losing it.
4. Upon exit, insert the token at the gate and it will prompt the user for payment.
5. Using the voucher, have it scanned on the barcode scanner to waive the fee.
6. The gate arms should open, guests can then proceed to exit.
7. To access the terminal:
8. The Canada Line provides free train access between the three Sea Island Stations.
9. Proceed to Templeton Station (north of the parking lot).
10. Get a free pass through the self-service kiosk.
11. Take the westbound train – YVR Airport. Exit on YVR Airport Station (2 stops).
12. The same process is on the way back to the Value Long-Term lot.

Arriving by SkyTrain (Canada Line)

1. Disembark and follow signs for 'US Departures.'
2. Proceed downstairs one level from the platform.
3. Cross the overhead walkway on P3 of the parkade toward the terminal
4. Proceed to your right and continue following signs for US departures, specifically toward check-in counters 268-276.
5. Proceed straight ahead down the terminal, passing US check-in and the entrance to the Fairmont Vancouver Airport Hotel. You'll find our Hackathon event location ahead.



YVR Airport Operations

Hackathon Housekeeping

HACKATHON 2024



Respect in the Terminal

Reminder: YVR is a 24/7 operating environment.

- Be respectful of travelers and staff
- Follow the instructions of all airport personnel
- Do not impede airport operations
- Please refrain from running and keep noise at a conversational level



Safety & Security

- Report all medical emergencies to 9-1-1
 - City: Richmond
 - Address: YVR Airport, then explain where in the airport (what's around you?)
- Please wear your “Hackathon” lanyard identification at all times
- Do not attempt to access the post-security area of the terminal

Report all safety or security concerns to Airport Operations 24/7 at **(604) 207-7022**

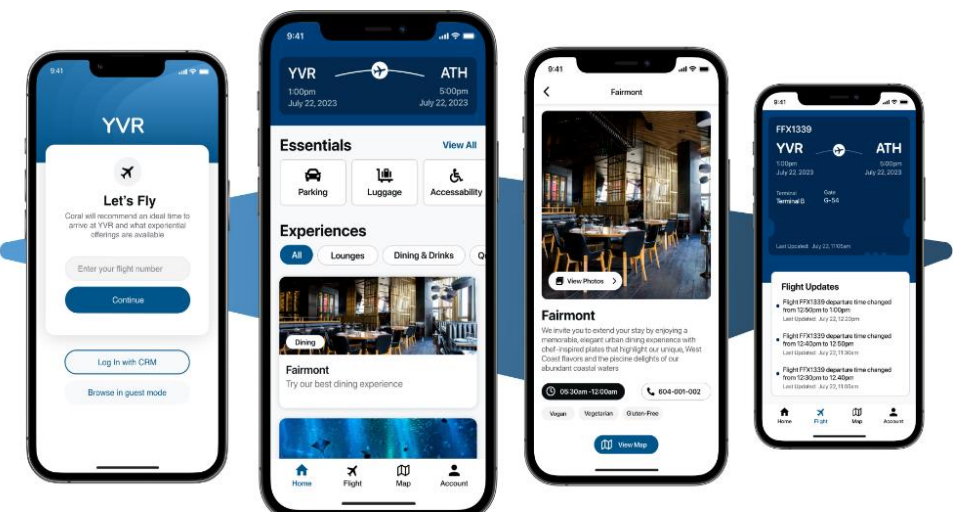


Innovation at YVR

HACKATHON 2024



YVR's Innovation Hub



YVR SMART AIRPORT

Additional Information

HACKATHON 2024



Focused on image analytics.

How can you leverage camera imaging to extract meaningful insights or perform specific tasks?

Or can you dive into the realm of thermal imaging and uncover innovative solutions utilizing this unique technology?

Participation

Limited to 125 participants, with teams not greater than 8 max per team.

Each team will choose one or more challenge(s) questions to tackle during the event.

Prizes will be awarded for the top 4 teams based on scores from a panel of judges looking for the teams demonstrating exceptional performance and innovation

Technical Resources

Each team will receive a video scenario to analyze, tailored to their chosen challenge(s).

For non-thermal challenges, teams will be provided with Bosch or similar type cameras to develop their solutions.

Company sponsors and partners will be available to aid during designated time slots throughout the event.

Event Details

Location: YVR East Concourse

Event Duration: April 5 - April 12

Final Judging: April 12th

Site access: 9am to 3pm daily

Prizes will be distributed as follows:

1st: \$5000

2nd: \$3000

3rd: \$1000

4th: \$1000



Milestones

April 05

Electronic Package Release 0900

YVR will release via email a package containing the 3 challenge questions, rules and details of the designated test area.

Question Period 1200

A non-mandatory Teams call will be held to review the event package and answer any questions.

Hardware pickup

Hardware will be available at YVR between 0930am and 1500, each day of the event.



April 5-11 0930 to 1500

Site Access – throughout

Access to the test location is available daily between 0930 and 1500 with limited chairs and tables.

Airport Security Requirements

While working on-site, all participants must always wear Hackathon lanyard identification.

Industry Experts

Industry experts will be available onsite during the afternoons throughout the event

Submit questions at any time to Hackathon@yvr.ca

April 12 – Hackathon!

Pens Down @ 9:00

Final submissions will consist of:

- Presentation describing goals and solution proposal
- Application testing

All submissions and hardware must be delivered by 9:15

Submit final presentations in PDF format to Hackathon@yvr.ca

All code must be able to be run and submitted on the provided Raspberry Pi 5.

Judging is based on a 10-minute, demonstration of the team's solution with an additional 5 minutes for questions from the judging panel.



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KICK OFF

HACKATHON 2024



Event Rules

1. Respect all other participants and report inappropriate behavior to the organizers.
2. Show appreciation for sponsors, organizers, and judges by engaging with them.
3. Network with industry professionals and potential future employers at the event.



Who Are WE

YVR is the largest building in British Columbia, covering an impressive 378,255 square meters. With over 70 gates, 56 airlines, and 124 destinations, YVR is a hub for international travel.

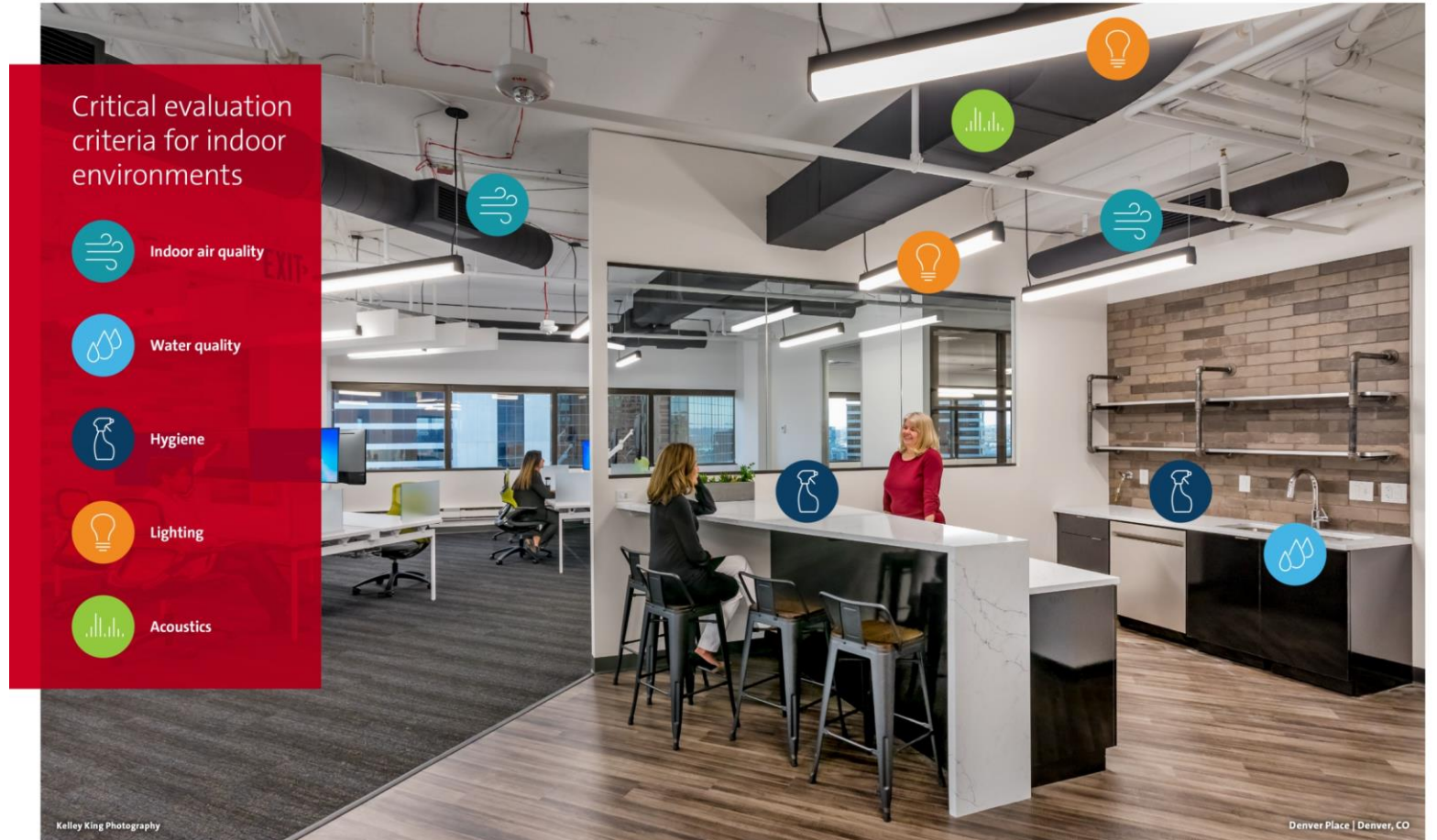
Our facility maintenance team is composed of 80 highly skilled professionals, working alongside contracted services to ensure the airport operates safely and at a high standard. At any given moment, over 50 individuals could be on site, performing different aspects of facility upkeep.

We use software platforms to monitor and receive alerts from our installed assets. This allows us to stay ahead of potential issues and address them quickly. In addition, we rely on our business partners and stakeholders to help identify and report any problems with non-interface hardware such as tiles or windows.

At YVR, we are committed to providing a world-class travel experience, and our maintenance and upkeep teams play a critical role in making that possible.



UL Healthy building



<https://www.ul.com/services/verified-healthy-buildings>



Energy Waste



Lack of integrated automation exists throughout the terminal.



Wayfinding signage outages



Multiple outages, typically due to LED driver failure



Repaired signage, bright and clear



Lighting Issues



Low light area or lights out.



Multiple lights out



Flooring Condition

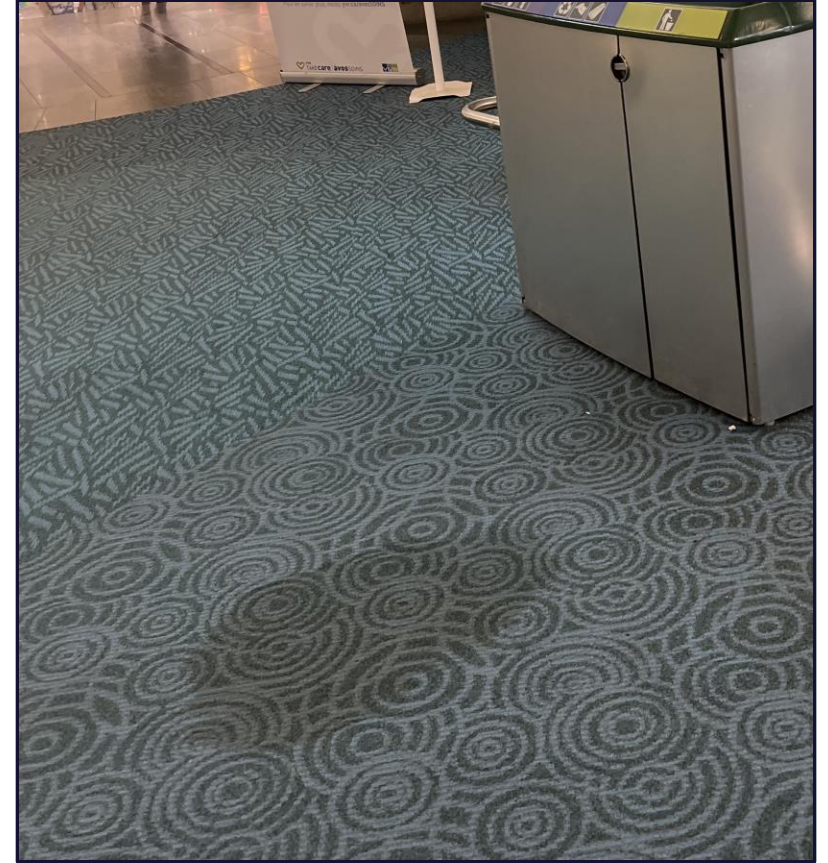
Broke tile with poor repairs



Broke tile and fine cracks



Stained carpet



Points to note

Marks and stains can lead and alert to bigger problems. In this case a failed baseboard



Hardware standards across the airport vary depending upon the building age and the function.



Submission Guidelines

Each team will have 10 minutes to present and demonstrate their solution for their problem with 5 minutes for judging and audience questions

One or more team members can contribute to the demonstration. Use slides and props to demonstrate the solutions/ ideas. Practical examples (analytics or demonstrations) will score strongly.

Each group also has access to the Drop Box containing information for their question of choice: [Drop Box](#)

Criteria for Pitch Assessment

Business Value: Does the solution have potential for commercial success?

Impact: Will the solution make a significant difference in the targeted area?

Feasibility: Is the solution feasible and realistic to implement?

Innovation: Has the team demonstrated creative thinking and innovation in their solution?



Challenge 1: Crow's Nest, Facility Standards Detection

Building upon last year's Crow's Nest idea, YVR aims to further enhance cleanliness and operational efficiency by leveraging cameras strategically placed throughout the terminal. Your task is to develop a solution that builds off the Crow's Nest concept, utilizing cutting-edge technologies such as intelligent sensors, computer vision, and machine learning to monitor, detect, and report real-time insights into the condition of public spaces.

- Identify areas requiring attention from cleaning staff due to high traffic volume or observed waste and clutter.
- Detect unattended baggage, left belongings such as chargers, clothing, and anything else that may come to mind. Some poor facility standard example images included in this presentation.

Bonus points will be awarded for solutions that can log passenger volume over time with separate classifications for types of use.



Challenge 1: Expectations

- Design and implement an evolved version of the Crows Nest solution that integrates intelligent sensors, computer vision, and machine learning.
- Enhance the capabilities of the Crows Nest system to accurately monitor and detect cleanliness issues, waste, and clutter in public spaces.
- Develop advanced algorithms to classify and prioritize detected issues based on severity and urgency.
- Automate the reporting process to operations center staff, ensuring quick and easy interpretation of reported issues.
- Maintain the core principles of Crows Nest, such as real-time monitoring and optimization of cleaning processes, while introducing new features and improvements.



Challenge 1: Judging

- Camera locations will be set with 1 on the roof, and 2 on orthogonal walls facing towards the testing area in the optimal orientation for testing. The 3 cameras have different focal lengths with a variety of capture distances and lens view angles including 131° and 56°.
- Requests for additional hardware (subject to delivery times) can be made to Hackathon@yvr.ca from April 8th through April 10th. The request must be within reason of cost (<\$1000) and delivery times. Request may not be fulfilled.
- There will be cameras mounted in 3 locations over the testing space which consists of a mockup of a holding room to simulate passengers waiting at a gate with seating arranged as you would find in our terminal. Teams can request access to use anywhere from 1-3 cameras on day of judging and extra points will be given to those who can utilize more than one in their solution.

Submissions:

- Code: Must be submitted via raspberry pi provided by the deadline on April 12th at 9:15 am and be able to access the network cameras provided
- Presentation: Must be submitted to Hackathon@yvr.ca by the deadline on April 12th at 9:15 am



Challenge 2: Automate and Roaming, Facility Standards Detection

YVR (Vancouver International Airport) aims to enhance its maintenance processes by automating the detection and cataloging of wear-and-tear and deviations from facility standards within the terminal. How can mobile equipment, integrated with technology be leveraged to achieve this goal?

Develop a retrofittable solution capable of seamlessly integrating with existing mobile equipment to automate the detection and cataloging of facility defects. Focus on utilizing intelligent sensors, computer vision, and machine learning to identify areas requiring maintenance or repair due to wear-and-tear or failure to meet established facility standards.

- Detect low light, garbage, property damage, and anything that is out of the ordinary as your system roams around the terminal. Some examples images for concerns included in past slides.

Bonus points

- Solutions that can report issues to maintenance staff in real-time, allowing them to quickly address any problems and minimize downtime.



Challenge 2: Expectations

- Design and implement a solution that can be retrofitted onto existing mobile equipment to detect and log issues related to wear-and-tear or deviations from facility standards.
- Utilize intelligent sensors to collect relevant data such as vibrations, temperature, and visual information from the terminal environment.
- Employ computer vision algorithms to analyze visual data and identify signs of wear-and-tear, damage, or deviations from facility standards in real-time.
- Develop machine learning models to classify and prioritize detected issues, allowing for efficient allocation of maintenance resources.
- Focus on automating the reporting process to maintenance staff, enabling real-time notifications of identified issues and facilitating prompt resolution to minimize downtime.



Challenge 2: Judging

- The camera locations will be set with 1 on either side on a moving baggage cart capturing the walls, ceiling, and floor in the optimal orientation for testing.
- Solutions can request access to additional cameras and equipment on day of judging. Requests must be submitted by 1030, April 11th to Hackathon@yvr.ca. Requests for additional hardware (subject to delivery times) can be made to Hackathon@yvr.ca from April 8th through April 10th. The request must be within reason of cost (<\$1000) and delivery times. Request may not be fulfilled
- The cameras will be moved through the testing areas that consist of poor facility standards, damaged property, and areas that are currently below facility standards.

Submissions:

- Code: Must be submitted via raspberry pi provided by the deadline on April 12th at 9:15 am and be able to access the network cameras provided
- Presentation: Must be submitted to Hackathon@yvr.ca by the deadline on April 12th at 9:15 am



Challenge 3: Efficient and Healthy Building

Every evening, the airport building management system adjusts temperature set points to conserve energy. However, the rate of temperature change varies across different areas, and the airport seeks to understand the underlying mechanisms causing these variations.

Develop a solution, either static or non-static, to determine the factors influencing temperature changes in different spaces within the airport building. Leverage cutting-edge technologies such as intelligent sensors, computer vision, and machine learning to identify why temperature is lost or gained.

Bonus points

- Innovative use of additional technologies beyond those suggested
- Provide sustainable and cost-effective mitigation solutions with minimal environmental impact
- Solution should be scalable and applicable to similar buildings or environments beyond airports.



Challenge 3: Expectations

- Utilize intelligent sensors and data collection techniques to gather temperature data from various spaces and features within the airport building.
- Apply computer vision algorithms to analyze thermal images or video feeds to detect heat sources, insulation issues, or other factors influencing temperature changes.
- Employ machine learning models to identify patterns and correlations between temperature fluctuations and potential causal factors, such as occupancy levels, sunlight exposure, HVAC performance, or structural properties.
- Quantify the observed temperature variations and provide insights into the magnitude of the issue across different areas of the airport building.
- Offer mitigation solutions that do not compromise the aesthetics of the building, such as optimizing HVAC scheduling, improving insulation, implementing smart zoning strategies, or enhancing energy-efficient architectural designs.
- Link to the all the provided practicing data and sensor locations are in a Drop Box linked here: [Hackathon Data](#)



Challenge 3: Judging

- Either a new thermal timelapse or sequence of thermal photos will be tested on, your decision. Your goal is to show defects, and temperature flow through the terminal in various places; highlighting points of poor temperature control and where heat may be escaping the building, effecting the internal temperature of the building.
- For Bonus marks, your presentation should incorporate the data from both the camera feed and the sensor data captured within the video camera angle and beyond from the sensors in the area.
- Request your testing preference, either timelapse or photos, along with real time temperature data, by emailing Hackathon@yvr.ca by the submission deadline on April 12th and 9:15am. If you choose timelapse to demonstrate your code, please provide requested FPS rate of the video. Ensure that, upon submission, a video or photo folder is easily added to your code for testing.

Submissions:

- Code: Must be submitted via raspberry pi provided by the deadline on April 12th at 9:15 am and be able to access the network cameras provided
- Presentation: Must be submitted to Hackathon@yvr.ca by the deadline on April 12th at 9:15 am



Networking Opportunities

- During the Hackathon, you will have the opportunity to meet and network with industry professionals from our sponsors and other local businesses in the sector.
 - A pop-up table will be set up near your workspace on the East Concourse, so keep an eye out if you see folks set up! We encourage you to chat and begin building your portfolio of industry contacts.



Hackathon Event Day

What to expect on April 12:

- 9:30 – Pens down and take your seats
 - All work must be finalized, presentations submitted, and programmed Raspberry Pi's turned in.
- 9:30-10:00 – Welcome to the 2024 Hackathon!
- 10:00-3:00 – Student team presentations (with break for lunch provided)
- 3:00-4:00 – Awards



Questions?





“The only energy you can save, is the energy you waste”

Energy Matters



Energy Matters