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# **X SESSION** **UN-GGIM:** **AMERICAS**

October 18, 19 and 20 - 2023

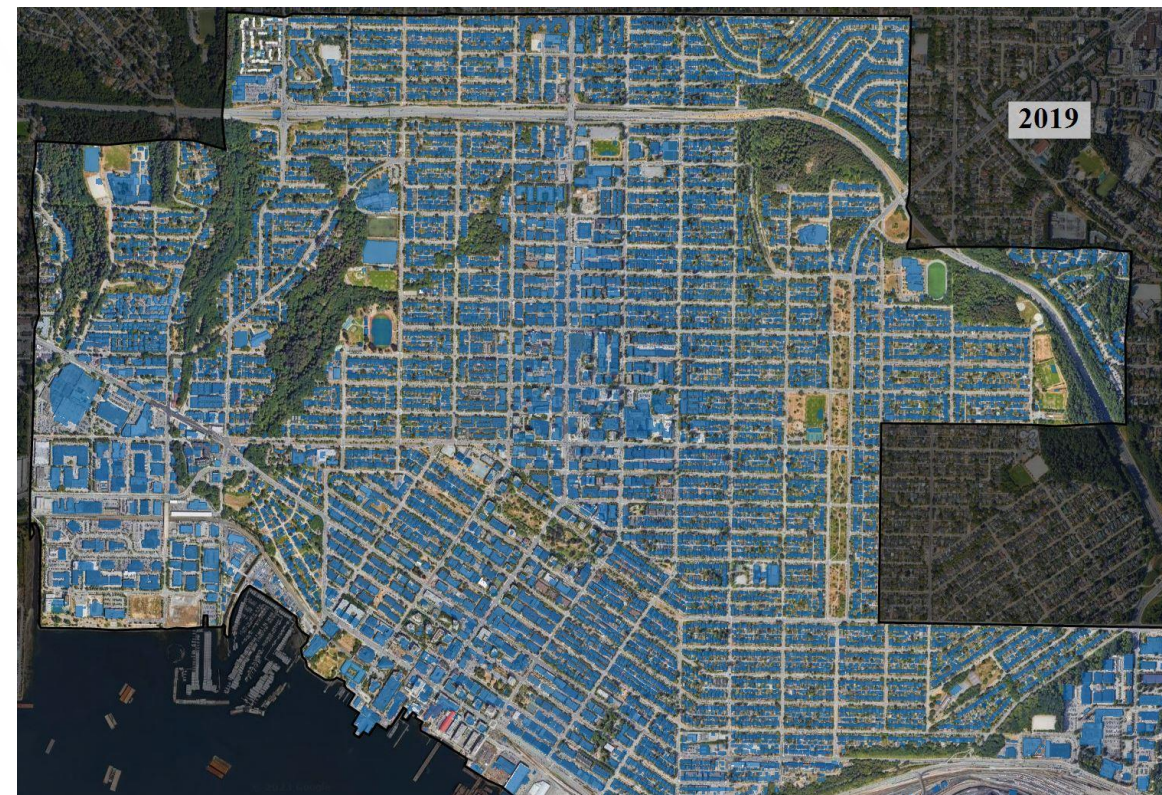
**Santiago de Chile, ECLAC**

## **AI-Based On-Demand Mapping: A Future for Collaboration**

Éric Loubier, Director General, Canada Centre for Mapping and Earth Observation, Natural Resources Canada

# Geospatial Artificial Intelligence: Unlocking Value in Existing Cartographic Data

- Geospatial Artificial Intelligence (“GeoAI”) is the use of software to automatically identify and extract data from aerial and satellite imagery.
- Technology is mature, fast and scalable.
- Governments are uniquely positioned to leverage GeoAI as existing imagery and ground truth data are prerequisite inputs needed to train AI.



GeoAI example: Buildings extracted from images of 1967 and 2019, North Vancouver, BC



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# Use Case: GeoAI for Disasters

- GeoAI offers immense potential for supporting disaster response
- Up to date insight into state of environments prior to a disaster
- Monitoring progression of the event
- Understanding changes from the disaster as they occur and post event
- Highlighted wildfire and flooding applications in Canada



Fort McMurray, Alberta in 2014, and in 2016 after wildfires. Green outlines show buildings extracted by GeoAI before and after wildfires occurred



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# Use Case: GeoAI for Foundational Data

- Canada is leveraging GeoAI for creating foundational geospatial data
- **Past:** 90+ classes of information extracted. **4 - 8 months** to complete
- **Today:** 4 core classes (roads, waterbodies, building and forested areas) at higher resolution. **4 - 5 hours** to complete once images acquired.
- **95% accuracy relative to manual approaches.**



Sherbrooke, Quebec 2022-09-30

Image © 2022 Maxar Technologies



Automatic extraction of roads, waterbodies, buildings, and forested areas using GeoAI



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# Demystifying GeoAI: Steps for Deployment

## 1. Install software

- Scalability: Can operate on variety of systems according to need.
  - A powerful personal computer could be used to process smaller areas of imagery.
  - Canada uses High Performance Computing due to large volume of imagery stemming from size of country.
  - Our open-source software is freely available: [GitHub repo](#) & [documentation](#)



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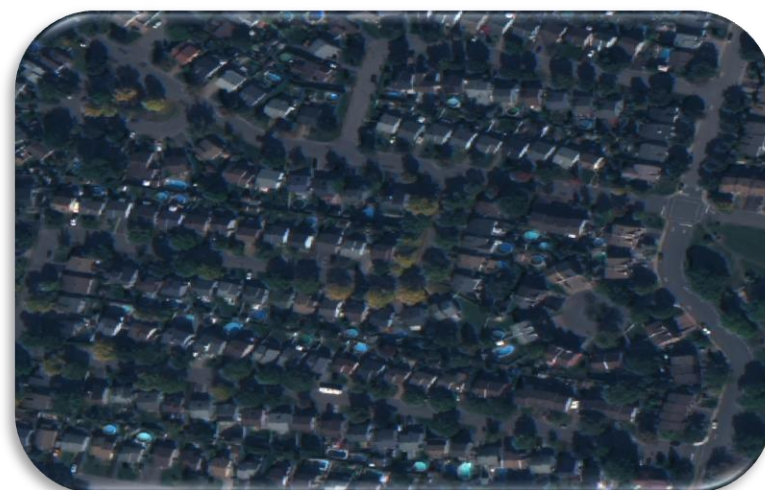
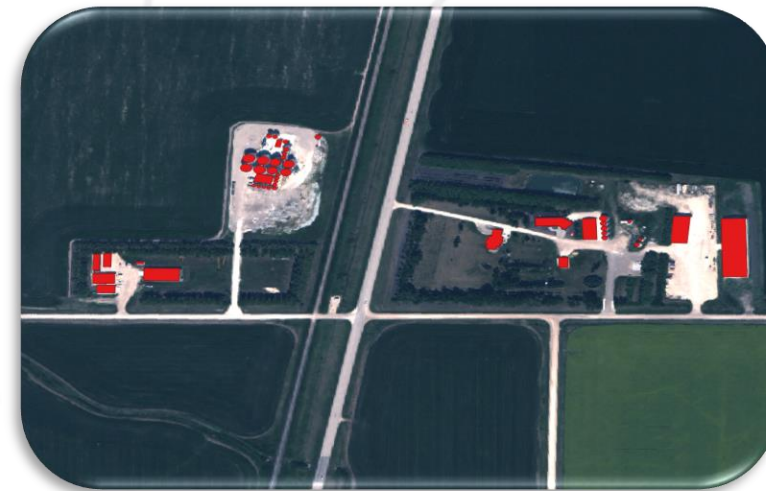
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# Demystifying GeoAI: Steps for Deployment

Imagery Acquired



Buildings Identified  
(shape and position)



Varied  
Context

## 2. Teach software what to identify and extract from imagery

- Existing & archival imagery used to train AI on local environments & context.
- More variety and differing contexts requires more training imagery and data.
- AI can be taught to extract many geospatial features; not limited to roads, buildings, waterbodies and forested areas
- The following describes the process for buildings.
  - a. Imagery with variety of buildings and contexts acquired.
  - b. Buildings in the image are identified, for example, manually or by overlaying existing maps. All other parts of the image are removed.
  - c. Images and position of the buildings are inputted to software so that it learns to recognize different types buildings in different contexts (e.g. rural, industrial, urban).



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# Demystifying GeoAI: Steps for Deployment

## 3. Validate AI Models

- The trained AI is tested on a smaller subset of images for which we also have ground truth data.
- AI outputs are compared with ground truth data.
  - Areas for improvement are identified. Additional imagery of those buildings and context are inputted back into the AI model.

## 4. Deployment & Inspection

- When AI performs at desired level of accuracy new imagery can be processed (and validated/corrected). Validation information can be used to continuously improve AI.



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# Thank You!

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