



Mitigating Risk

Analytics, Artificial Intelligence and Technology

Canada Border Services Agency
World Customs Organization

June 2021

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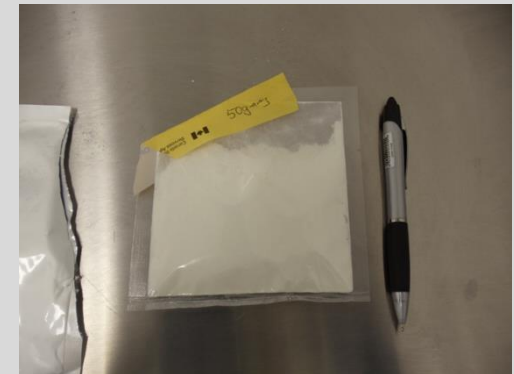
Purpose

- To provide an overview of Canada Border Services Agency's approach to risk mitigation by leveraging artificial intelligence (AI), machine learning (ML) and data and image analytics.

Background

- With the continued increase in volumes at the border due to E-Commerce, and an evolving threat landscape, our frontline is facing new challenges, with less and less time available to make informed decisions.
- E-Commerce presents us unprecedented pressures in our efforts to:
 - identify and interdict high-risks goods, such as opioids and guns;
 - ensure all duty and taxes owed to the Government of Canada and provincial and territorial governments are properly assessed and collected.
- The Agency is supporting innovation by making space for and encouraging experimentation with AI, technology and data analytics to digitize, automate, and enhance our risk targeting capability and streamline processes at the border.

Needles in the Haystack



50g of fentanyl = 25 000 fatal overdoses



Receiver (gun part)



E-Commerce Customs Strategy Four Pillars

 <h3>Legal/Regulatory</h3> <p>Strengthen legal and regulatory frameworks to enhance safety and security, and facilitation of physical goods in the cross-border E-Commerce environment</p>	 <h3>Enabled Operations</h3> <p>Enable and transform all affected CBSA operations to better respond to the growing volumes of cross-border E-Commerce shipments</p>	 <h3>Partnerships/Collaborations</h3> <p>Strengthen existing collaborations and partnerships and forge new ones with various internal and external stakeholders</p>	 <h3>Capacity Building</h3> <p>Build capacity for a proactive and forward-thinking border agency which continues to explore technological developments and innovation and proffer solutions to emerging E-Commerce challenges</p>
<p>Robust and adaptive legal and regulatory frameworks that meet the new and emerging requirements while balancing the diverse interests of stakeholders involved in cross border E-Commerce</p>	<p>Agile, efficient CBSA operations equipped with automated systems and tools, managed by empowered workforce that uses data and analytics</p>	<p>Enhanced partnerships and collaboration with international partners and other government agencies for identifying illicit goods;</p> <p>Strategic partnerships with the E-Commerce stakeholders to optimize compliance and facilitation</p>	<p>Build capacity for proactive, forward-thinking border agency that continues to leverage technological developments, innovative solutions to emerging E-Commerce challenges</p>

Enablers



Investments in Systems and Tools



Cross-Sectional Policy and Technology Working Groups



Agile & Data Fluent Workforce



Image Analytics and Machine Learning – Guns and Gun Parts

- Manual inspection of x-ray images during live scanning leaves room for human error in interpretation and involves at least one officer to verify and read each image.
- In response, the Agency is training computers to detect handguns and gun parts in x-ray images, yielding a preliminary 95% accuracy rate in a testing environment.
- Benefits include:
 - Increased capacity to interdict guns and gun parts;
 - Future applicability to detect other restricted and prohibited goods;
 - Reduces the “fatigue” factor by giving officers an indicator of risk.
- Further work is necessary before this model can be deployed in an operational environment.
 - Larger data set, increased accuracy and speed.



Data Analytics, Cloud, Machine Learning and AI Algorithms Contraband in Courier Stream

- CBSA has developed a **cloud-based mobile and desktop app**, using **AI** to enhance risk assessment through third party information.
- It **focuses on contraband** in the courier low value stream.
- It is a **demonstration of what could be possible** across the commercial continuum, and include revenue risk.
- Once this prototype application has sufficient features, we will test it in the field, refining and enhancing over the next year.



Importance of Quality and Enhanced Data

- With increased volumes, frontline officers have less time to interdict contraband.
- Better tools supported by quality data will help focus our efforts on high risk goods.
- Any machine learning, data analytics or algorithms are only as effective as the data it is based on.

Analytics & Algorithm

Addressing the data needs and developing the algorithm solution

- Data needs to be cleaned, consistent and interoperable.
- Enriched with other data sources to make it more reflective of the reality on the ground.
- Consolidated into a single environment for analytics.
- Contraband risk prediction algorithms designed using ML and AI, in preparation for field testing on CBSA cloud platform.

Analytics Platform

Building the infrastructure and operationalizing the algorithm solution

- Capacity on cloud computing bringing software development and IT operations together (DevOps).
- Modern ML algorithm deployment strategies, and developed solutions to implement interoperation between algorithms and application systems.
- Data migration business processes.



Mitigating Unknown Risk

Enriching Data and Improving Data Quality

Improving data quality: Formatting data in consistent ways is critical to being able to effectively move it from where it is first captured, to where it is stored, and then retrieved to be used by various tools.

- Significant efforts were focused on ensuring mailing addresses are consistent.

Enriching data: Interoperable data allows it to be linked with other valuable sources of data.

- The enriched data brought in attributes to packages and address where risks are higher.

AI algorithms were used in three stages of the process:

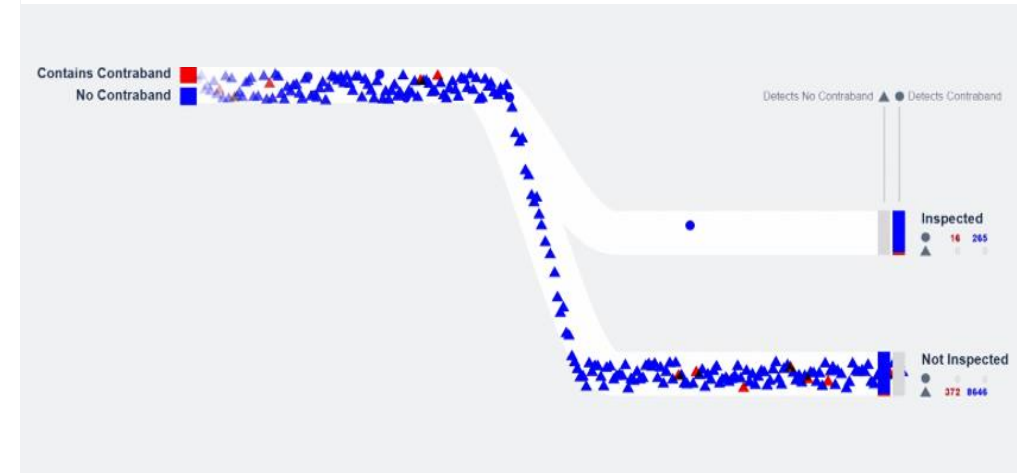
- Improving data quality;
- Enriching through data linkages; and,
- Contraband risk prediction model.

Low Technical Debt in analytics, pipeline and data quality process can be reused in the future with adjustments made with low effort.

Predictive Algorithms

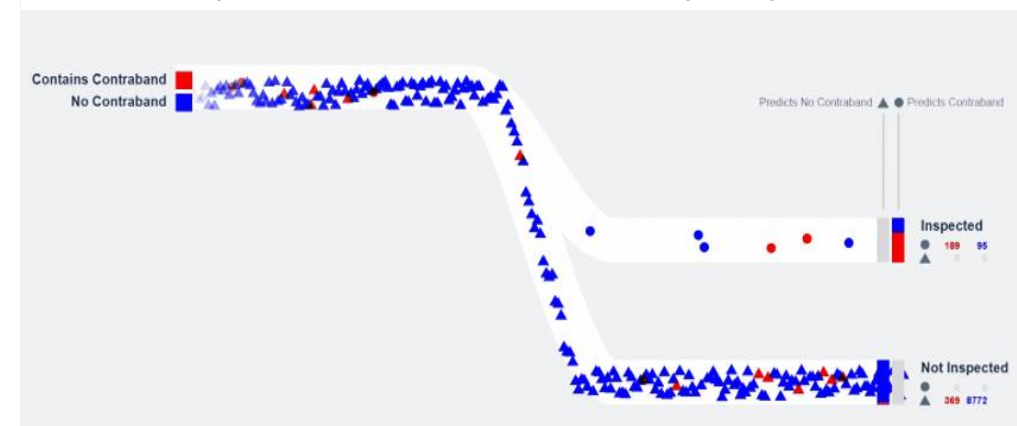
- We developed algorithms to estimate the probability of a package containing opioids/firearms. We built a data pipeline to feed the algorithms, and to retrain them.
- Pilot testing of the algorithms is planned for later this year to validate their efficacy. If pilot data is comparable to simulation results, we could expect an improvement in targeting in ***several orders of magnitude***.

Simulation of Existing Process



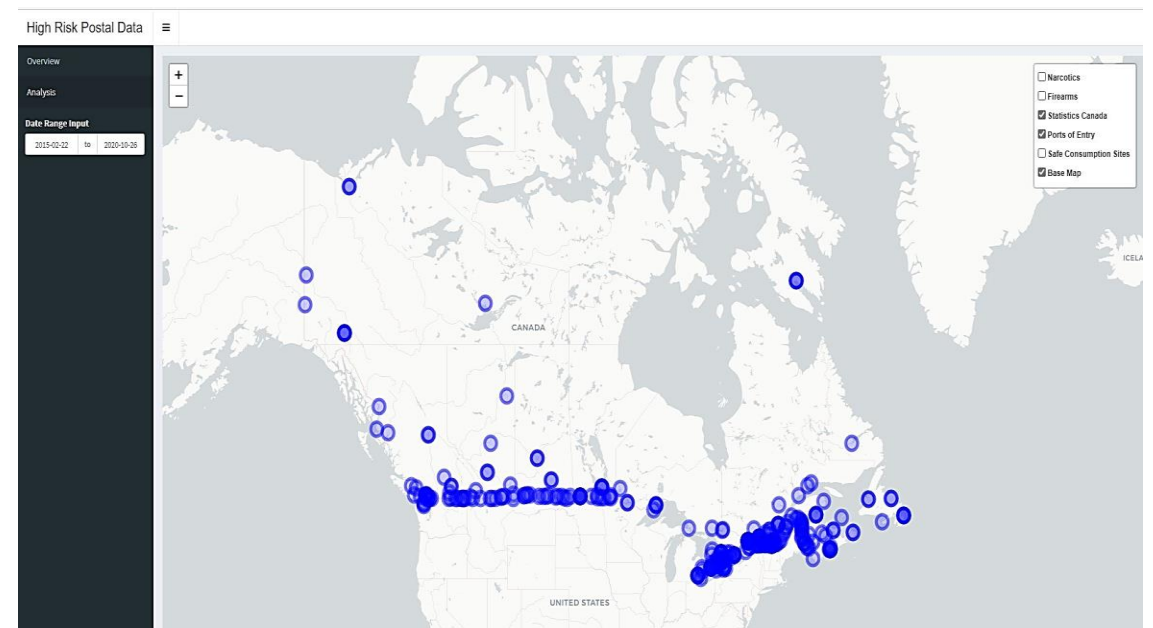
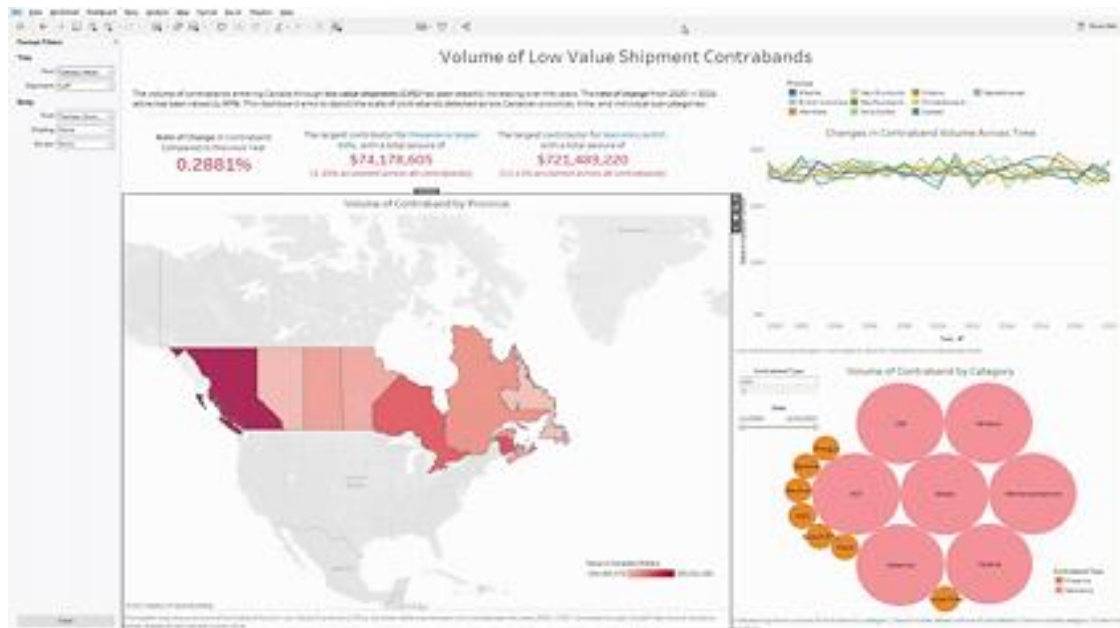
Simulation of New Process

Higher inspection rate of contraband-containing packages (red)



Visualization for Reporting and Analysis

- We are building visualizations of contraband import to inform the program. Geospatial analysis can highlight contraband destinations, to inform enforcement and other activities.
- These capabilities will be provided as self-service analytics to CTB.





Questions?

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