

Team Copy Waste

Project Vlog 5
Feb. 1, 2022 - Mar. 8, 2022

Mitacs



THE TEAM



Nolan Flegel

Machine Learning



Rishabh Prasad

Front-End Services



William Peers

Back-End Services

PROJECT VISION

REDUCE RISK FOR
WASTE MANAGEMENT
WORKERS & COST FOR
MUNICIPALITIES



PROJECT MISSION

TO AUTOMATE THE
DETECTION OF
SEVERE & RARE
CONTAMINANTS IN
RECYCLING



Business Needs

- Reduce Risk of Fires and Associated Health Concerns
- Reduce Cost
- Address Careless Recycling & Hazardous Contamination

Business Needs



Saskatchewan

Firefighters knock down recycle depot fire in Regina's west end



<https://www.cbc.ca/news/canada/saskatchewan/crews-fighting-fire-at-crown-shred-and-recycling-1.5980051>

<https://www.cbc.ca/news/canada/saskatchewan/emterra-recycle-depot-fire-1.6202918>

**STATUS
GREEN**

Project Issues / Changes

- Mitacs Project Approved
- IP contracts signed with Industry Partner
- Bin Detector completed and handed off to Industry Partner



Team Contributions

- Audit 90,000 images
- Pair Programming and Code Reviews
- Meetings with our Industry Partner

Individual Contributions



- Process for converting Annotation Polygon formats
- Detecting and adjusting overlapped annotation masks
- Implemented flags for edge cases
- Generated additional metrics for the bin tip detector
- Transition management of bin detector to partner
- Created GIS review of our project dashboard
- Experiment with data augmentation pipeline parameters
- Create function to handle environment variables
- Export data directly to S3 Buckets

Individual Contributions



- Multi-object placement w/ unique transforms
- Layering existing and artificial objects
- Re-trigger transformations based on edge case flags
- Exporting augmented annotations in COCO format
- Conducting User Testing on the dashboard
- Auditing yard waste images
- Begin logging performance metrics

Individual Contributions



- Auditing grocery bag annotations
- Exporting Annotations in Coco Format
- Layering original and artificial objects
- Refactoring
 - Changing variable/function names
 - Extracting logic for more reusable code
- Auditing and annotating yard waste images
- Change exporting format to match that of incoming data

Product Demonstration

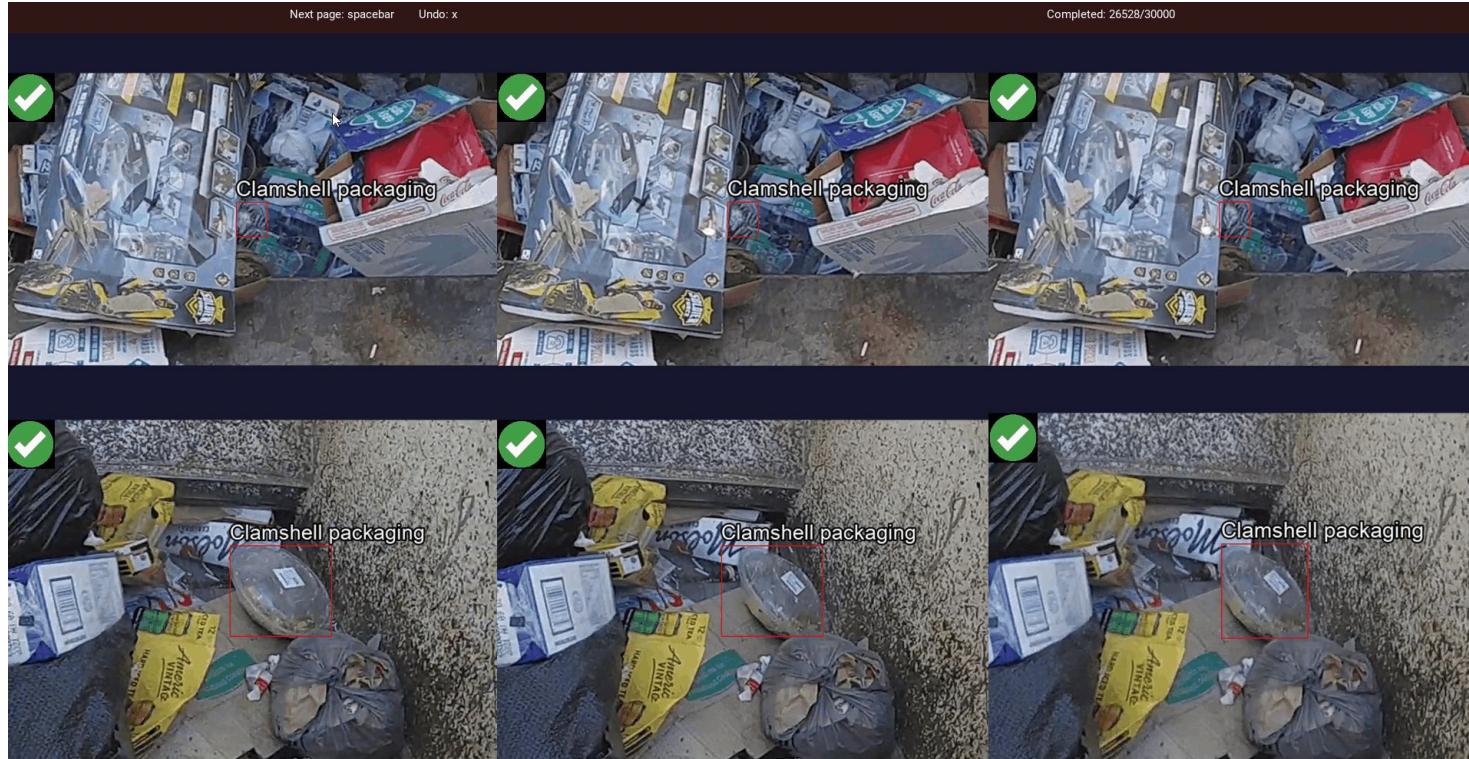


Bin Tip Overview

- Bin Detector Real-World Performance Evaluated
- Transferred Management to Industry Partner



Simple Copy-Paste



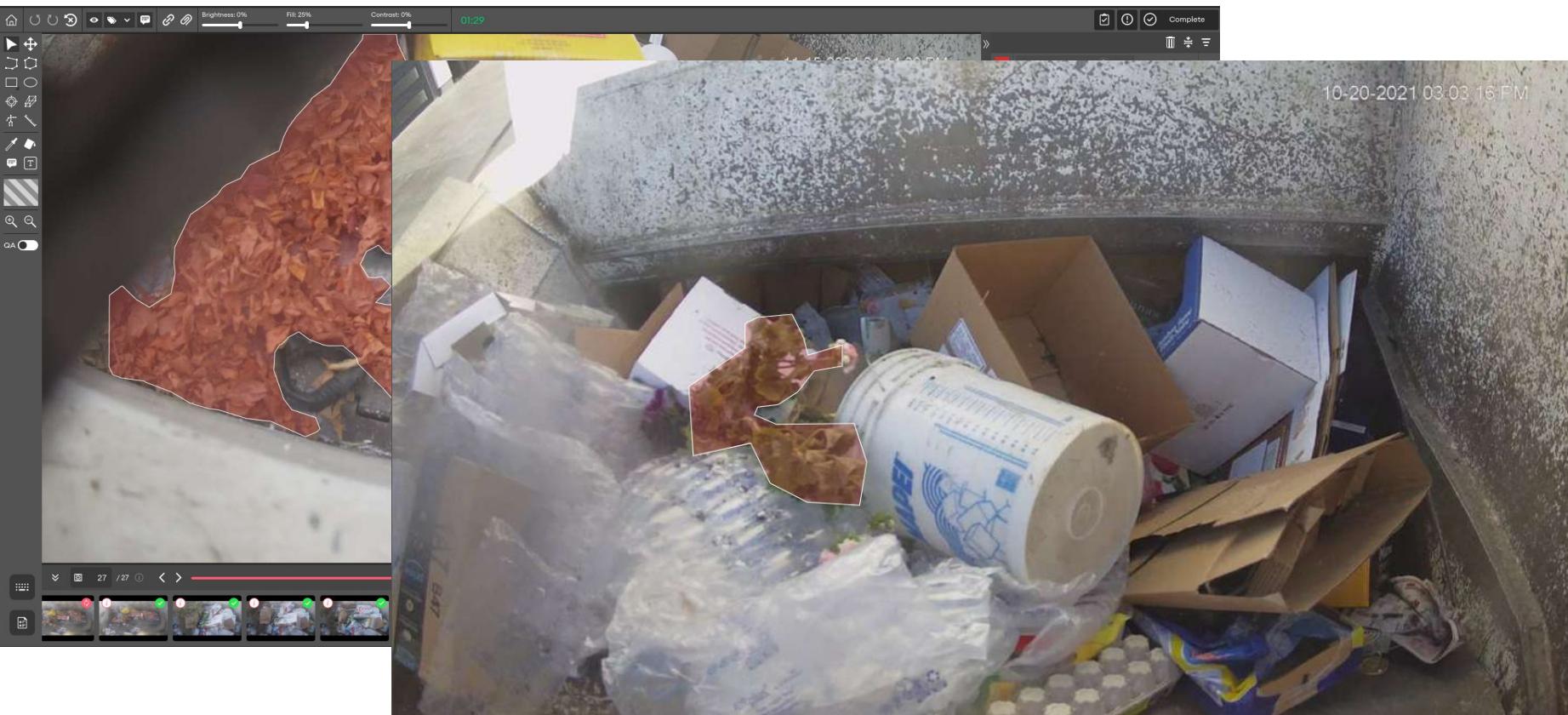
Simple Copy-Paste



Simple Copy-Paste



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Simple Copy-Paste

> Augmented_Images ▾ 🔍 Search Augmented_Images



AUGMENTED_20220307_0



AUGMENTED_20220307_1



AUGMENTED_20220307_2

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{
  "images": [
    {
      "id": 0,
      "width": 1080,
      "height": 607,
      "file_name": "20220307/Augmented_Images/AUGMENTED_20220307_0.png"
    },
    {
      "id": 1,
      "width": 1080,
      "height": 607,
      "file_name": "20220307/Augmented_Images/AUGMENTED_20220307_1.png"
    },
    {
      "id": 2,
      "width": 1080,
      "height": 607,
      "file_name": "20220307/Augmented_Images/AUGMENTED_20220307_2.png"
    }
  ],
  "annotations": [
    {
      "id": 0,
      "image_id": 0,
      "category_id": 5,
      "segmentation": [
        [...]
      ],
      "area": 9049,
      "bbox": [
        0,
        75,
        142,
        128
      ],
      "iscrowd": 0
    },
    {
      "id": 1,
      "image_id": 0,
      "category_id": 7,
      "segmentation": [...],
      "area": 47068,
      "bbox": [
        ...
      ]
    }
  ]
}
```

Dashboard User Testing

Users:

- Our Industry Partner

Goal:

- evaluating the utility,
usability, and desirability
of the dashboard from
the user's perspective

Strategy:

- Provide Background
- Complete a list of
tasks
- Freedom to Explore

Dashboard User Testing

Key Findings:

- Explicitly stating why information is coloured with green, yellow, and red
- Adding Legends to the Map displayed on the collection day pages
- Display Contamination Rates across neighbourhoods with different intensities of colour

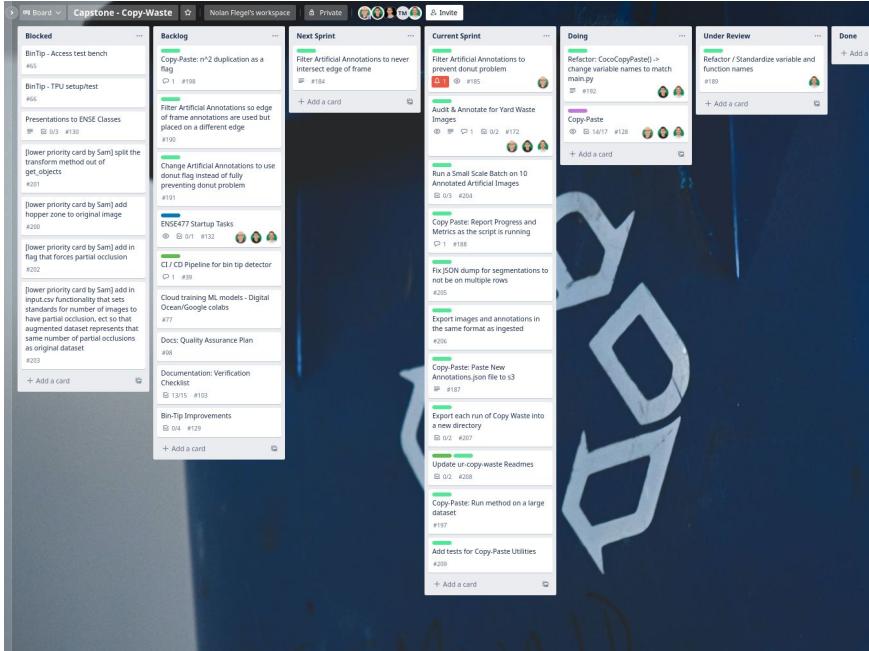
Dashboard User Testing

✓ Utility

✓ Usability

✓ Desirability

Knowledge Management Overview



Team Meeting

Feb 28, 2021 / 4:00 PM / Zoom

Attendees

Nolan Flegel, Rishabh Prasad, William Peers, Sam Dietrich

Agenda

- Setup Code Review
- Test Pipeline
- Bazaar #2

Notes

- Pull Requests for pipeline modules happening this week
- Testing complete pipeline and looking to produce dataset by end of week
- Start with 10 original images and 10 artificial images, produce 1 to 1 dataset
- Focus on producing a basic dataset before adding any additional features
- In person Bazaar this week, setting up demos of dashboard, bin tip and sample augmented images
- Setup logging for rejected images
- Tested: Polygon conversion, Polygon clipping, Image export, Annotation Export
- Refactoring completed, waiting on other Pull Requests to be merged
- Audit Yard Waste: Categorize -> Branches, Soil, Leaves, Grass or combined.

Action Items

1. Audit Yard Waste
2. Finish Testing Pipeline and Produce first Dataset
3. Code Refactor + Code Review

Next Meeting Agenda (Mar 7, 4:00 pm)

1. Scale up dataset / Training
2. Next features / flags
3. Connecting to S3

Next Up

- Refactoring and Code Reviews
- Large scale data ingestion from Industry Partner's dataset
- Finalize project documentations, poster, and commercial



Reflection

- Does the team feel "on track"?
 - We believe we are still on track
- What progress does the team particularly feel good (great) about?
 - Universal Bin Detector
 - Progress on Copy Paste Implementation

Reflection

- What barriers (if any) does the team feel are a current impediment to success?
Potential for unexpected problems with model training.
- What help (if any) does the team require to move positively forward?
Guidance and resources from our Industry Partner regarding model training.

Reflection

- What questions or concerns does the team have (if any)?
Potential risks related to experimental / cutting edge software development.

Thanks for Watching!