

# Pixel.js: Web-based Pixel Classification Correction Platform for Ground Truth Creation

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# Context: The SIMSSA Project

SIMSSA | Single Interface for Music  
| Score Searching and Analysis



Social Sciences and  
Humanities Research  
Council of Canada

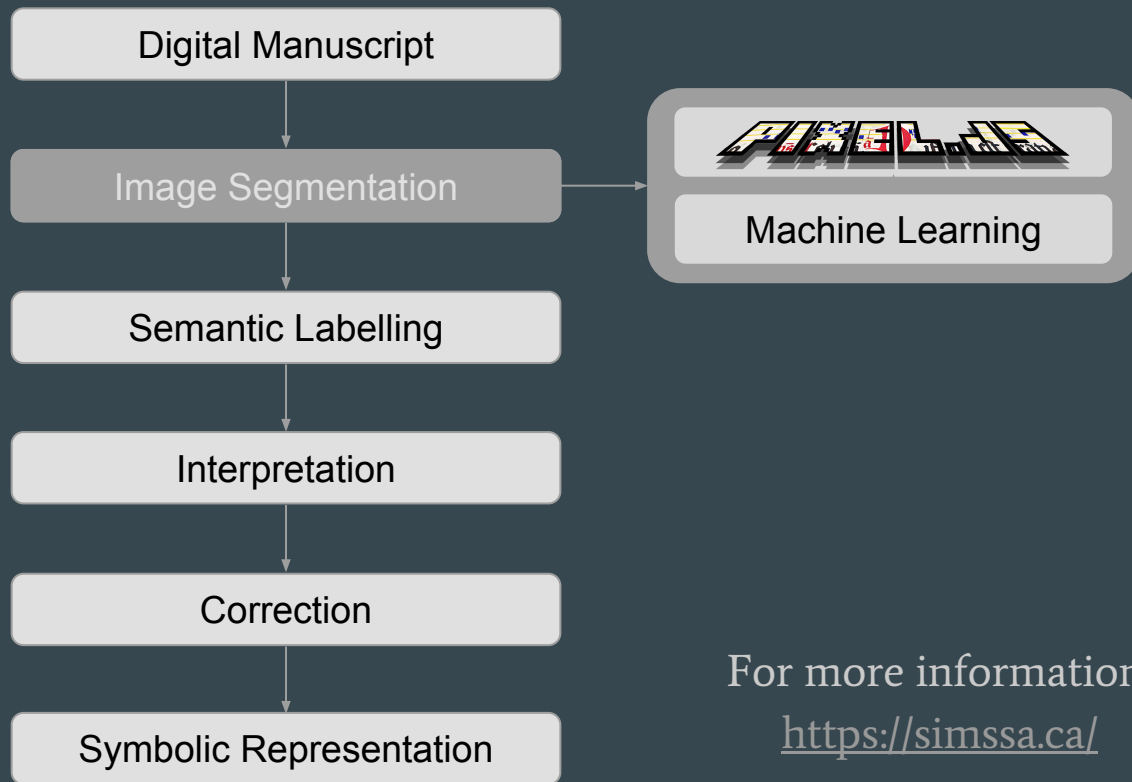
Conseil de recherches  
en sciences humaines  
du Canada

Canada

Teach computers to recognize the musical symbols in digital images of musical scores



# Context: The SIMSSA Project

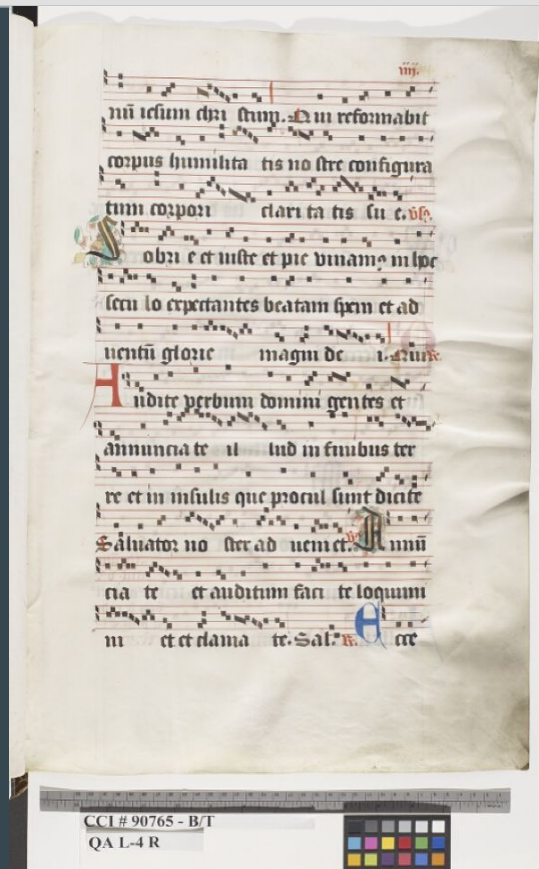


For more information:  
<https://simssa.ca/>



# Motivation

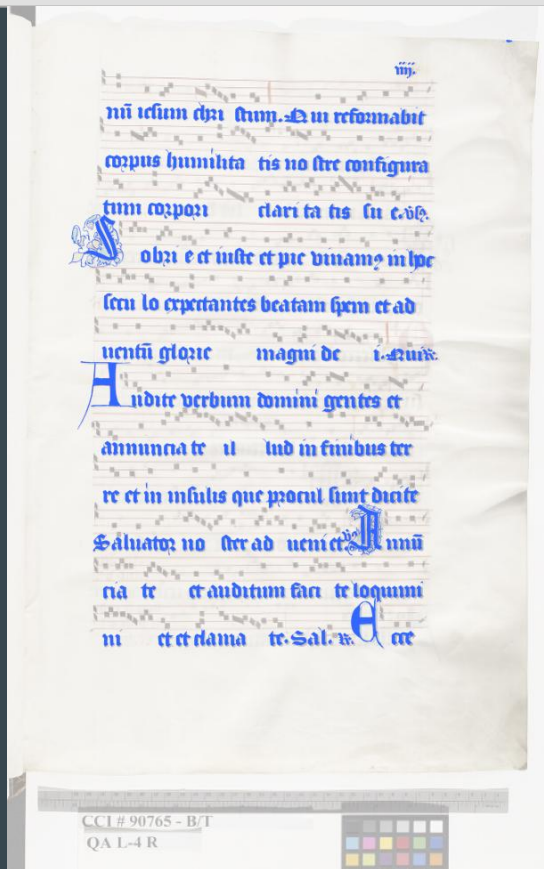
Separate elements of document images such as:



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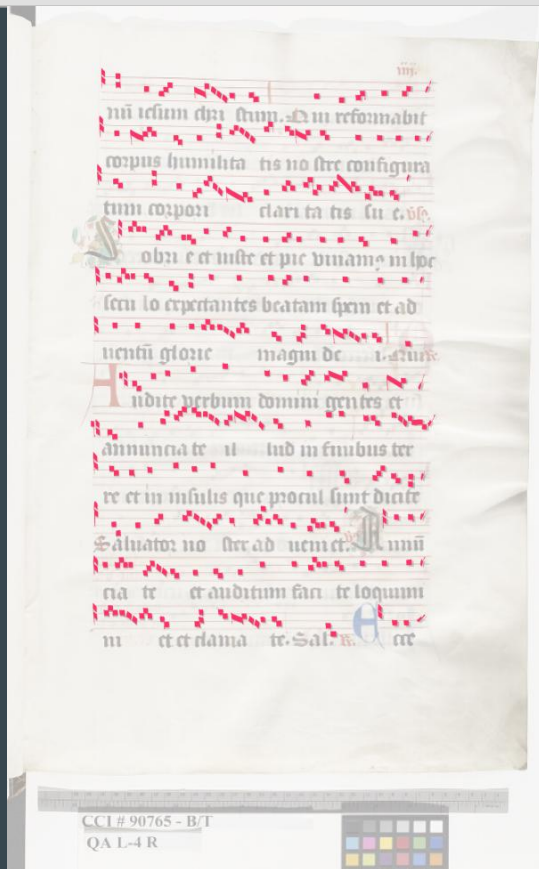
- Text



# Motivation

Separate elements of document images such as:

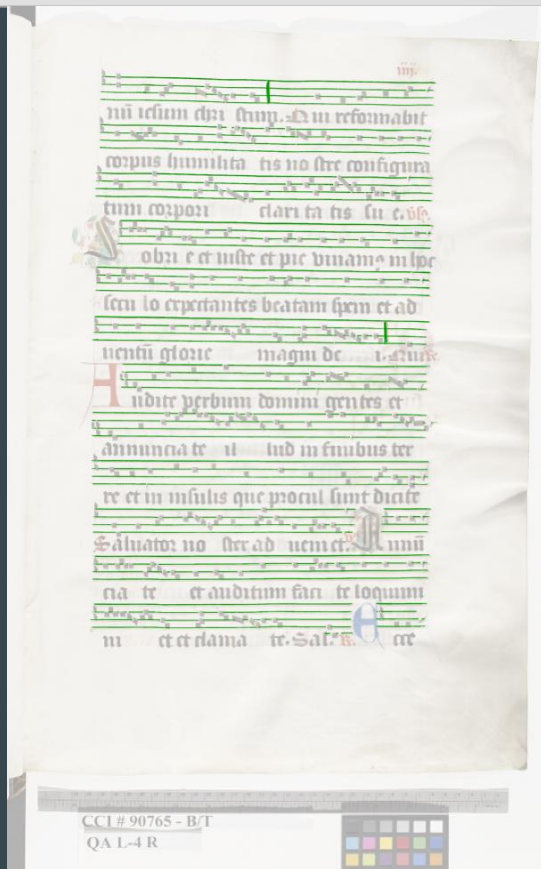
- Text
- Glyphs



# Motivation

Separate elements of document images such as:

- Text
- Glyphs
- Staff Lines

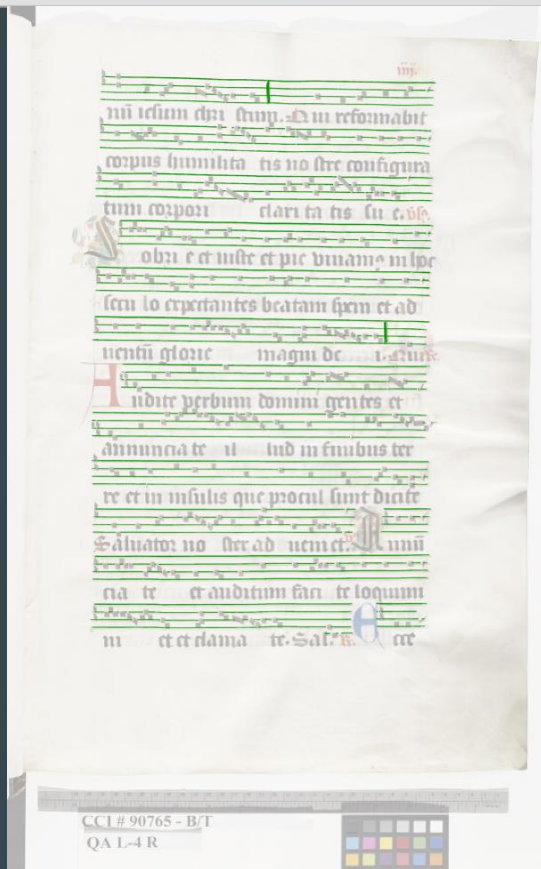


# Motivation

Separate elements of document images such as:

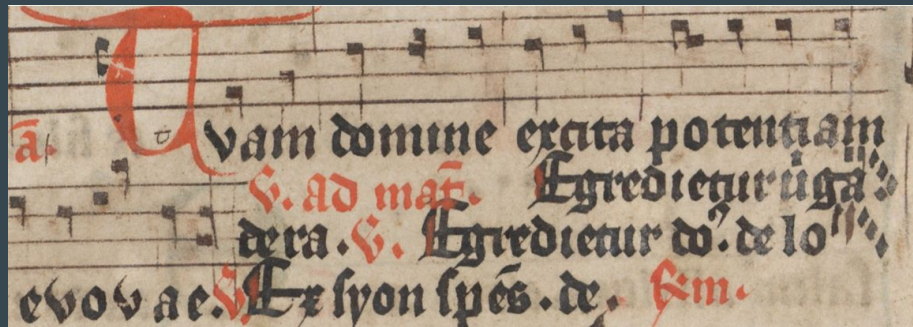
- Text
- Glyphs
- Staff Lines

Process the different elements of the document image separately





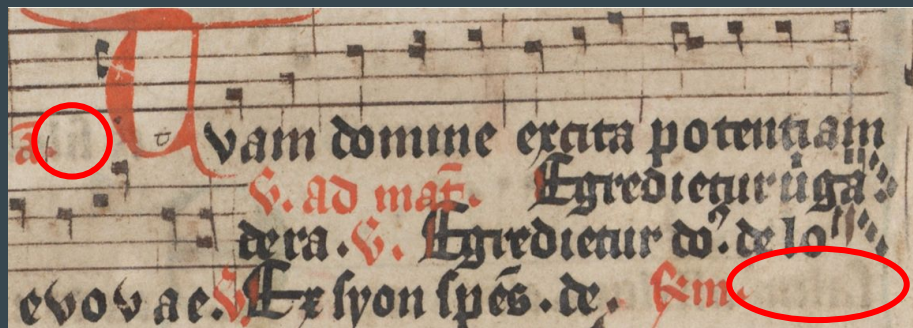
# Motivation: Heuristic Algorithms



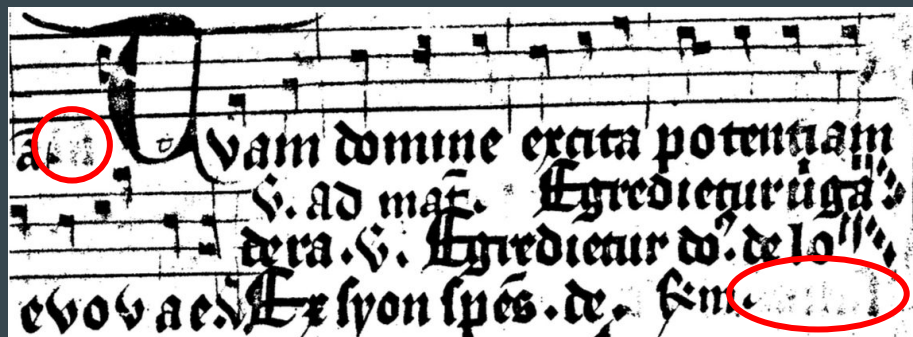
Original image

Calvo-Zaragoza et al.  
2016

# Motivation: Heuristic Algorithms



Original image



Heuristic Binarization (Sauvola)

Calvo-Zaragoza et al.  
2016

# Motivation: Heuristic Algorithms

Use previous results of automatic, pixel-level image segmentation algorithms  
and correct its misclassified pixels to produce ground truth

(Instead of creating it from scratch)



# Motivation

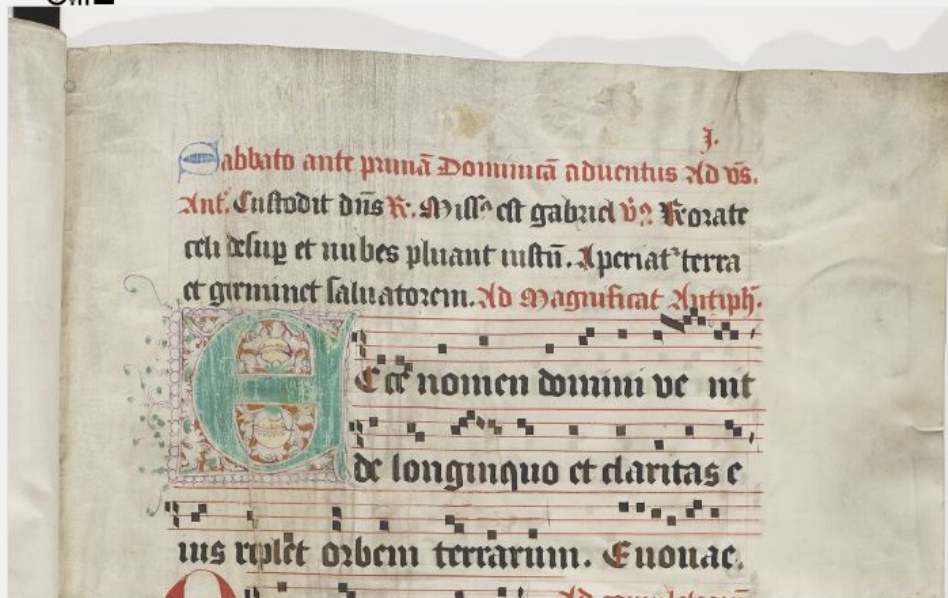
Ground truth in this context refers to creating multiple layers of information



An online platform for correcting the results of image classification algorithms at pixel-level



Zoom level: 4



Undo Redo Delete selected layer Create new layer

Layer 1  
Background

brush rectangle grab erase select

Brush size:

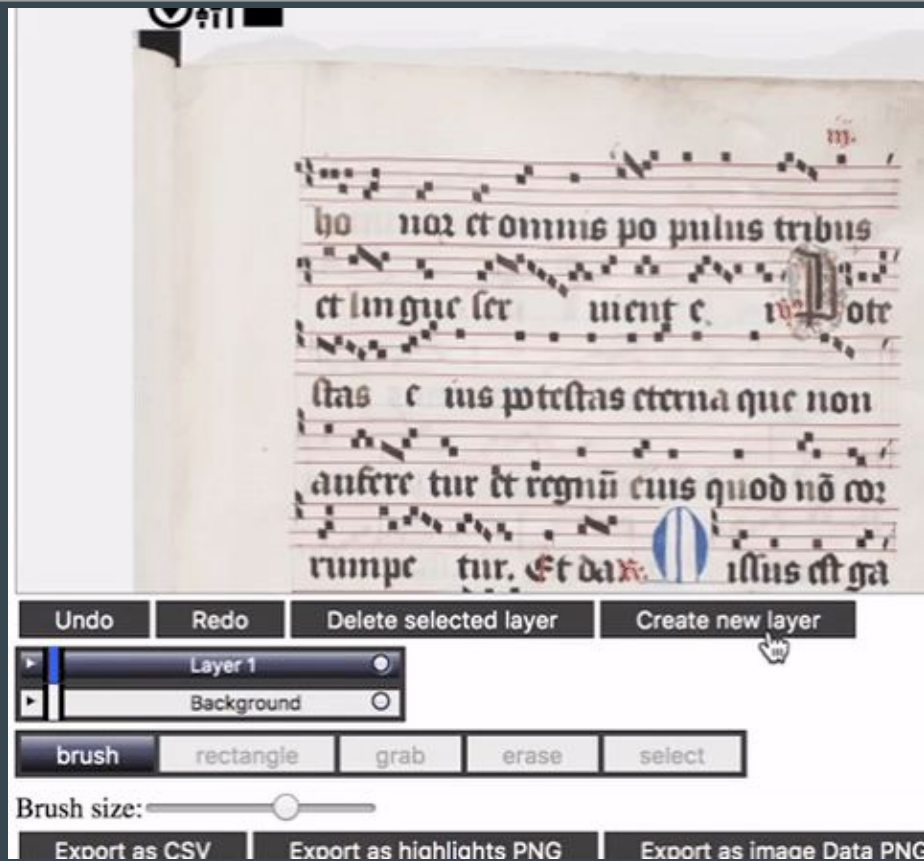
Export as CSV Export as PNG Export as image Data PNG Choose File No file chosen

How to use Keyboard shortcuts

# Pixel.js: Tools & Functionalities

## Representation:

- Layers
- Colour-coding

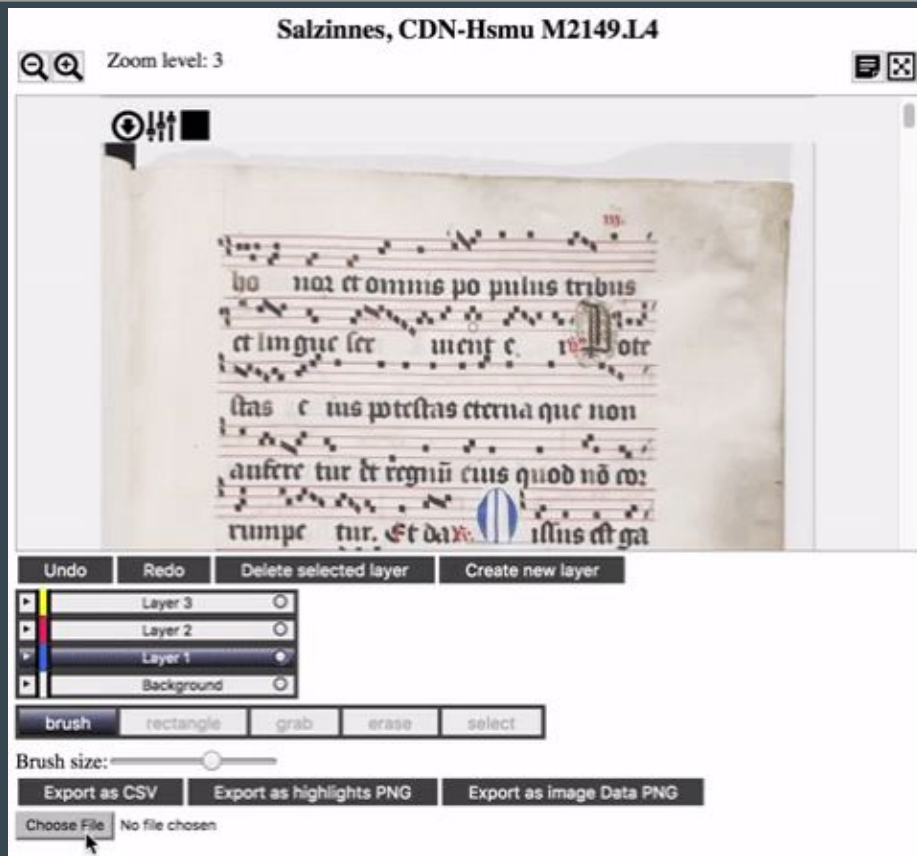




# Pixel.js: Tools & Functionalities

## Uploading images to layers

- Automatic colour conversion
- Transparent background required

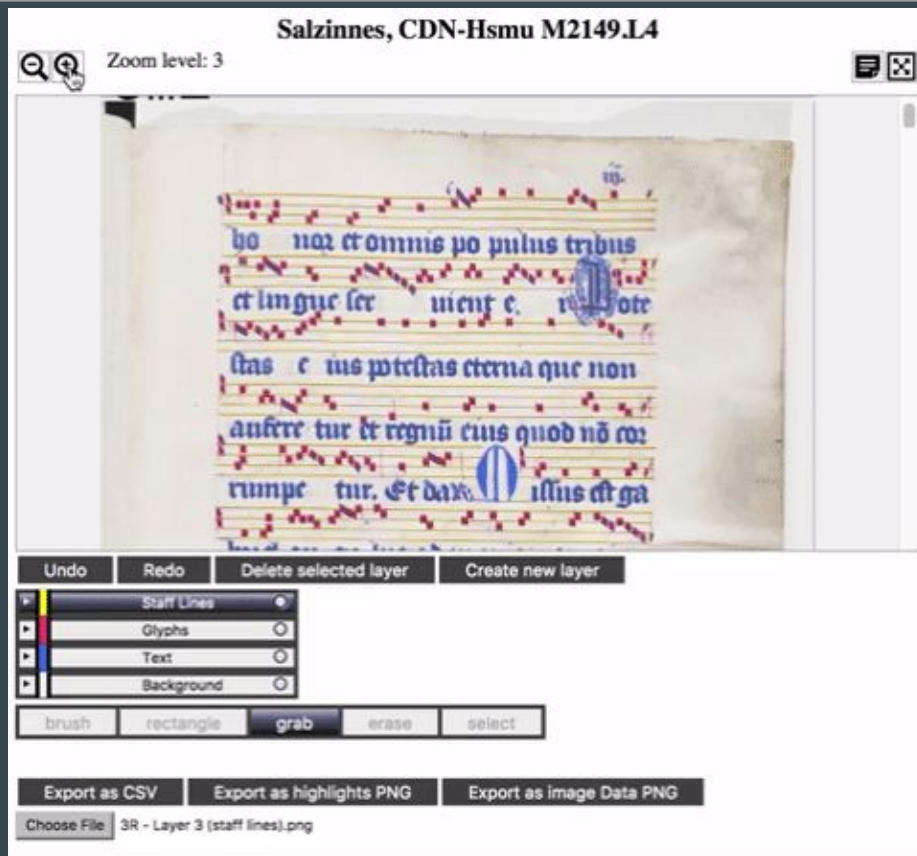




# Pixel.js: Tools & Functionalities

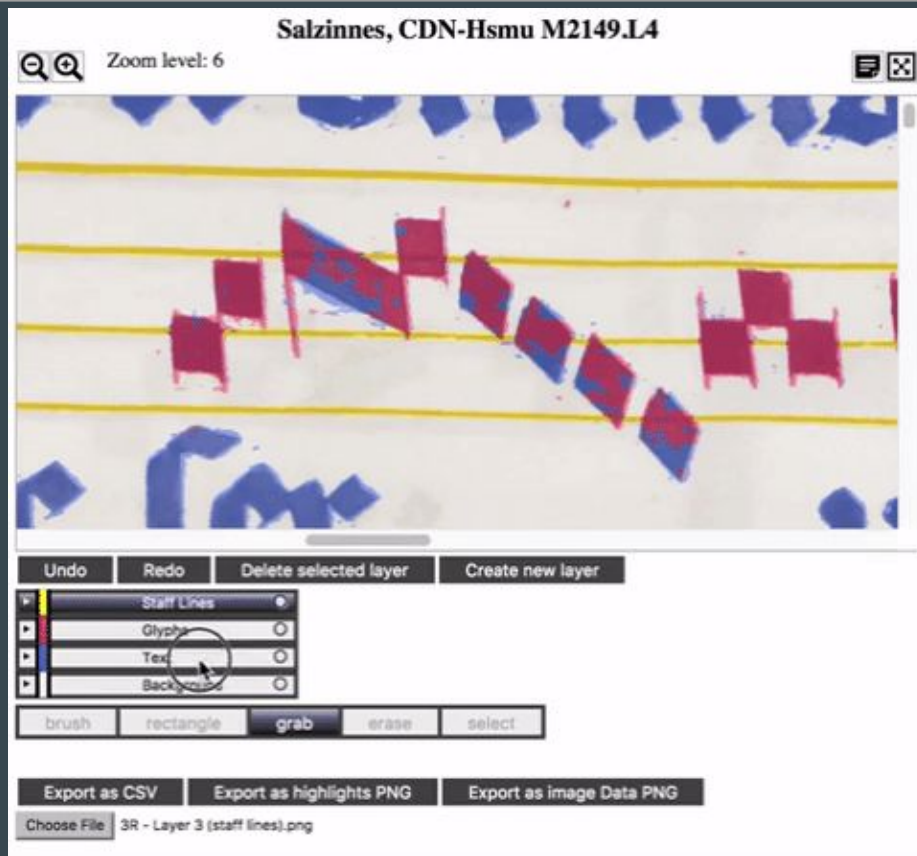
## Zooming & Navigation

Notice misclassified pixels:



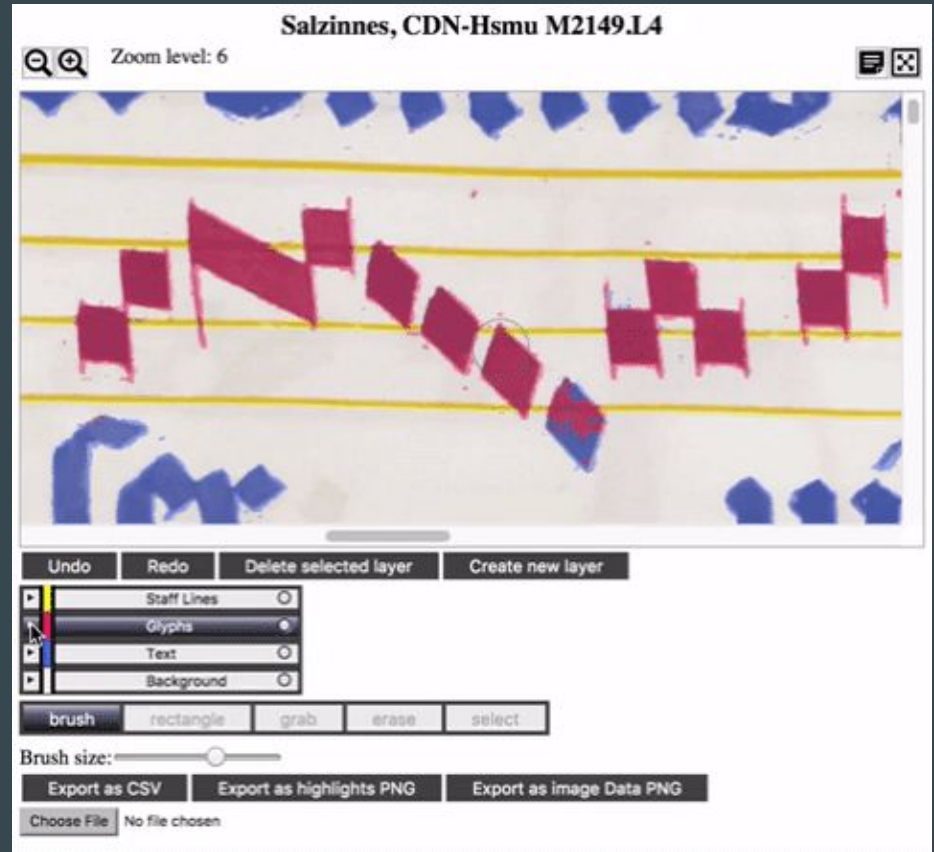
# Pixel.js: Tools & Functionalities

Quickly move regions of  
pixels from a layer to  
another



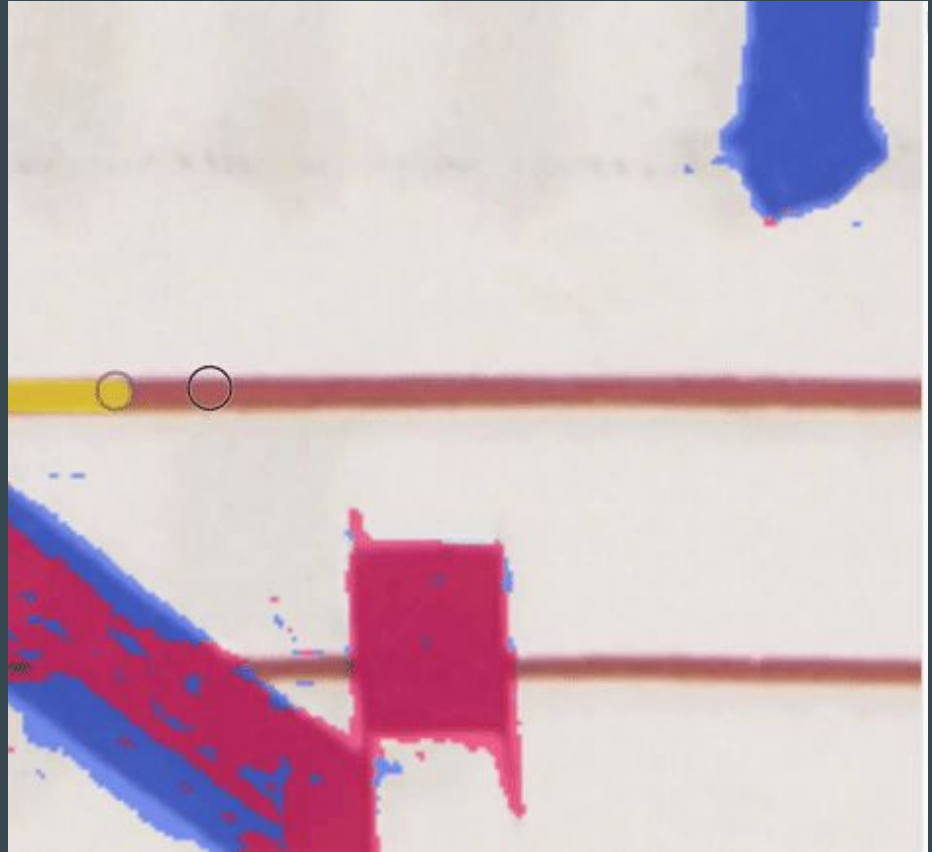
# Pixel.js: Tools & Functionalities

Changing layer's opacity



# Pixel.js: Tools & Functionalities

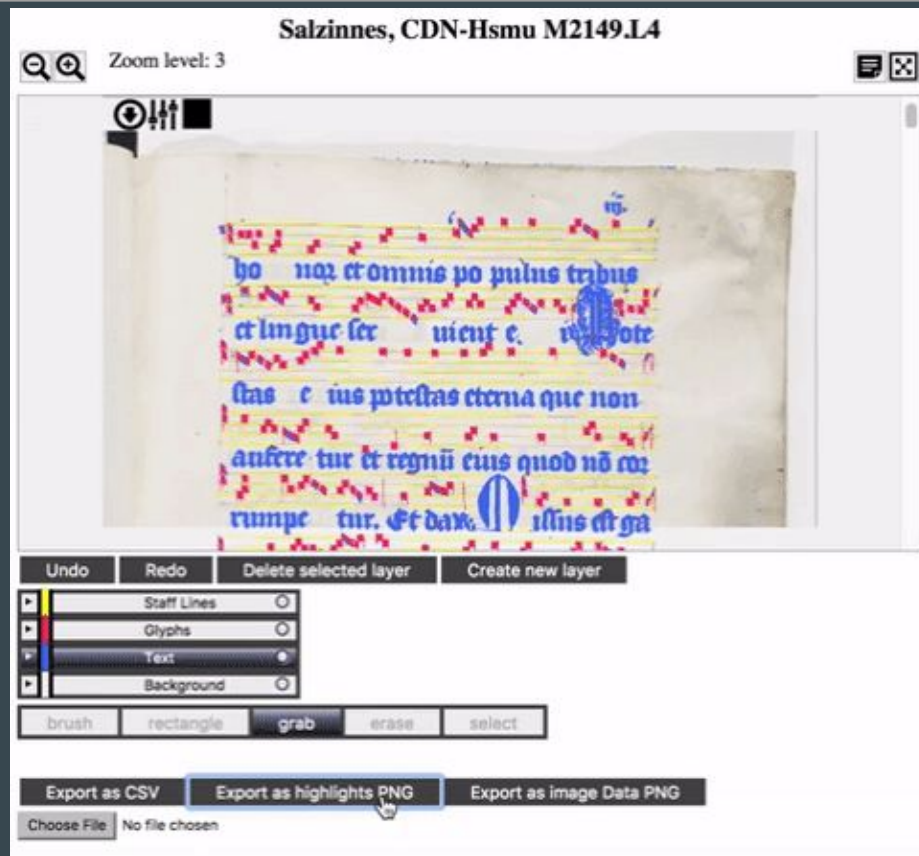
Drawing & Erasing  
Changing brush size



# Pixel.js: Tools & Functionalities

## Exporting

- Can re-import to continue work
- 3 different formats



# Pixel-level Ground Truth

## Why Pixel.js?

- Music documents require a higher level of ground truth accuracy
- Opens up ground truthing to a larger audience
- Keyboard shortcuts built specifically for ground truth creation

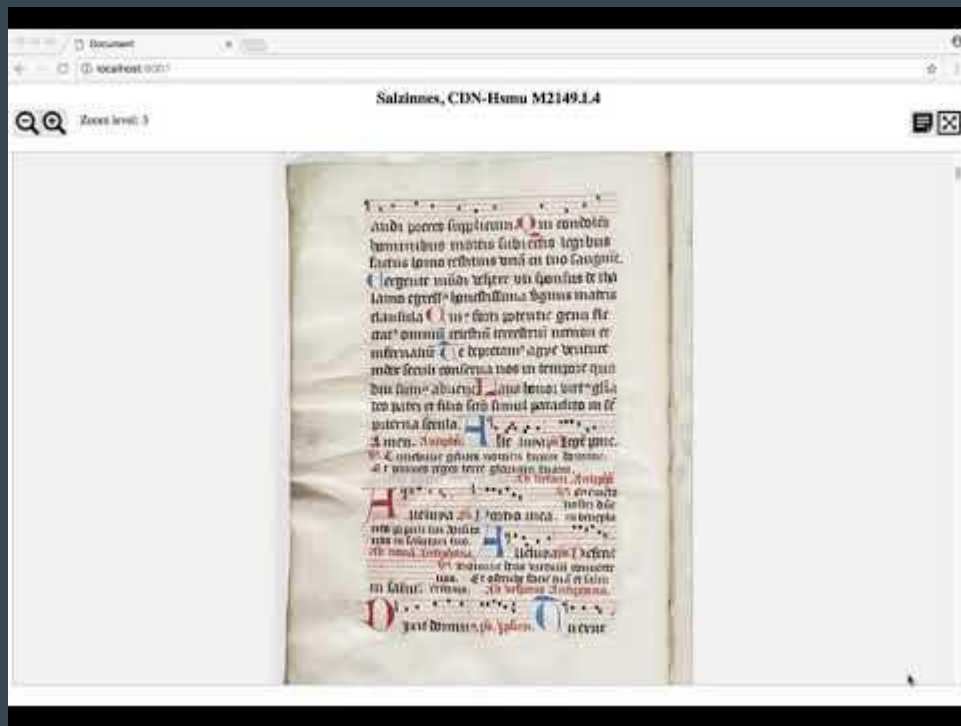


# Existing Tools: Comparison

	Web-based	Open Source	Free to use	Freeform Labelling	Batch Labelling	Handles Large Images	Pixel-level Classification	Independent from preprocessed input
Pixel.js	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PixLabeler	No	No	Yes	Yes	Yes	Yes	Yes	No
Divadia	No	Yes	Yes	No	Yes	No	No	Yes
Web-GT	Yes	No	Yes	No	Yes	No	No	Yes
Photoshop / Pixelmator	No	No	No	Yes	Yes	Yes	Yes	Yes
Picozu	Yes	No	Yes	Yes	No	No	Yes	Yes

## A web-based document viewer optimized for high-resolution image collections

- Supports IIF
- 30 megapixels, ~180 MB per image
- 180MB x 479 images = 86 GB





# Preliminary Testing

Classifying the different elements of the same music manuscript page using both Pixelmator and our tool Pixel.js

# Testing: Results

## Positive feedback:

- Time efficiency: A reduction of 40% in production time
  - From 30 with Pixelmator to 18 hours/page with Pixel.js

# Future Work

- Collaborative platform
- More targeted tools



Check out our Github repository

<https://github.com/DDMAL/Pixel.js>

# Thank you!

<https://github.com/DDMAL/Pixel.js>



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Conseil de recherches en  
sciences humaines du Canada

Canada



McGill



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Société et culture

Québec



**compute**  
canada

**calcul**  
canada

