Jan. 6th, 2021

Class 2: Data

Exploring AI and Neural Nets in Design

Gia Jung
Research Associate, Lab for Design Technologies, Harvard University
Irving Innovation Fellow 2020 - 2021

Claire Djang
Lab for Design Technologies, Harvard University
Currently at Certain Measures

Housekeeping & Troubleshooting

1. Clarifying errors from the first workshop - could you install all packages?

2. Deciding your project and making your own Dataset:

   What's your progress?

   GO TO: https://forms.gle/YAeVCmhUeHtA7e569

1.1

Final Project & Data

Data - Model - Project

Workshop Visualization
Project Preview

1.2

Building Dataset

Data
- Collection
- Curation
- Processing

Focus Project
- “Beaux-arts Latent Walk”

Breakout room:
- What is your Dataset?

1.3

Workshop

Review: Toolset and Data Scraping

Data Processing and Augmentation

Making Custom Dataset: Office Hours

1.1

Final Project & Data

Data - Model - Project

Workshop Visualization
Project Preview

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Data	Model	Project (Workshop)
1. Collection	1. Choosing a Model	Latent Space Exploration #1 **Interpolation Animation**
2. Curation	2. Training a Model	Latent Space Exploration #2 **Interpolated Grid**
3. Processing		Latent Space Exploration #3 **Vector Arithmetic**

Data

1. Collection

2. Curation

3. Processing

Model

1. Choosing a Model

DCGAN

2. Training a Model

Workshop

Project (Workshop)

Latent Space Exploration #1

Interpolation Animation

Latent Space Exploration #2

Interpolated Grid

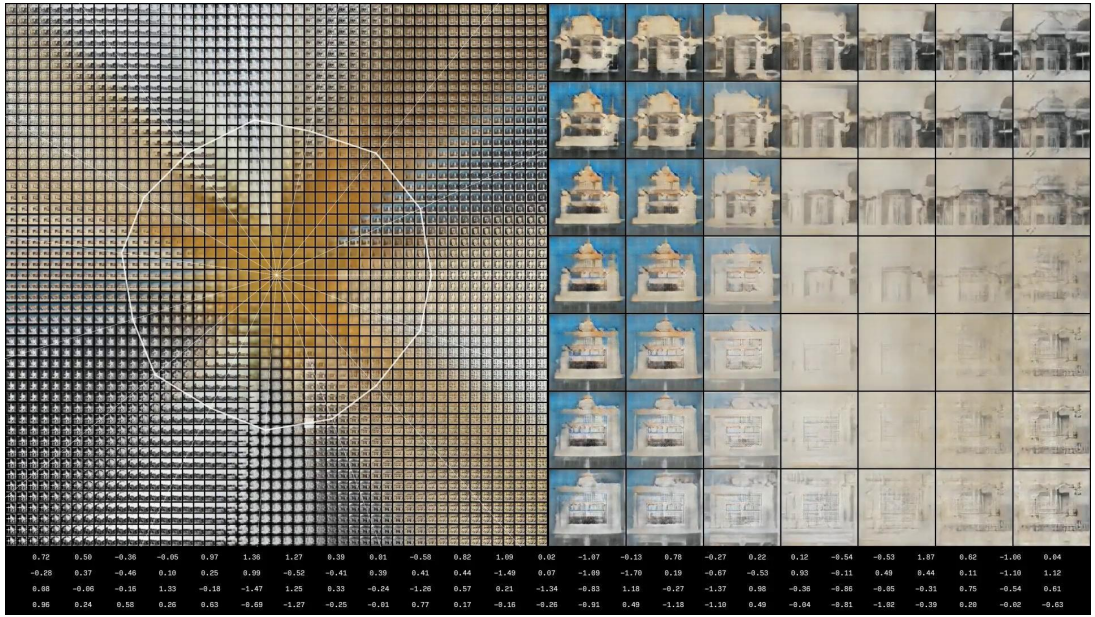
Latent Space Exploration #3

Vector Arithmetic

Latent Space Exploration #1 Interpolation Animation

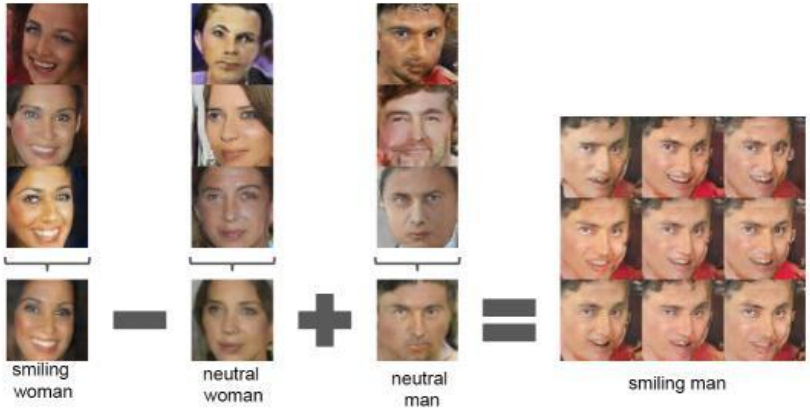
The Landscape of Emotions by Shiyi Peng MDes'20 (2020)

Latent Space Exploration #2 Grid Animation



“Beaux-art Latent Walk” (2020)
Lab for Design Technologies
Prof. Andrew Witt, Gia Jung, Claire Djang

Latent Space Exploration #3 Vector Arithmetic



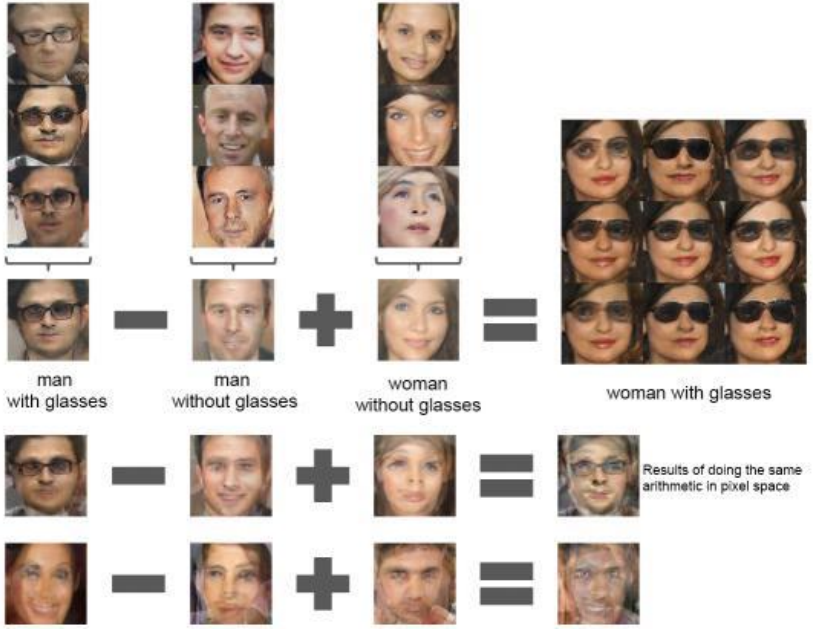


Figure 7: Vector arithmetic for visual concepts. For each column, the Z vectors of samples are averaged. Arithmetic was then performed on the mean vectors creating a new vector Y. The center sample on the right hand side is produce by feeding Y as input to the generator. To demonstrate the interpolation capabilities of the generator, uniform noise sampled with scale +-0.25 was added to Y to produce the 8 other samples. Applying arithmetic in the input space (bottom two examples) results in noisy overlap due to misalignment.

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3. Processing		Latent Space Exploration #3 **Vector Arithmetic**

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Example DCGAN Project (1) Balenciaga

08-22-18

This AI designs Balenciaga better than Balenciaga

It's really into asymmetry and color-blocking.

[Image: Robbie Barat]

Robbie Barat, GAN-generated fashion design (left)
Coat from ACNE Studios (right)

Example DCGAN Project (2) Beaux-arts Drawings

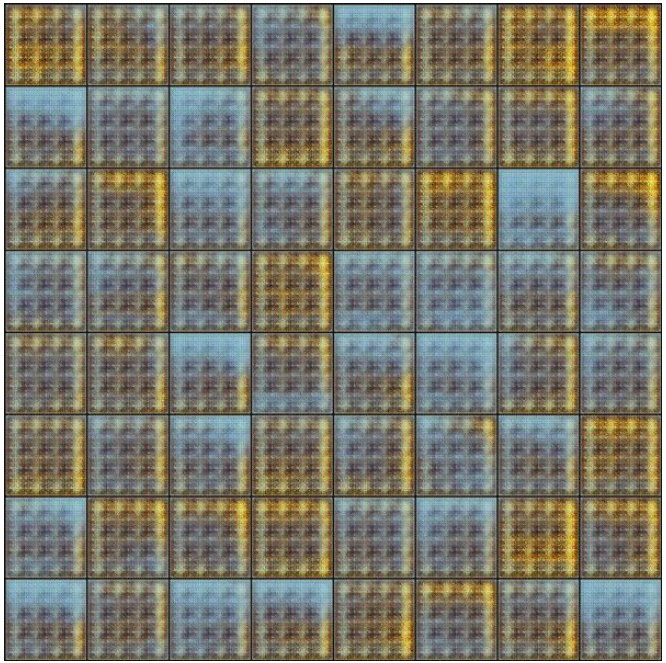
"Model is a generalization; form is a special case." – Buckminster Fuller[1]

A matrix of architectural drawings generated from a neural network trained on thousands of Beaux-arts drawings. Project team: Andrew Witt, Gia Jung, Claire Djang, 2020.

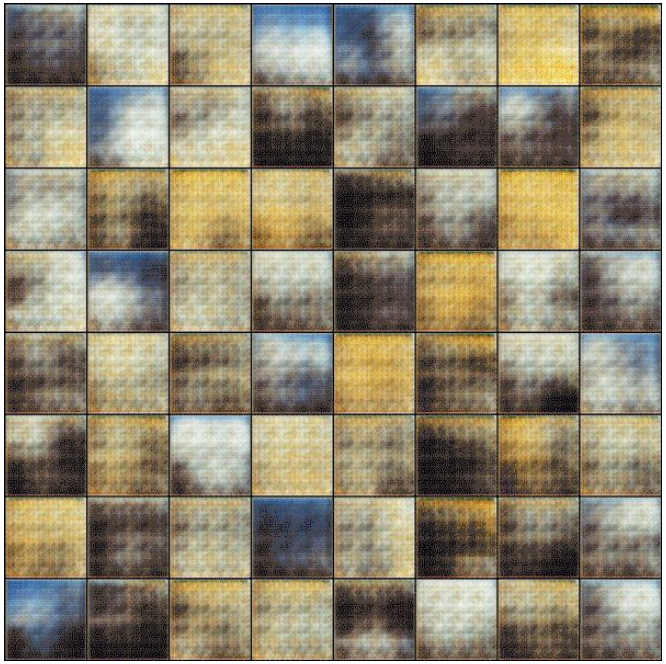
Example DCGAN Project (3) Genre Paintings



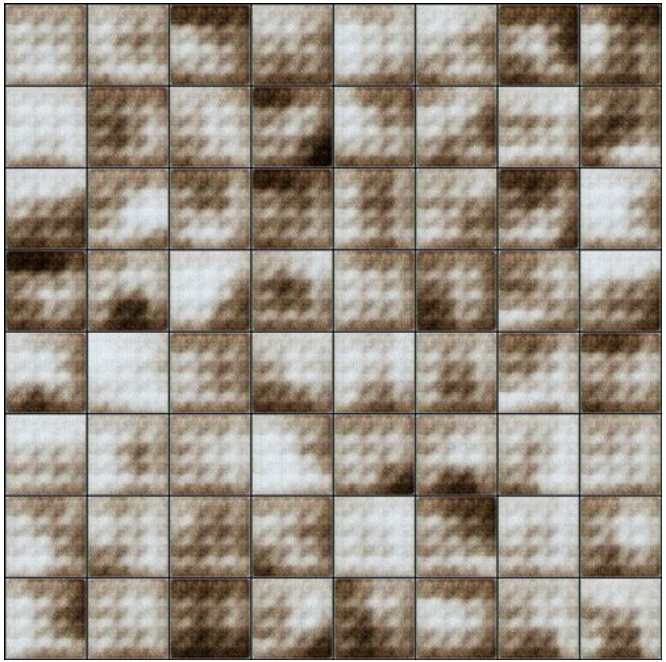
Example DCGAN Project (3) Genre Paintings



Example DCGAN Project (3) Genre Paintings



Example DCGAN Project (4) Dwell



1.1

Recap: Final Project

Data - Model - Project

What is your Project?

1.2

Data

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Focus Project

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Project

Latent Space Exploration #1

Interpolation Animation

Latent Space Exploration #2

Interpolated Grid

Latent Space Exploration #3

Vector Arithmetic

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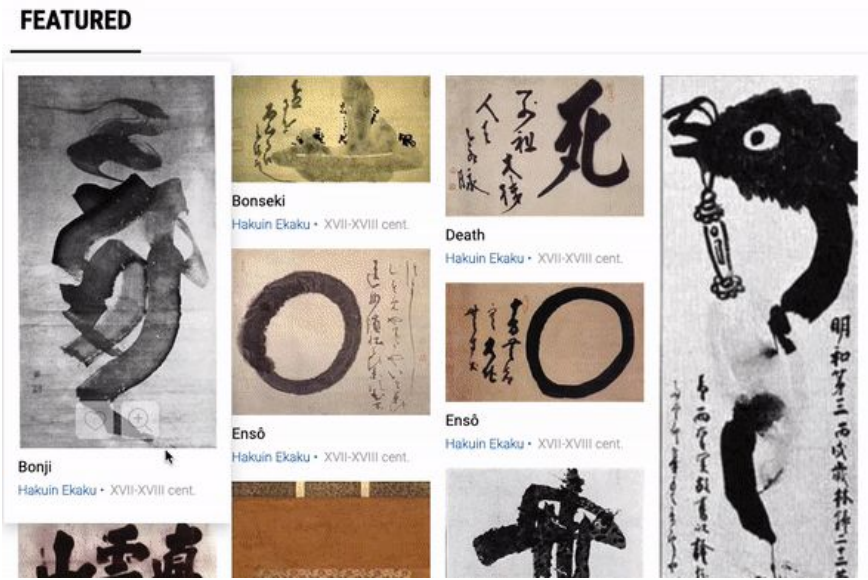
Latent Space Exploration #2

Interpolated Grid

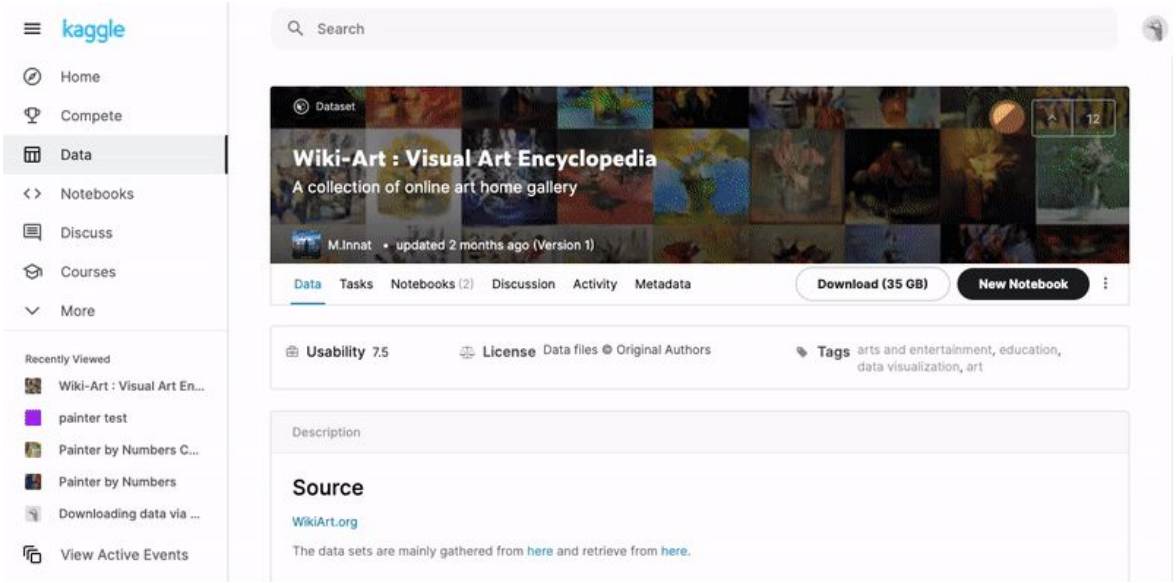
Latent Space Exploration #3

Vector Arithmetic

Data Collection (1) Building your own data



Data Collection (2) Open Datasets



https://www.kaggle.com/ipythonx/wikiart-gangogh-creating-art-gan

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Interpolated Grid

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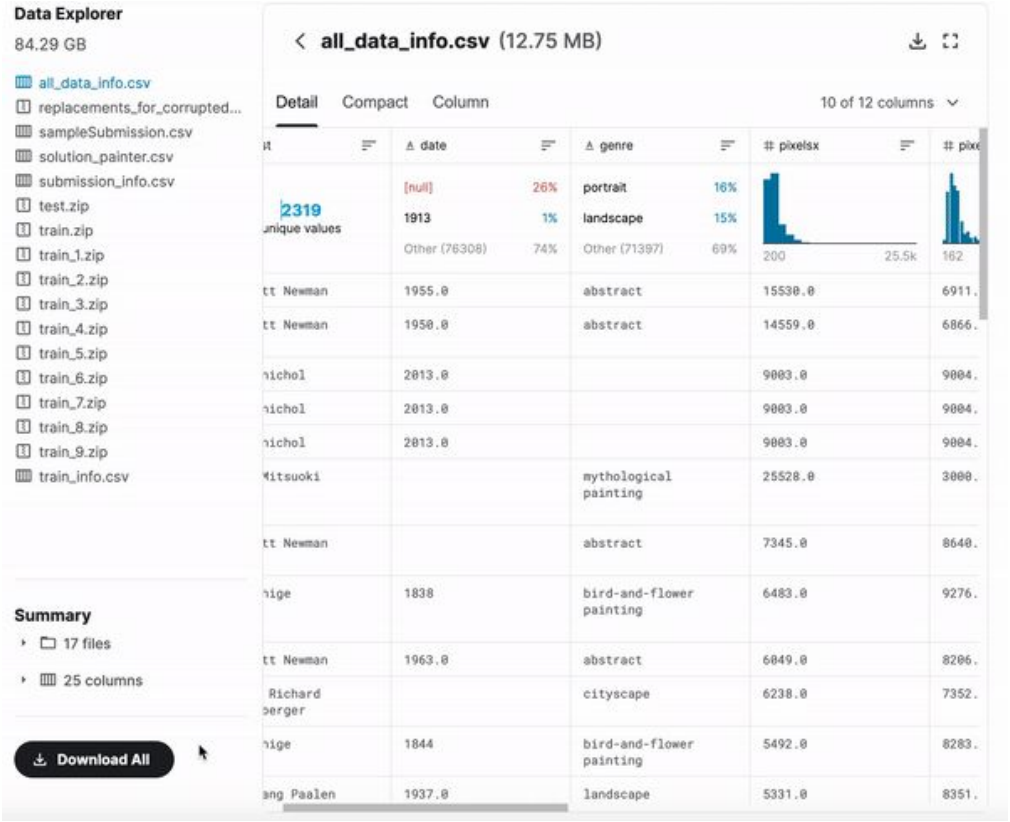
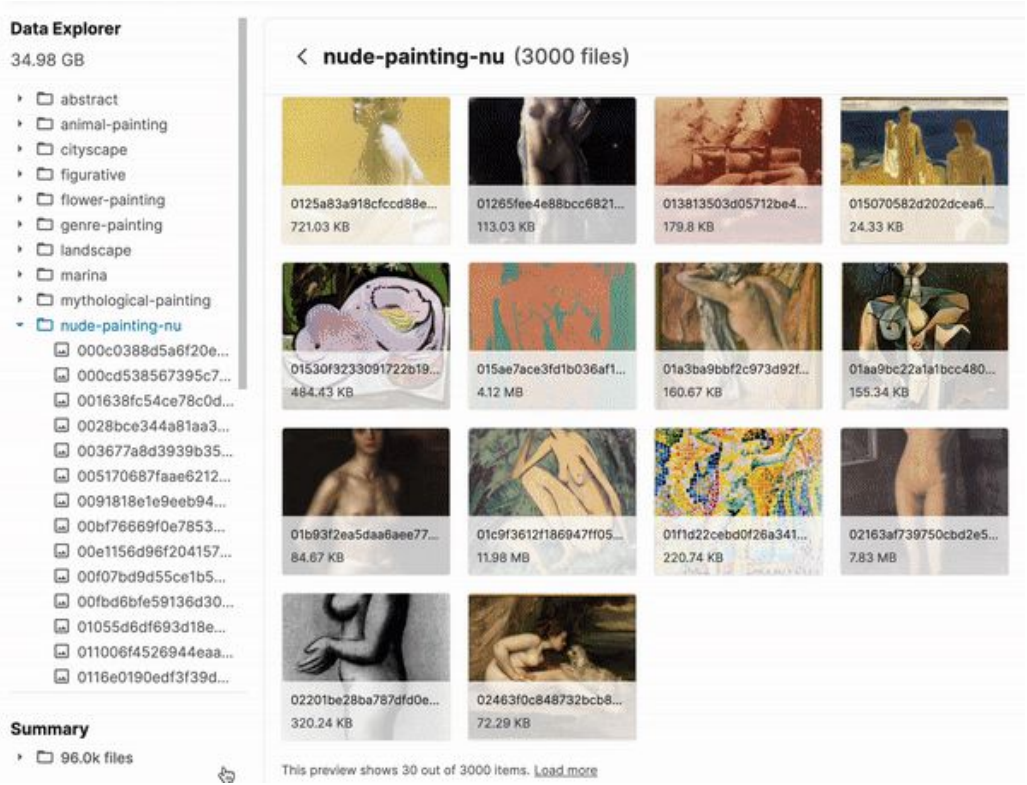
Vector Arithmetic

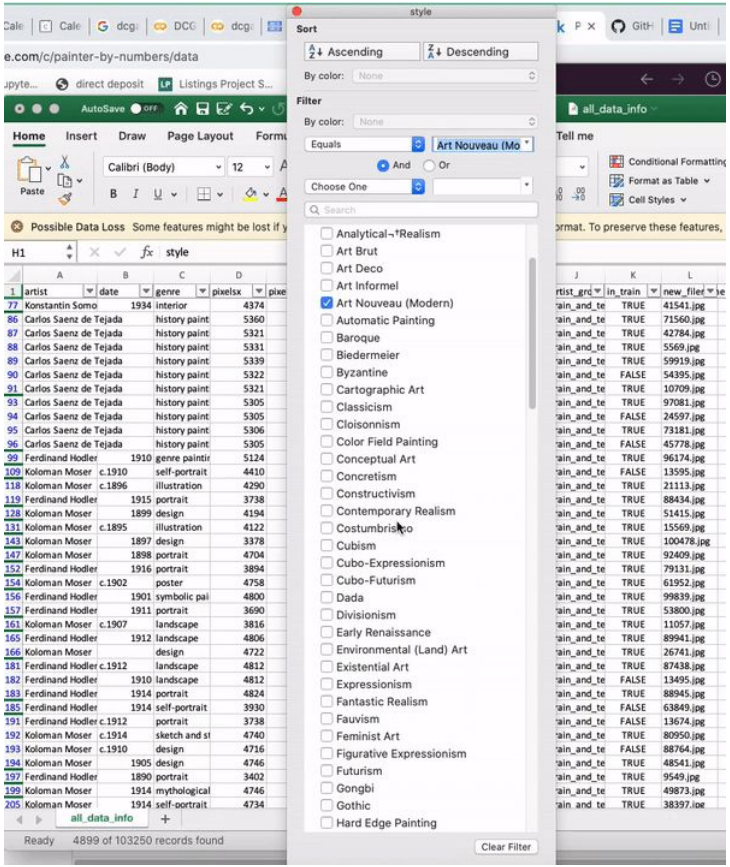
Data Curation: (1) Analysis



Data Curation: (2) Segmentation

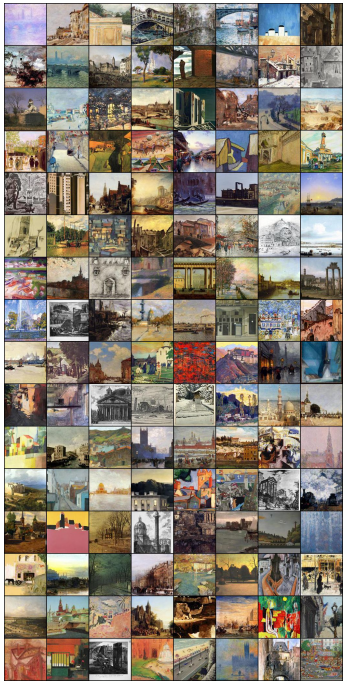


Data Curation: (2) Segmentation

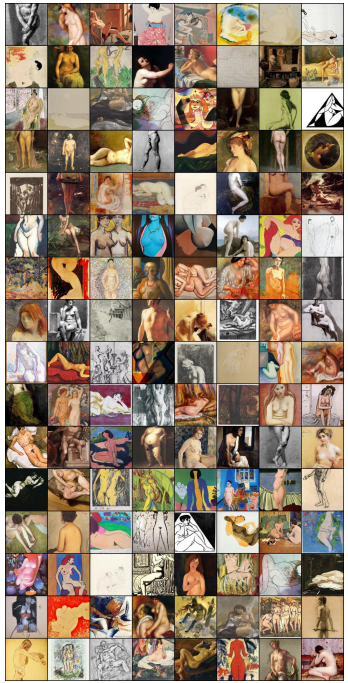


Data Curation: (2) Segmentation

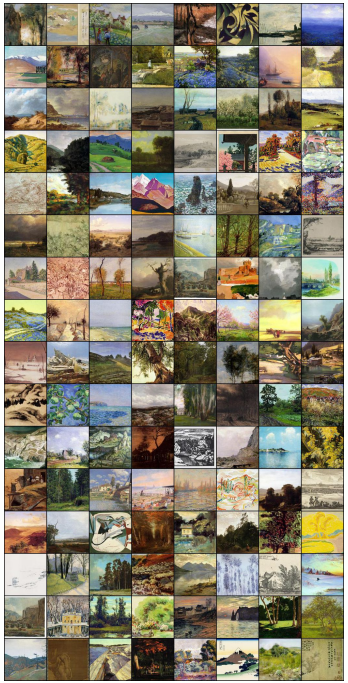
Flower



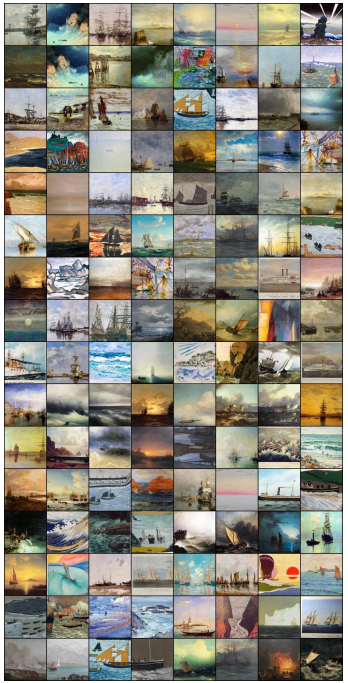
Cityscape



Nude

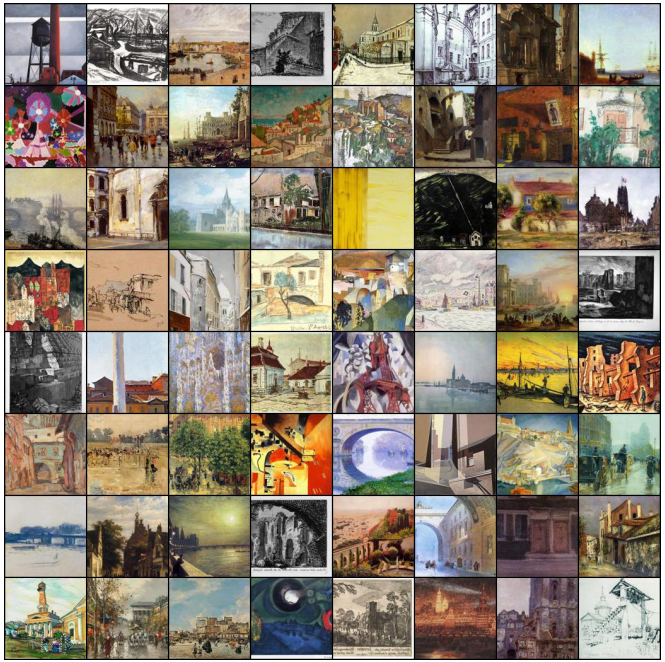


Landscape



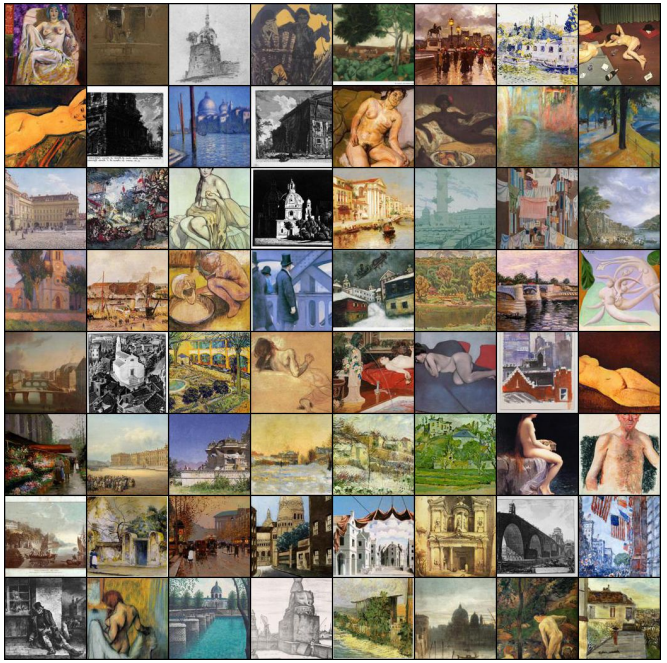
Marina

Data Curation: (3) Hybridization



Training Data: Cityscape (Left), Cityscape and Nude (Right)

Data Curation: (3) Hybridization



Training Data: Cityscape (Left), Cityscape and Nude (Right)

Data Curation: (3) Hybridization

Generation: Cityscape (Left), Cityscape and Nude (Right)

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Project

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Interpolation Animation

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Latent Space Exploration #3

Vector Arithmetic

Data Processing (1) Formatting: Squares

2232x2952

128x128

Data Processing (2) Augmentation: Cropping, Rotating, Flipping...

Data Processing: (2) Augmentation

jupyter crop_augment Last Checkpoint: 2 hours ago (autosaved)

Logout

File Edit View Insert Cell Kernel Widgets Help

Trusted | Python 3

Run Code

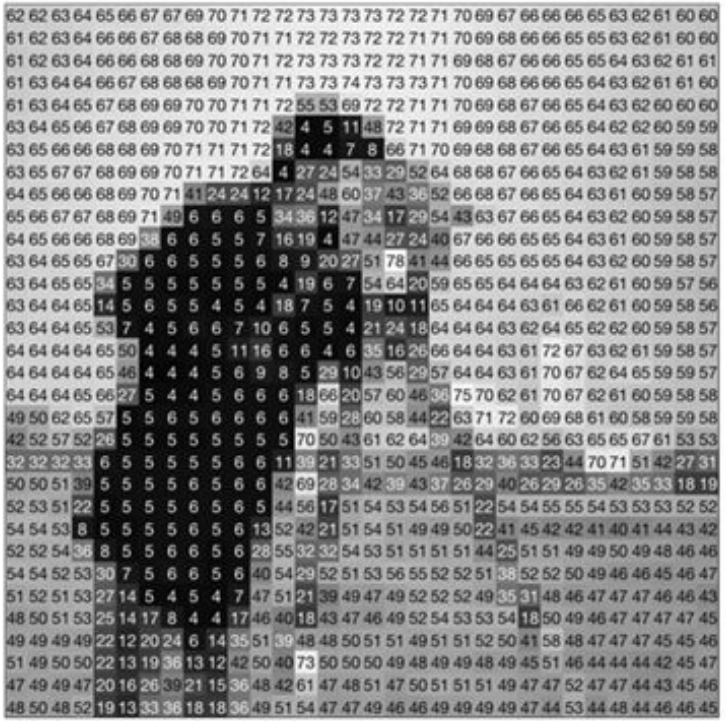
In [15]:
```
import math
import os
import PIL
from PIL import Image
import glob
```

In [16]:
```
# given images that have been resized to 200 on smaller dimension
# code to crop into square 128x128 images

for file_path in glob.glob('/Users/Claire/Dropbox/FALL_2020/GSDAI_Workshop/data/cropped200/landscape/*.jpg'):
    save_path = '/Users/Claire/Dropbox/FALL_2020/GSDAI_Workshop/data/augmented128/landscape128/'
    # print(file_path)
    img = Image.open(file_path)
    path, filename_w_ext = os.path.split(file_path)
    filename = os.path.splitext(filename_w_ext)[0]
    if not os.path.exists(save_path):
        os.makedirs(save_path)
    w = img.width
    h = img.height
    cropped = []
    if h <= w:
        # horizontal images - output images of dimensions h x h
        r = math.floor(w/h)
        print('r='+str(r))
        if r == 1:
            # code to crop center
            left = (w/2)-(h/2)
            right = (w/2)+(h/2)
            crop=img.crop((left,0,right,h))
            crop = crop.resize((128,128))
            crop.save('{}{}{}{}'.format(save_path,filename,'_0','.jpg'))
            crop = crop.transpose(method=Image.FLIP_LEFT_RIGHT)
            crop.save('{}{}{}{}'.format(save_path,filename,'_0M','.jpg'))

            # code to crop right and left
            if w/h > 1.2:
                crop=img.crop((0,0,h,h))
                crop = crop.resize((128,128))
                crop.save('{}{}{}{}'.format(save_path,filename,'_L','.jpg'))
                crop = crop.transpose(method=Image.FLIP_LEFT_RIGHT)
                crop.save('{}{}{}{}'.format(save_path,filename,'_LM','.jpg'))
                crop=img.crop((w-h,0,w,h))
                crop = crop.resize((128,128))
                crop.save('{}{}{}{}'.format(save_path,filename,'_R','.jpg'))
                crop = crop.transpose(method=Image.FLIP_LEFT_RIGHT)
                crop.save('{}{}{}{}'.format(save_path,filename,'_RM','.jpg'))
```

Data Processing (2) How machines see images



Data Processing (2) Augmentation: Cropping, Rotating, Flipping...

1.1

Recap: Final Project

Data - Model - Project

What is your Project?

1.2

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Focus Project

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Making Custom Dataset: Office Hours

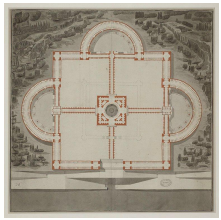
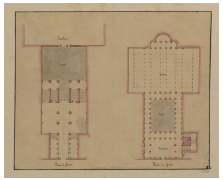
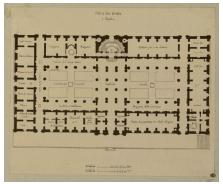

Focus Project: “Beaux-arts Latent Walk”

Focus Project: “Beaux-arts Latent Walk”

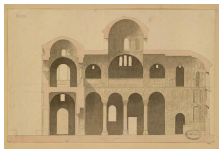
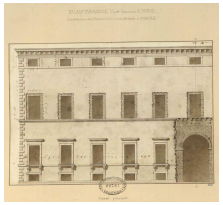
Go To:

http://www.ensba.fr/ow2/catzarts/index.xsp

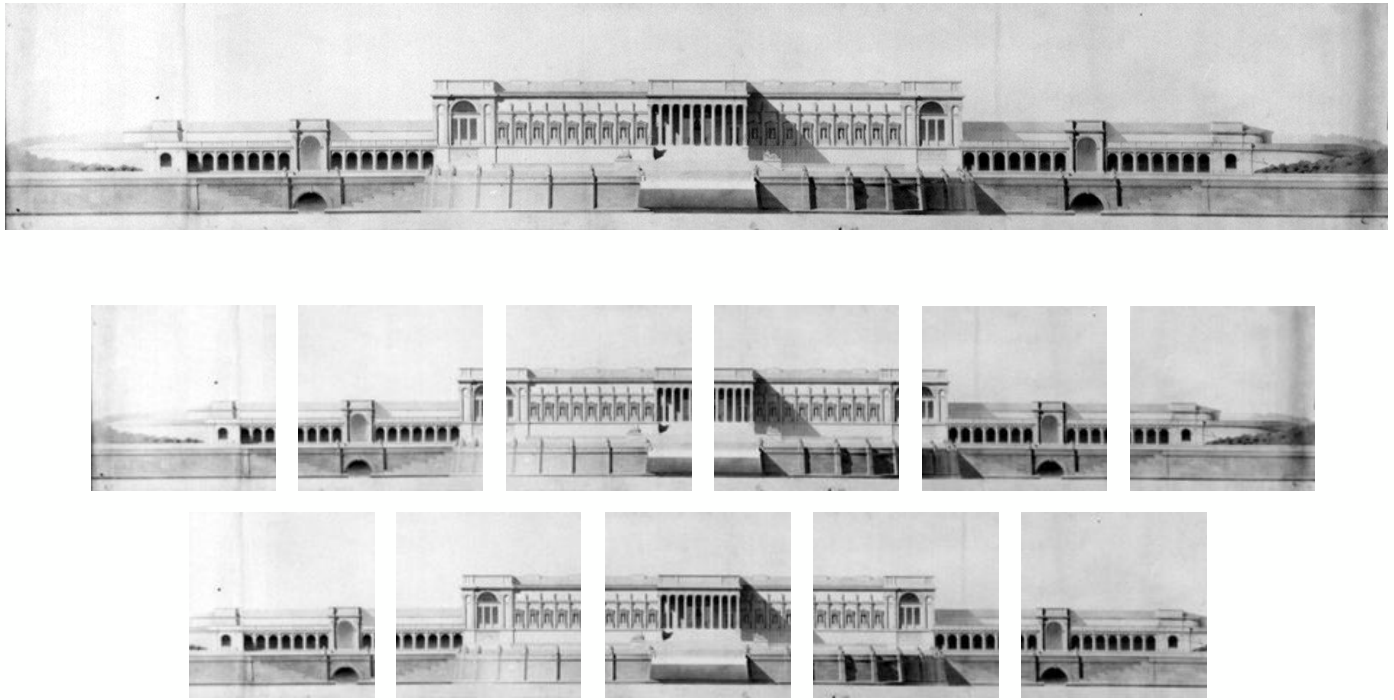
Total Scraped Images - Plan Images

Total	Number of Images	Example	Search terms
Plan: **1813**	864		"Dessin d'architecture et ornement" ET plan
	667		"Dessin scolaire d'architecture" ET plan
	282		estampe ET plan SAUF elevation SAUF coupe

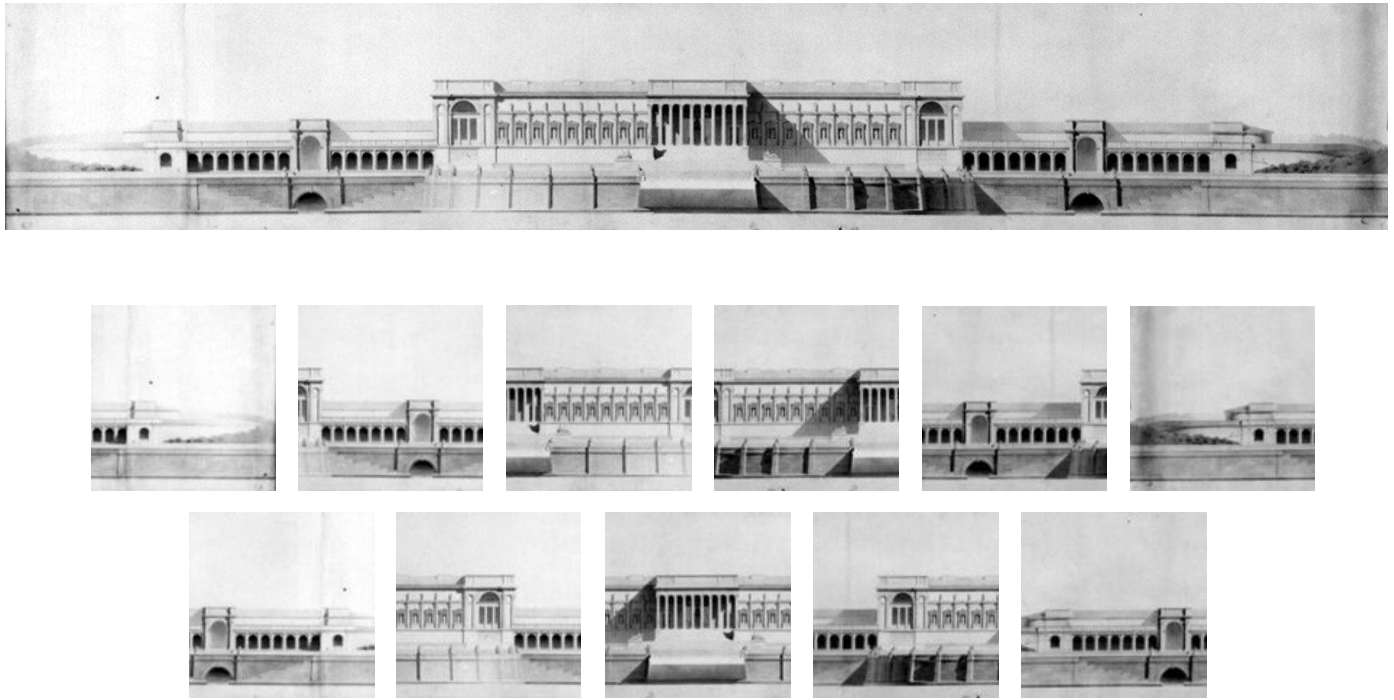
Total Scraped Images - Section/Elevation Images

Section & Elevation: **2027**	1127		"Dessin scolaire d'architecture" ET elevation; "Dessin scolaire d'architecture" ET coupe
	500		"Dessin d'architecture et ornement" ET elevation
	290		"Dessin d'architecture et ornement" ET coupe SAUF elevation
	110		"Dessin d'architecture et ornement" ET façade SAUF coupe SAUF elevation SAUF plan

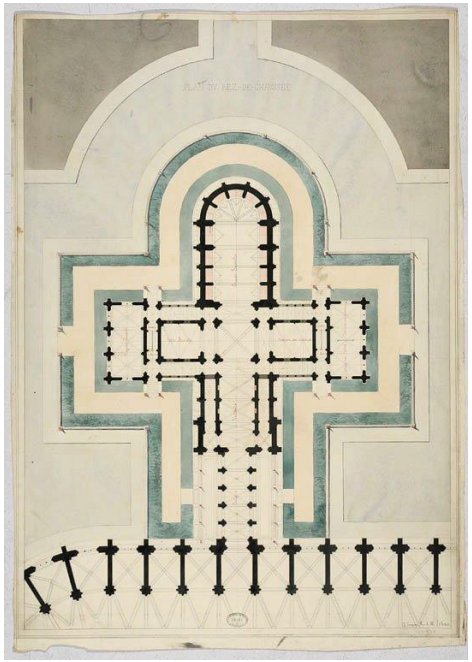
Data Augmentation: Horizontal Elevation with Many Square Crops

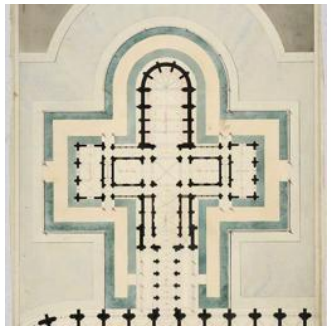


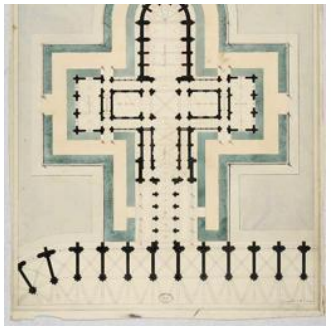
Data Augmentation: Horizontal Elevation with Many Square Crops - Flipped



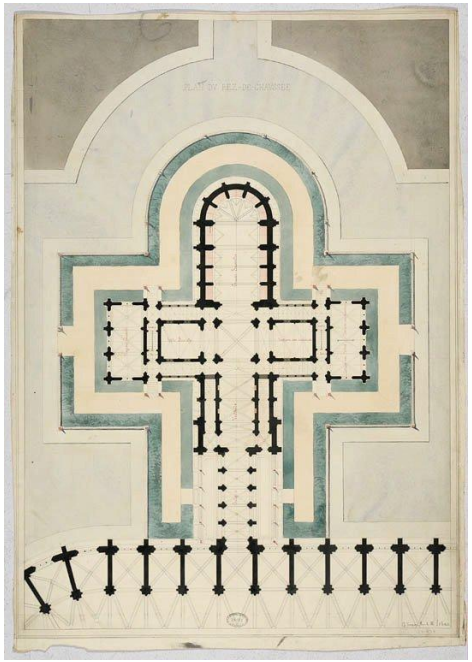
Data Augmentation: Plan Image with Top, Middle, Bottom Crops

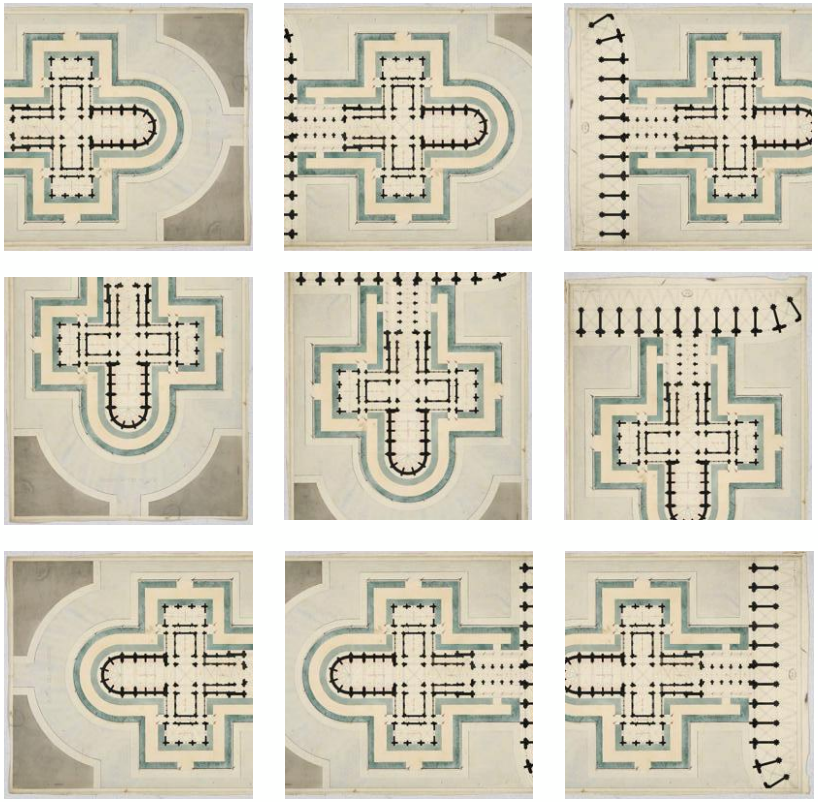




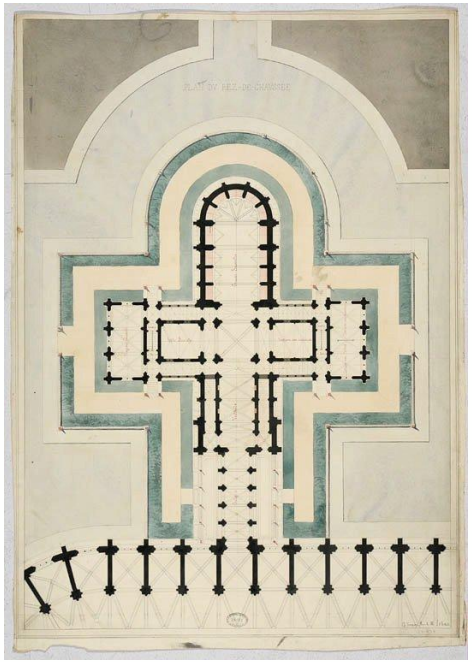


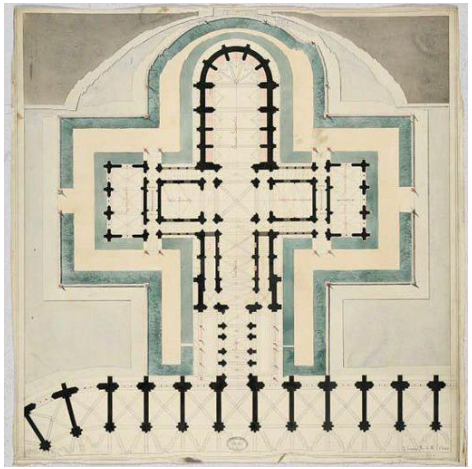
Data Augmentation: Plan Image with Top, Middle, Bottom Crops - Rotate x4

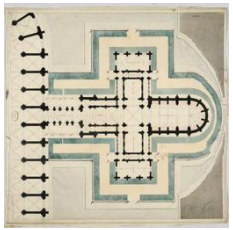


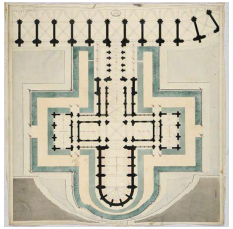


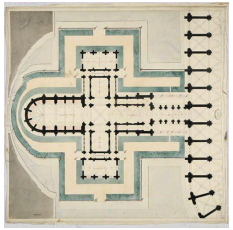
Data Augmentation: Plan Image with Seam-Carving (Content-Aware Resizing) + Rotate











Algorithm: Seam-Carving for Content-Aware Resizing

https://www.youtube.com/watch?v=wR3HMyMi2dw
http://graphics.cs.cmu.edu/courses/15-463/2007_fall/hw/proj2/imret.pdf

Final Training Set

1.1

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What’s your project?

—

Go To:

http://bit.ly/contact-gsdai

Austin Lu (MLA II)
Keisheng Gao (MDes Tech)
Peitong Chen (MDes)
George Guida (MArch II)
Benjamin Villa
Yuxin Yang
Tsz Kit Justin Ng (MArch I)
Elisa Ngan (MDE)
Siqi Joyce Zhu (MLA II)
Dongyun Kim (MDes Tech)

Ana Gabriela Loayza (MArch II)
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1.1

Recap: Final Project

Data - Model - Project

What is your Project?

1.2

Data

Data Scraping

Data Curation

Data Processing

Focus Project
“Beaux-arts Latent Walk”

1.3

Workshop

Review: Toolset and Data Scraping

Data Processing and Augmentation

Making Custom Dataset: Office Hours