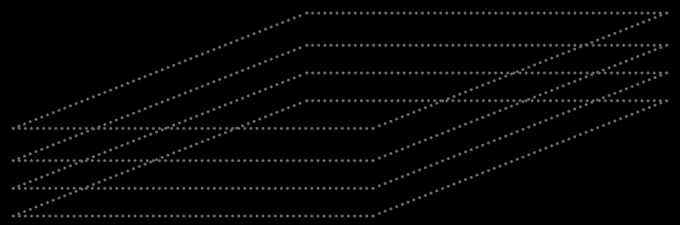
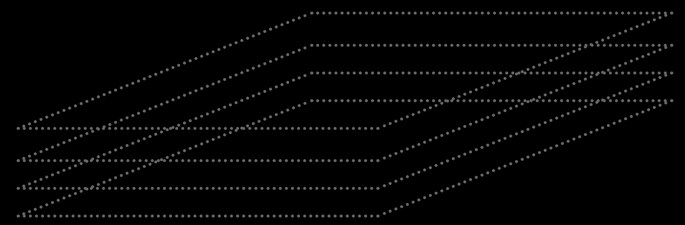
ARCHI_BASE

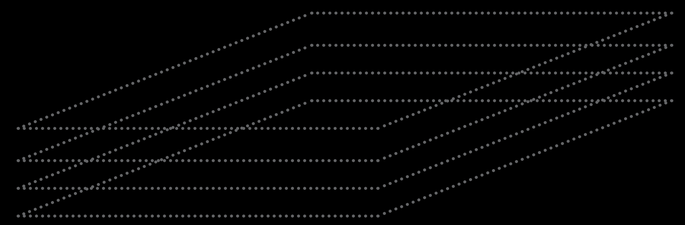
YOUR CUSTOM ARCHITECTURE DATASET



A tool to create very large datasets of labelled and sorted architectural imagery for ML / AI based modeling.

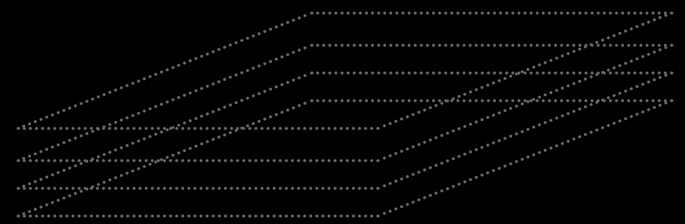


For architects, design offices,
researchers, academics, students
& the general public.

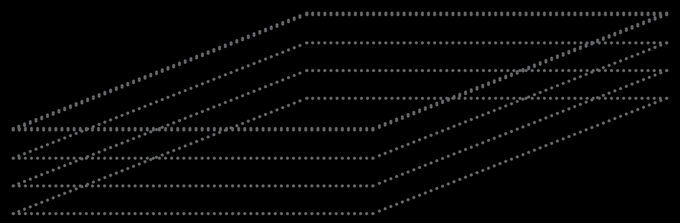


Current method to aggregate

architectural image data is inedequate



scattered



Current method to aggregate

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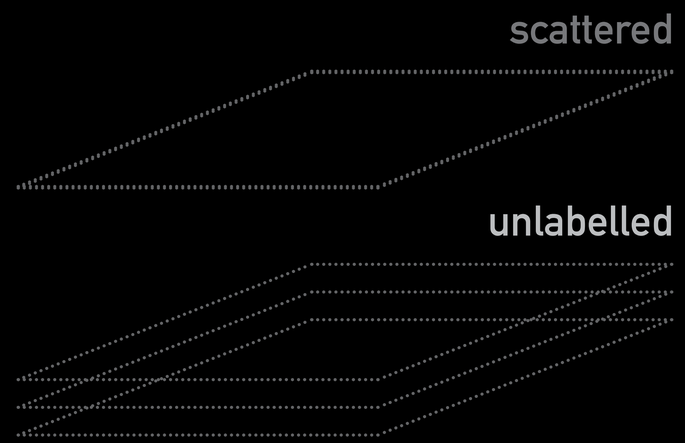
architectural image data is inedequate



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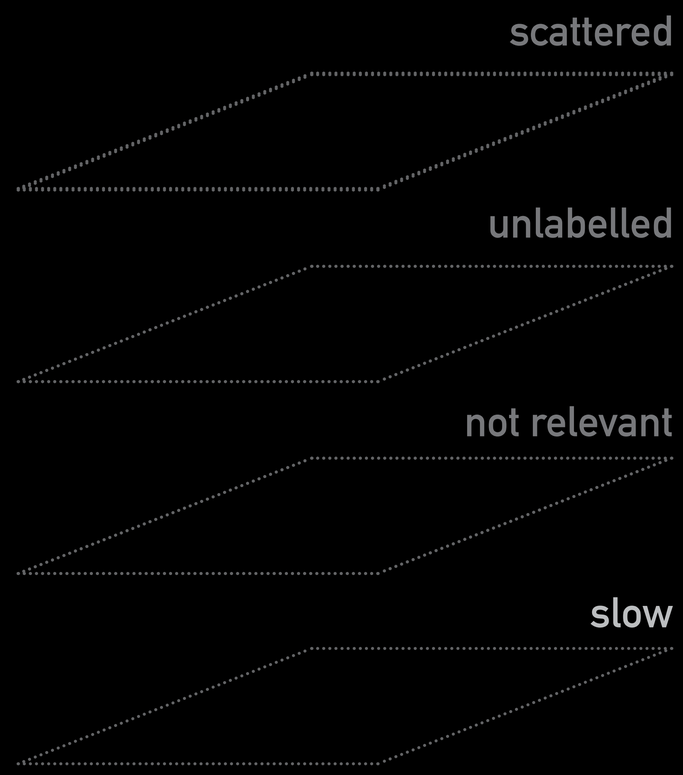
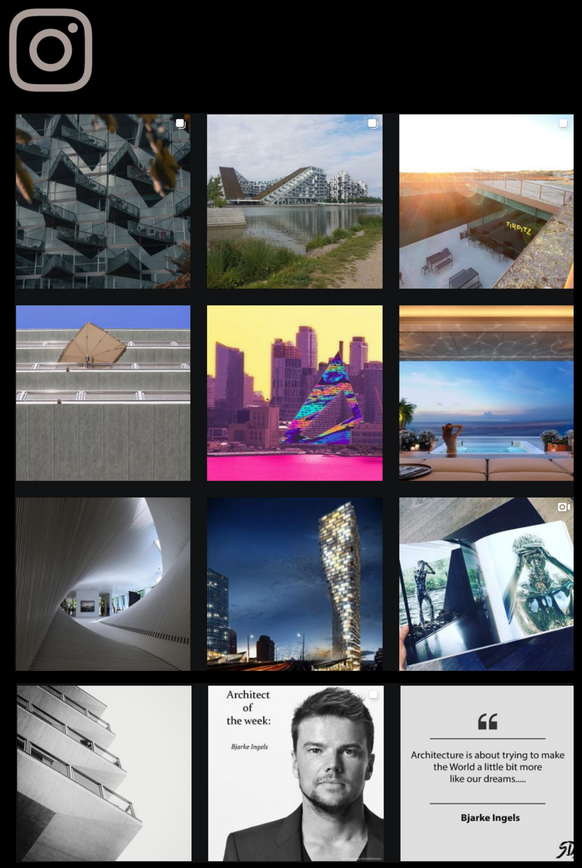


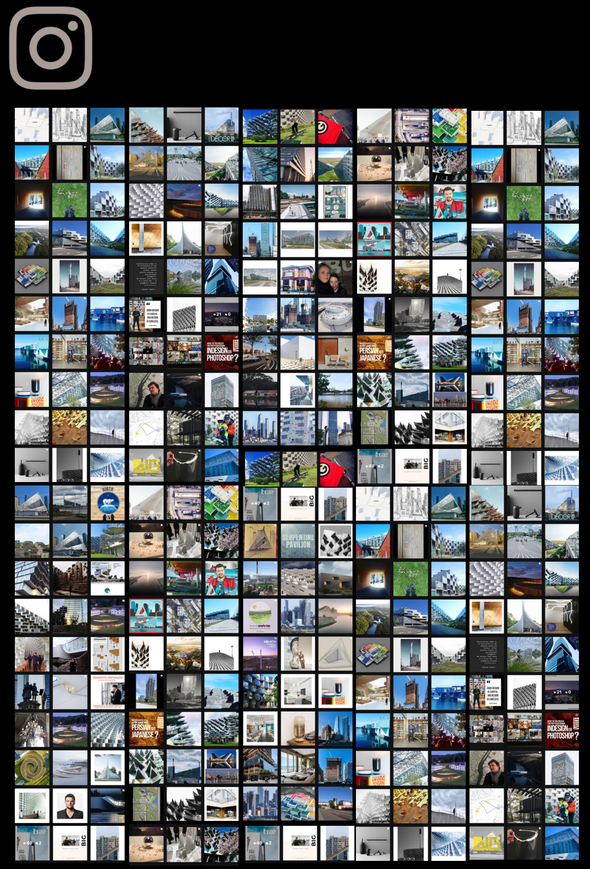


scattered

unlabelled

not relevant

slow

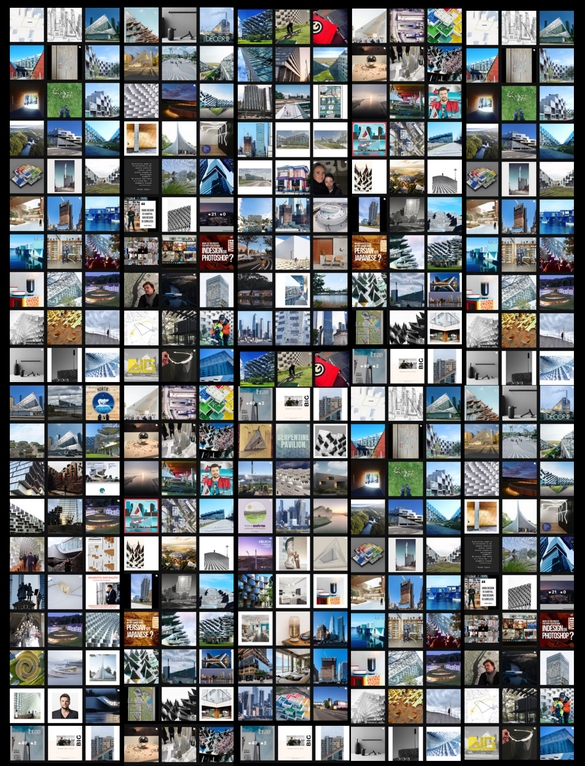


scattered

unlabelled

not relevant

slow



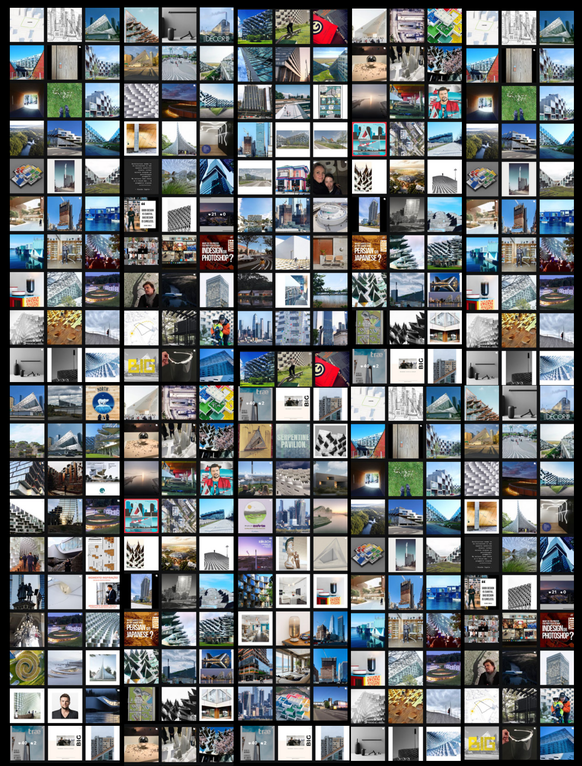
MANUAL COLLECTION

Time: **1m 50 sec / 10 images**

- screen capture
- sort
- label

Batch: **3 hrs / 1,000 images**

30 hrs / 10,000 images



ARCHI_BASE autonomous collection

Time: 15.15 sec / 10 images

- find & scrape
- label & sort
- download

Batch: 11 min / 1,000 images

1.6 hrs / 10,000 images

MANUAL COLLECTION

Time: 1m 50 sec / 10 images

- screen capture
- scroll
- sort

Batch: 3 hrs / 1,000 images

30 hrs / 10,000 images

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AUTOMATED COLLECTION

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- scrape
- sort
- download

Batch: 11 min / 1,000 images

1.6 hrs / 10,000 images

18.75 X faster automatic highly accurate

Why is aggregating architectural data important?

The architectural industry is experiencing an AI driven rennaisance that is drastically transforming the way in which buildings are designed and built.

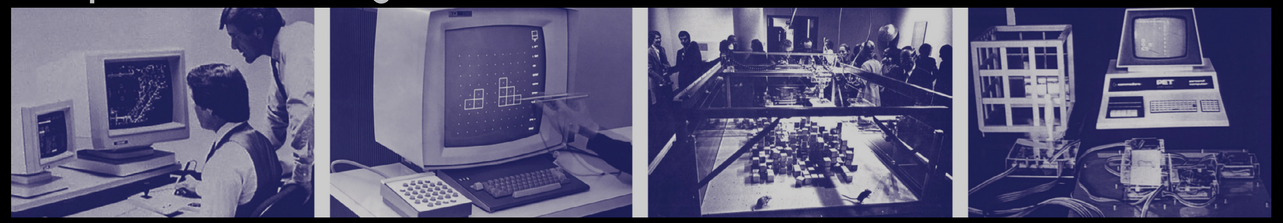
A relationship with technology

1930

modular design

1960

computer aided design

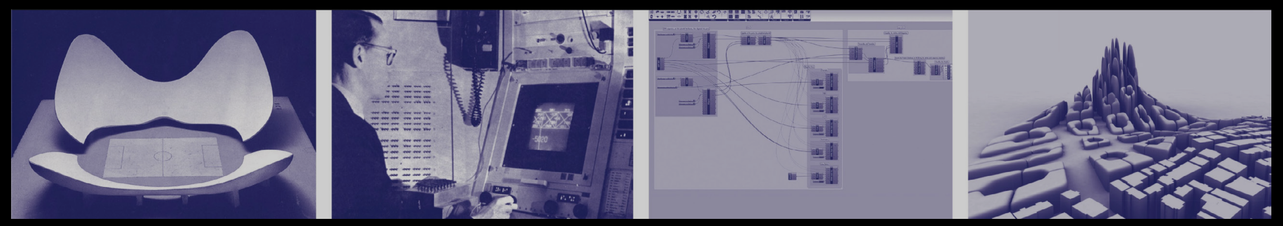


Artificial Intelligence is finally undertaking image creation, a fundamental medium in the practice of architectural design. Indeed, the image has emerged in architecture as the central mean of drawing and designing cities. It is, therefore, an obvious bridge between artificial intelligence and architecture.

- Stanislau Chaillou

2000

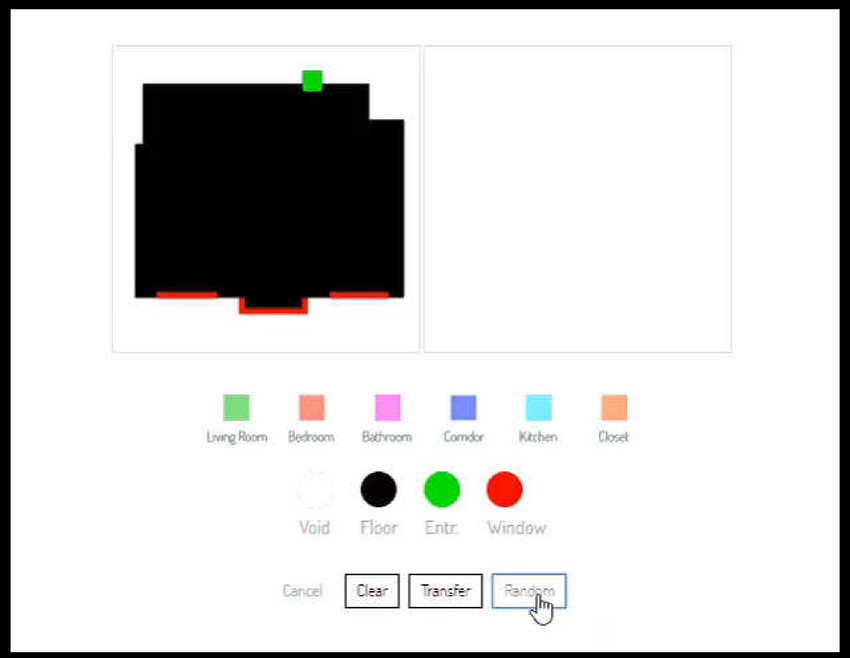
parametric design



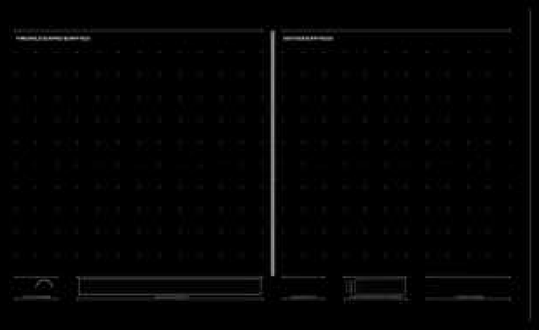
2015
onward

artificial intelligence led design

Autonomous design



Certain Measures



How does Archi_base work?

Archi_base is a 3-step pipeline that leverages ML & AI technology to build very large databases of custom architectural imagery for deep learning projects.

How does Archi_base work?

ResNet Image Classifer

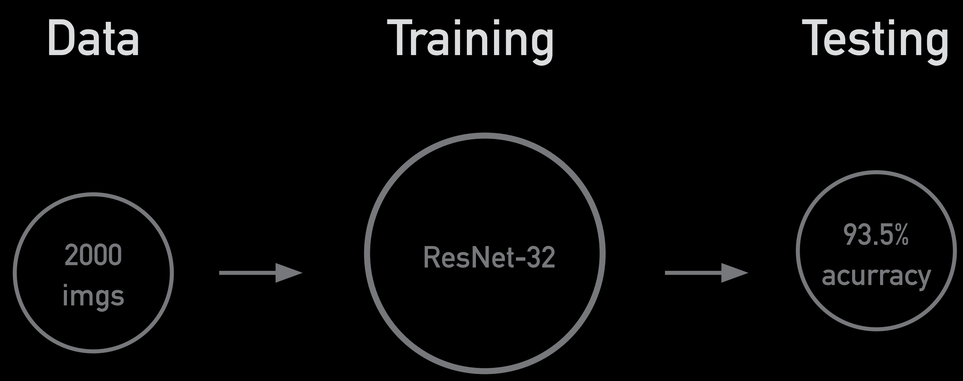
Web Image Scraper

Image predictor & sorter

ResNet Image Classifer

Web Image Scraper

Image predictor & sorter



total
• 2000 images

architectural
(Zaha Hadid)
• street: 300
• interior: 300
• closeup: 300
• aerial: 300
• texture: 300

misc.
• books / posters: 200
• people: 100
• drawings / sketches: 200

Type:
• Resnet-32 &
FastAi backend

Libraries:
• PyTorch library
for computer vision

epochs
• 20

training time
• 25 mins

accuracy
• 93.2 %

training loss
• 0.082

testing loss
• 0.221

ResNet Image Classifer

Web Image Scraper

Image predictor & sorter

Data

Training

Testing

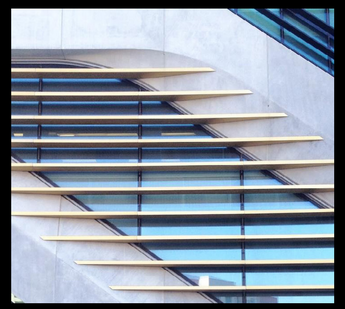
2000
imgs

aerial

street

close-up

texture



interior

ResNet Image Classifer

Web Image Scraper

Image predictor & sorter

Data

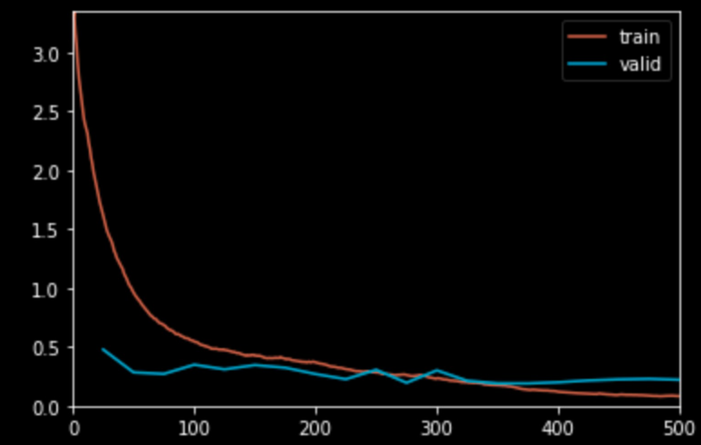
Training

Testing

ResNet-32

scores

epoch	train_loss	valid_loss	accuracy	time
0	1.663365	0.477455	0.850000	02:37
1	0.980022	0.283897	0.910000	01:16
2	0.691287	0.270999	0.915000	01:16
3	0.551337	0.349041	0.902500	01:16
4	0.478905	0.309997	0.907500	01:16
5	0.433914	0.345890	0.902500	01:16
6	0.402701	0.323627	0.895000	01:14
7	0.373118	0.269987	0.900000	01:13
8	0.315268	0.226447	0.905000	01:17
9	0.285231	0.305518	0.915000	01:16
10	0.264219	0.195655	0.942500	01:14
11	0.230233	0.300807	0.915000	01:17
12	0.200659	0.212528	0.940000	01:14
13	0.176079	0.190591	0.945000	01:15
14	0.137951	0.189999	0.937500	01:14
15	0.121763	0.199747	0.935000	01:18
16	0.103091	0.215356	0.922500	01:18
17	0.092752	0.224449	0.927500	01:21
18	0.088024	0.228941	0.930000	01:18
19	0.082835	0.221231	0.932500	01:16



ResNet image classifiers

deep residual learning neural

networks for image recognition

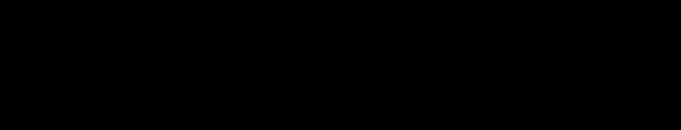
ResNet image classifiers

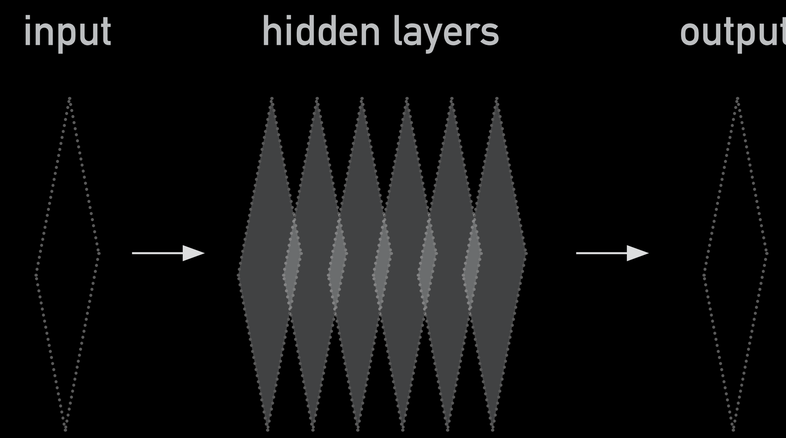
deep residual learning neural networks for image recognition

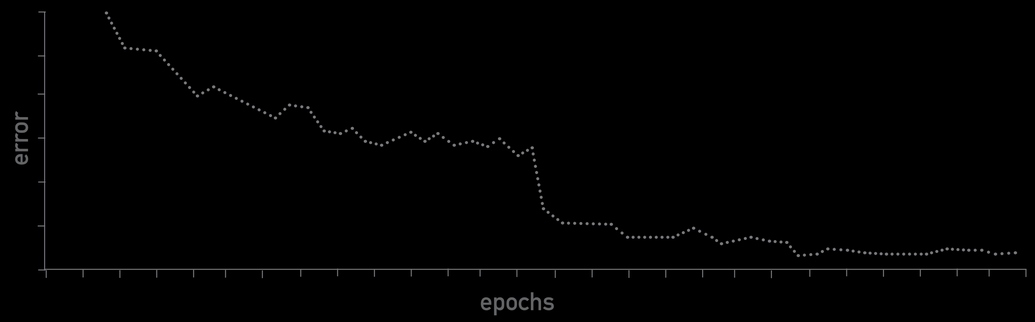
microsoft research department

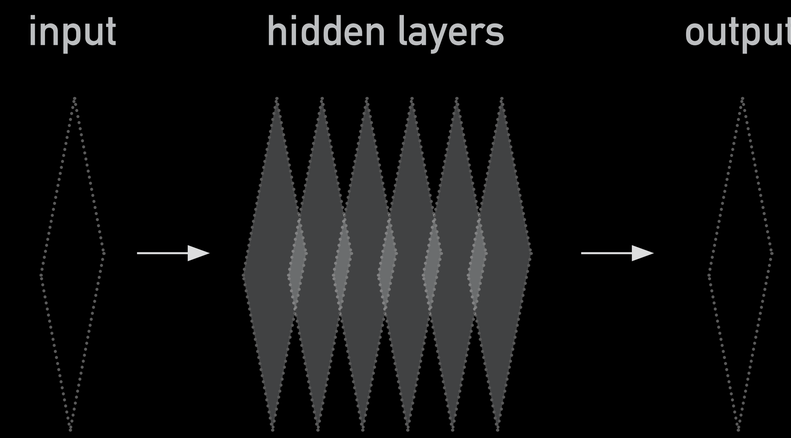
2015 publicly available paper

vanilla neural network

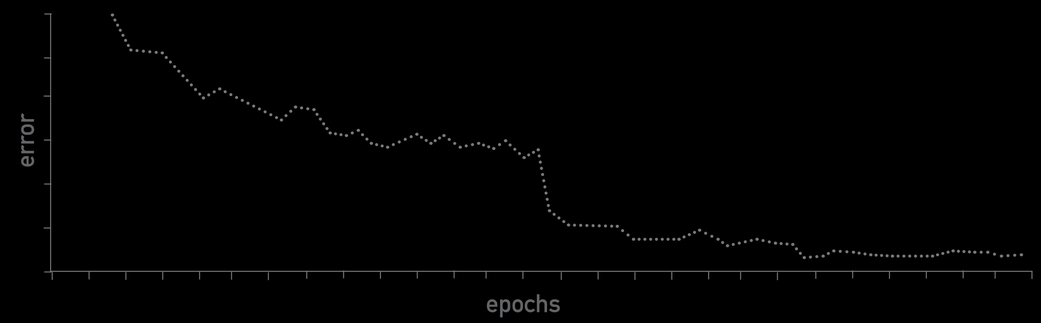


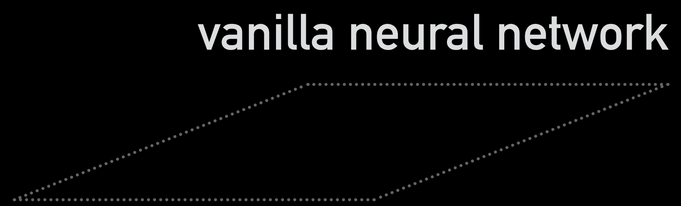


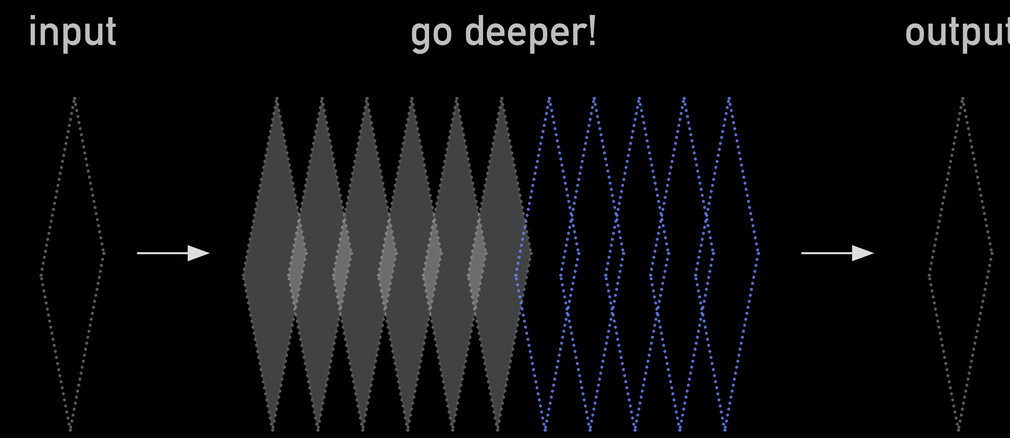


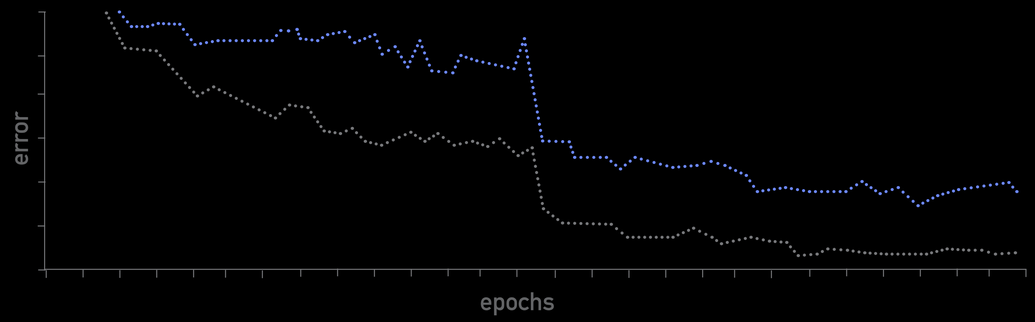


vanilla neural network


error
epochs


vanilla neural network

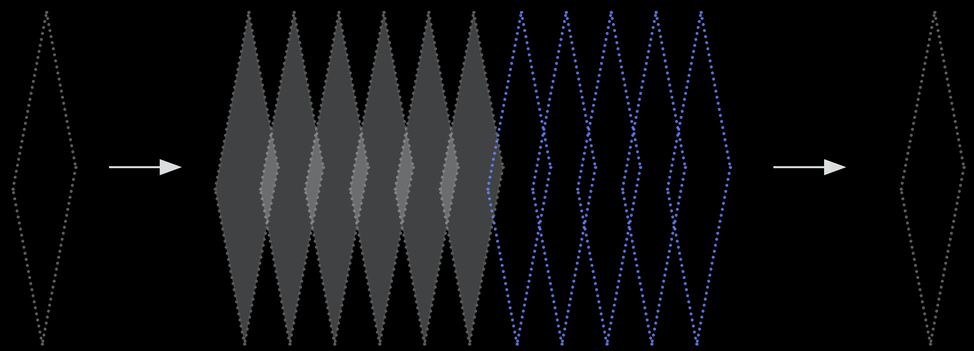

input
go deeper!
output



input

go deeper!

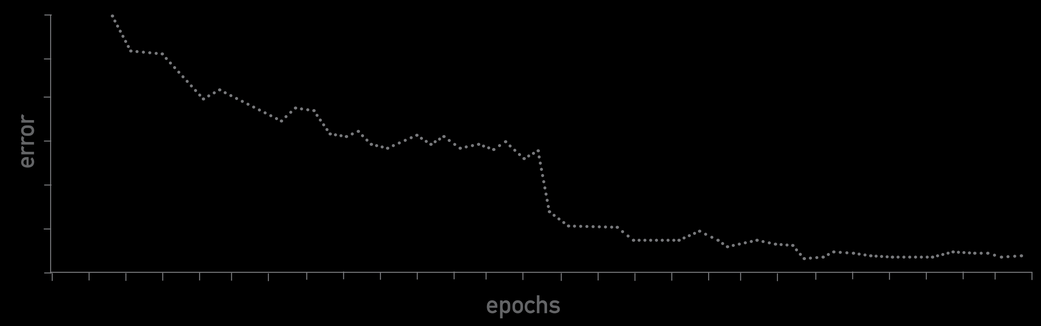
output

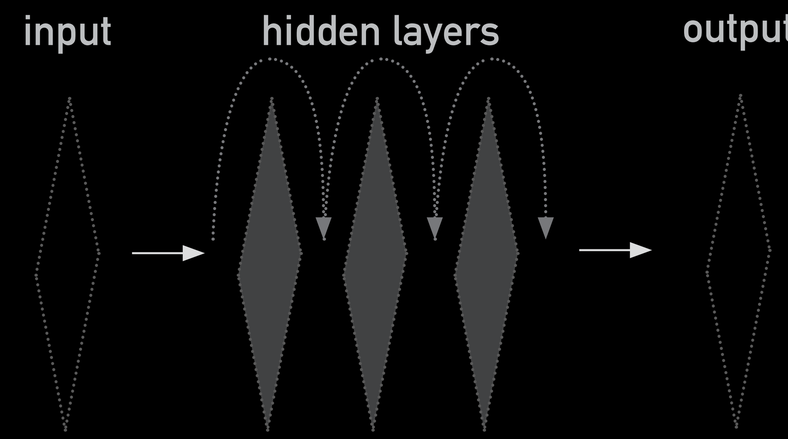


vanilla neural network

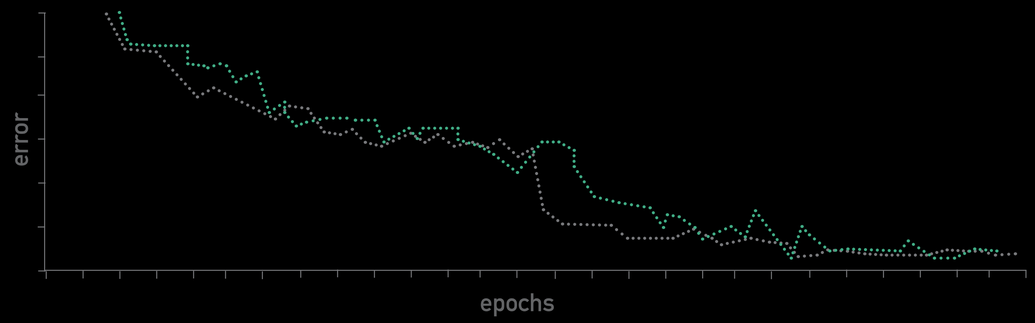
information loss

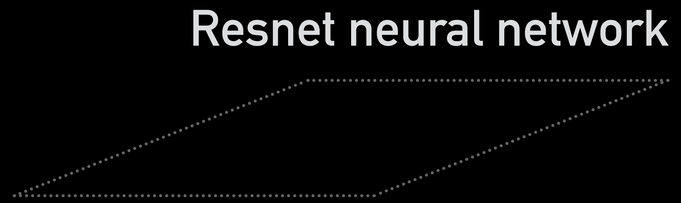
(increased error rate)

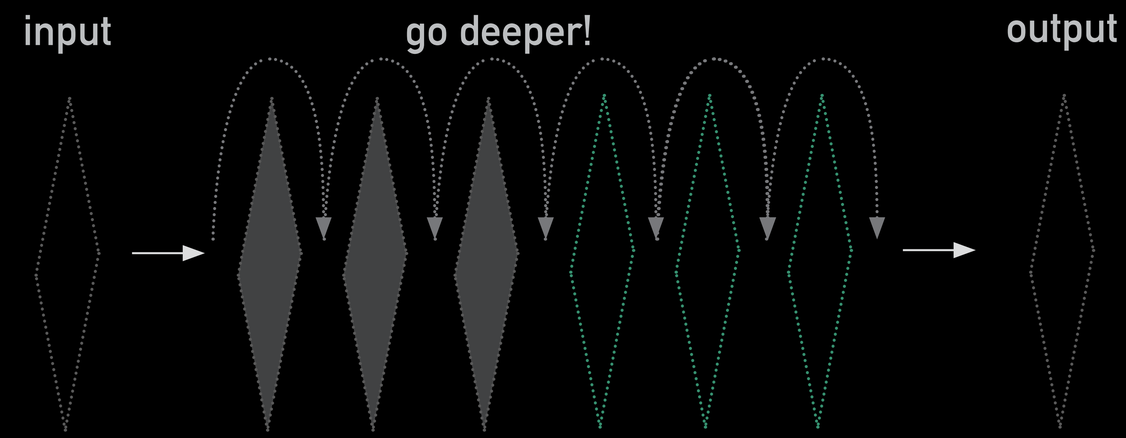




Resnet neural network







information maintained
and carried forward

ResNet Image Classifer

Web Image Scraper

Image predictor & sorter

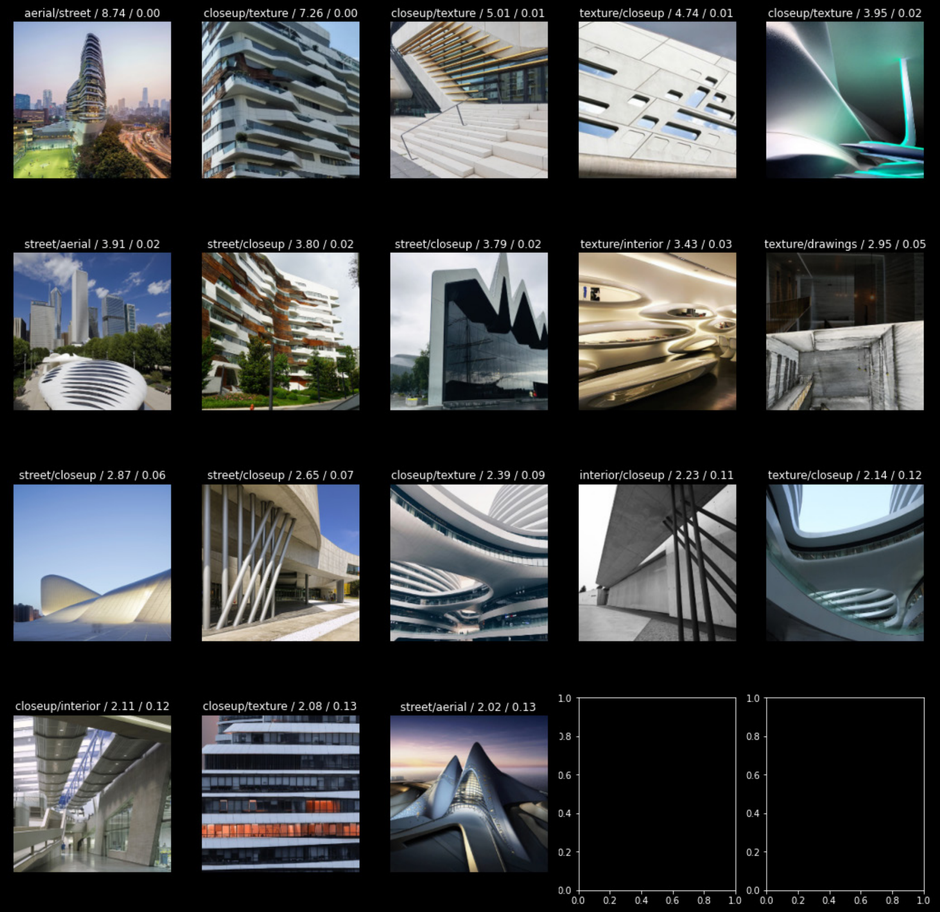
Data

Training

Testing

93.5%
acurracy

prediction vs. actual loss



ResNet Image Classifer

Web Image Scraper

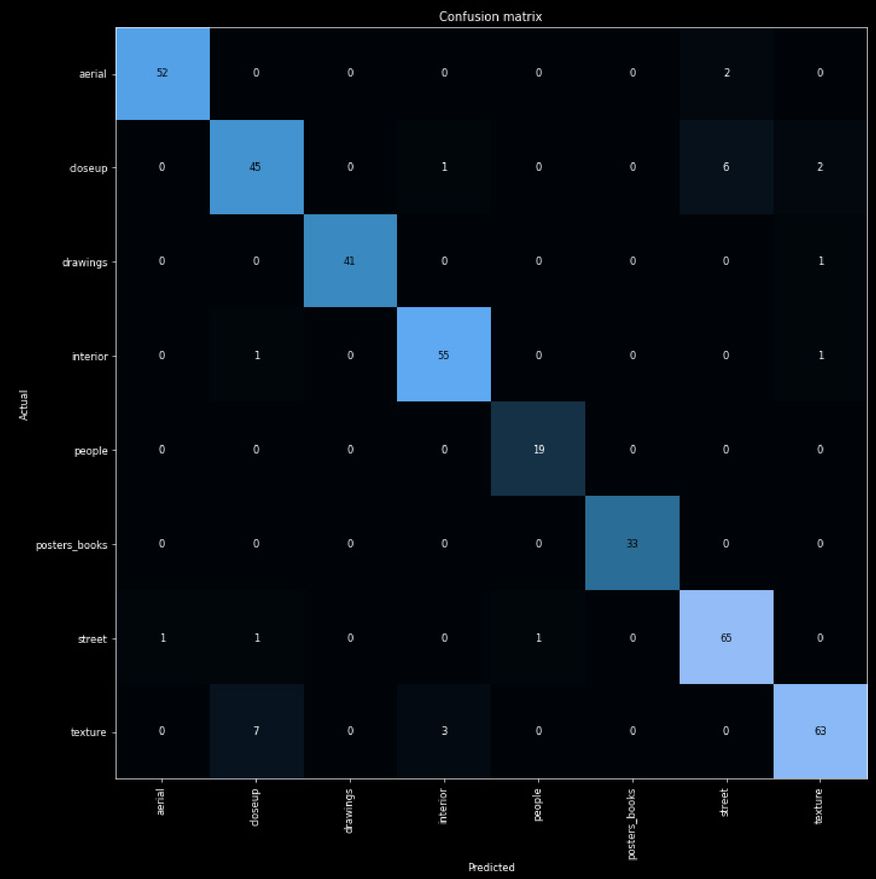
Image predictor & sorter

Data

Training

Testing

confusion matrix



ResNet Image Classifer

Web Image Scraper

Image predictor & sorter

Instagram

choose your target:

architect / office / style

(ex. Bjarke Ingels Group)

select # of images:

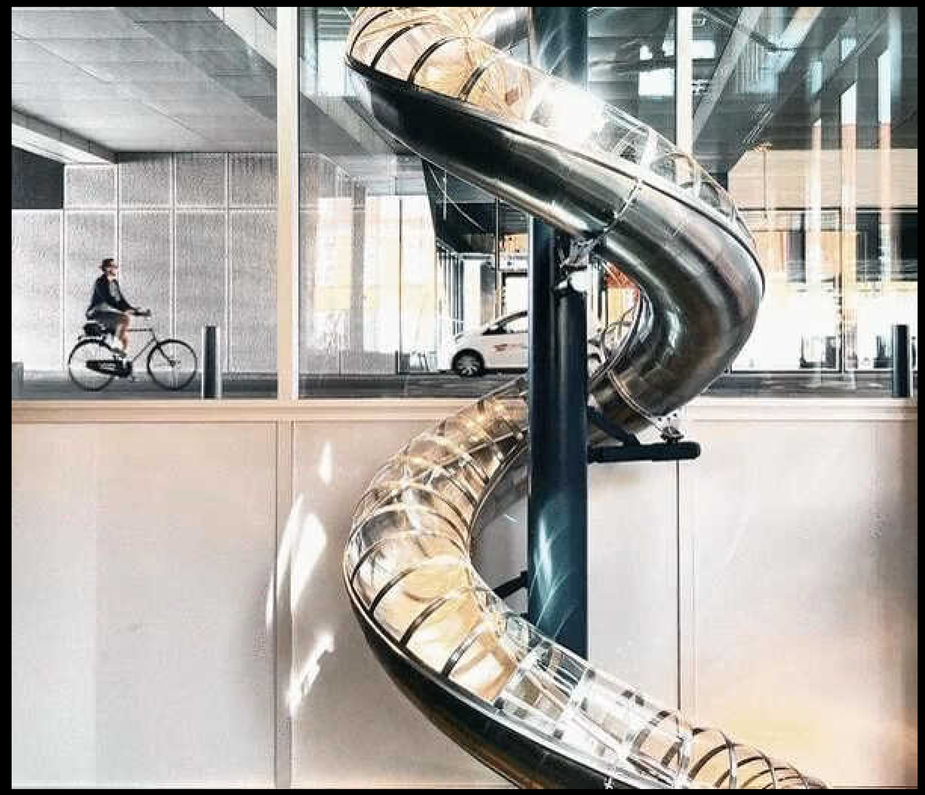
unlimited

ResNet Image Classifer

Web Image Scraper

Image predictor & sorter

Unsorted images directly from instagram



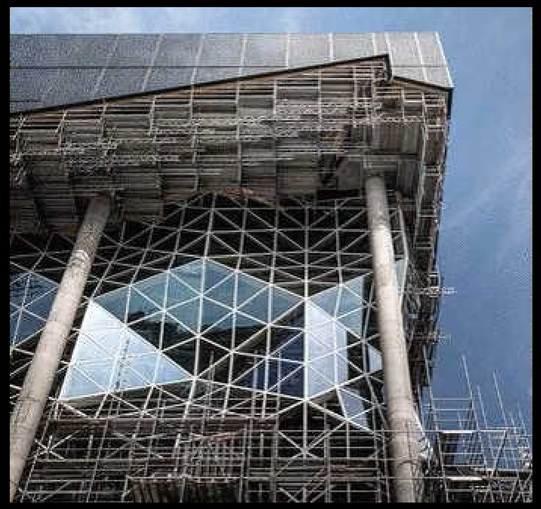
ResNet Image Classifer

Web Image Scraper

Image predictor & sorter

Images class prediction and sorting

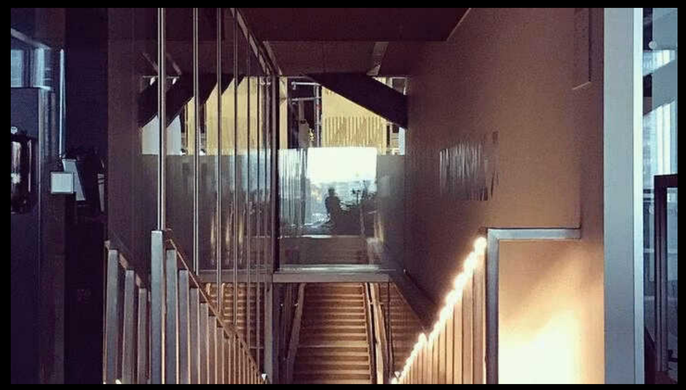
street



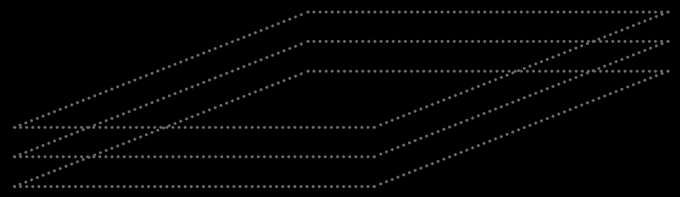
close-up

texture

interior



Stacked Workflow

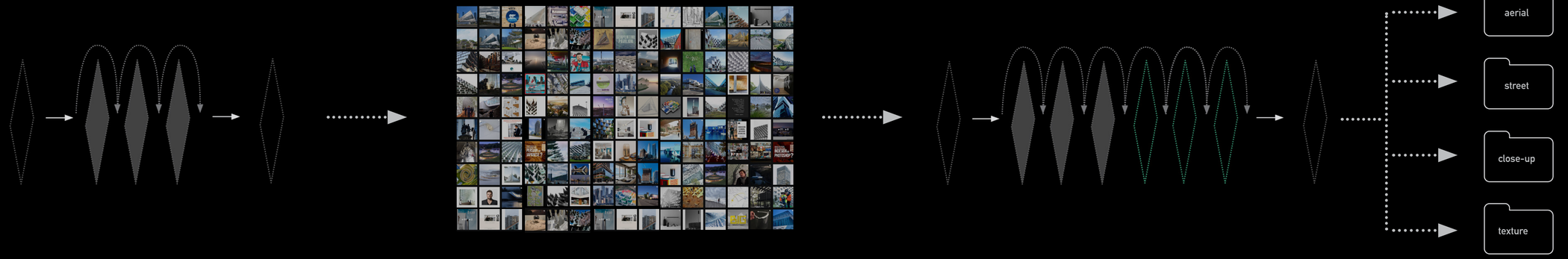


Build ResNet
Image Classifer

Scrape Target
Images

Predict Image
Class

Sort into
Folders



ARCHI_BASE

MANUAL COLLECTION

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30 hrs / 10,000 images

AUTOMATED COLLECTION

Time: 15.15 sec / 10 images

- scrape
- sort
- download

Batch: 11 min / 1,000 images

1.6 hrs / 10,000 images

18.75 X faster automatic highly accurate

ARCHI_BASE

The fastest and easiest way to make custom, large, and robust architectural imagery data-set for AI deep learning projects

Future Improvements

1_ Improve model efficiency and increase speed of:

1. Instagram Scraper: download speeds slow
2. RNN training model:
2. Predictor: 1 classification / sec is not very good

2_ Scrape multiple hashtags and from multiple sources at once

1. Currently can only scrape one entry from one source
2. Scrape multiple specific buildings from google, instagram, flickr, pinterest at once

3_ Improve models performance

1. Many images that don't associate with any classes
2. Determine how to make more specific classes
3. Remove blackbox element and determine ways to reveal how classifications are being done (heatmap)

ARCHI_BASE

YOUR CUSTOM ARCHITECTURE DATASET