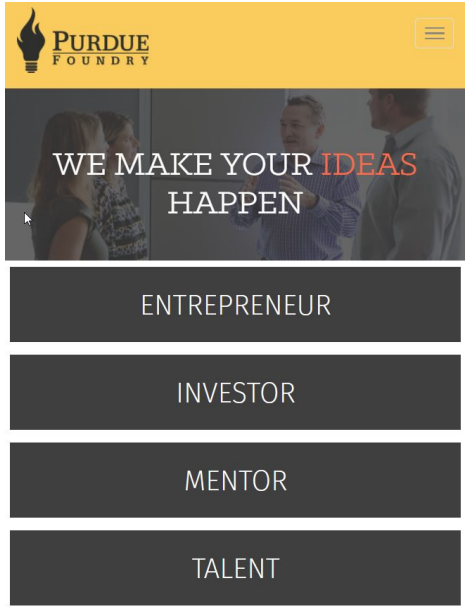
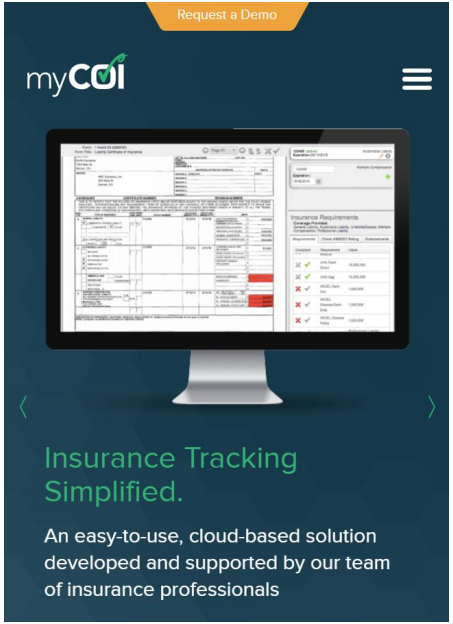
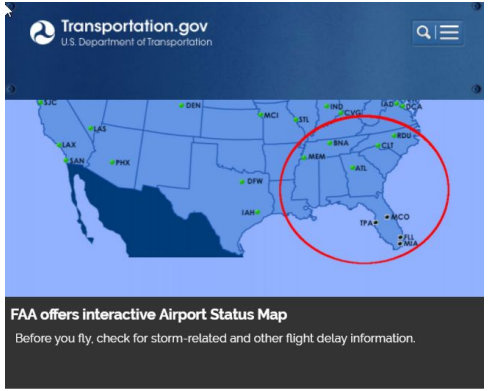
Kyler Nunery

https://goo.gl/2pQYdG



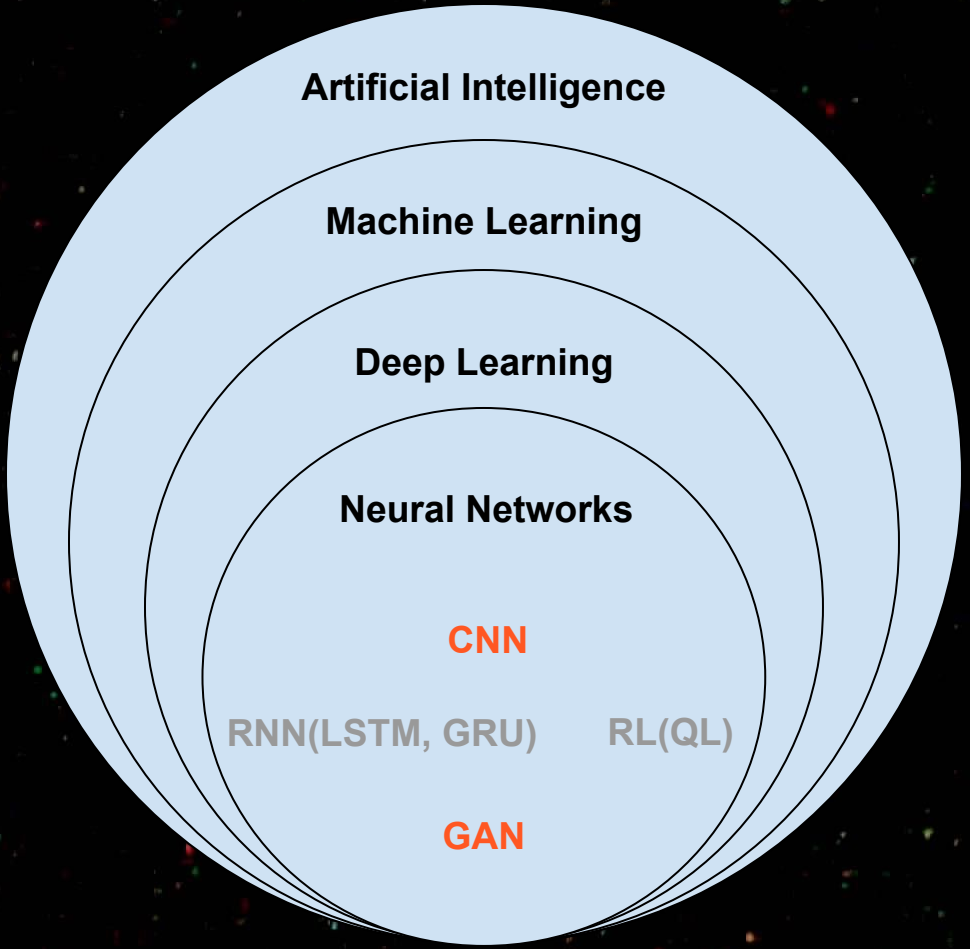




How to spot opportunity:

"Look for disrupting technology that creates a gap between how things have been done and how they can be done."

- Aaron Levie (Box CEO)


Artificial Intelligence
Machine Learning
Deep Learning
Neural Networks
CNN
RNN(LSTM, GRU)
RL(QL)
GAN

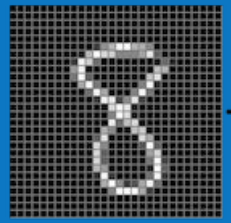
Neural Network Hello World

MNIST

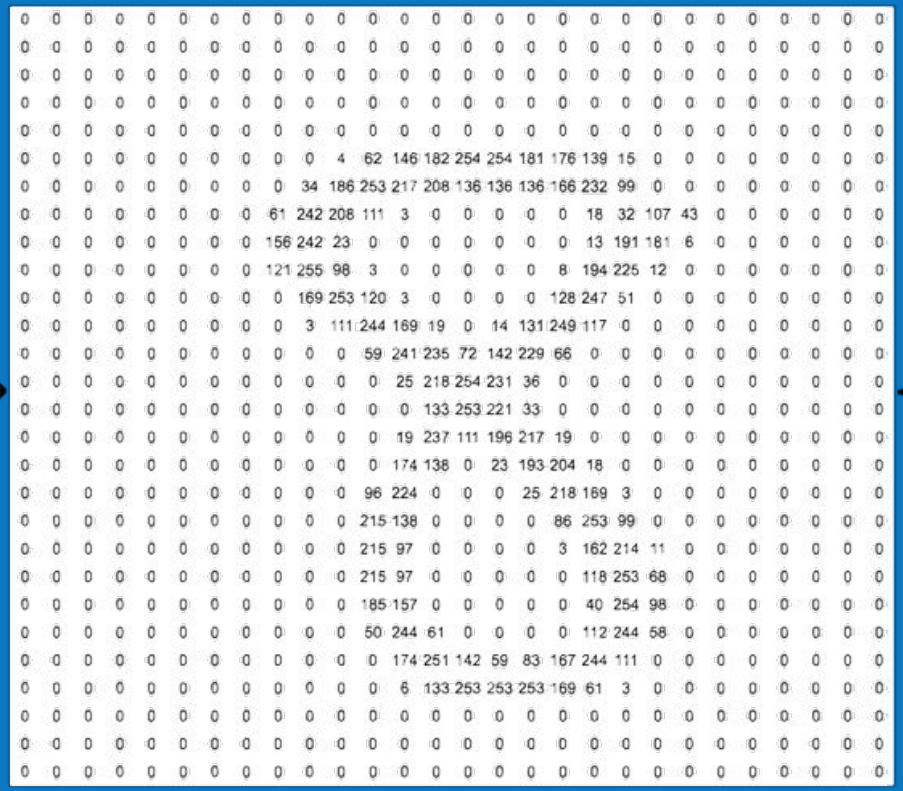
MNIST

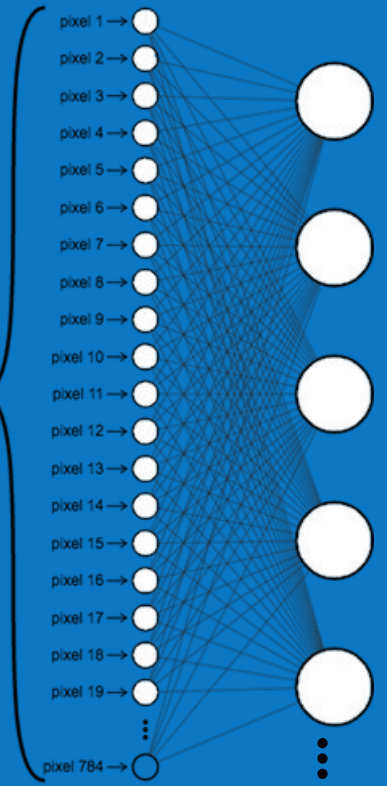
784 input neurons

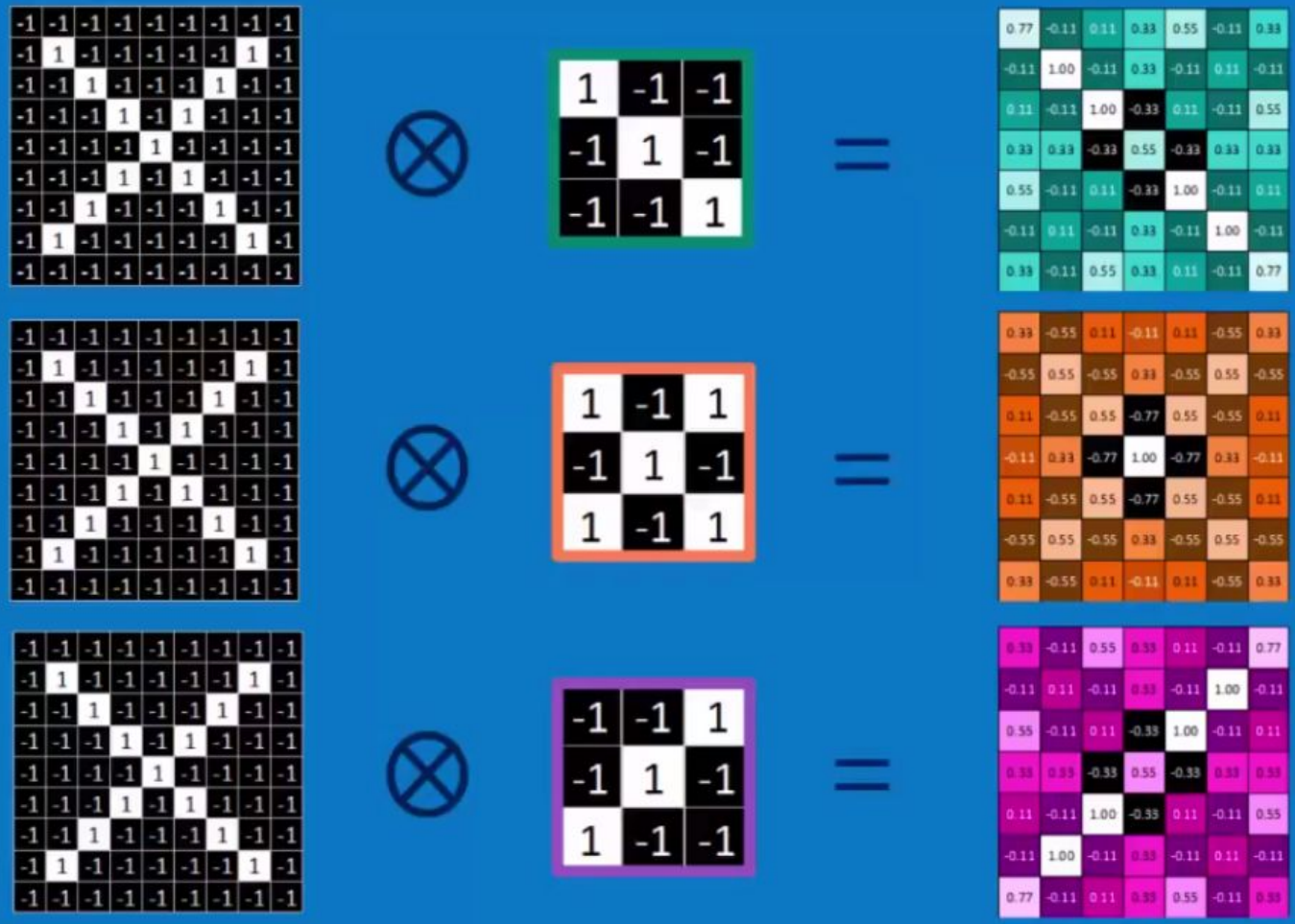
10 output neurons



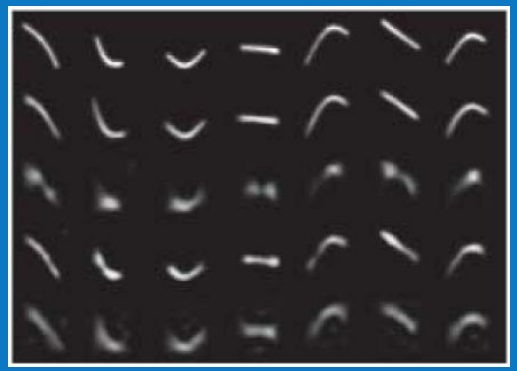
28 x 28
784 pixels

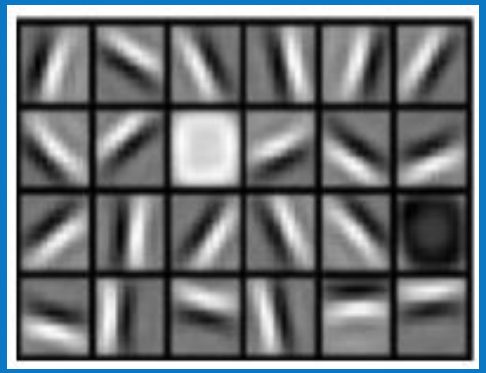





-1 -1 -1 -1 -1 -1 -1 -1 -1
-1 1 -1 -1 -1 -1 -1 1 -1
-1 -1 1 -1 -1 -1 1 -1 -1
-1 -1 -1 1 -1 1 -1 -1 -1
-1 -1 -1 -1 1 -1 -1 -1 -1
-1 -1 -1 1 -1 1 -1 -1 -1
-1 -1 1 -1 -1 -1 1 -1 -1
-1 1 -1 -1 -1 -1 -1 1 -1
-1 -1 -1 -1 -1 -1 -1 -1 -1
1 -1 -1
-1 1 -1
-1 -1 1
0.77 -0.11 0.11 0.33 0.55 -0.11 0.33
-0.11 1.00 -0.11 0.33 -0.11 0.11 -0.11
0.11 -0.11 1.00 -0.33 0.11 -0.11 0.55
0.33 0.33 -0.33 0.55 -0.33 0.33 0.33
0.55 -0.11 0.11 -0.33 1.00 -0.11 0.11
-0.11 0.11 -0.11 0.33 -0.11 1.00 -0.11
0.33 -0.11 0.55 0.33 0.11 -0.11 0.77
1 -1 1
-1 1 -1
1 -1 1
0.33 -0.55 0.11 -0.11 0.11 -0.55 0.33
-0.55 0.55 -0.55 0.33 -0.55 0.55 -0.55
0.11 -0.55 0.55 -0.77 0.55 -0.55 0.11
-0.11 0.33 -0.77 1.00 -0.77 0.33 -0.11
0.11 -0.55 0.55 -0.77 0.55 -0.55 0.11
-0.55 0.55 -0.55 0.33 -0.55 0.55 -0.55
0.33 -0.55 0.11 -0.11 0.11 -0.55 0.33
-1 -1 1
-1 1 -1
1 -1 -1
0.33 -0.11 0.55 0.33 0.11 -0.11 0.77
-0.11 0.11 -0.11 0.33 -0.11 1.00 -0.11
0.55 -0.11 0.11 -0.33 1.00 -0.11 0.11
0.33 0.33 -0.33 0.55 -0.33 0.33 0.33
0.11 -0.11 1.00 -0.33 0.11 -0.11 0.55
-0.11 1.00 -0.11 0.33 -0.11 0.11 -0.11
0.77 -0.11 0.11 0.33 0.55 -0.11 0.33

Convolutional Neural Network (CNN)

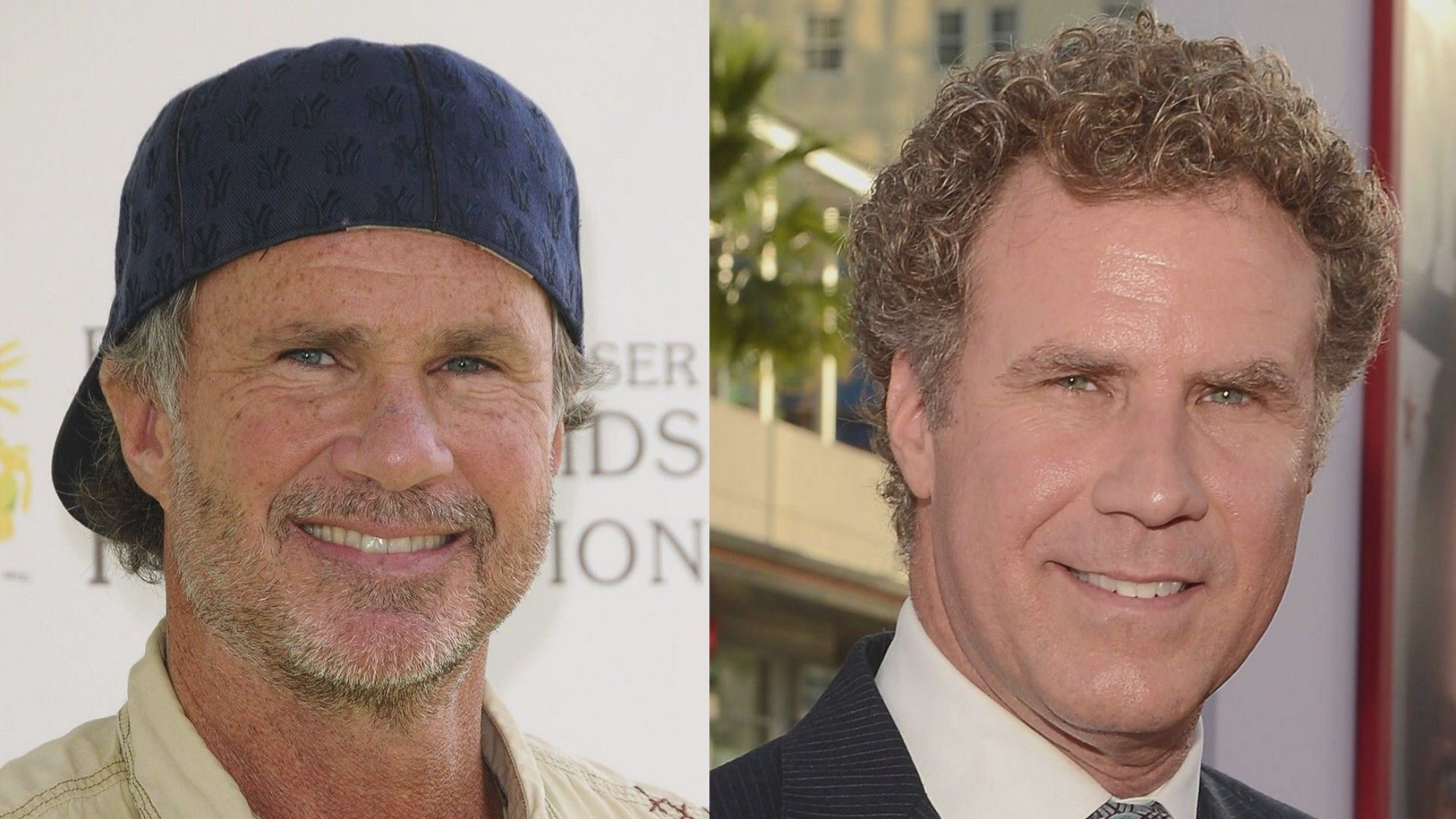




Automated Feature Engineering

- Instead of hand coding features... ex: an ear should be taller than it is wide, and have contrast ridges in proportion to the height...

- Through training, it learns features itself, *with more advanced features than we could have coded.*



Why Now?

BIG
DATA
ANALYTICS
TECHNOLOGIES
STORAGE
INFORMATION
SOFTWARE
INTERNET
SIZE
NEEDED
PETABYTES
SHARED
TIME
SYSTEMS
NETWORKS
RECORDS
MANAGEMENT
LARGE
SOCIAL
COMPLEX
DATABASES
RESEARCH
SETS
EXAMPLES
ABILITY
HUNDREDS
SEARCH
INCLUDE
DISK

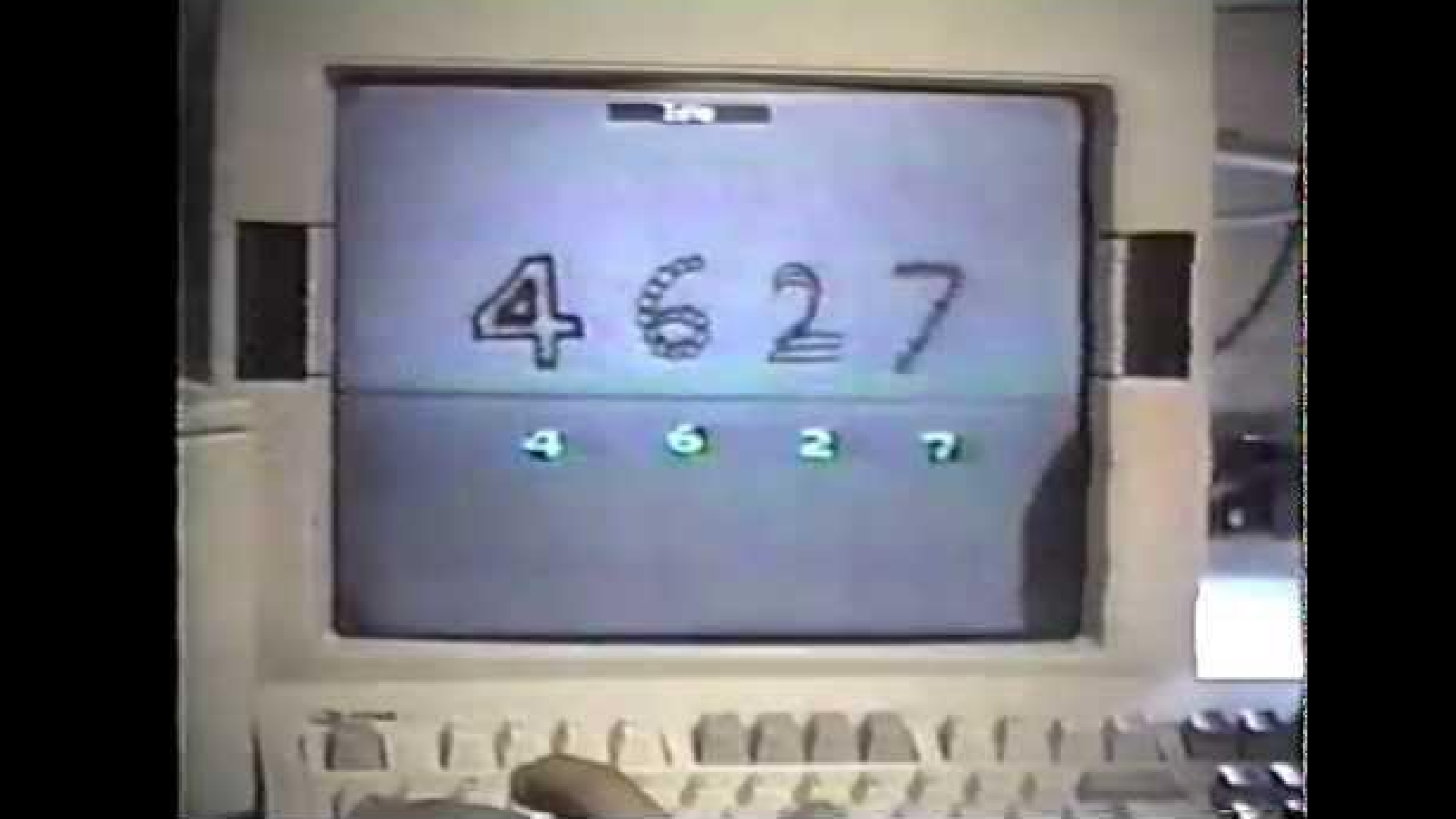
+

ZOTAC
AMP!
EDITION

=

Ai

Yann LeCun


4627
4 6 2 7

Quickdraw

Classification

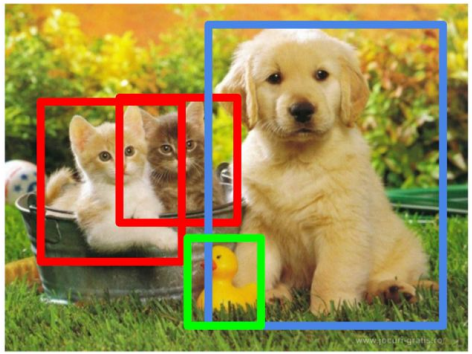
CAT

Classification + Localization

CAT

Single object

Object Detection



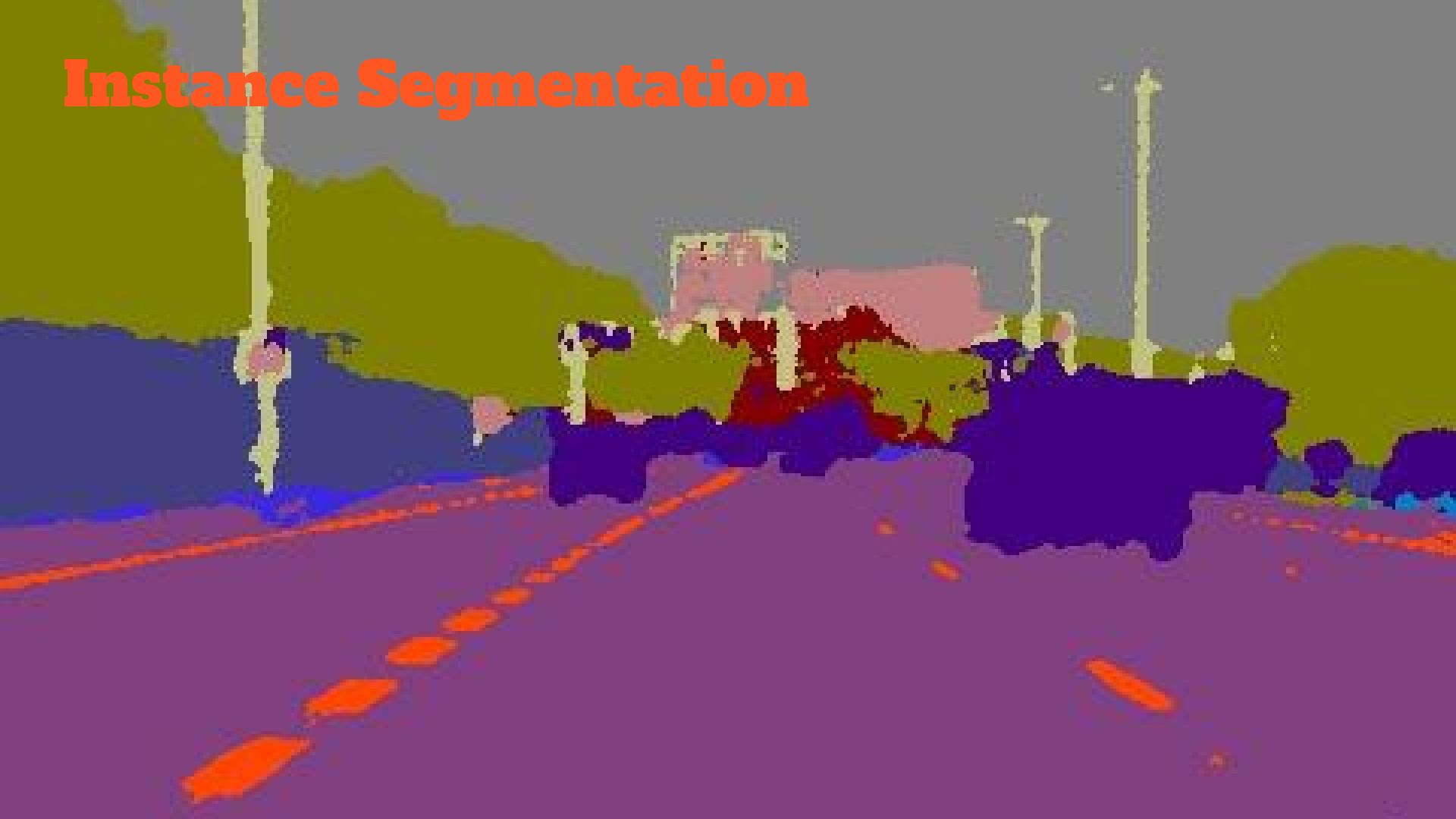
CAT, DOG, DUCK

Instance Segmentation

CAT, DOG, DUCK

Multiple objects

Object Detection


Instance Segmentation

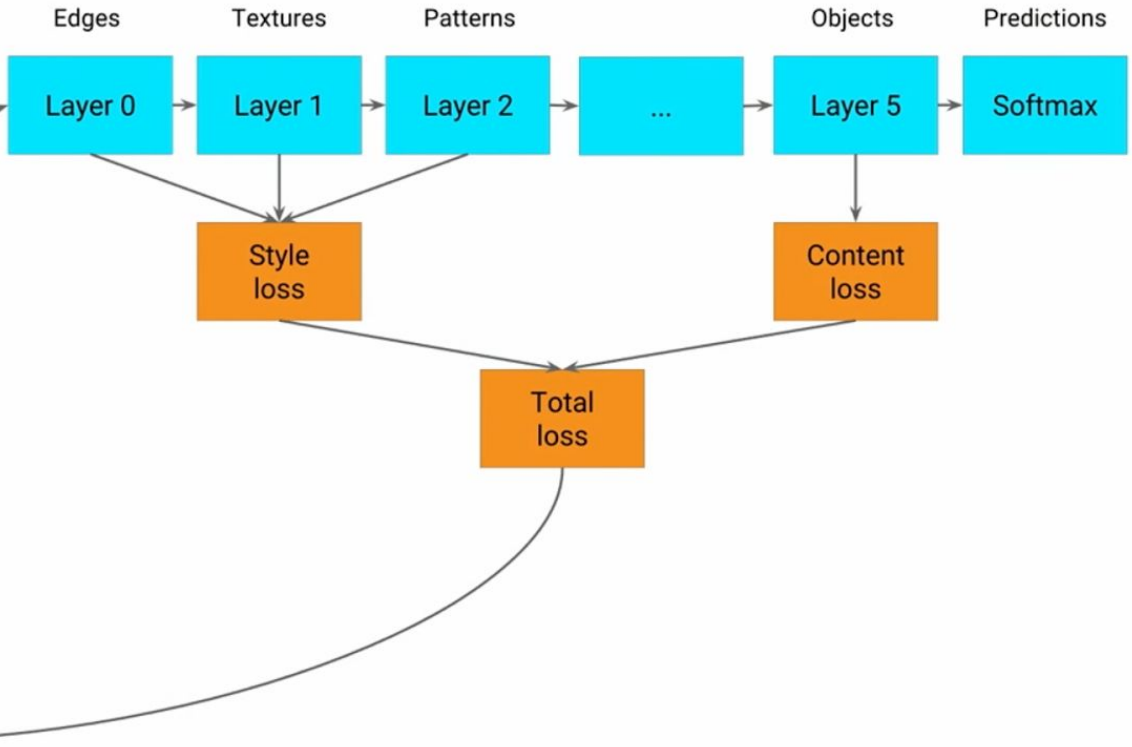
Style Transfer

Style Transfer

Style

Content

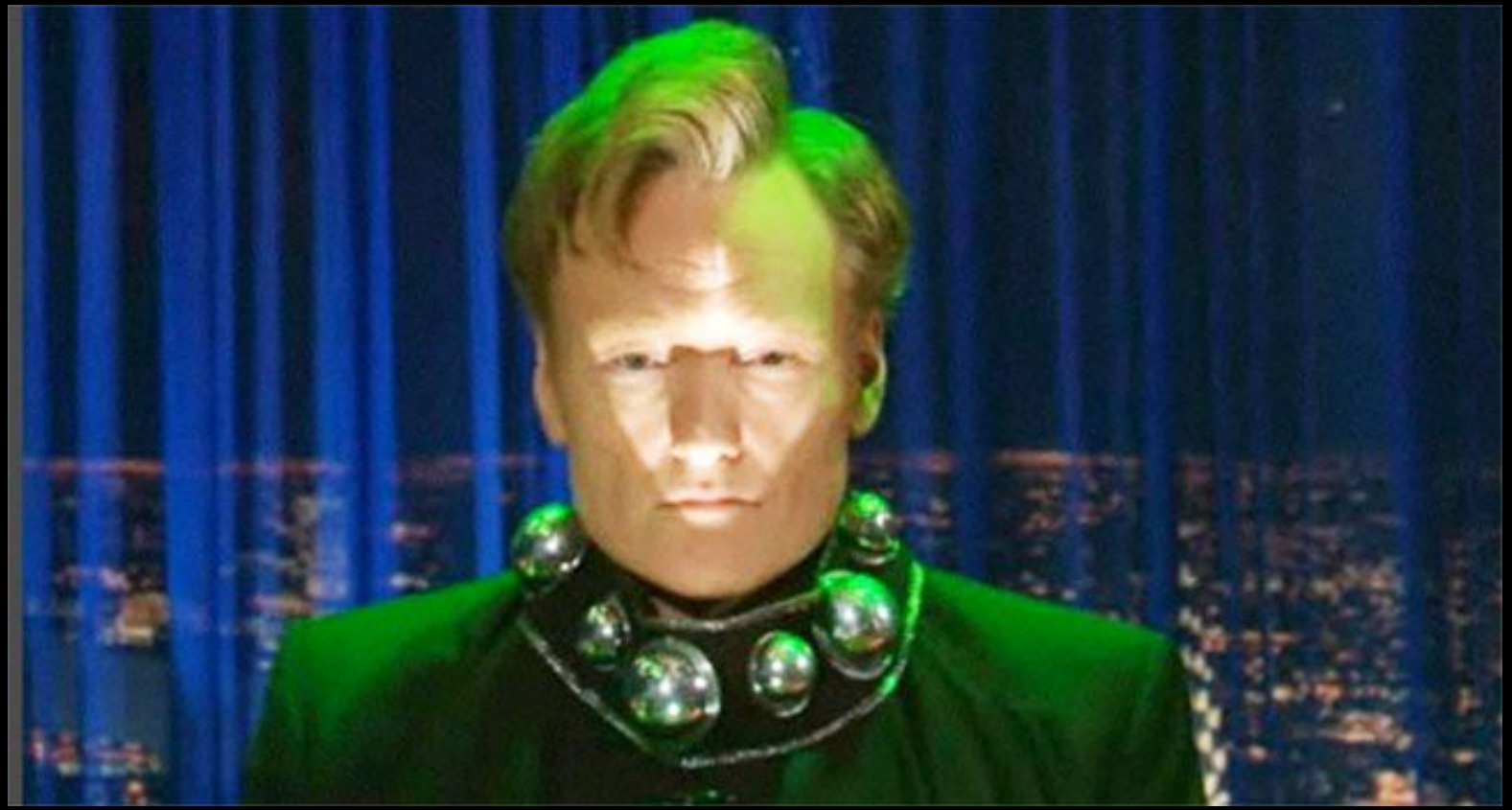
Target



Deep Image Analogy

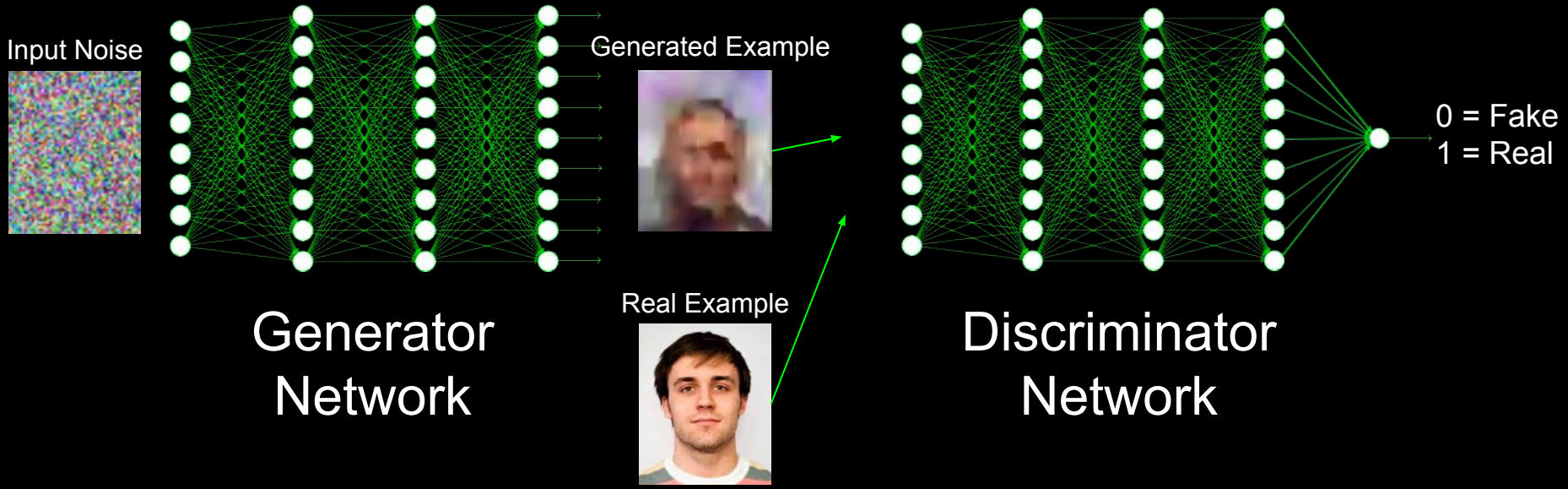
Freiburger Münsterplatz

Where is all this going?



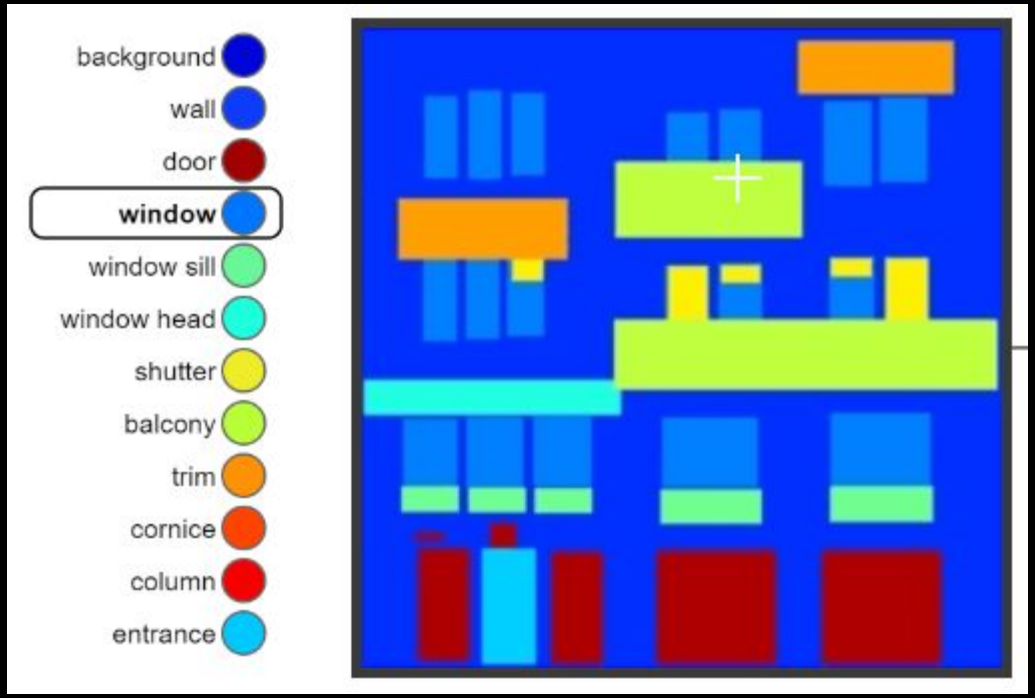
The Cutting Edge

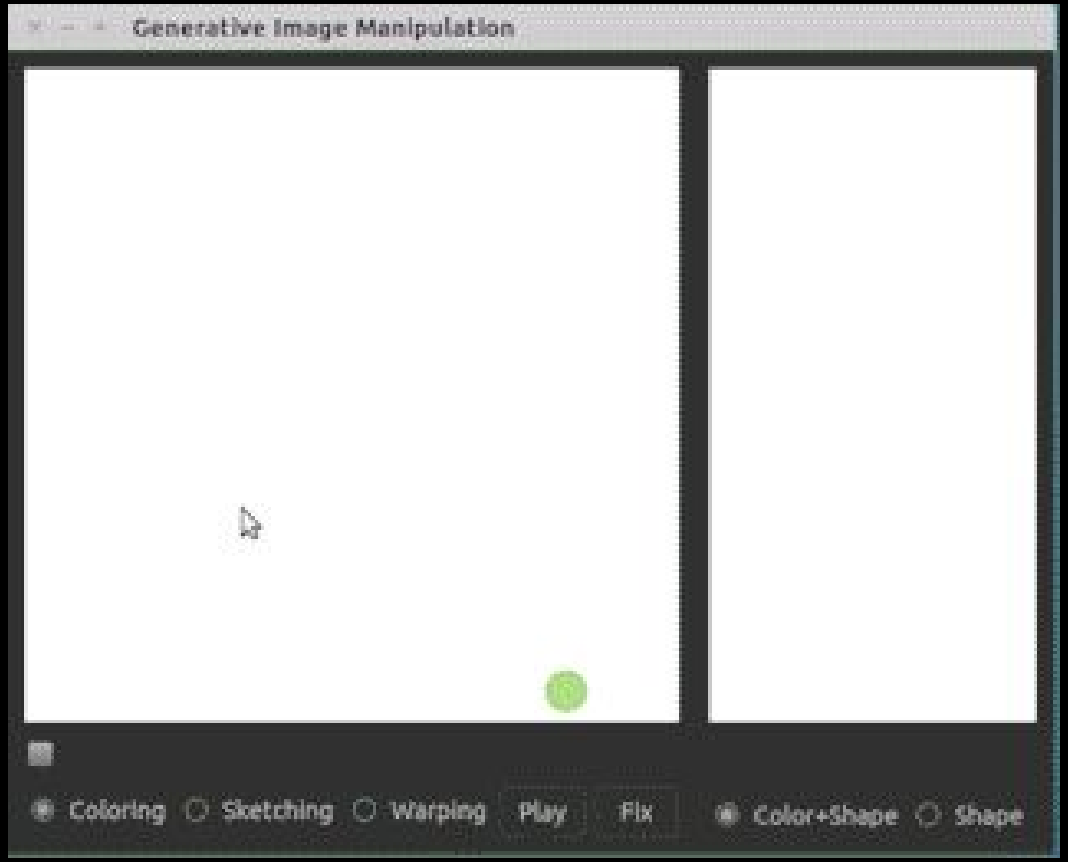
GAN (Generative Adversarial Network) - can *generate* content

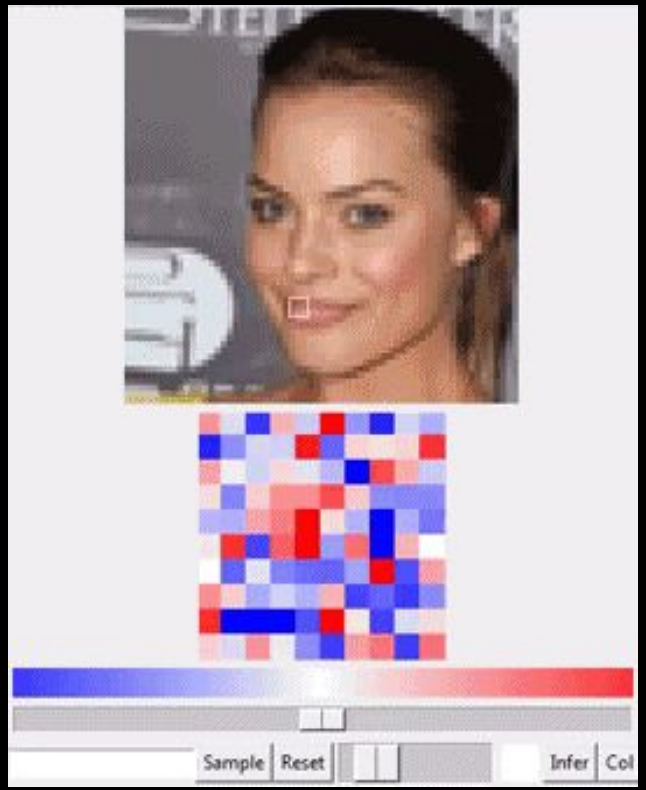


Noise to image

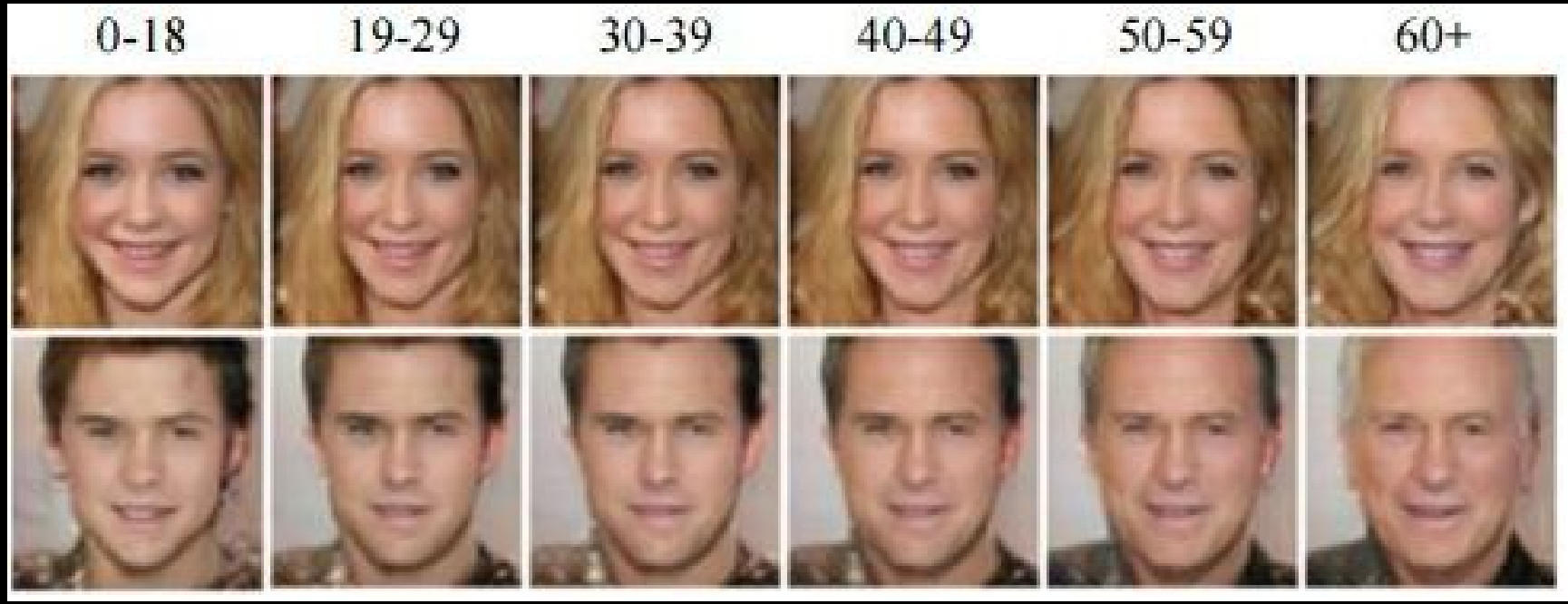
The Cutting Edge
Ian Goodfellow


background
wall
door
window
window sill
window head
shutter
balcony
trim
cornice
column
entrance


Generative Image Manipulation
Coloring
Sketching
Warping
Play
Fix
Color+Shape
Shape


Sample
Reset
Infer
Col

Zebputin !


0-18
19-29
30-39
40-49
50-59
60+

FaceApp

Make them smile

Meet your future self

Look younger

Change gender

input 2D image

output textured 3D face (Jack Ma)

Face Image to 3d Model

Not just *image* recognition & generation

Instead of...

Pixels ➜ numbers in array

How about...

Sound ➜ numbers in array	...Shazam
Words ➜ numbers in array	...Sentiment Analysis
Activity ➜ number in array	...Fraud Detection

Synthesized voice

Source Actor

Real-time Reenactment

Reenactment Result

This bird has a yellow belly and tarsus, grey back, wings, and brown throat, nape with a black face	This bird is white with some black on its head and wings, and has a long orange beak	This flower has overlapping pink pointed petals surrounding a ring of short yellow filaments

Image-to-Image Translation with Conditional Adversarial Networks
Nov 2016

StackGAN: Text to Photo-realistic Image Synthesis with Stacked Generative Adversarial Networks
Dec 2016

Photorealistic Facial Texture Inference Using Deep Neural Networks
Dec 2016

Face Aging with Conditional Generative Adversarial Networks
Feb 2017

Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks
Mar 2017

Tacotron: Towards End-To-End Speech Synthesis
Apr 2017

Learning to Discover Cross-Domain Relations with Generative Adversarial Networks
May 2017

Generative Adversarial Text to Image Synthesis
May 2017

New AI Can Mimic Any Voice
May 2017

Visual Attribute Transfer through Deep Image Analogy
Jun 2017

All in the last 10 months

Frameworks

PYTORCH

Caffe

theano

DL4J
Deeplearning4j

Microsoft
CNTK

CNN & RNN Use Cases

Predict poverty from satellite images
Detect engine noise indicating failure
Detect electrical noise indicating failure
Detect people in security video
Classify ‘handedness’ of galaxy images
Filter SPAM
AR art history tours
Train neurostimulators for pain relief
FMRI ‘thought reader’ reconstruction
Do ‘Neural Forensic’ police work
Identify radar signature of aircraft
Recognize individual faces
Analyze text sentiment

Generate audio from text
Determine meaning from text
Make product recommendations
Predict outcome of court cases
Recommend diagnoses
Add motion to a photo
Predict next frames of a video
Write a caption for an image
Summarize text
Mobile app to detect diabetic retinopathy or skin cancer
Generate music
Generate art

Fin

Machine Learning 'Study Hall'

kylernunery@gmail.com