



DESIGNING MACHINE LEARNING

A Multi-Disciplinary Approach



A wide-angle photograph of a calm sea under a clear, light blue sky. The horizon is visible in the distance, and the water is a deep, vibrant blue.

Where are we?



you

I'm in the middle of this massive, ambiguous design project with no way out

I'm not a technologist, and you're giving me all this new information

I am a technologist, but you aren't giving me enough time to build something

*The best way to see through the fog is
to first look at where you are standing*

Why design ML?

*deconstructing ML
systems as decision
making systems*



*Why
design ML?*

*deconstructing ML
systems as decision
making systems*



Does ML fit the problem?

*The data science
pipeline &
understanding data*



How do I turn ML to UX?

*Does ML fit
the problem?*

*The data science
pipeline &
understanding data*



*Adjacent thinking &
recommendation
systems*

NETFLIX

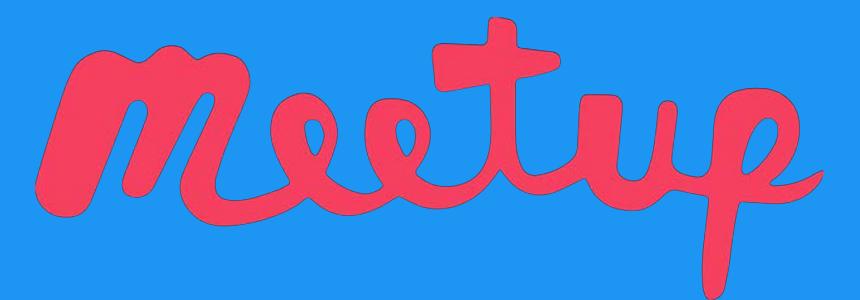
*How do I turn
ML to UX?*

Adjacent thinking &
recommendation
systems



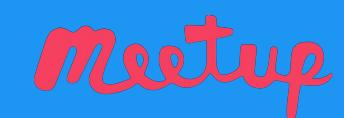
Can ML help me design?

*Clustering and
visualizing data*



*Can ML help
me design?*

*Clustering and
visualizing data*



Empower my imagination

*Neural systems &
complex inference*

Course Overview

*“designer who wants
to work with
technical people”*

*“engineer/scientist who
wants to make products
more human-centered”*

*“non-technical person who wants
to understand what’s going on
inside the system”*

*“product manager
who wants to
prototype ML
solutions”*

*“business person who wants to
know what is possible with ML”*



Course Overview

*Collaborate
Effectively*

*Deconstruct
Systems*

*Integrate
Diverse Values*

*Prototype &
Roadmap*

*Imagine &
Envision*



*Integrate
Diverse Values*

*Collaborate
Effectively*

data designer

*Prototype &
Roadmap*

*Deconstruct
Systems*

*Imagine &
Envision*



*Can ML help
me design?*

*Clustering and
visualizing data*



Empower my imagination

*Neural systems &
complex inference*

data ux



data = Machine Learning, AI, Data Analysis, Statistical Inference, and more
ux = User Experience Design, Research, Interaction Design, Info Architecture, and more

~~Crafting~~

No engineering chops

Idealistic

~~Researching~~

Can't turn ideas into specs

Creative

Descriptive

~~Mapping~~

Black Box / Opaque System

Realistic

~~Monitoring~~

Product too customized



Crafting

Researching



Mapping

Monitoring

Crafting

Researching



Mapping

Monitoring

Crafting

Researching



Mapping

Monitoring

Crafting

Researching



Mapping

Monitoring

Crafting

Researching

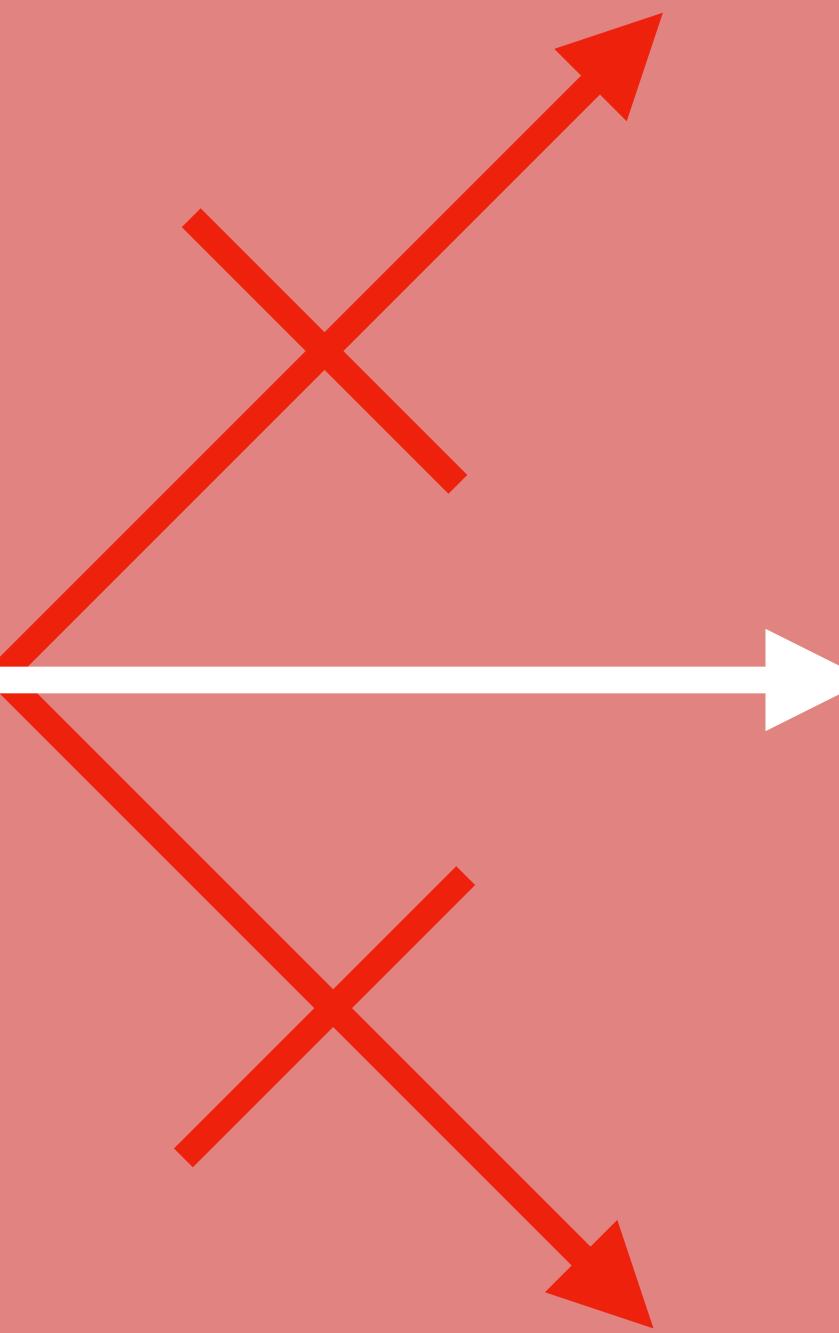


Mapping

Monitoring



ML is not just part
of your *product*, it
can be part of
your *process*



Mindlessly trust
your algorithmic
conclusions

ML is not just part
of your *product*, it
can be part of
your *process*

Use the data to
validate your
existing opinions

*(clustering
demos)*



*Can ML help
me design?*

*Clustering and
visualizing data*



Empower my imagination

*Neural systems &
complex inference*



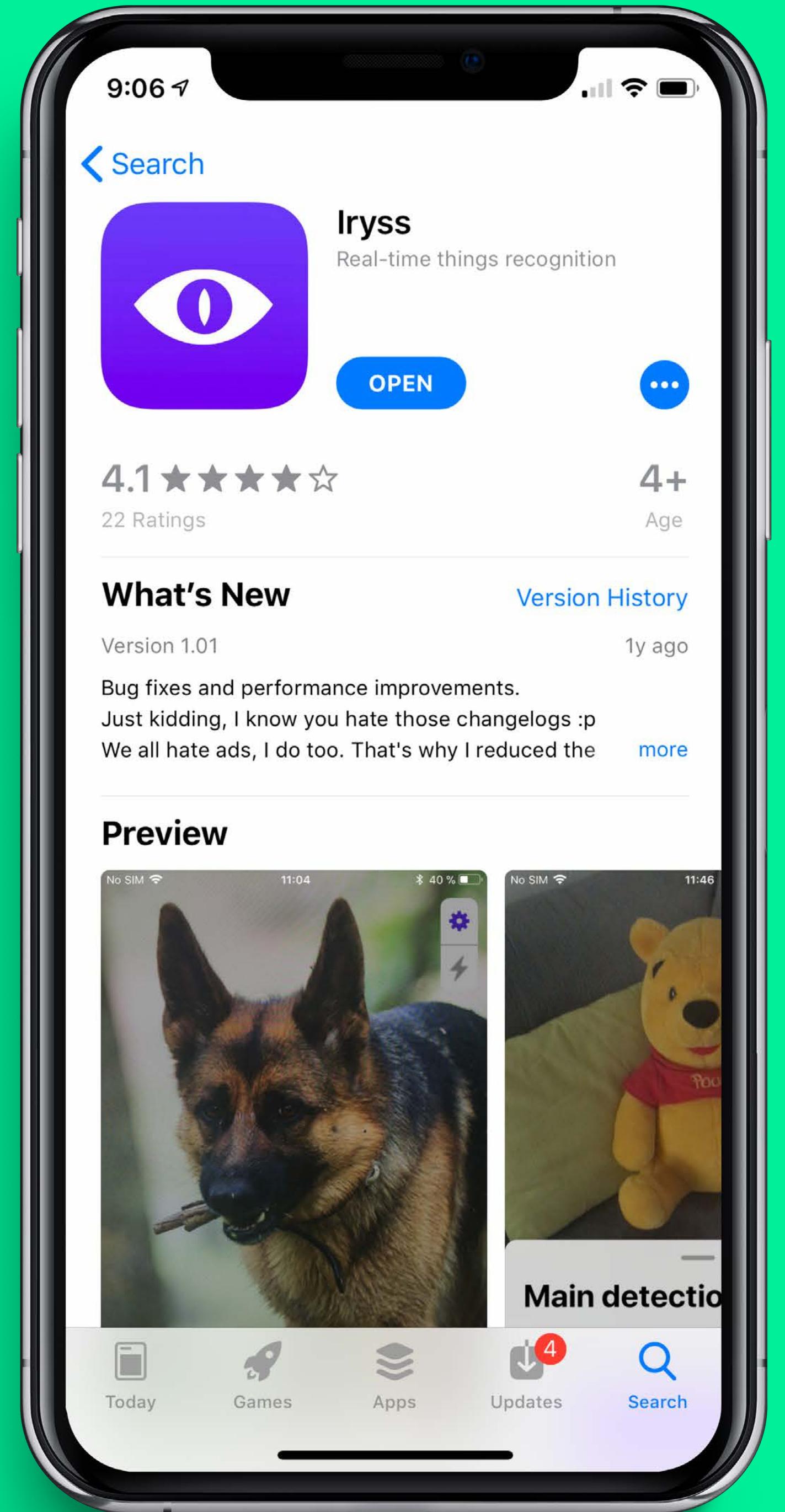
Deep Neural Systems



Instead of being taught what deep neural systems are, we're going to start by experiencing them for ourselves...

*A real-time object
detection app
that works right
on your phone*

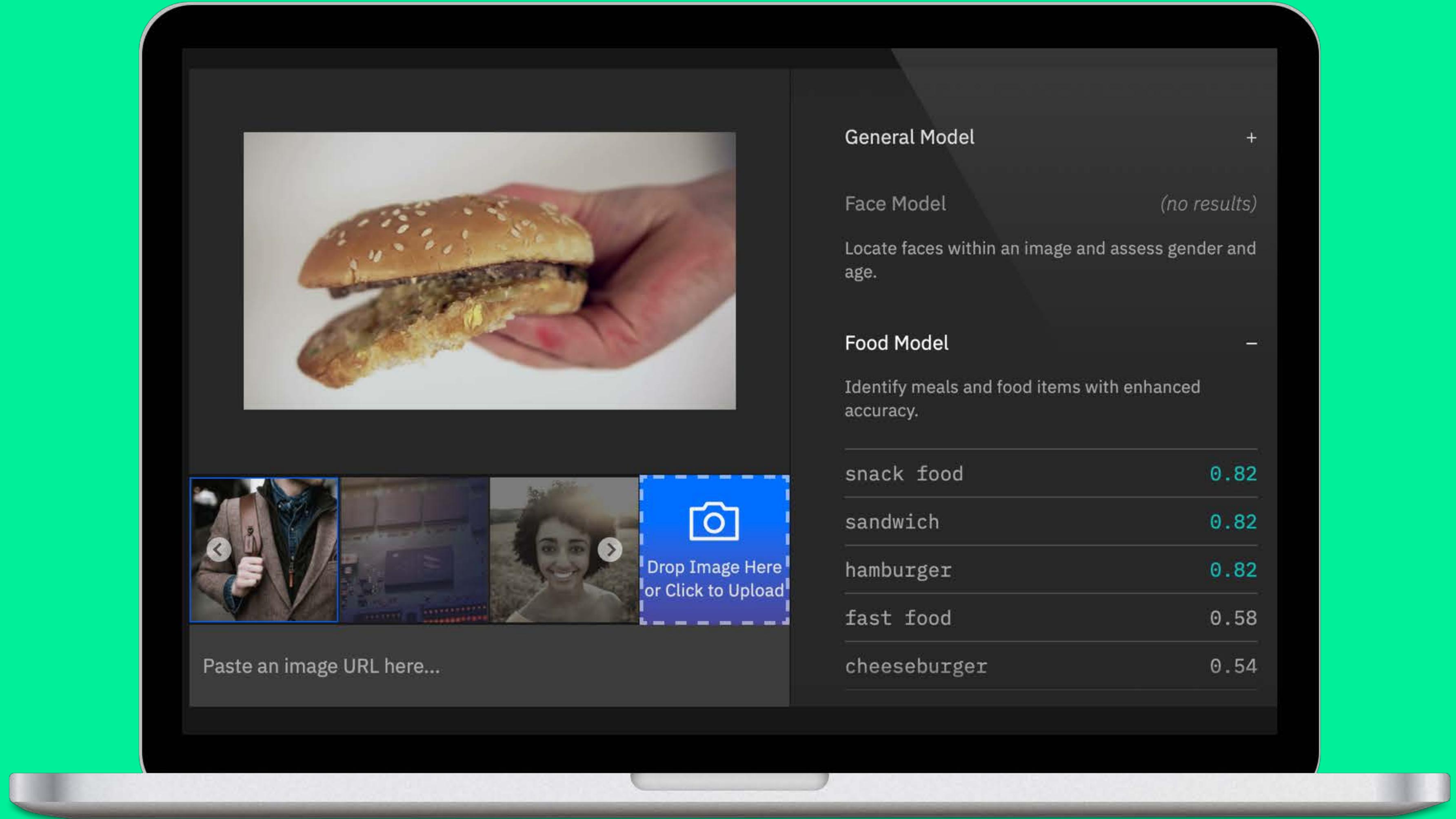
Iryss



Iryss

*A real-time object
detection app
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IBM Visual Recognition

A descriptive meta-data service that identifies various hierarchical features



IBM Visual Recognition

A descriptive meta-data service that identifies various hierarchical features

Neural Systems Quick Primer

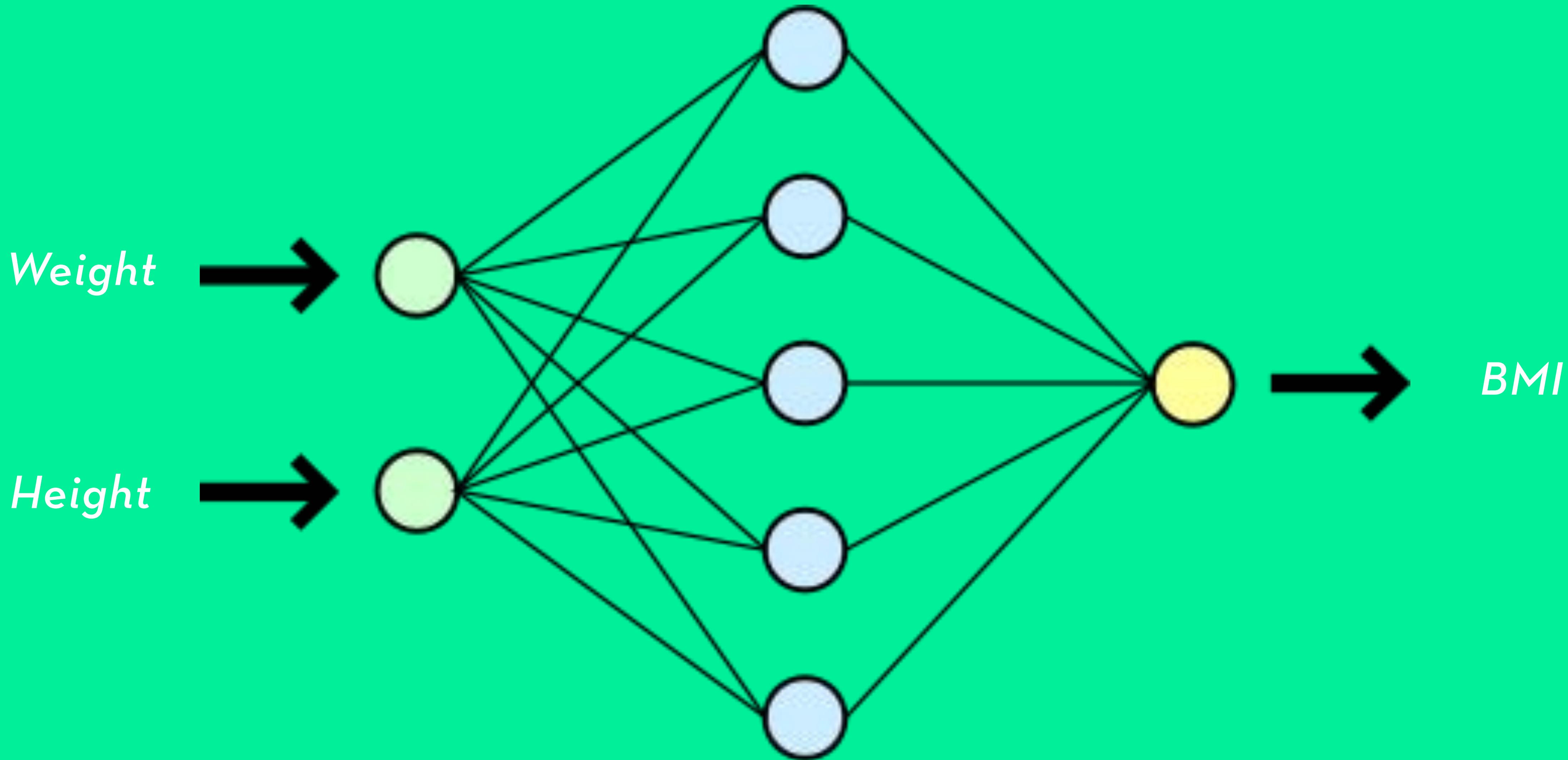
$Y = f(x)$

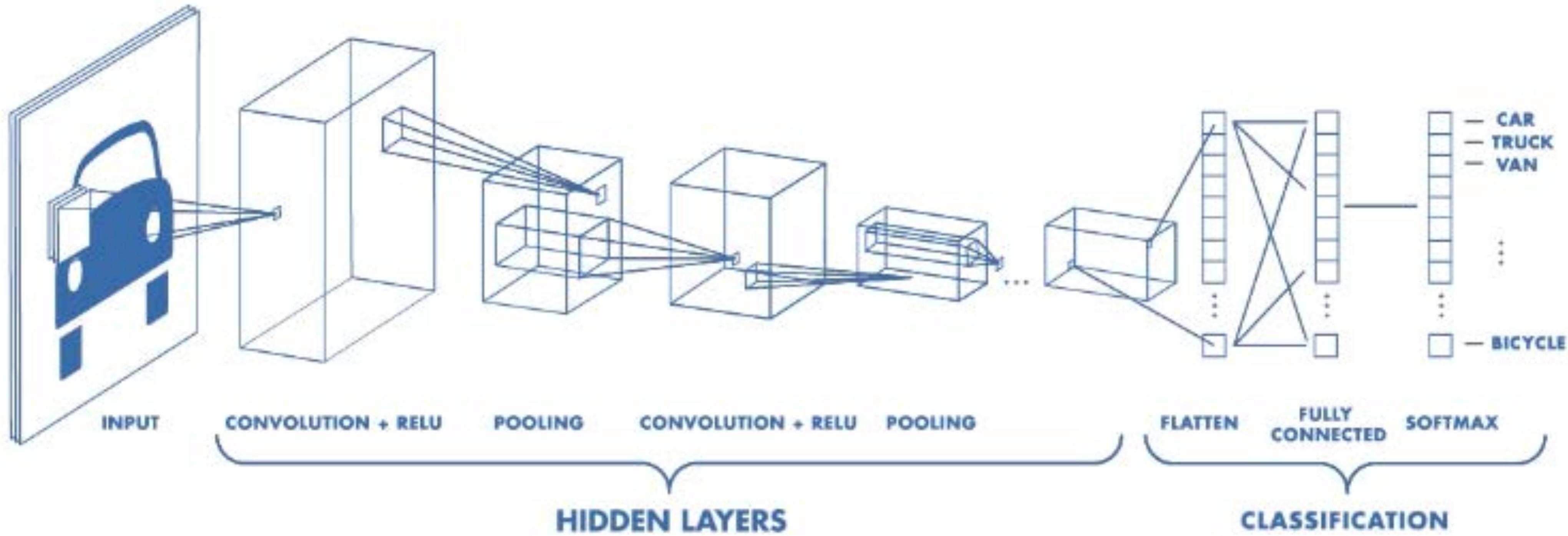
BMI

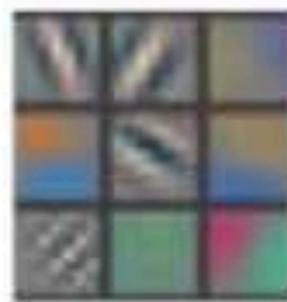
$$Y = f(X_1, X_2)$$

Weight

Height



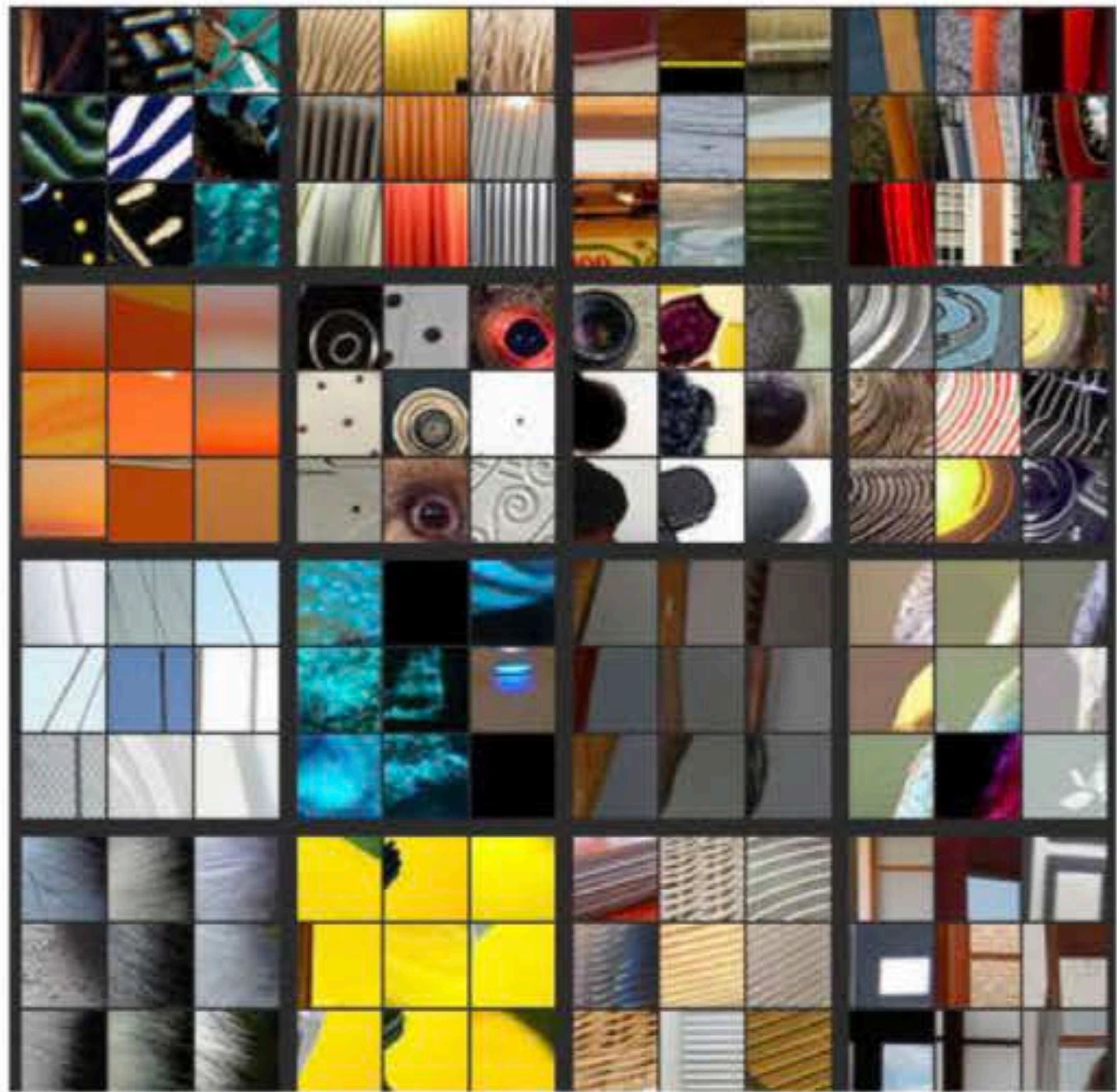
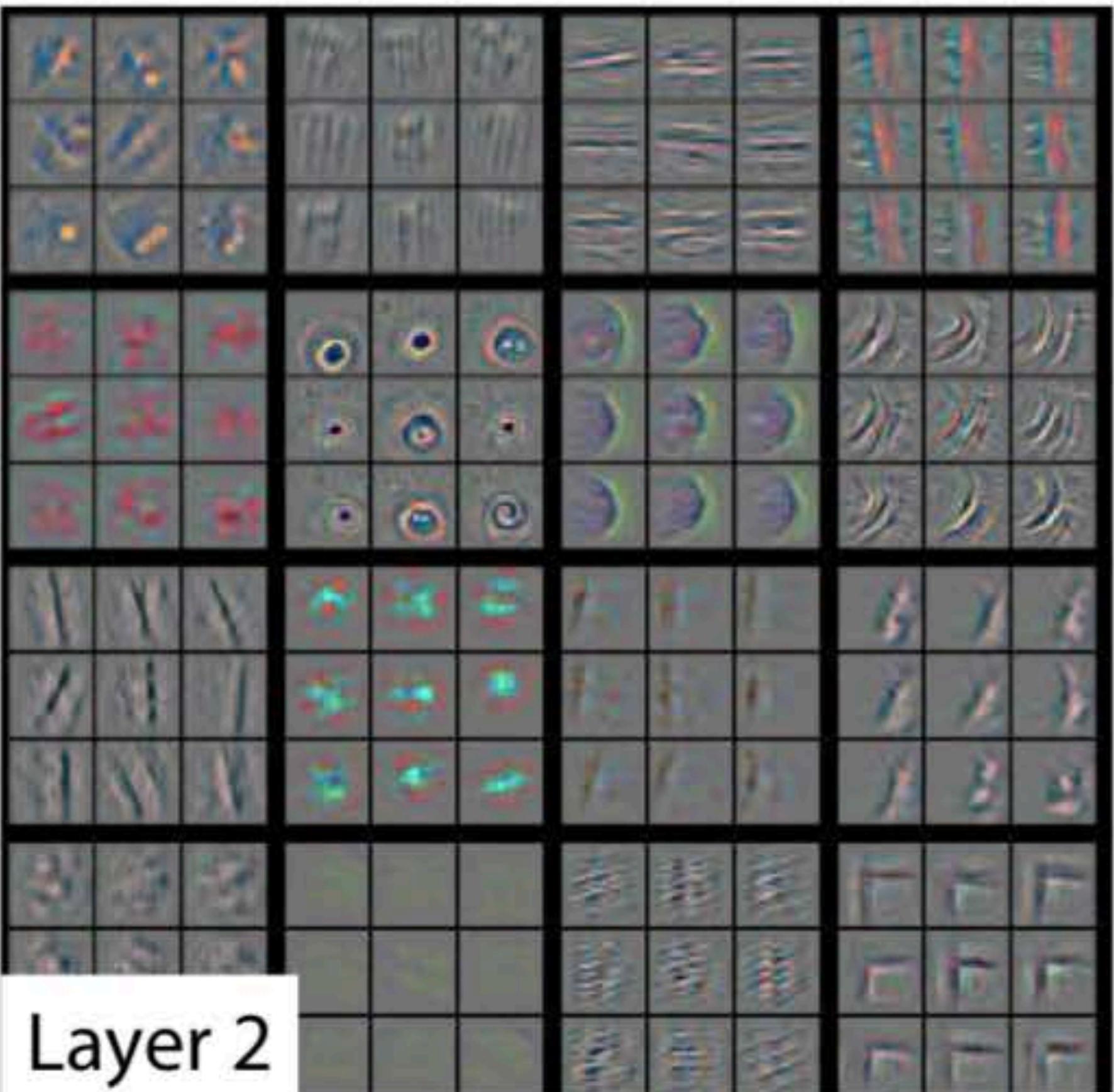




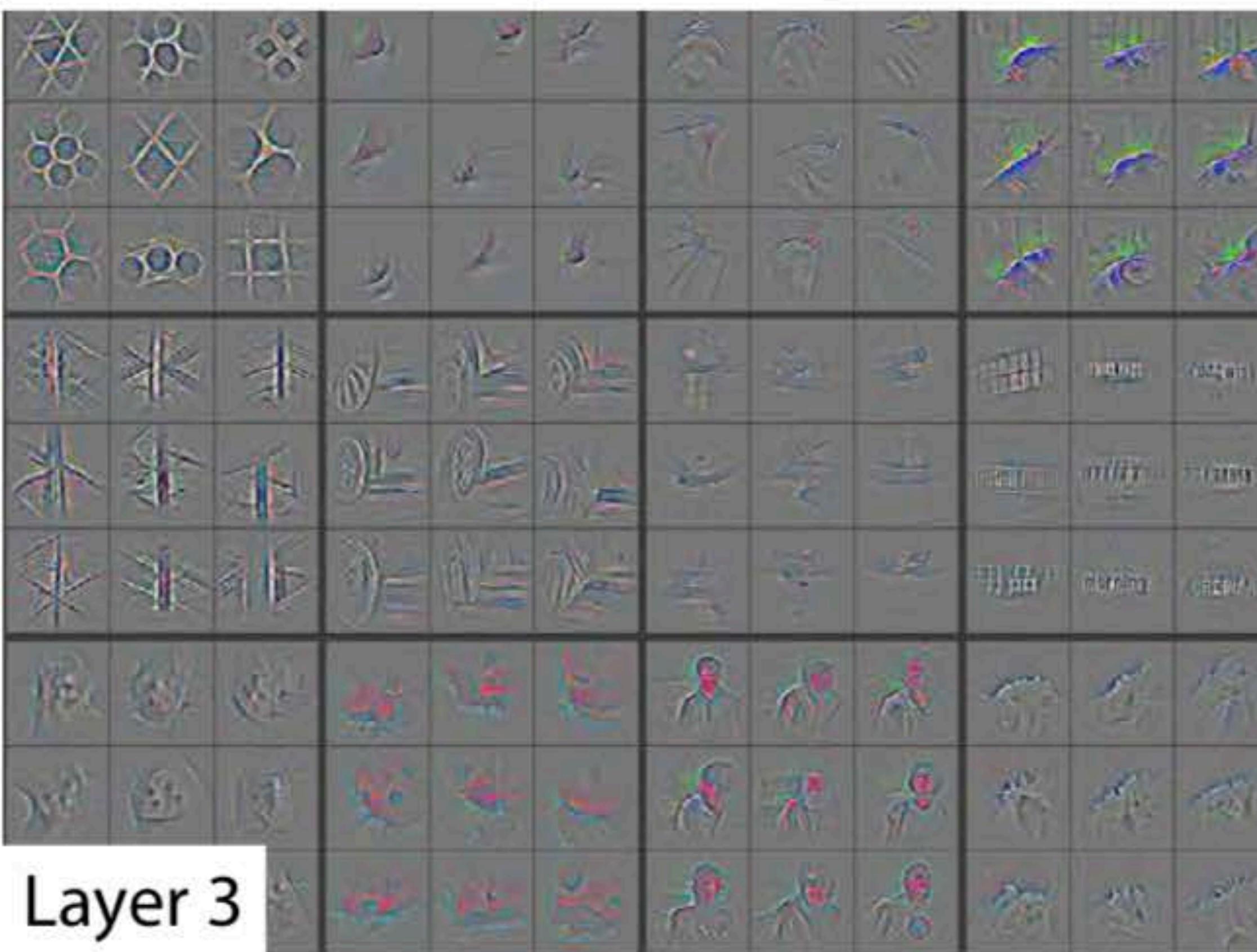
Layer 1



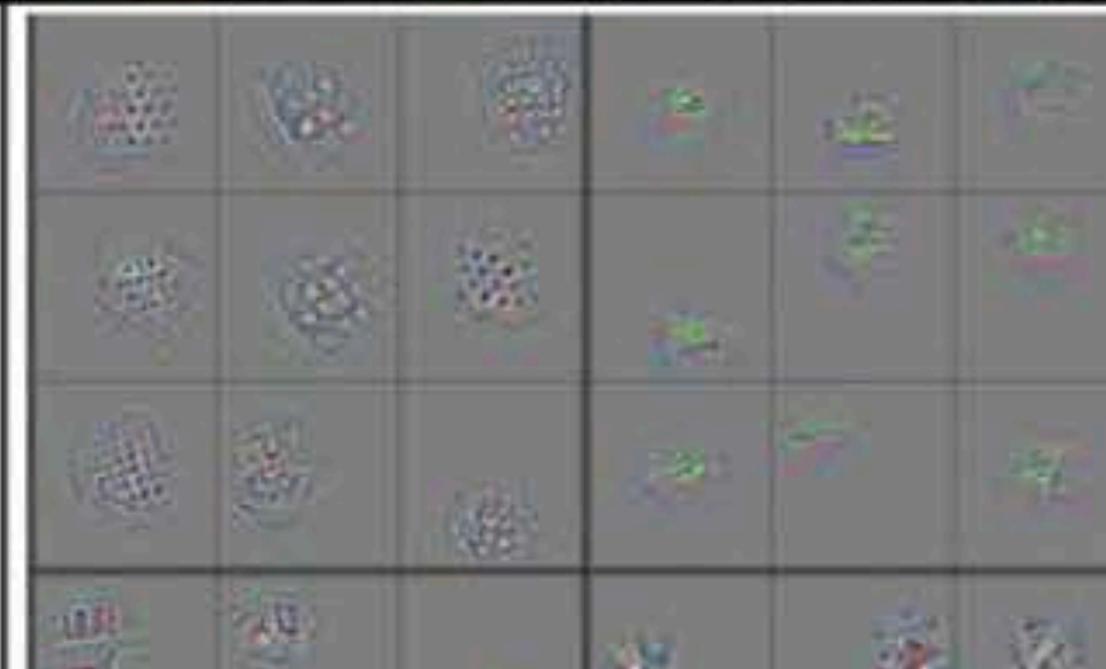
Layer 2



Layer 2

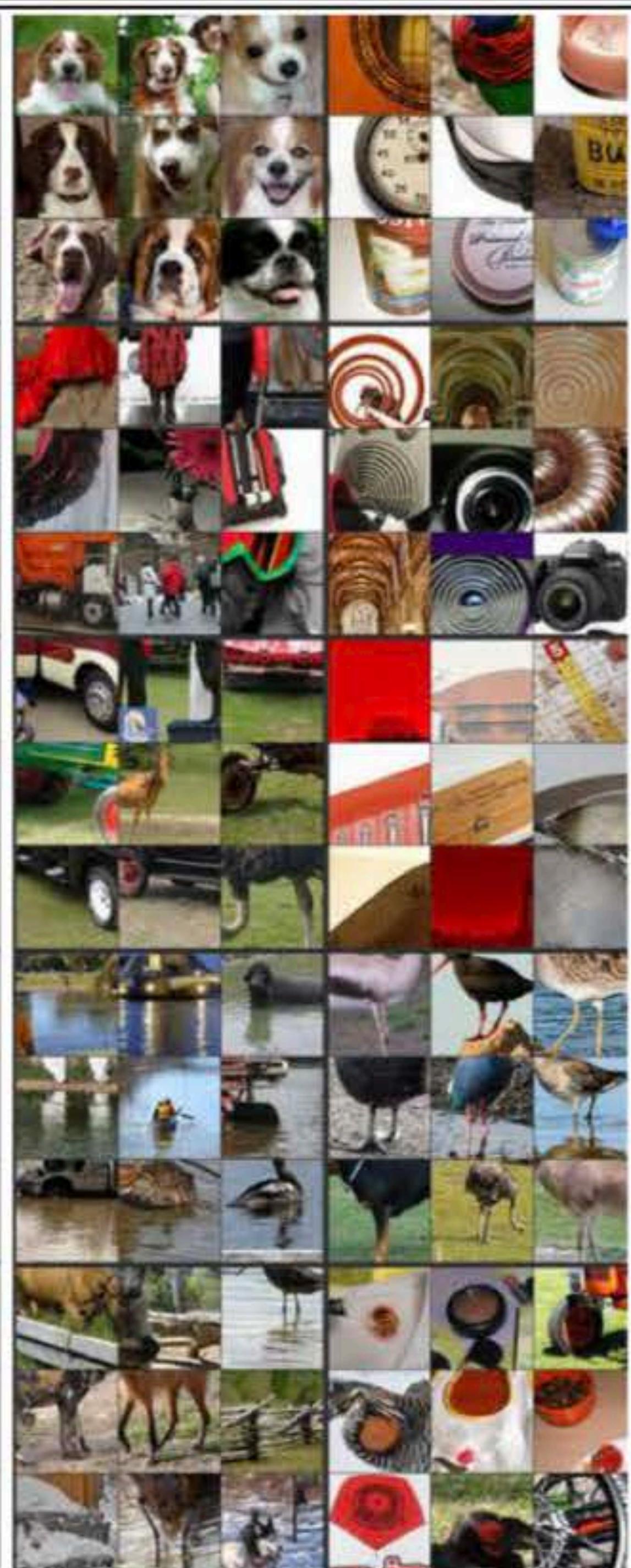


Layer 3

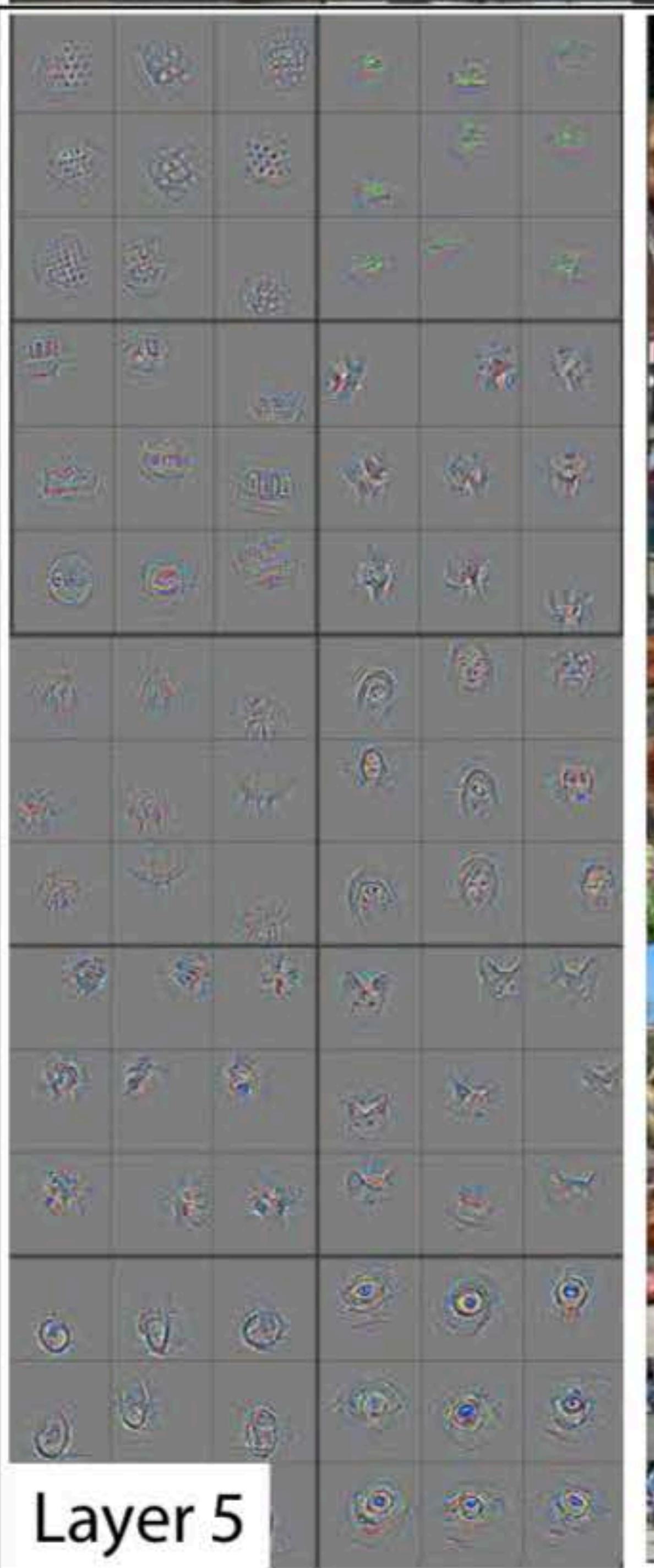




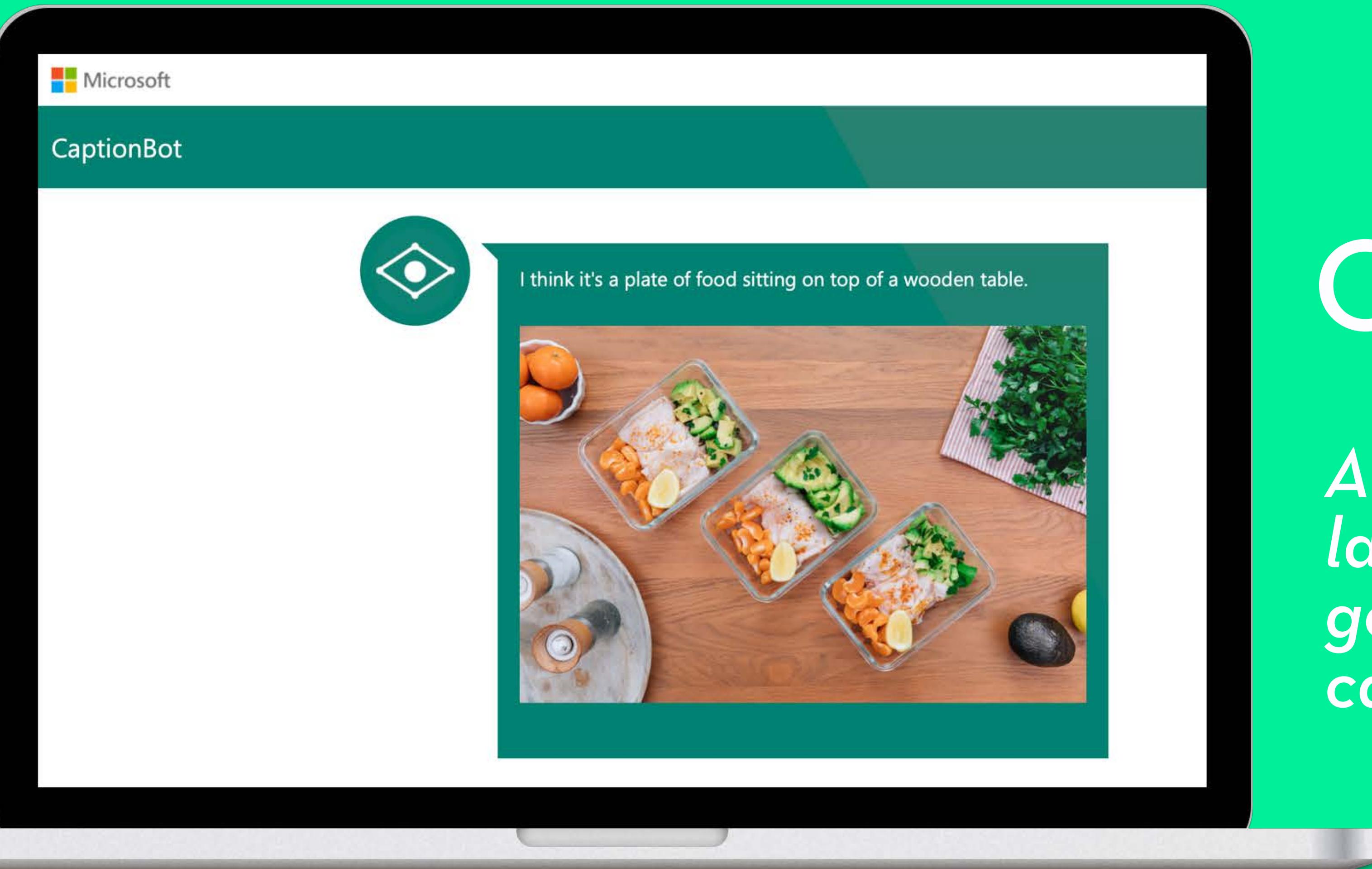
Layer 4



Layer 5



*Now you're an expert
(seriously)*



CaptionBot.ai

An automated image-labelling service that generates plausible caption sentences

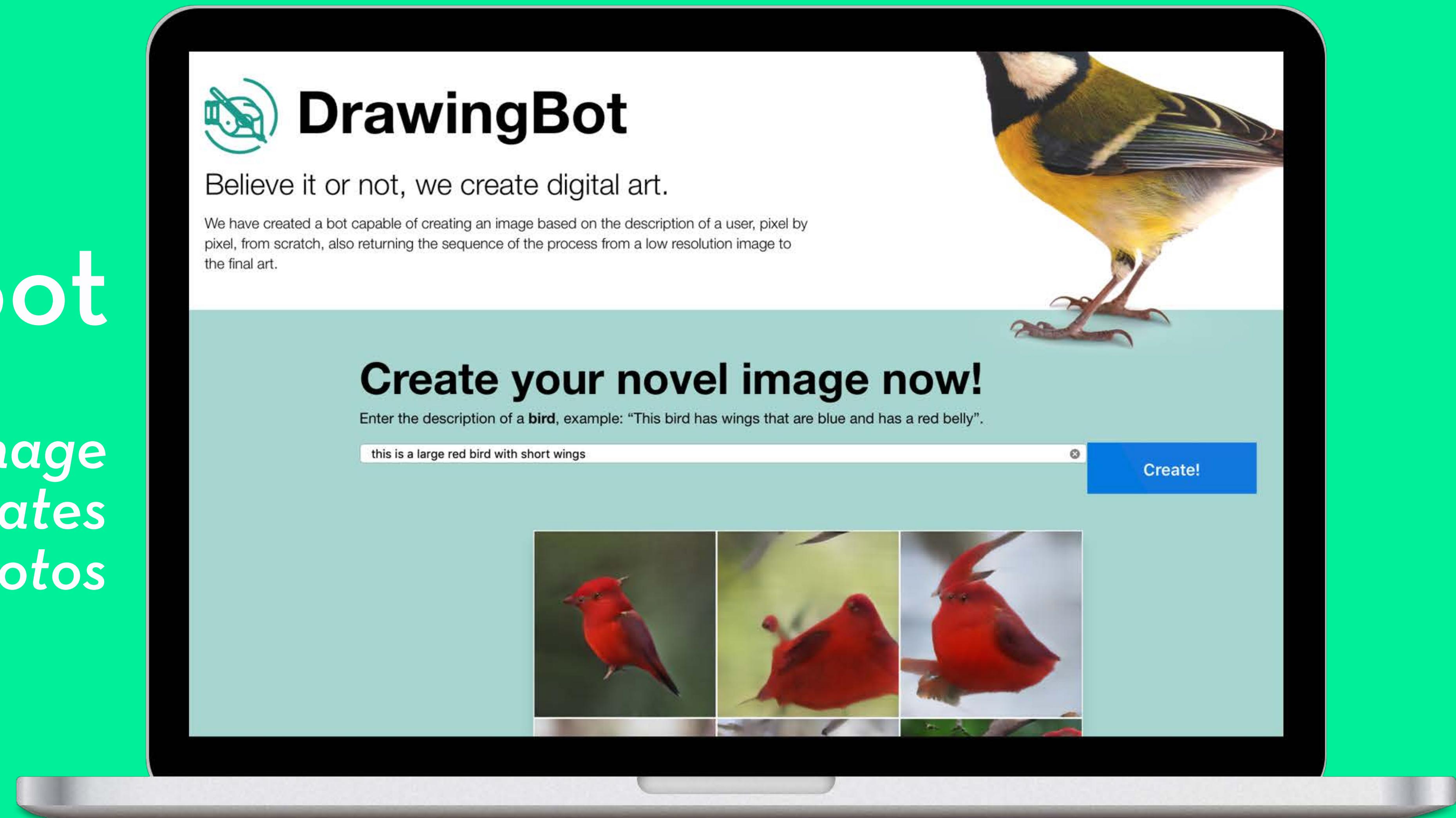
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DrawingBot

A caption-to-image service that generates plausible bird photos



DrawingBot

*A caption-to-image
service that generates
plausible bird photos*



PerformanceRNN

A keyboard trained on piano performances to play music on its own

The screenshot shows the Performance RNN application running in a browser. The interface includes a blue header bar with the text "Performance RNN". Below the header, the main title "Performance RNN" is centered. On the left, there are two radio buttons for "Conditioning": "On" (unselected) and "Off" (selected). Next to them are two sliders: "Note Density (4)" and "Gain (25%)". To the right of these controls is a piano-roll style visualization showing note onset times for various keys. Below this are buttons for "Reset RNN", "Save Preset 1", and "Save Preset 2". A dropdown menu for "midi in" is set to "none". A message below the piano-roll says "No midi output devices found." At the bottom of the screen is a piano keyboard graphic.

Performance RNN

Conditioning

On

Off

Note Density (4)

Gain (25%)

Reset RNN

Save Preset 1

Save Preset 2

midi in none

No midi output devices found.

magenta

[Performance RNN](#) was trained in TensorFlow on MIDI from piano performances. It was then ported to run in the browser using only Javascript in the [TensorFlow.js](#) environment. Piano samples are from [Salamander Grand Piano](#).

d.ML

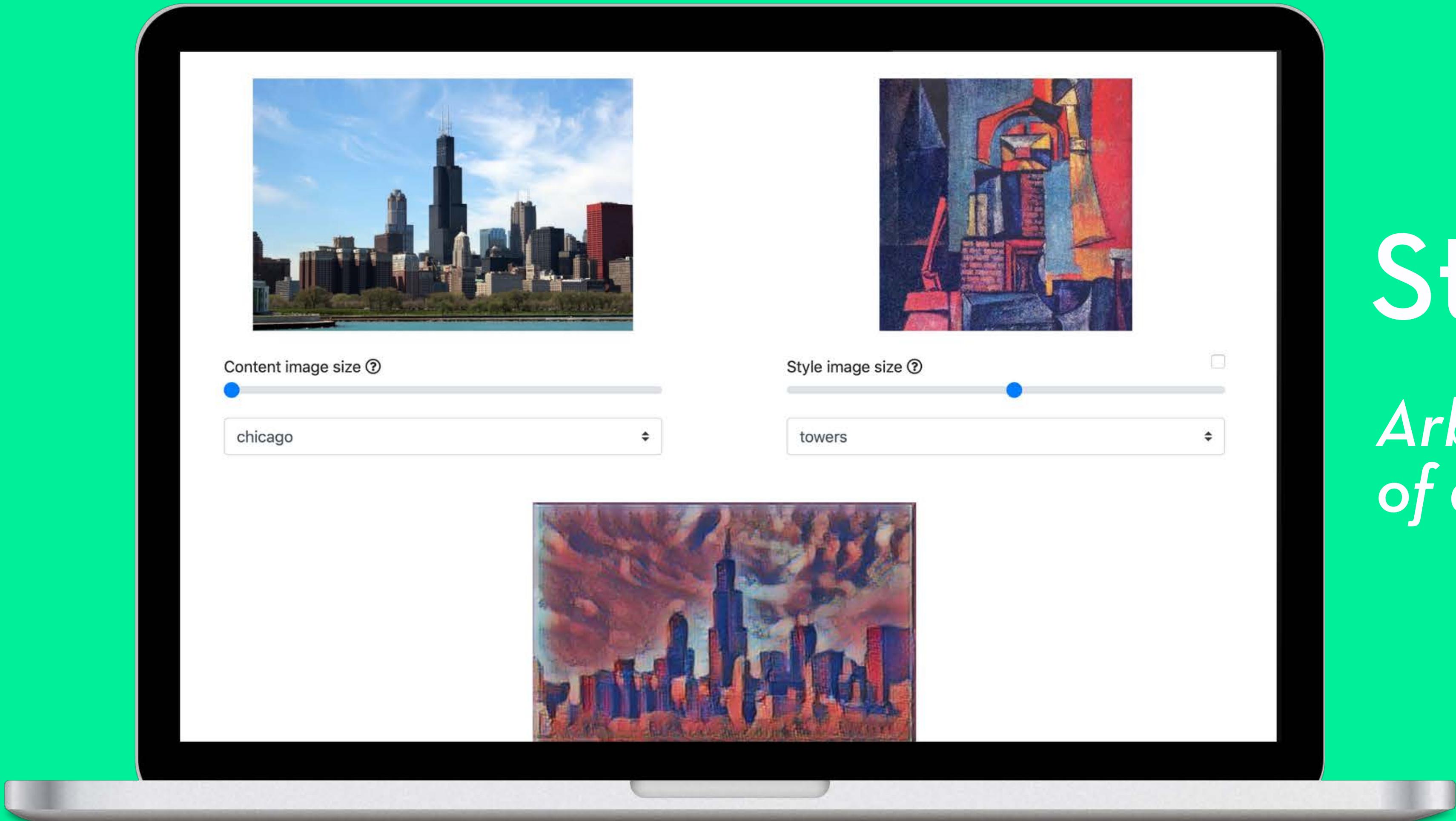
PerformanceRNN

*A keyboard trained on
piano performances to
play music on its own*



Style Transfer

*Arbitrary style transfer
of a photo to another*



Style Transfer

*Arbitrary style transfer
of a photo to another*



General Learnings

machine > human
or machine + human?