



DESIGNING MACHINE LEARNING

A Multi-Disciplinary Approach





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

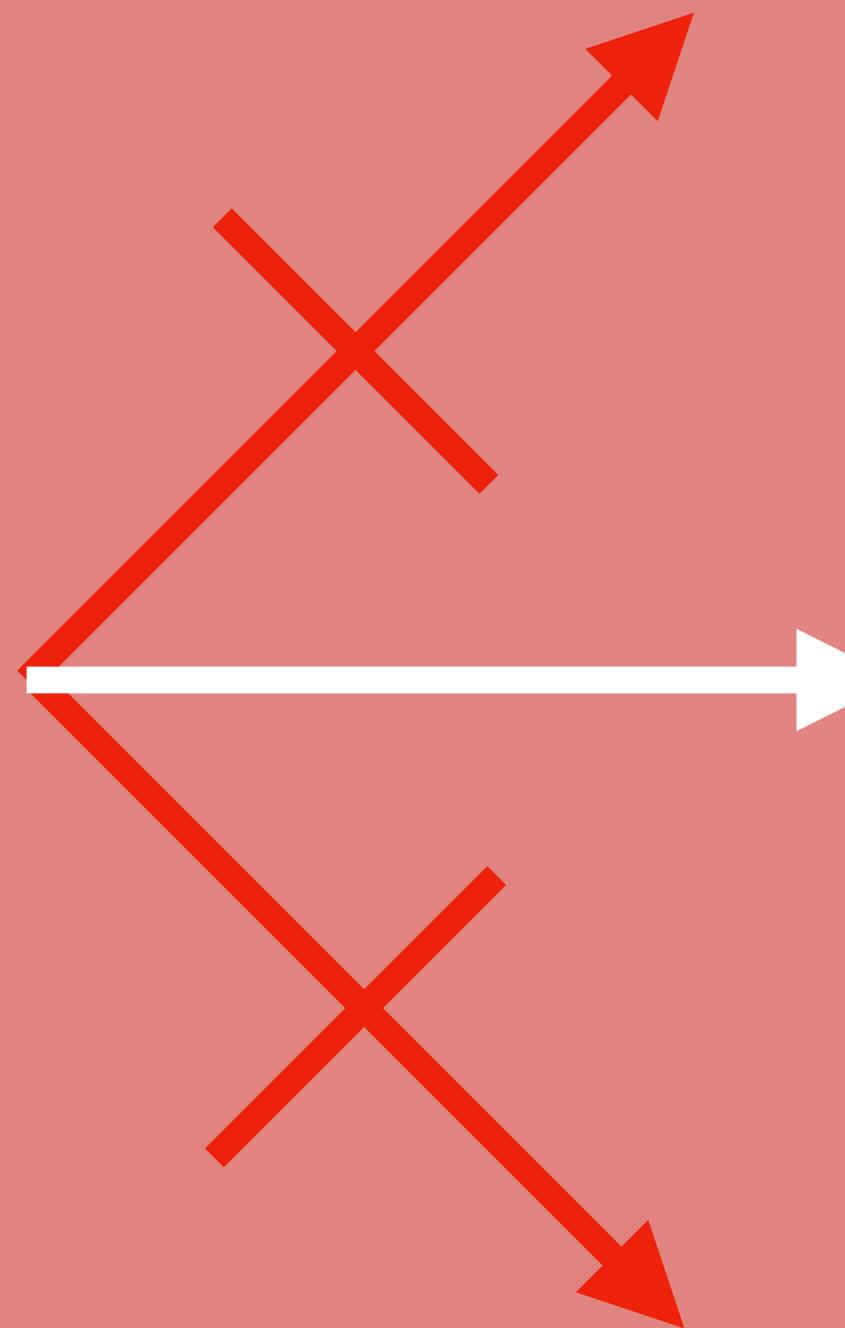


Mapping

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

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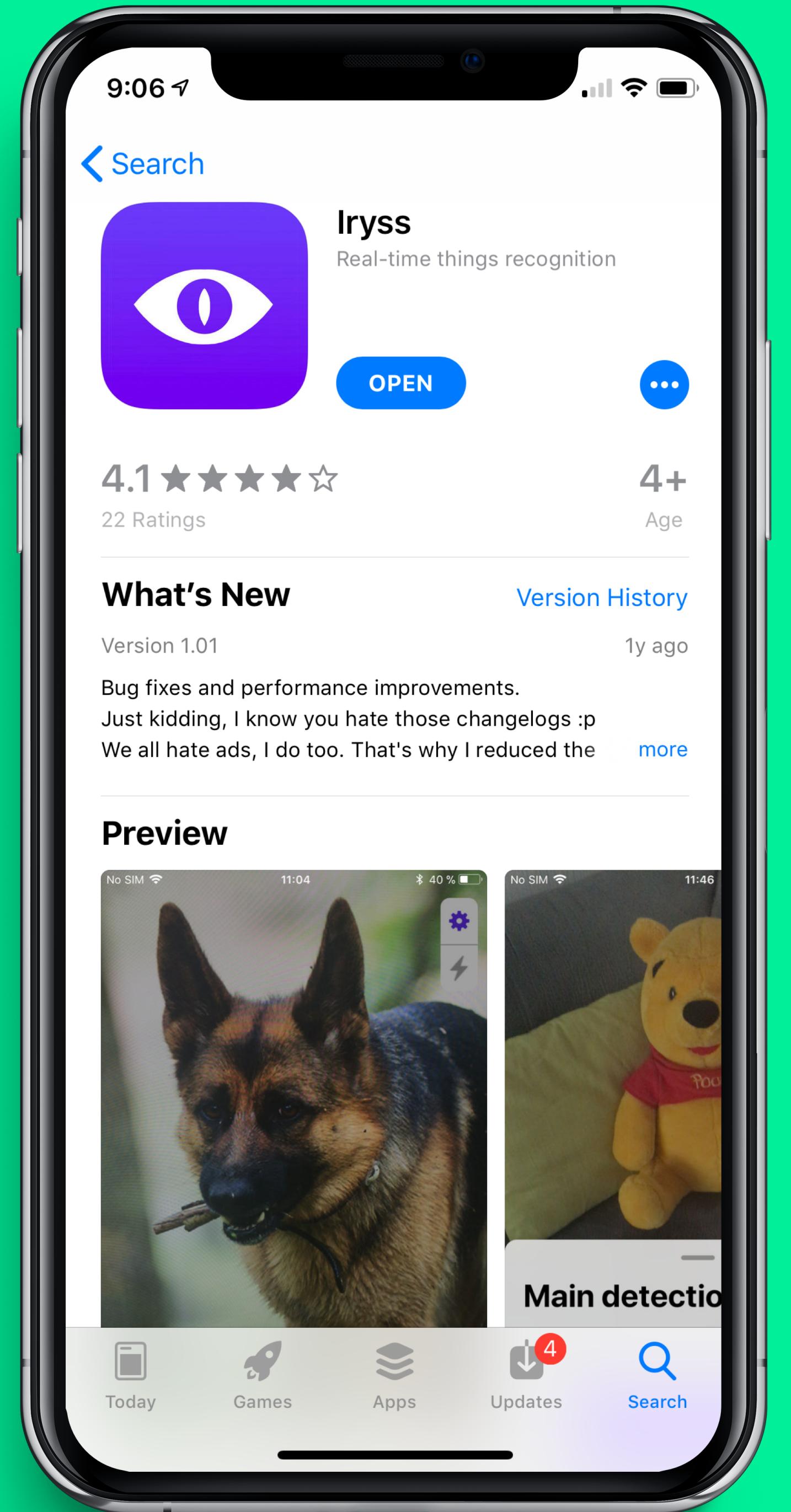
Deep Neural Systems



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*

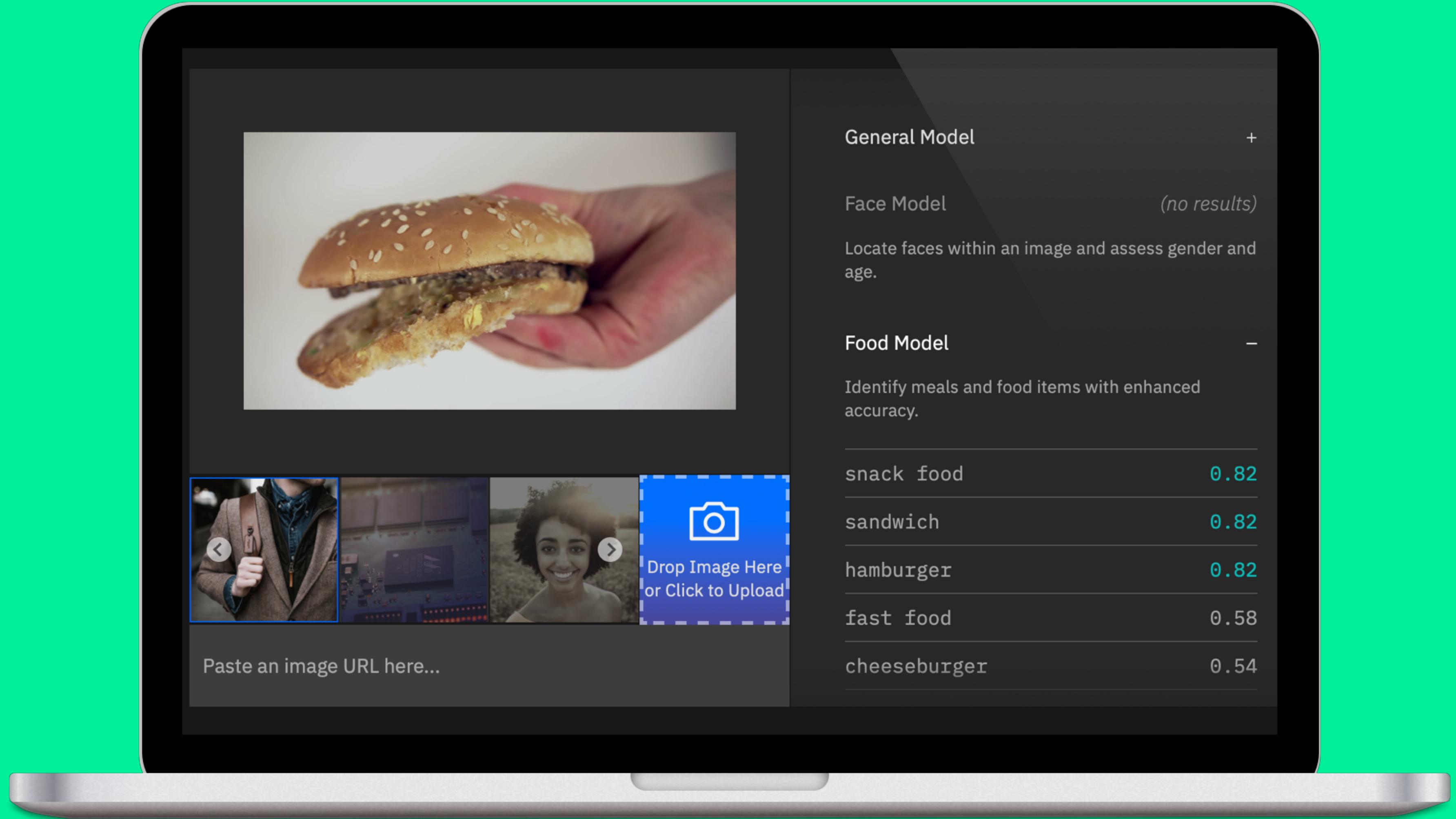
Iryss



Iryss

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





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

$Y = f(x)$



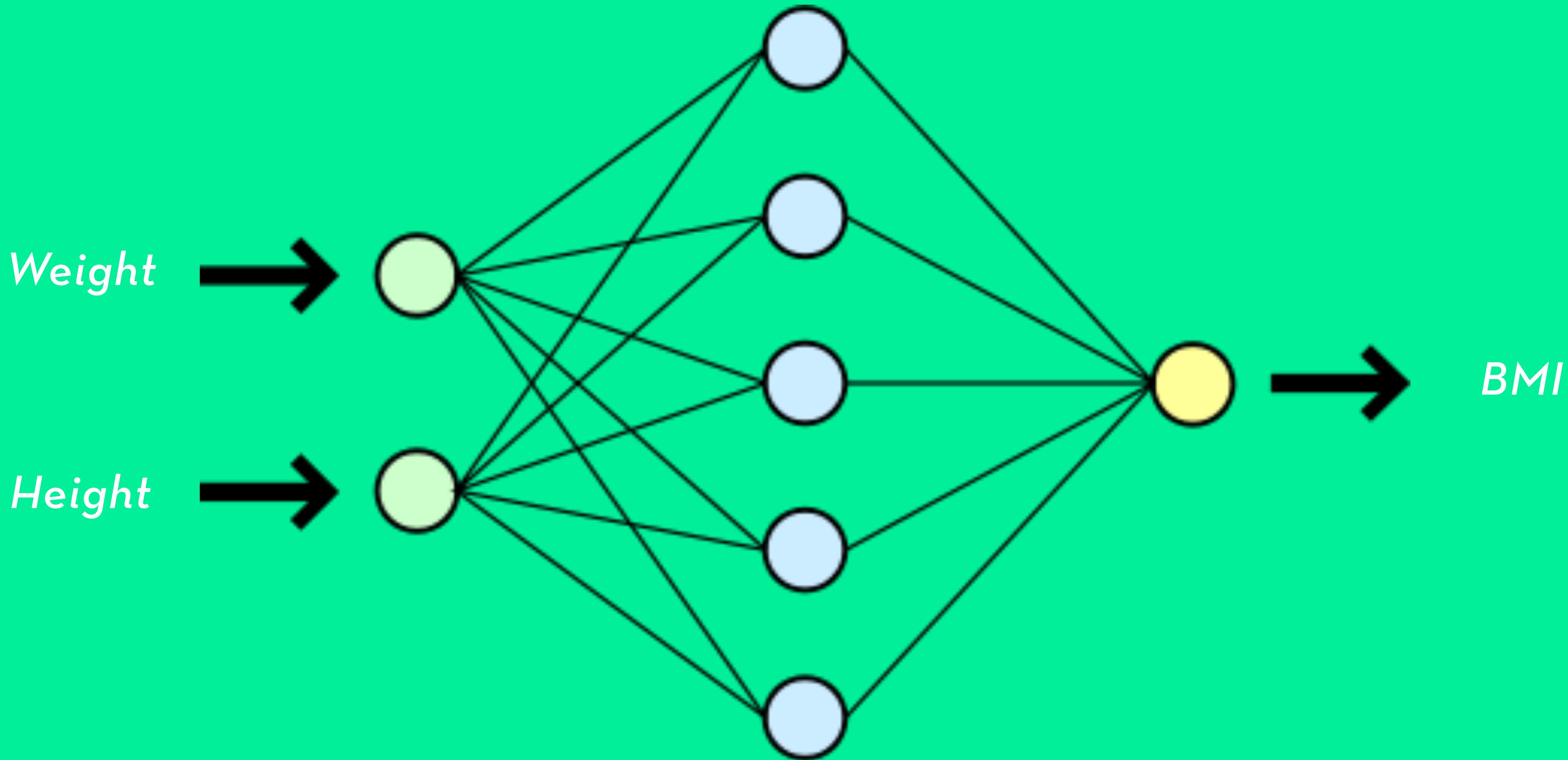
BMI

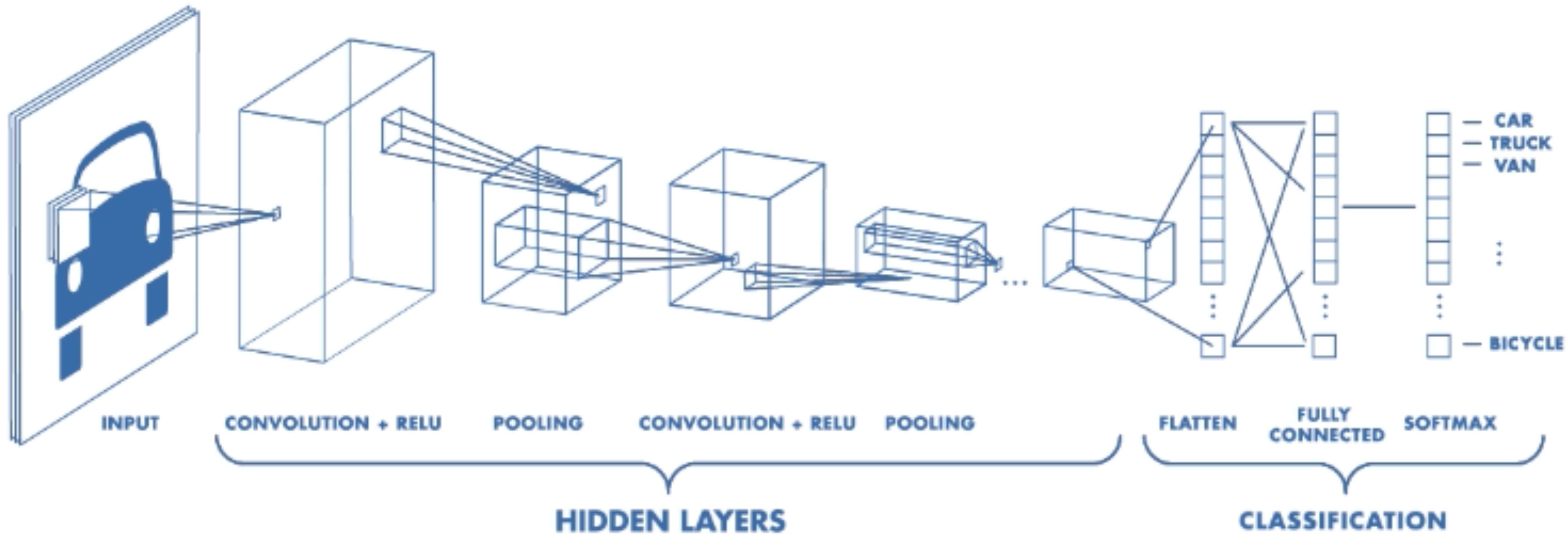
$$Y = f(X_1, X_2)$$

Weight

Height

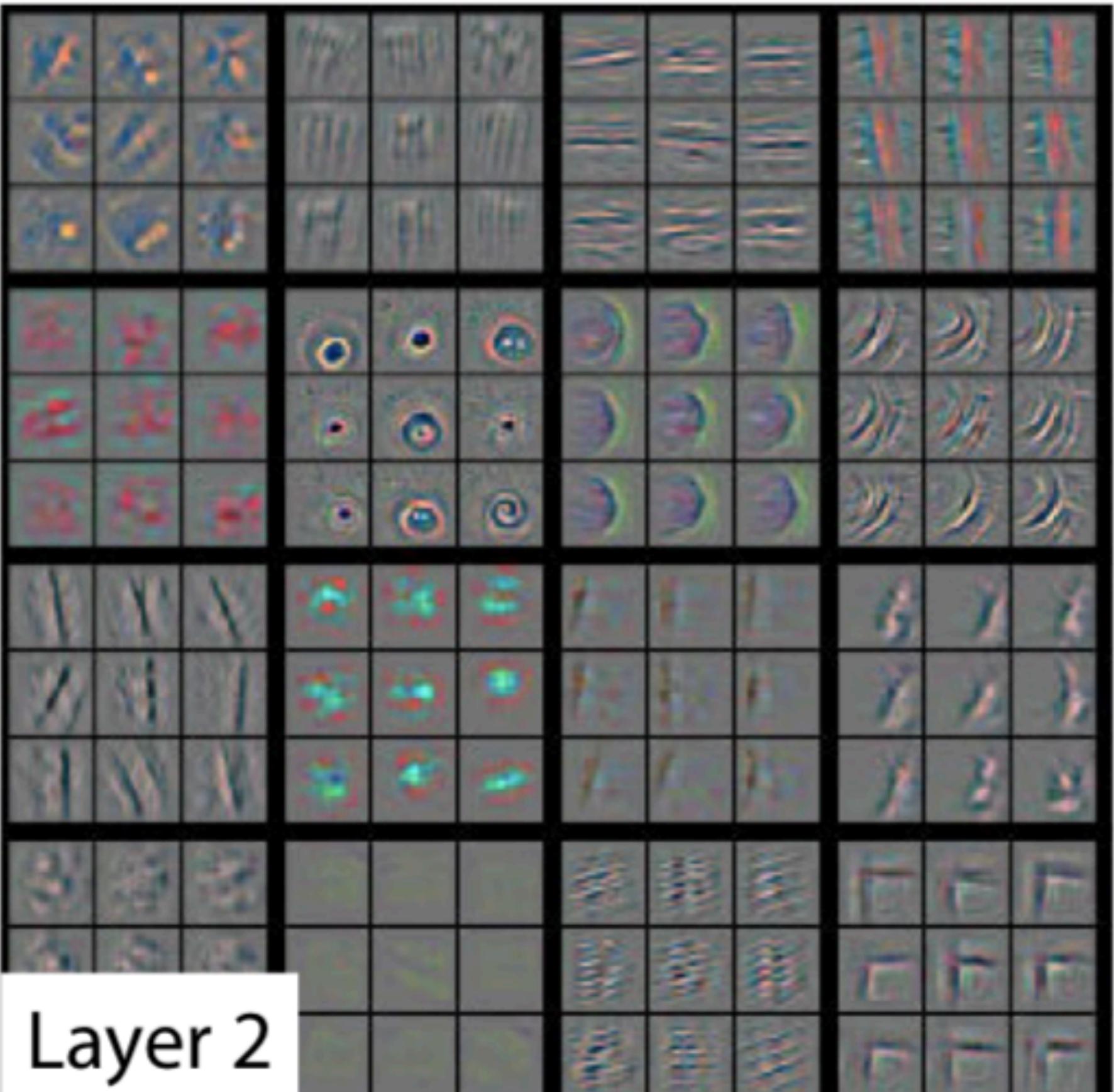




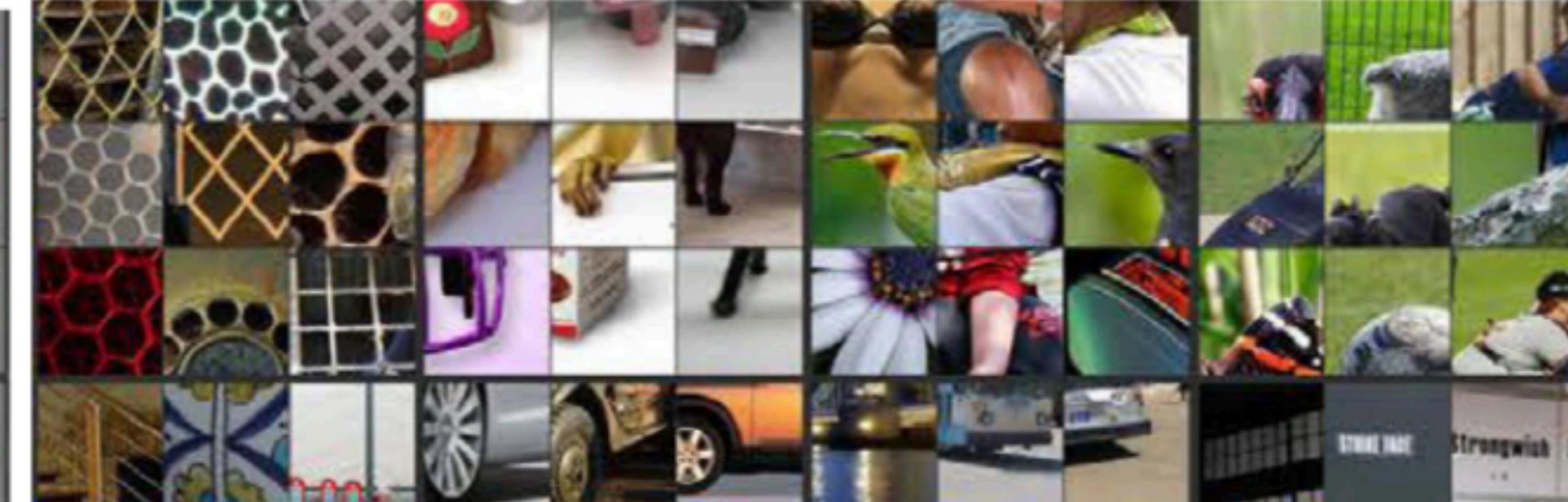
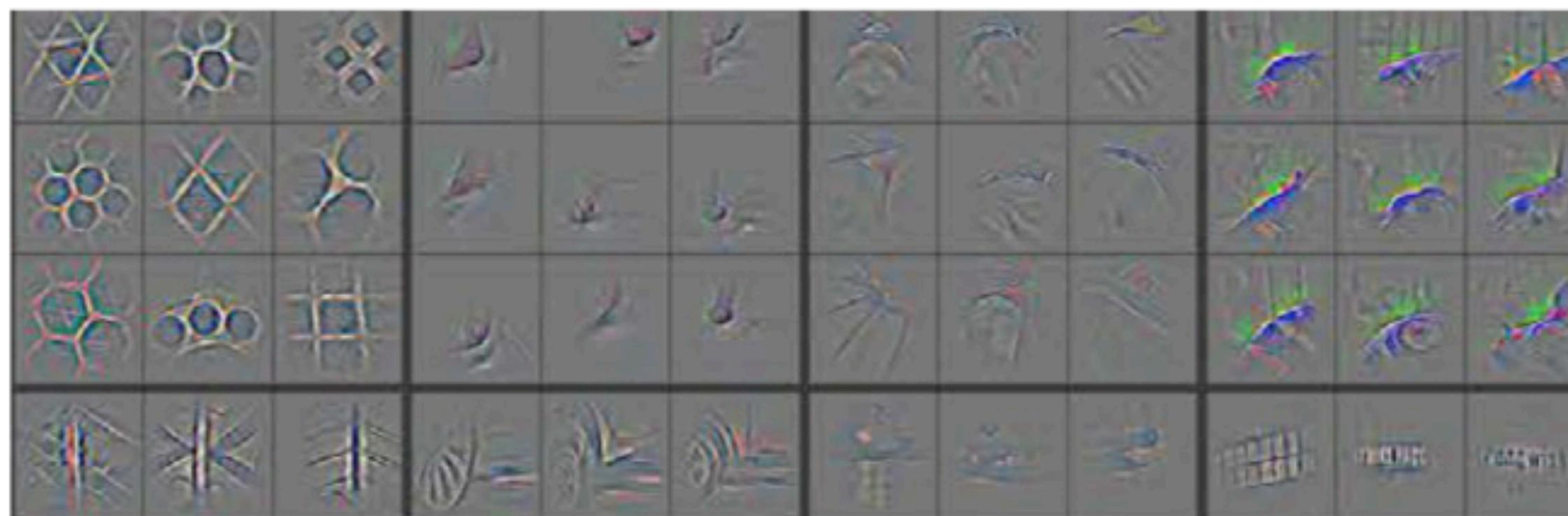
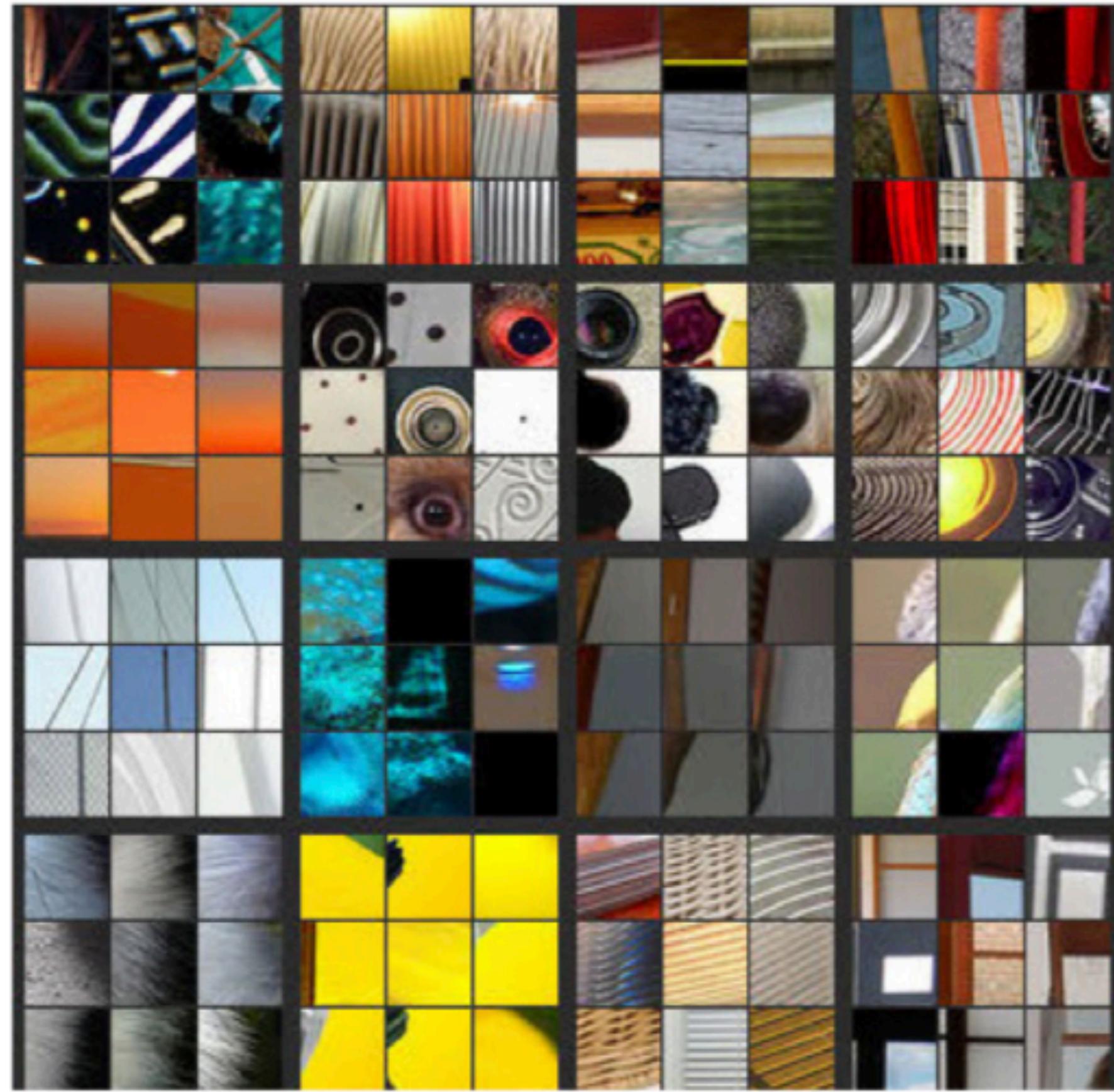




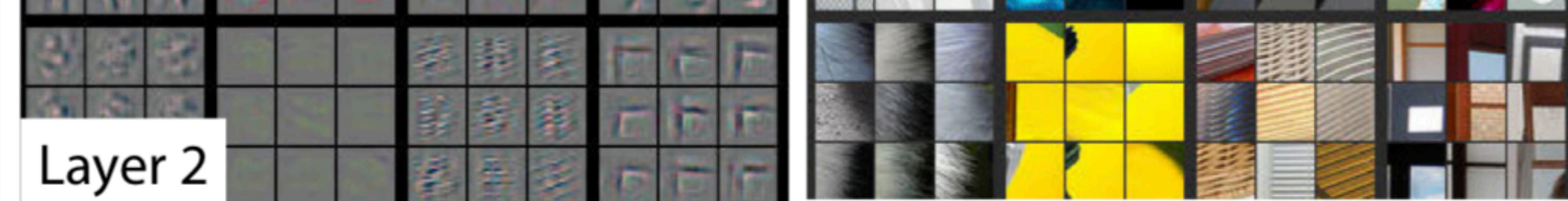
Layer 1



Layer 2



Layer 2

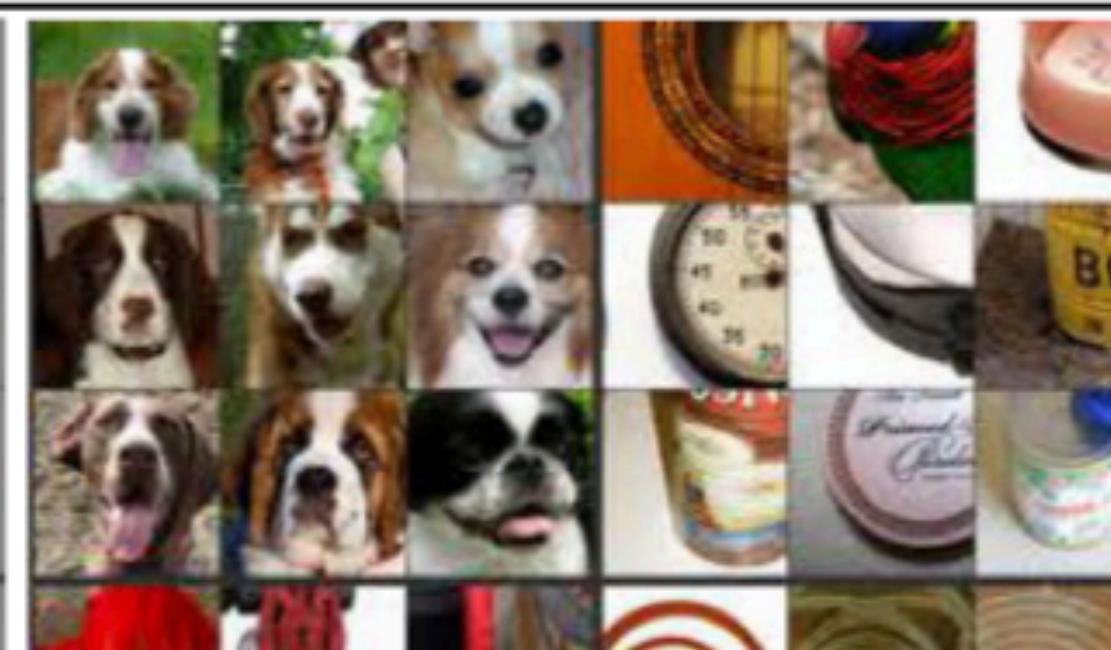


The image displays a 10x10 grid of 100 small square images, each representing a different abstract pattern or shape generated by a neural network's third layer. The patterns are highly varied, ranging from geometric shapes like stars and diamonds to more organic forms like leaves and flowers. Some images feature vibrant colors (red, blue, green) against a dark background, while others are more muted. The overall effect is a diverse collection of visual motifs.

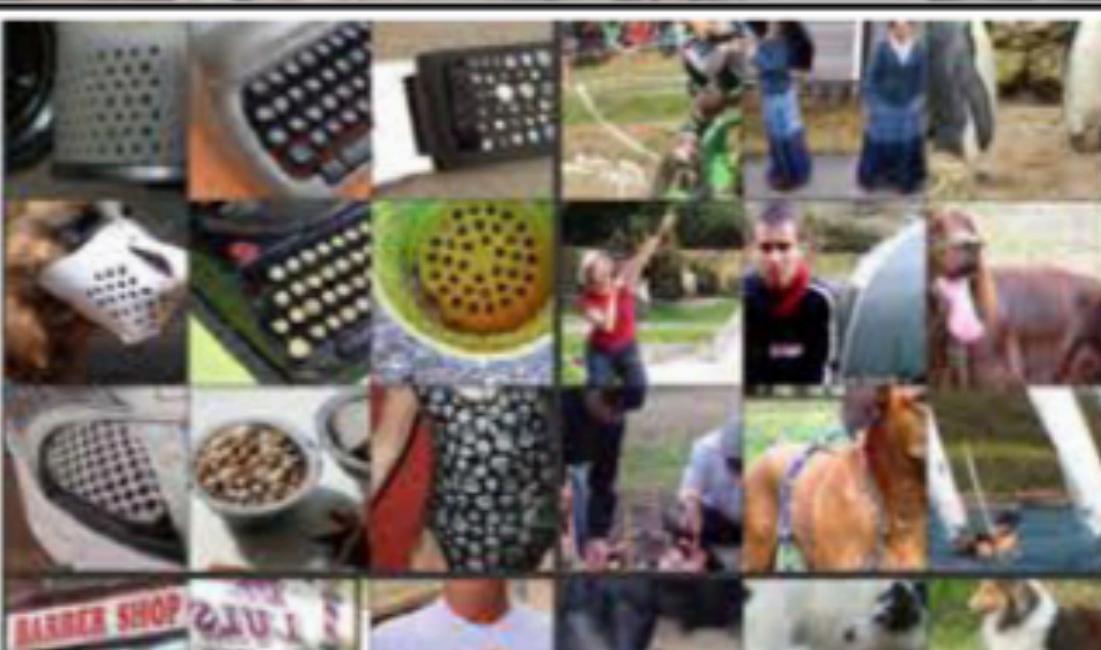
Layer 3

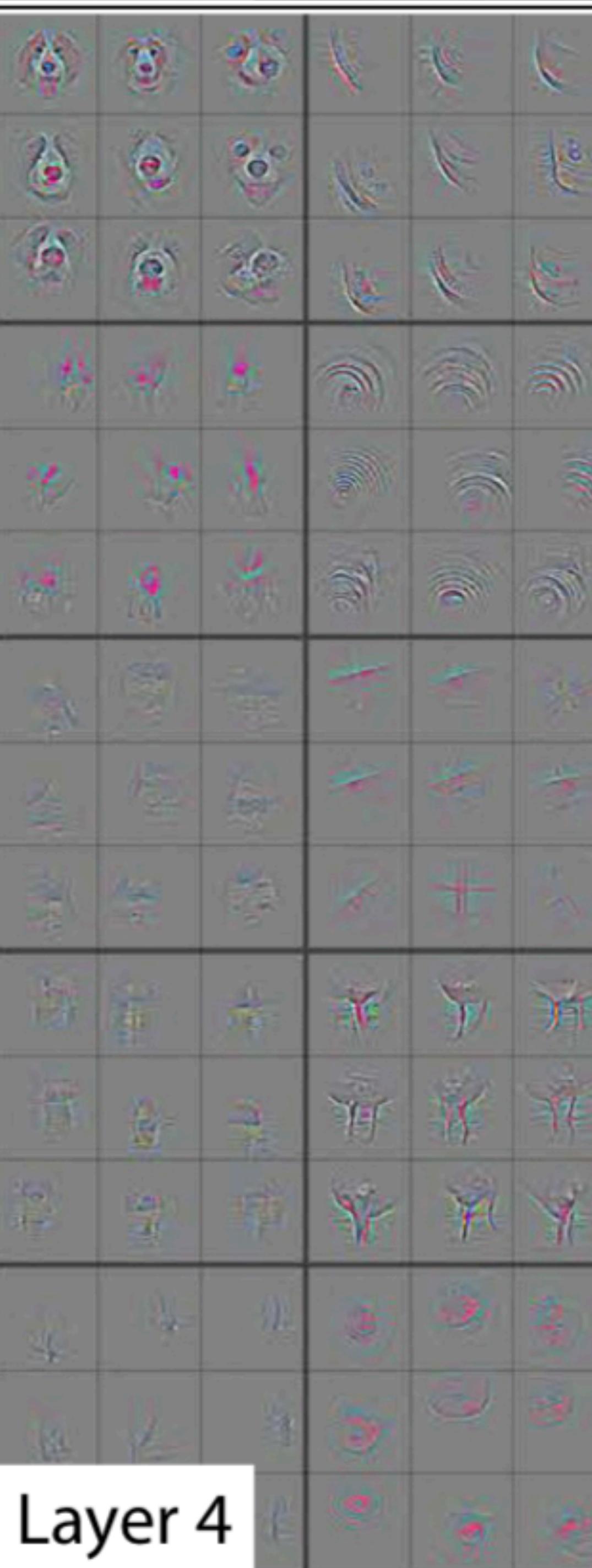


A 3x6 grid of 18 images showing various dog breeds and their corresponding 3D point cloud models. The images are arranged in three rows and six columns. Each row contains two images of a dog's head and its corresponding 3D point cloud model, followed by four images of a dog's body and its corresponding 3D point cloud model. The breeds shown include a Golden Retriever, a Bulldog, a Pug, a Shiba Inu, a Dachshund, a Beagle, a Boxer, a Rottweiler, a Husky, a German Shepherd, a Border Collie, and a Poodle.

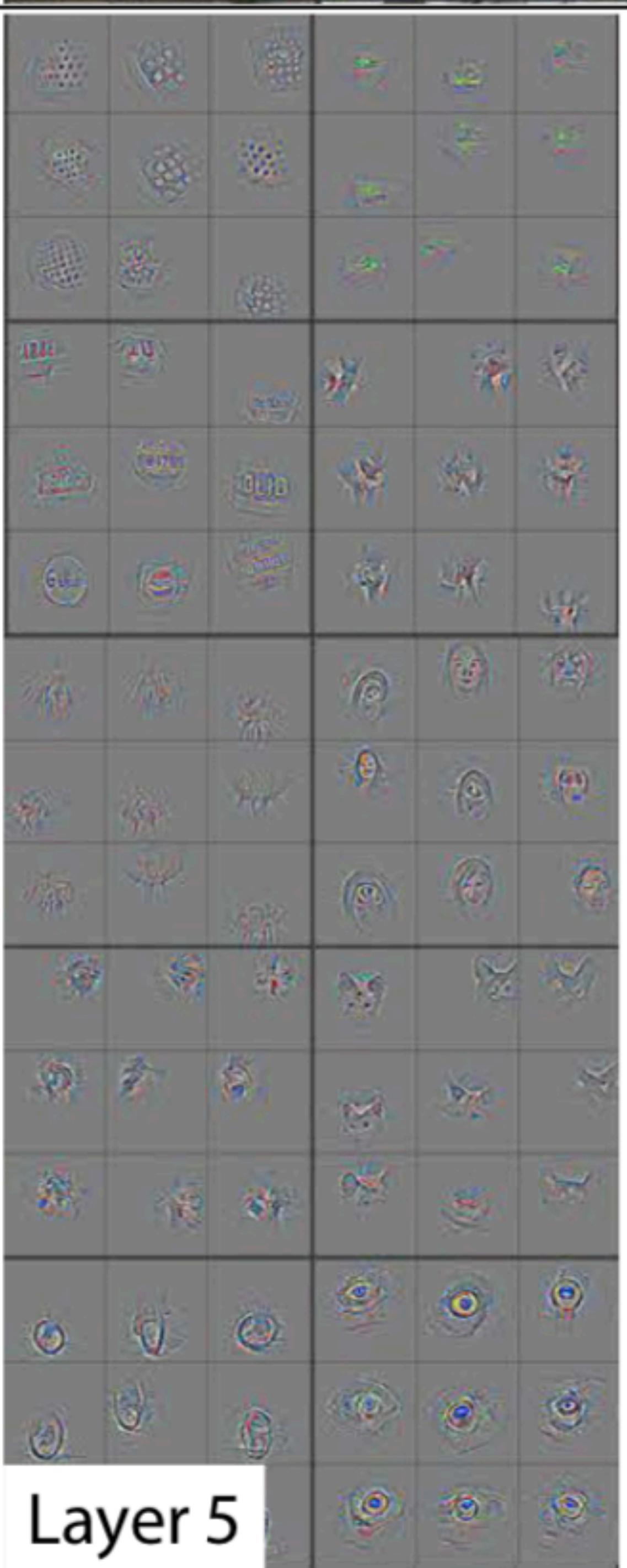
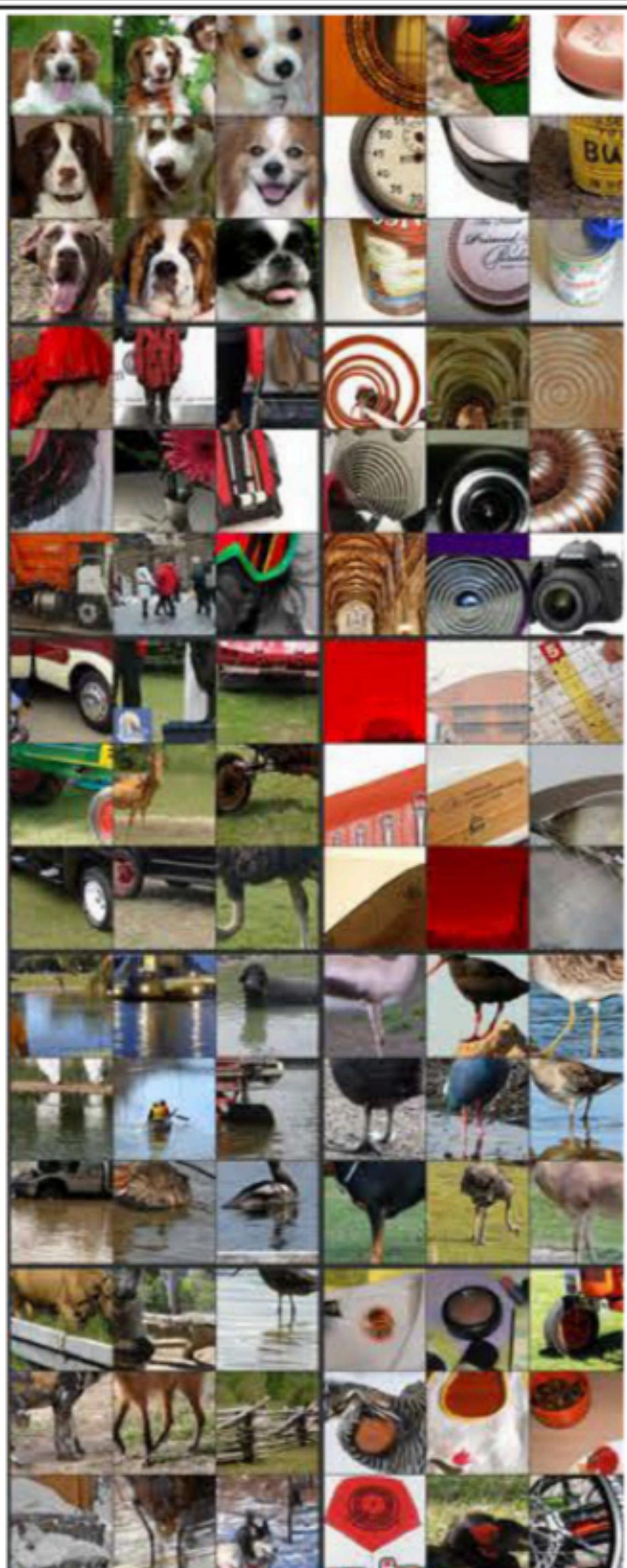


A 4x6 grid of 24 small images, each containing a different geometric shape or pattern. The images include various types of polygons, some filled with dots or other symbols, and some showing internal lines or shading. The colors used are primarily shades of blue, green, yellow, and red.





Layer 4

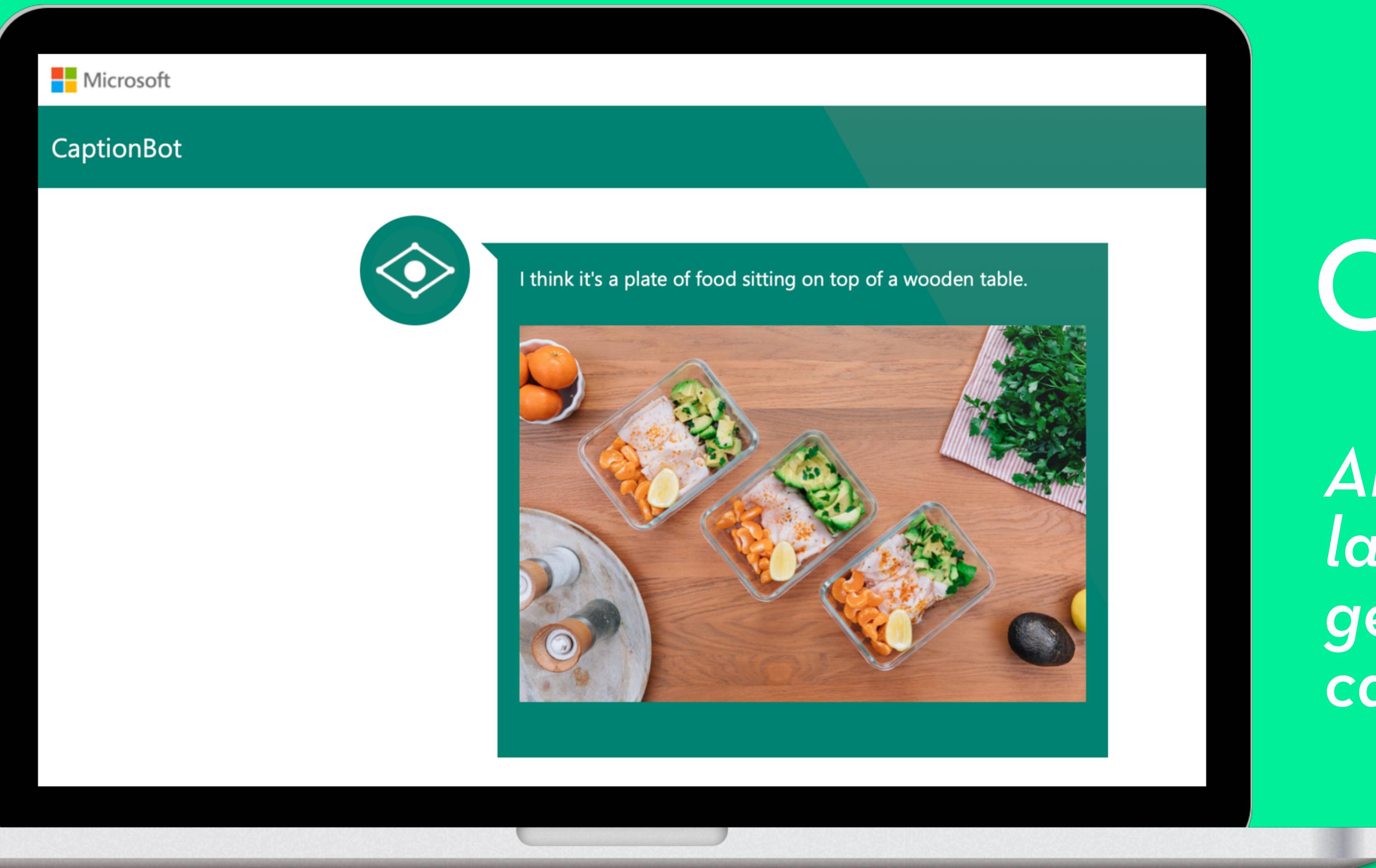


Layer 5



*Now you're an expert
(seriously)*





CaptionBot.ai

An automated image-labelling service that generates plausible caption sentences

CaptionBot.ai

An automated image-labelling service that generates plausible caption sentences



DrawingBot

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

DrawingBot

Believe it or not, we create digital art.

We have created a bot capable of creating an image based on the description of a user, pixel by pixel, from scratch, also returning the sequence of the process from a low resolution image to the final art.

Create your novel image now!

Enter the description of a **bird**, example: "This bird has wings that are blue and has a red belly".

this is a large red bird with short wings

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 web application. At the top, there's a blue header bar with the text "Performance RNN". Below it, 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%)". In the center, there's a piano-roll style visualization showing note on/off events for various keys. Below this are buttons for "Reset RNN", "Save Preset 1", "Save Preset 2", and "Preset 1" and "Preset 2". A dropdown menu for "midi in" is set to "none". A message below says "No midi output devices found.". At the bottom, there's a piano keyboard graphic and the Magenta logo.

Performance RNN

Conditioning

On

Off

Note Density (4)

Gain (25%)

C C# D D# E F F# G G# A A# B

C Major F Major D Minor Whole Tone Pentatonic Preset 1 Preset 2

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

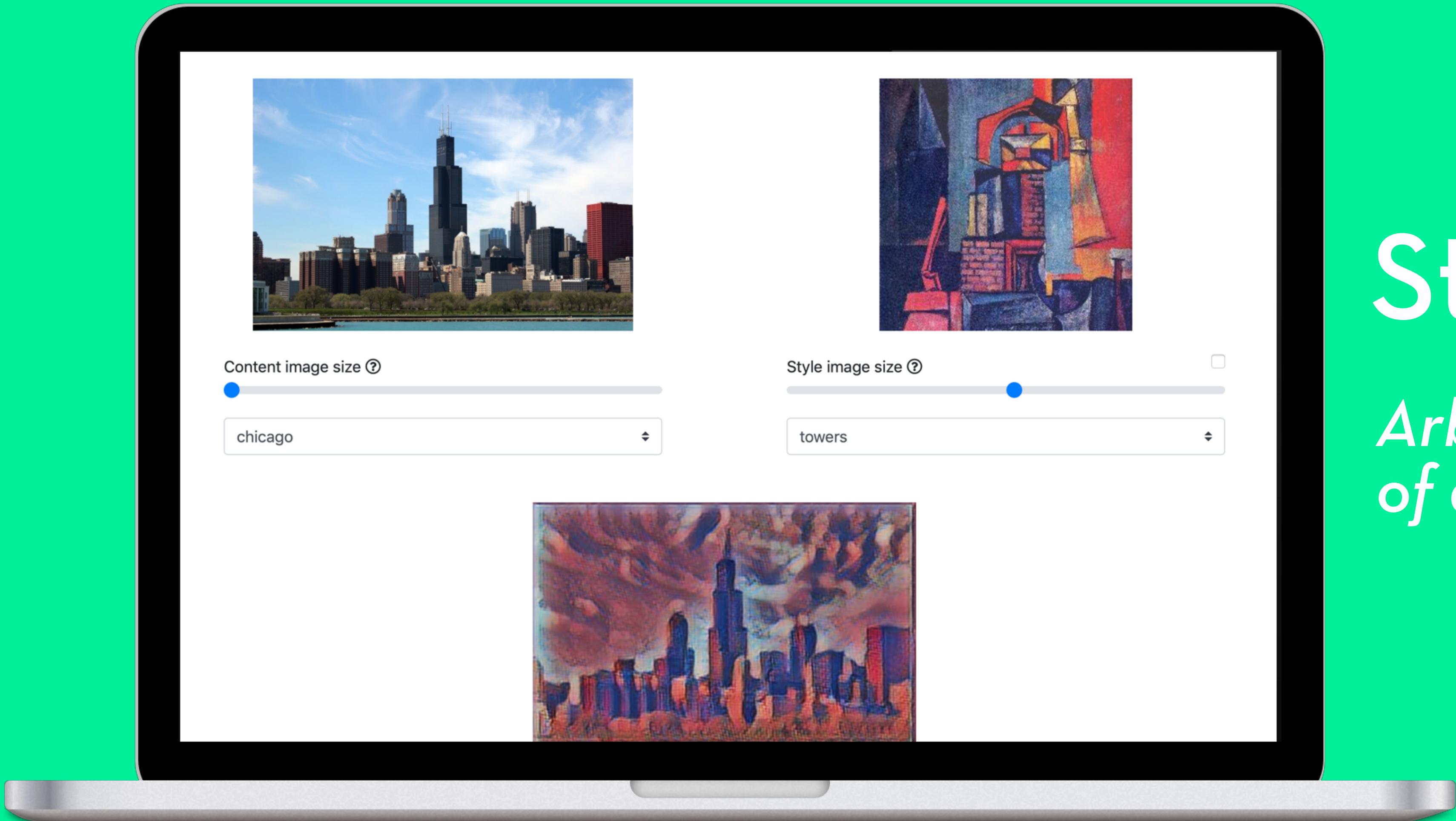
PerformanceRNN

*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?