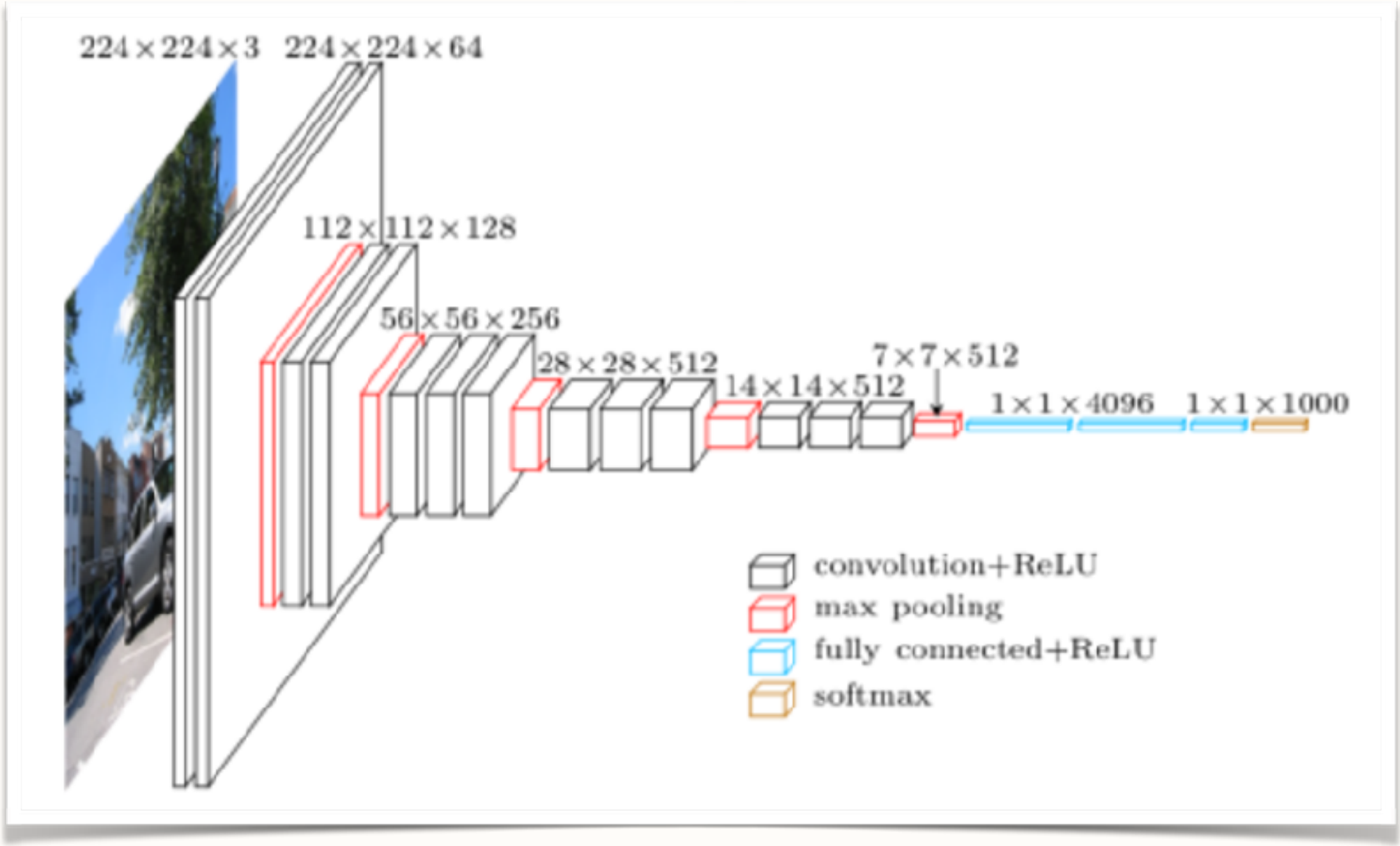
Deep Learning Needs Clojure

Carin Meier - Cognitect
@gigasquid

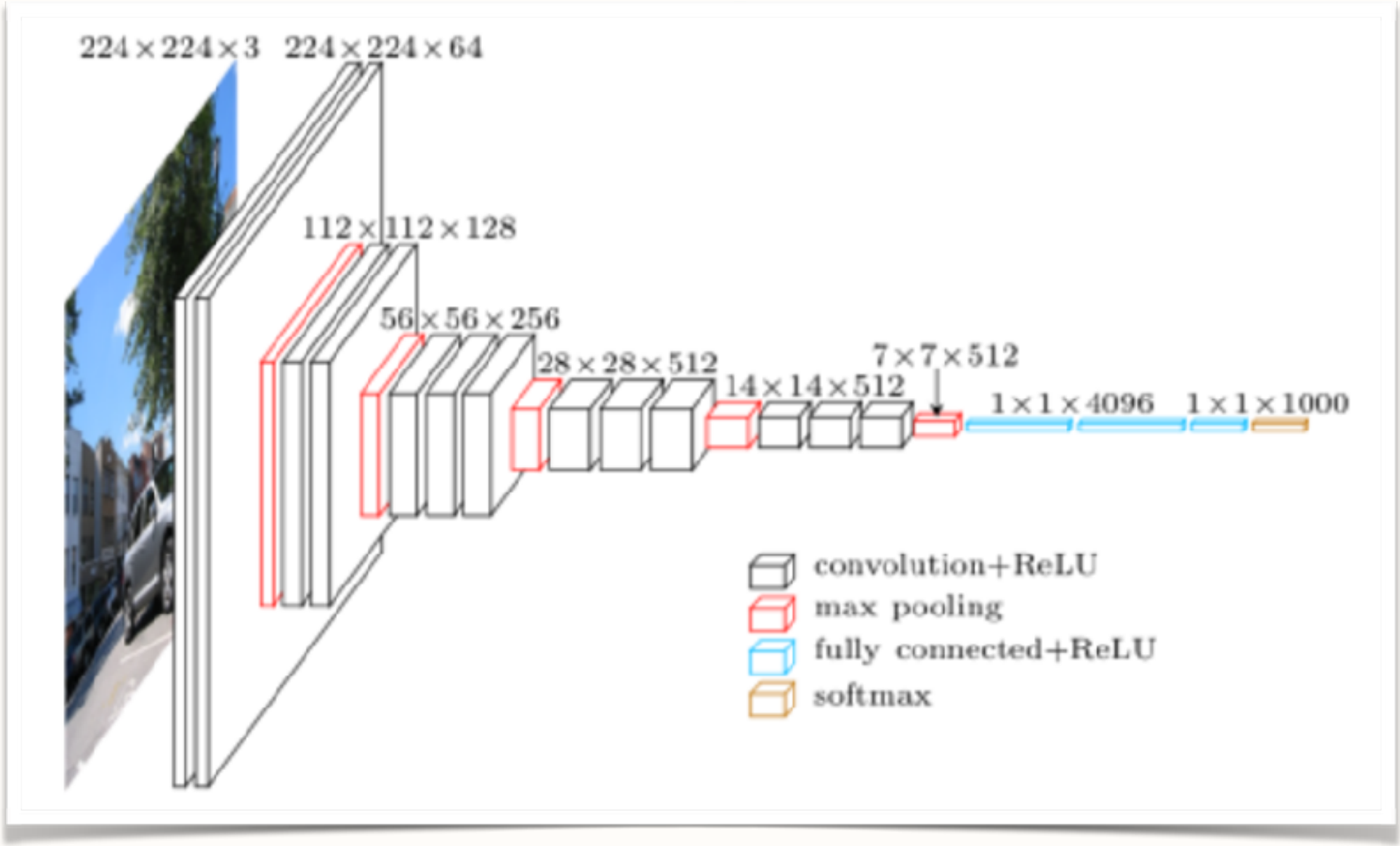
Thank You for Coming

Why should you care about Deep Learning?

Why should you care?

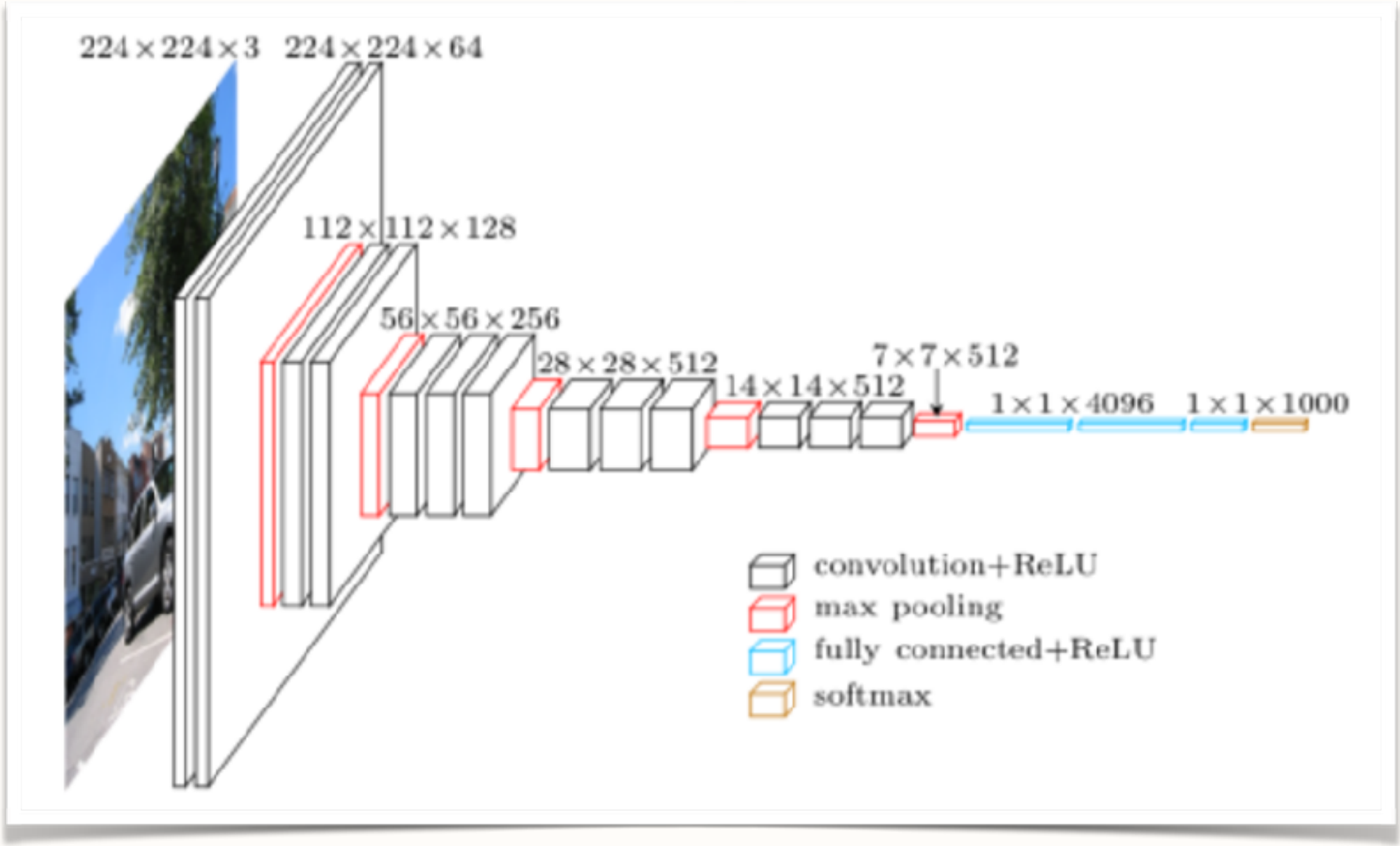


Why should you care?



Recognize Images

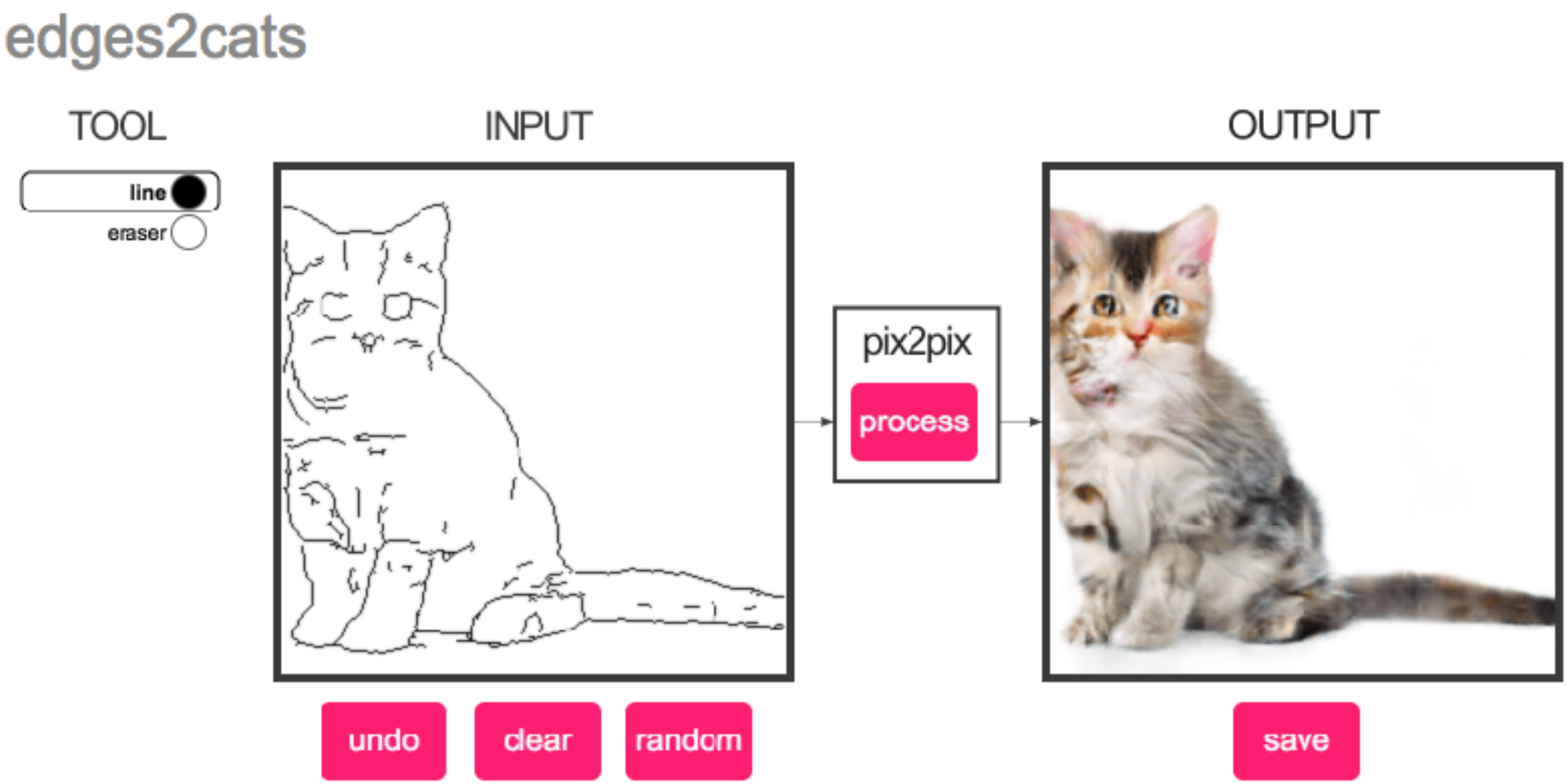
Why should you care?



Drive Cars

They can also create!

Why should you care?



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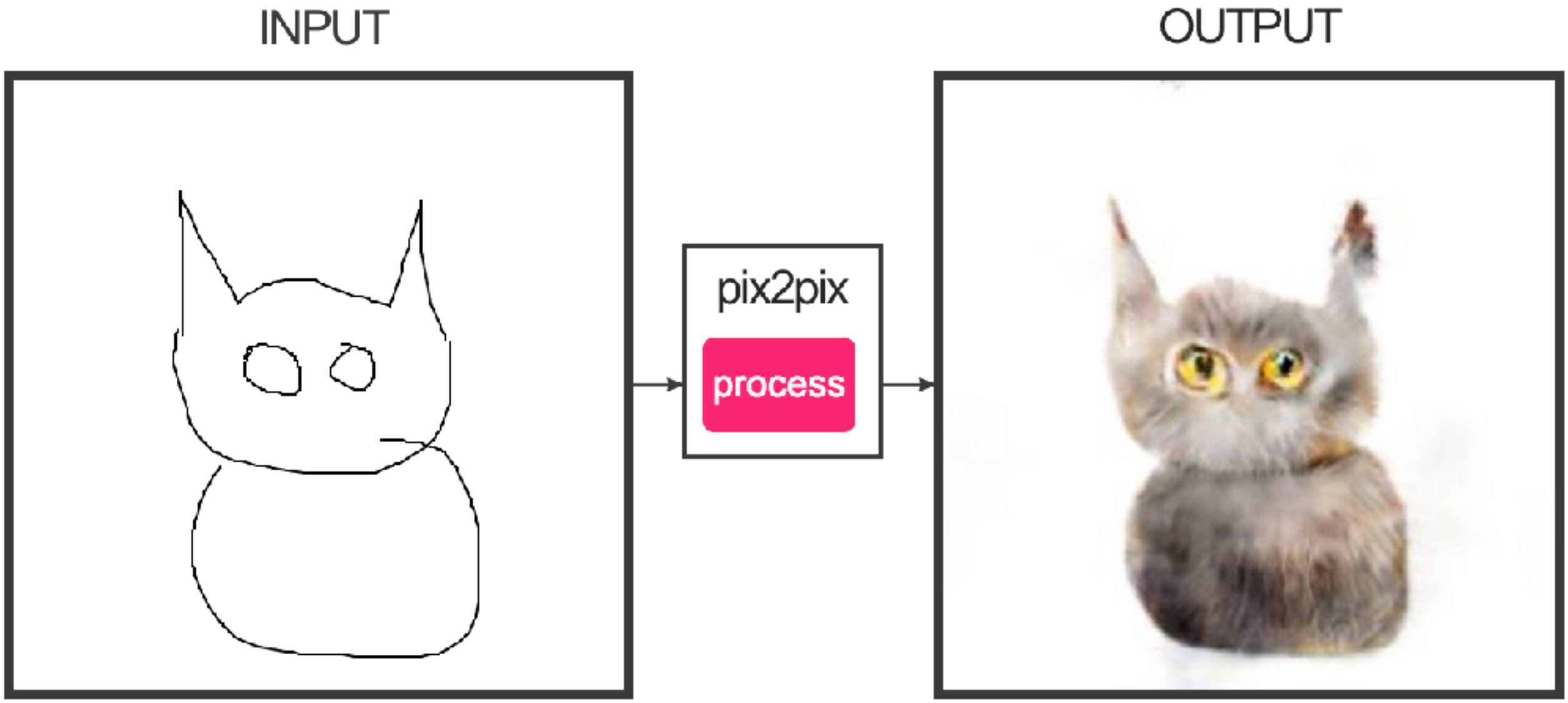
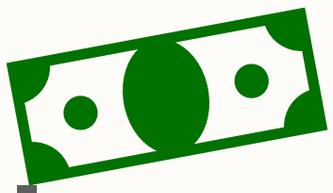


Why should you care?

Incredible Energy and Innovation going on!

Why should you care?



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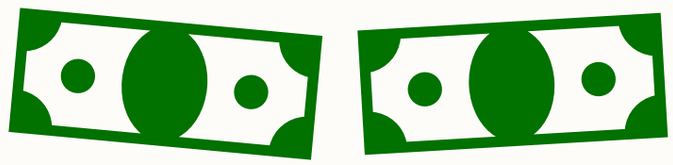


Why does Deep Learning need Clojure?

EARTH NEEDS LISPERS

As We May Program - Peter Norvig

EARTH NEEDS LISPERS

Machine Learning System

Bottoms up/ ML
Probabilistic

Rest of the Programming World

Top down
Logic/constraint/ flow

EARTH NEEDS LISPERS

Flexibility in
Language Design

EARTH NEEDS LISPERS

Flexibility in Language Design

Syntax different than semantics and control flow

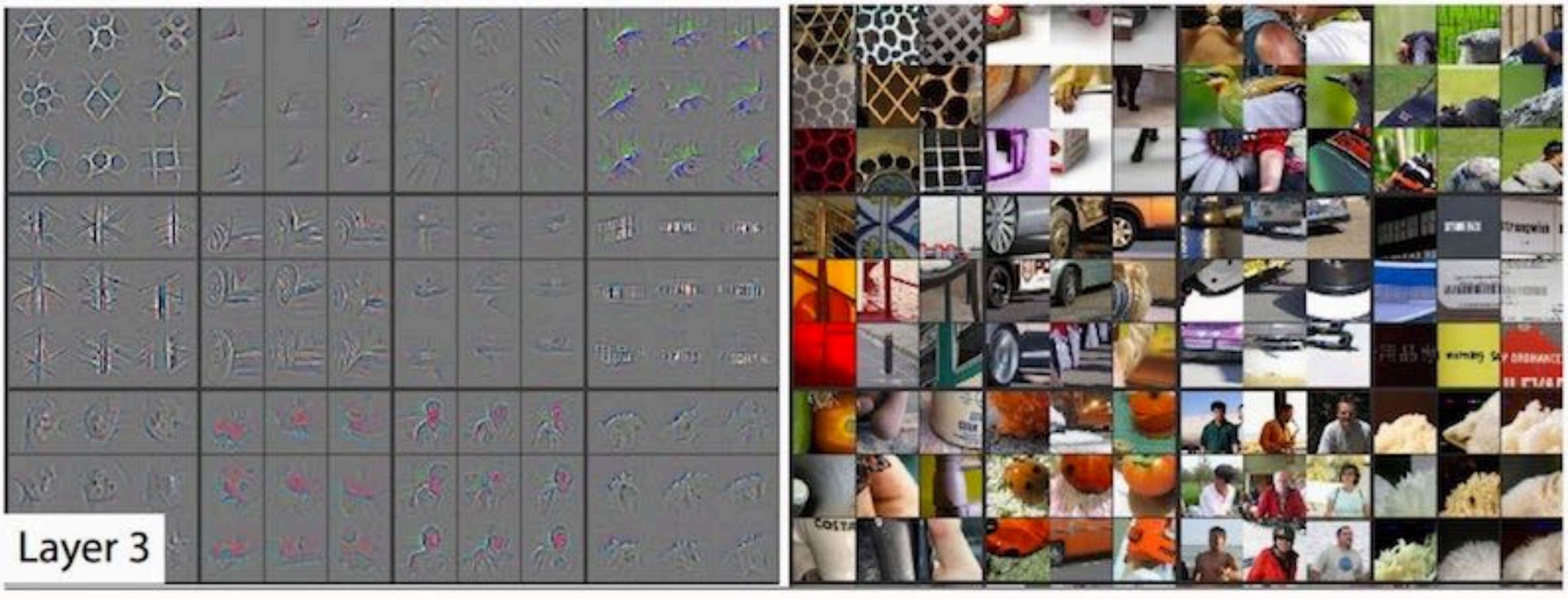
EARTH NEEDS CLOJURE

Clojure has features that other languages do not

DEBUGGING

Black Box

DEBUGGING



DEBUGGING

Persistent Data
Structures

DEBUGGING

Persistent Data Structures

Time Travel

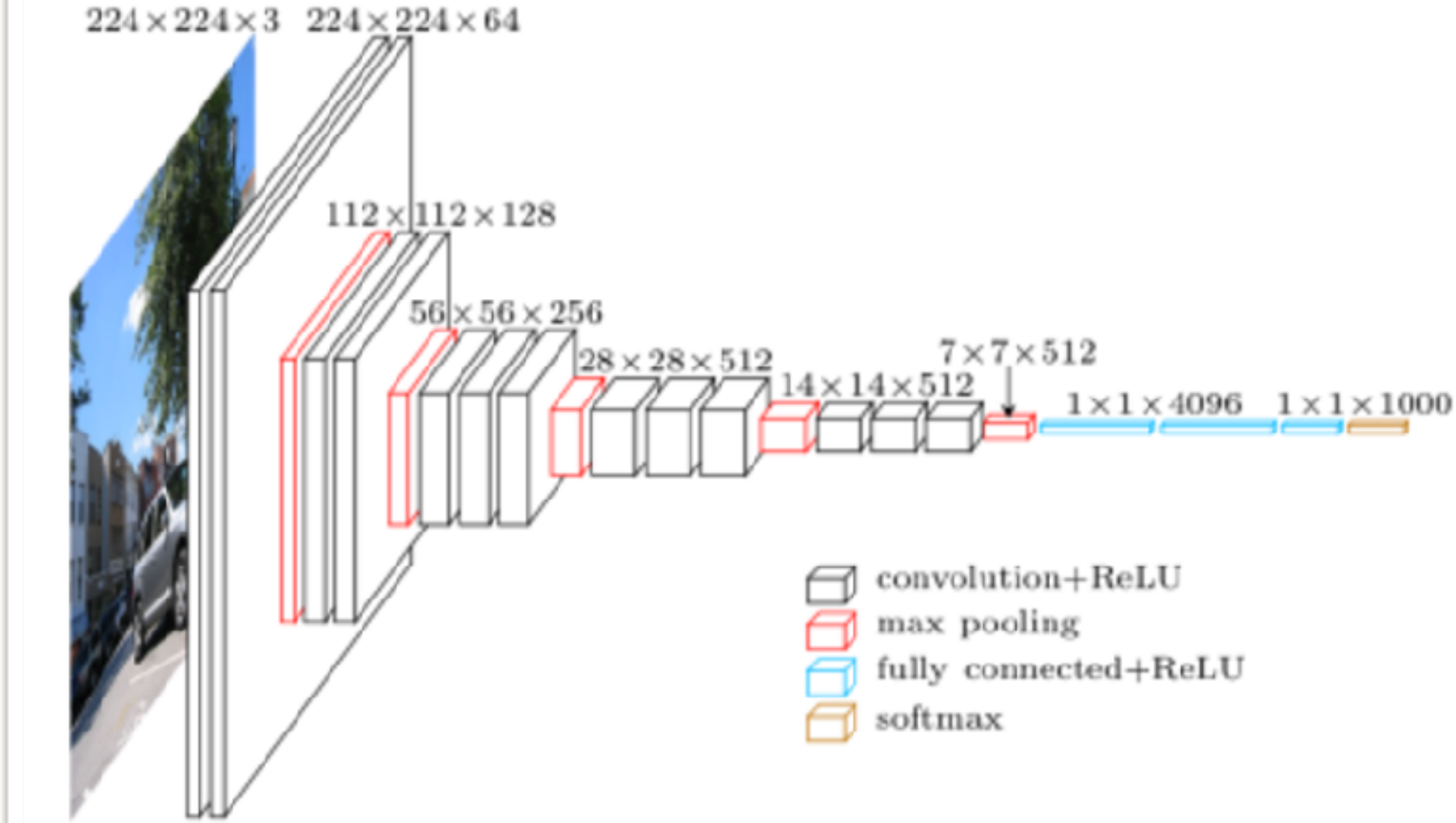
DEBUGGING

Persistent Data Structures

Time Travel

REPL

clojure.spec



Takes a lot of skill and hand tuning

```clojure

(s/def ::layer (s/or :conv ::convolutional
                     :maxp ::max-pooling
                     :drop ::dropout
                     :mutld ::multiplicative-dropout
                     :relu ::relu
                     :prelu ::prelu
                     :bn ::batch-norm
                     :lin ::linear
                     :lrn ::local-response-norm))

(s/def ::layers (s/coll-of ::layer :min-count 1 :max-count 4))

```

Spec it

Generate Networks with spec

Generate Networks with spec

Use Genetic Programming

Use Genetic Programming

```
Greeting please wait while we load all the MNIST data ...
The simulation will write the results of every gen to creature-report.txt
Running sim with pop-size 20  max-gen 5  tournament-size 4
Loading mnist training dataset.
Done loading mnist training dataset in 21.803s
Loading mnist test dataset.
Done loading mnist test dataset in 4.333s
Ensuring image data is built, and available on disk.
Building dataset from folder: mnist/training
Building dataset from folder: mnist/test
============================
=
=
=    Generation 0
=
=
============================
Recording results
= Working on creature  1
Training network:

```

Use Genetic Programming

```
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============================
=
=
=    Generation 0
=
=
============================
Recording results
= Working on creature  1
Training network:

```

Use Genetic Programming

```
[(layers/input 28 28 1 :id :data)
  (layers/convolutional 5 3 1 3)
  (layers/convolutional 5 3 1 3)
  (layers/convolutional 2 0 1 2)
  (layers/convolutional 5 3 1 3)
  (layers/linear 10)
  (layers/softmax :id :labels)]
```

clojure.spec

Other possibilities

clojure.spec

Can a spec be a classifier?

```
(s/def cat  )
```

clojure.spec

Can a spec be a GAN?

```
(s/exercise cat);=>
```

It’s great

Let’s go!

Not so fast

Aggregate popularity (30•contrib + 20•issues + 3•forks + 1•stars)•1e-3

#1:	377.51	tensorflow/tensorflow
#2:	174.15	fchollet/keras
#3:	143.84	BVLC/caffe
#4:	128.26	dmlc/mxnet
#5:	72.85	Theano/Theano
#6:	69.32	Microsoft/CNTK
#7:	67.30	deeplearning4j/deeplearning4j
#8:	61.54	baidu/paddle
#9:	54.07	pytorch/pytorch
#10:	29.65	pfnet/chainer
#11:	29.35	torch/torch7
#12:	29.33	NVIDIA/DIGITS
#13:	28.42	tflearn/tflearn
#14:	28.09	caffe2/caffe2
#15:	21.41	davisking/dlib

so much energy and innovation going on

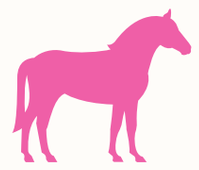
it's hard to keep up

- JVM land/ Clojure :(

Consume Java Libs

Consume Java Libs
Consume JavaScript libs

Consume Java Libs
Consume JavaScript libs
Consume Python libs



Insert Pony

The Way Forward

JVM - Deeplearning4J

Pure Clojure - Cortex

Tensorflow bindings - Guildsman

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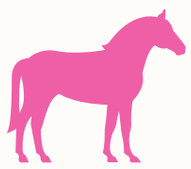
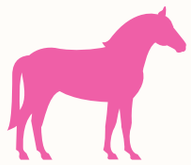
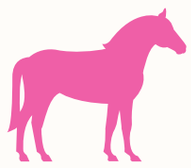
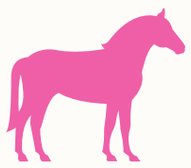


Any magical ponies?

Magical Pony?



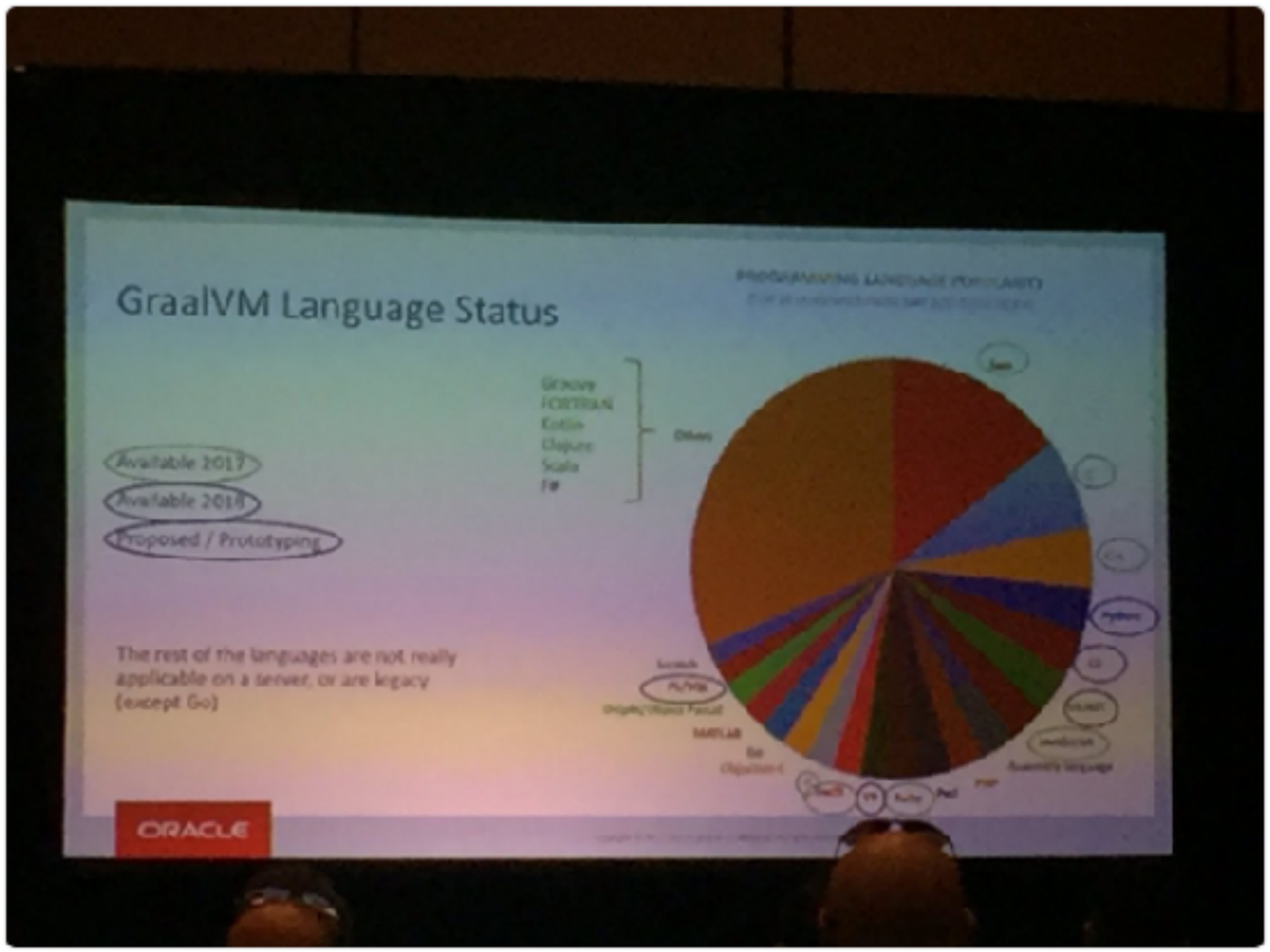
Graal VM & Truffle

Ruby  Clojure  C

Y. S. Ramakrishna
@ysr1729

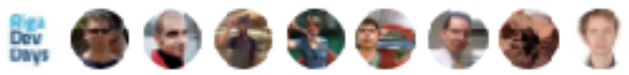
Follow

#JavaOne2017 #EricSedlar and @thomaswue : Graal VM w/Truffle will run Python in 2018



2:32 PM - 3 Oct 2017 from San Francisco, CA

5 Retweets **17** Likes



Eric Sedlar and JavaOne Conference

1 5 17

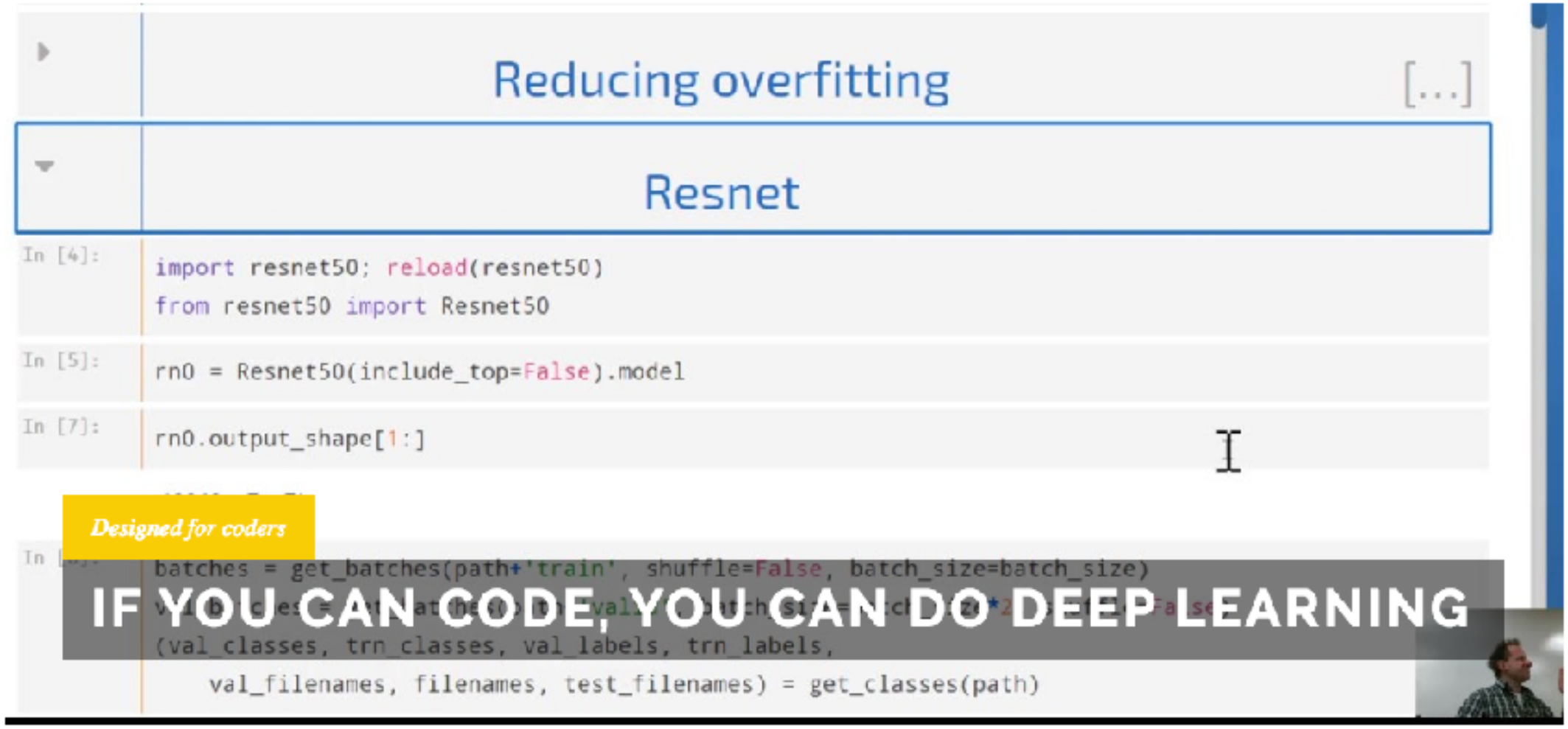
How can you get Involved?

Welcome to fast.ai's 7 week course, **Practical Deep Learning For Coders, Part 1**, taught by Jeremy Howard (Kaggle's #1 competitor 2 years running, and founder of Enlitic). Learn how to build state of the art models without needing graduate-level math—but also without dumbing anything down. Oh and one other thing... it's totally free!

When you're done here, head over to part 2, Cutting Edge Deep Learning for Coders, to continue your learning.

"fast.ai... can actually get smart, motivated students to the point of being able to create industrial-grade ML deployments"

Harvard Business Review
The Business of Artificial Intelligence



Learn from the Python deep learning ecosystem

Be inspired by what Clojure can bring to it

Seek bridges and collaboration

Deep Learning is an exciting place to be right now!

Deep Learning needs Clojure and you